Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3

Response to Comments

United States
Environmental Protection
Agency

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Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

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EPA-420-R-24-007
March 2024

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			large Charlotte, NC; Dow Constantine, King County Executive Seattle, WA; Dr. Ajay V. Raman, Oakland County Commissioner, District 14 Novi, MI; Elliott Payne, Council Member Minneapolis, MN; Erica Briggs, Council Member Ann Arbor, MI; Jason Chavez, City Council Member, Ward 9 Minneapolis, MN; Jeffrey Joneal Lunde, Hennepin County Commissioner Brooklyn Park, MN; John Hayes, Chair, Sustainability, Energy, and Resiliency Committee, Salem, MA; John Odell, Chief, Department of Sustainability & Resilience, Worcester, MA; Katherine Golub, City Councilor Greenfield, MA; Kelli Curtis, Council Member Kirkland, WA; Kelly Rae Kirkpatrick, Council Member Rochester, MN; Kristen Nelson, Oakland County Commissioner Waterford, MI; Marion Greene, Hennepin County Commissioner Minneapolis, MN; Martha Simon, School Committee Member Burlington, MA; Mayor Angela Birney Redmond, WA; Mayor Cassie Franklin Everett , WA; Mayor Chance Cutrano Fairfax, CA; Mayor Christopher Taylor Ann Arbor, MI; Mayor Devin T. Murphy Pinole, CA; Mayor Jacob Frey Minneapolis, MN; Mayor John J. Bauters Emeryville, CA; Mayor Kim Norton Rochester, MN; Mayor Mason Thompson Bothell, WA; Mayor Matt Mahan San Jose, CA; Mayor Melvin Carter Saint Paul, MN; Mayor Mike Nelson Edmonds, WA; Mayor Penny Sweet Kirkland, WA; Mayor Pro Tem Braxton Winston Charlotte, NC; Mayor Pro Tem Travis Radina Councilmember, Ward 3, Ann Arbor, MI; Mayor Viola Lyles Charlotte, NC; Michael Bettencourt, Select Board Member Winchester, MA; Mitra

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			Jun Jalali, Council Member Saint Paul, MN; Robin Wonsley, Council Member, Ward 2 Minneapolis, MN; Ryan N. Mello, Chair, Pierce County Council Tacoma, WA; Samantha Perlman, City Councilor Marlborough, MA; Teresa Mosqueda, Council Member Seattle, WA; Trista Matas Castillo, Chair, Ramsey County Board of Commissioners, St. Paul, MN
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1 Introduction

EPA's Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles - Phase 3 was signed by Administrator Michael Regan on April 11, 2023. A pre-publication version of the proposal was made available on EPA's website on April 12, 2023, after Administrator Regan's announcement of the program but prior to publication of the proposal in the Federal Register on April 27, 2023 (88 FR 25926 et seq.). The proposal indicated that the rule would be open for public comment until June 16, 2023. The Docket ID No. for the rule is EPA-HQ-OAR-2022-0985.

This Response to Comments (RTC) document is a compilation of public comments submitted to the public docket for this rule as well as EPA responses to those comments. Some aspects of our responses appear in the preamble to the final rule or other documents in this rule's docket and are incorporated by reference in this document.

This RTC document is organized by category of comment topic. The original documents submitted by commenters, including any attachments, footnotes, tables, and figures, are included in the docket.

More than 172,000 written comments were submitted to the public docket for this proposal.[1] The vast majority of these, about 170,500 comments, were submitted in the form of 29 mass comment campaigns. Some of these are identical letters submitted by many individuals, while others consist of a petition with many signatures. The vast majority of comments submitted in the form of mass comment campaigns express general support for the proposed rule or urge EPA to adopt even more stringent standards to reduce greenhouse gas emissions from heavy-duty engines and vehicles, although some other mass comment campaign commenters urged EPA not to adopt the proposal. More information about the mass comment campaigns can be found in Appendix B to this RTC document.

There were nearly 1,200 other, individual comments on the proposal submitted to the public docket by individuals, organizations, companies, or government entities. Many of these comments express support for the proposal or urge EPA to adopt more stringent standards, although some express concern with or opposition to its adoption.

Of these comments, nearly 150 comments provide specific information and feedback about particular data or assumptions used in EPA's analysis supporting the proposal or other aspects of the proposal. A list of these comments can be found at the beginning of this RTC document. They are reproduced verbatim, in excerpts, in the following sections, organized by issue topic. Each section includes a summary of the comments received on that topic and EPA's response. Note that an individual comment or part of an individual comment submitted by a particular commenter may be reproduced in more than one section of this document if it contains observations on more than one aspect of an issue. It is worth noting that if a comment has been reproduced in more than one section it may be addressed in only one of those sections. Conversely, an individual comment that touches on several issues may not be duplicated verbatim across this document if the same issues were raised by other commenters. In other

[1] The total numbers of comments excludes a mass comment campaign that was submitted twice to the docket (EPA-HQ-OAR-2022-0985-1540, identical to EPA-HQ-OAR-2022-0985-2155, 756 signatures).

words, the responses contained in this document reply to the comments raised in the public process and are not solely to the specific commenters' verbatim comments that precede the responses in the document.

An additional 1,000 additional individual comments on the proposal express general support for or opposition to the proposal and/or contain opinions or statements about issues but without detailed data, information, or comment relating to specific provisions of the proposal or EPA's supporting analysis. These comments are not reproduced verbatim in this document because they do not raise issues with reasonable specificity. However, we note that we have provided a detailed rationale for the final rule in the preamble and that, to the extent the same issues were raised by other commenters with reasonable specificity, they are addressed in our responses in this document. These comments are listed in Appendix A along with a brief description of their overall nature.

EPA held a public hearing on the proposal, and the transcript of that hearing is included in the docket (EPA-HQ-OAR-2022-0985-2666). During the 2-day public hearing (May 2 and 3, 2023), 213 individuals testified. Appendix C contains a list of the testifiers and a brief description of the overall nature of the testimony. If public testimony provides information that is specific in nature and was not subsequently included in written comments submitted by the testifier or the testifier's organization, that statement is included verbatim in this RTC document.

Comments received after the comment period closed were considered to the extent practicable, and those received through July 18 are included in the various sections of this RTC document. Additional comments that were received after July 18, 2024, are set out in Section 29.

The proposed rule included proposed revisions to the locomotive preemption regulations at 40 CFR part 1074; comments on those changes were submitted to the docket for this rule. EPA finalized the changes to the locomotive preemption regulations in a separate final rule (88 FR 77004, November 8, 2023). The comments pertaining to the proposed locomotive preemption regulation are addressed in that rulemaking.

The responses presented in this RTC document are intended to augment the rationale and responses to comments that appear in the preamble to the final rule and to address comments not discussed in the preamble to the final rule. To the extent there is any confusion or apparent inconsistency between this RTC document and the preamble, the preamble itself remains the definitive statement of the rationale for the final rule. This document, together with the preamble to the final rule and the information contained in the Regulatory Impact Analysis, and related technical support documents, should be considered collectively as EPA's response to all of the significant comments submitted on the proposal.

2 CO_2 Standards

2.1 Legal Authority

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

AVE supports EPA's goal to reduce emissions from the heavy-duty vehicle segment of the transportation sector. The automotive supplier community provides solutions to develop cost-effective technologies to meet current and future emissions standards. AVE members appreciate the continued partnership with EPA in advancing vehicle technologies through meaningful standards that make a difference to the country's environmental goals, innovation, and economy. [EPA-HQ-OAR-2022-0985-1571-A1, p. 1]

AVE requests that EPA seek to maximize immediate environmental gains by implementing greater flexibility into the Proposal's ZEV definition. [EPA-HQ-OAR-2022-0985-1571-A1, p. 2]

Considering the need for significant and immediate greenhouse gas (GHG) reductions, the current definition of ZEVs serves as a barrier to automotive technologies that can deliver significant real-world emission reductions. It serves as a de facto technology mandate and undermines our national effort to dramatically reduce emissions. [EPA-HQ-OAR-2022-0985-1571-A1, p. 2]

EPA's goal should be to reduce emissions from ALL new trucks since it is estimated that in 2050 over 70% of our energy consumption will continue to come from petroleum and natural gas.4 This is another reason why EPA should do more to incentivize all technology options and to further the development of the renewable fuels market. [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

4 U.S. Energy Information Administration, Annual Energy Outlook 2022 (AEO2022)

AVE requests that EPA finalize a proposed rule that is truly technology neutral. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

Despite claims of technology neutrality, the Proposal incentivizes specific technologies, including BEVs and hydrogen fuel cell powered vehicles. AVE supports the development of these important technologies, but our concern with such a pathway is well-established: An incentive for one technology proves to be a disincentive for other technologies. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

To fully meet our environmental goals as a nation, EPA should encourage technology investments in ALL heavy-duty truck platforms that significantly reduce CO2. Heavy-duty trucks sold today will remain on American roads for decades. Only focusing on how many BEVs may be produced will ignore the need for reducing emissions from all other trucks. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

Compliance pathways that incentivize the increased use of renewable fuels, advanced emission control technologies, and new internal combustion platforms, will accelerate investment and fleet turnover with cost-effective technologies that are ready to be adopted today, not eight to ten-years from now. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

Furthermore, we should not base the success or failure of our environmental goals on the public statements made by manufacturers and fleet owners. The Proposal should provide alternatives for manufacturers to reach compliance if the proposed standards are not achievable with only ZEV production. Incentivizing the production and use of renewable and low-carbon fuels and cleaner engine systems will offer greater emissions reduction and be a strong hedge against the unknowns we face as the heavy-duty fleet attempts to decarbonize. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

The challenge of decarbonizing heavy-duty trucks demands action and hydrogen-powered vehicles should be a part of the clean transportation solution because they are scalable, clean, and affordable. All technology solutions should be implemented in parallel to address the urgent need to solve the climate crisis. [EPA-HQ-OAR-2022-0985-1571-A1, p. 6]

Organization: Allison Transmission Inc.

Allison supports the EPA in developing durable regulations that provide certainty to our industry, our supply chain, and our customers and that enables development of new technologies such as BEV, FCEV, and ICE powered by renewable net-neutral fuels. [EPA-HQ-OAR-2022-0985-1657-A2, p. 1]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

We are deeply concerned about the federal government's ongoing push to mandate the electrification of the American vehicle fleet. While electric vehicles are a promising technology, the attempt to mandate electrification rather than to improve efficiency and reduce emissions through realistic, technology-neutral standards is both bad policy and, in many instances, contrary to law. Unfortunately, this proposal exemplifies both problems. [EPA-HQ-OAR-2022-0985-1660-A1, p. 2]

EPA should not press forward with finalizing an unlawful, irrational rule that cannot succeed and is unlikely to survive judicial scrutiny. The agency should instead engage meaningfully with all affected stakeholders to develop sound, workable measures to address vehicle emissions. [EPA-HQ-OAR-2022-0985-1660-A1, p. 6]

DISCUSSION

EPA should not and cannot lawfully adopt the Heavy-Duty rule it has proposed. EPA lacks statutory authority to remake the motor-vehicle industry, a massive segment of the Nation's economy and daily life, by forcing manufacturers to produce electric and other zero-emission vehicles. Even if EPA had such authority, the approach it has proposed in the Heavy-Duty rule is arbitrary and irrational at every turn. The transformation it would mandate is not feasible, especially on the proposed truncated timeline. EPA's projections of resulting emissions reductions are unreliable, and its approach to assessing compliance is illogically selective and sets the rule up for failure. EPA's cost-benefit analysis also suffers multiple fatal defects, and the proposed rule fails to address obvious, more workable alternatives. Finally, by expanding the issues on which California may (with EPA's future blessing) develop its own idiosyncratic (and even more aggressive) regulatory framework, the proposed rule exacerbates existing tension between the Clean Air Act and the Constitution. EPA should not press forward with its unlawful and unrealistic Heavy-Duty rule. It should instead engage meaningfully with stakeholders to develop permissible, viable solutions to GHG emissions. [EPA-HQ-OAR-2022-0985-1660-A1, p. 8-9]

And it will have profound impacts on national security by forcing the American truck and engine manufacturing industry to depend on critical minerals coming from foreign suppliers, with geopolitical challenges—most notably, China—rather than a domestically-abundant and secure resource. EPA should, but does not, address the market constraints for foreign sources of critical minerals needed to produce EV batteries and copper for transmission wiring.25 These issues go well beyond EPA's expertise, and the Agency is not positioned to fully grapple with the consequences that such a rapid push for ZEV will have across the nation. EPA can only proceed with the Proposed Rule if Congress bestowed clear authorization to do so. But Congress did not. [EPA-HQ-OAR-2022-0985-1659-A2, p. 9]

25 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions (March 2022), available at https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf; James Fernyhough, Copper Mine Flashes Warning of 'Huge Crisis' for World Supply, Bloomberg News, May 2, 2023.

DISCUSSION

I. The Proposed Rule Exceeds EPA's Statutory Authority

Like every agency, EPA "'literally has no power to act' ... unless and until Congress authorizes it to do so by statute." FEC v. Ted Cruz for Senate, 142 S. Ct. 1638, 1649 (2022) (citation omitted). Moreover, under the major-questions doctrine, given the nature and breadth of the power EPA claims to reshape a large sector of the economy, congressional authorization would have to be unmistakably clear. But nothing in the Clean Air Act plausibly—let alone clearly—authorizes EPA to mandate replacing a particular percentage of internal- combustion-engine vehicles with a different category of vehicles that themselves emit no GHGs at all. [EPA-HQ-OAR-2022-0985-1660-A1, p. 9]

A. The Forced Electrification Of The Country's Heavy-Duty Vehicles Is A Major Question

For the first time, EPA has proposed heavy-duty vehicle-emissions standards that it recognizes cannot be met by internal-combustion-engine vehicles alone. Instead, as EPA forthrightly admits, its proposed Heavy-Duty rule (like its proposed Light- and Medium-Duty rule) would compel manufacturers to transform their heavy-duty vehicle fleets, by increasing the percentage of electric vehicles from zero percent today to between 25 and 57 percent by 2032. See 88 Fed. Reg. at 25,932, 25,940. That is the proposed rule's purpose, consistent with the Administration's avowed goal "that 100 percent of all new medium and heavy-duty vehicles sold in 2040 be zero-emission vehicles, with an interim 30 percent sales target for these vehicles in 2030."1 [EPA-HQ-OAR-2022-0985-1660-A1, pp. 9 - 10]

1 FACT SHEET: Biden-.Harris Administration Proposes New Standards to Protect Public Health that Will Save Consumers Money, and Increase Energy Security, White House Briefing Room (Apr. 12, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/12/factsheet-biden-harris-administration-proposes-new-standards-to-protect-public-health-that-willsave-consumers-money-and-increase-energy-security/.

EPA's proposal "to substantially restructure" a major sector of the American economy implicates the major-questions doctrine, under which EPA must identify "'clear congressional authorization' for the power [EPA] claims." West Virginia v. EPA, 142 S. Ct. 2587, 2609–10 (2022) (citation omitted). The Supreme Court formally recognized and applied the major-questions doctrine last Term in West Virginia, which rejected a similarly aggressive assertion of regulatory power by EPA under the Clean Air Act. Under West Virginia and in a long line of cases predating it, the proposed rule here presents a major question, for at least three reasons. [EPA-HQ-OAR-2022-0985-1660-A1, p. 10]

First, EPA has claimed a power of "vast economic . . . significance," West Virginia, 142 S. Ct. at 2605 (citation omitted): the power, in effect, to phase out internal-combustion-engine heavy-duty vehicles in favor of electric vehicles. The financial consequences alone are staggering: EPA's own estimates project that the rule will have a net effect of $320 billion, much more than in West Virginia. 88 Fed. Reg. at 26,081; cf. Ala. Ass'n of Realtors v. HHS, 141 S. Ct. 2485, 2489 (2021) (per curiam) (noting that the "sheer scope" of the agency's "claimed authority . . . counsel[s] against the Government's interpretation"). The economic significance of the proposed rule extends beyond those immediate financial effects. A shift of this scale would have spillover effects on the broader economy that EPA's projections do not even attempt to capture. For example, in addition to those who manufacture and purchase conventional vehicles, the proposed rule would affect those who fuel them (oil, natural-gas, and biofuel producers), and in turn other sectors that depend on those products (from asphalt to lubricants). These effects would also spread to industries that rely on heavy-duty vehicles, such as the shipping, construction, and agricultural industries. From any standpoint, the "magnitude" of the "'unprecedented power over American industry'" EPA has claimed reflects a major question. West Virginia, 142 S. Ct. at 2612 (quoting Indus. Union Dep't, AFL-CIO v. Am. Petroleum Inst., 448 U.S. 607, 645 (1980)). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 10 - 11]

Second, the proposed rule wades deep into issues of "political significance" that are "the subject of an earnest and profound debate across the country." West Virginia, 142 S. Ct at 2613–14 (citations omitted). Congress is currently considering vehicle electrification. See, e.g., Pub. L. No. 117-58, §§ 25006, 40435, 40436, 135 Stat. 429, 845–49, 1050 (2021) (requiring reports on "the cradle to grave environmental impact of electric vehicles" and supply-chain impacts). Proposals have been introduced, for example, to impose electric-vehicle mandates, but none thus far has made it out of committee. See, e.g., Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong.; Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. That Congress has "considered and rejected" such proposals is a sign that EPA is "attempting to 'work around' the legislative process to resolve for itself a question of great political significance." West Virginia, 142 S. Ct. at 2620–21 (Gorsuch, J., concurring) (brackets and citations omitted). Just recently, 151 members of the U.S. House of Representatives, led by the Energy and Commerce Committee Chair, joined a letter urging EPA to rescind these proposed emissions standards—calling them an effort to "commandeer America's transportation sector and force its complete vehicle electrification under the guise of mitigating climate change." Letter from Rep. Cathy McMorris Rodgers et al. to Adm'r Michael S. Regan, at 1 (May 22, 2023). [EPA-HQ-OAR-2022-0985-1660-A1, p. 11]

Third, EPA's assertion of authority here is an "unheralded power representing a transformative expansion in its regulatory authority." West Virginia, 142 S. Ct. at 2610 (quotation marks omitted). Although EPA has long set emissions standards with which manufacturers must comply, until recently it has treated shifting to electric vehicles merely as one “option” manufacturers may select that provides them “flexibility” in meeting much less radical emissions standards. See, e.g., 77 Fed. Reg. 62,624, 62,917 (Oct. 15, 2012); NRDC v. Thomas, 805 F.2d 410, 425 (D.C. Cir. 1986) (“EPA’s argument that averaging will allow manufacturers more flexibility in cost allocation while ensuring that a manufacturer’s overall fleet still meets the emissions reduction standards makes sense.” (emphasis added)). Unlike the proposed rule, prior heavy-duty emissions standards “were not in any way premised on the application of [zero-emission vehicle] technologies.” 88 Fed. Reg. at 25,957; see 88 Fed. Reg. 4296, 4304 (Jan. 24, 2023) (noting that standards in recent heavy-duty rule on criteria pollutants were “not based on projected utilization of [zero-emission vehicle] technology”). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 11 - 12]

Under the proposed rule, however, manufacturers will have no choice but to introduce a significant number of electric heavy-duty vehicles into their fleets to meet EPA’s stringent standards. EPA “based the proposed standards on technology packages that include both [internal-combustion-engine] and [zero-emission vehicle] technologies,” and it projects that by 2032, in order for manufacturers to comply with the standards, 50 percent of vocational vehicles, 35 percent of day-cab tractors, and 25 percent of sleeper-cab tractors will have to be electric. 88 Fed. Reg. at 25,933, 25,991. EPA’s projections of a massive shift to a new, “non-emitting” category of motor vehicles belie its suggestion that the proposed rule amounts to business as usual and merely continues a longstanding regulatory approach. See id. at 25,929. As in West Virginia, EPA has never previously claimed power to use emissions limitations to shift a significant portion of this industry from one technology to another. Its proposed rule thus embodies “an enormous and transformative expansion [of] EPA’s regulatory authority.” Util. Air Regul. Grp. v. EPA, 573 U.S. 302, 324 (2014). [EPA-HQ-OAR-2022-0985-1660-A1. p. 12]

Like EPA’s assertion of authority in West Virginia, its unprecedented claim of power in the proposed rule to reshape a major industry through emissions limitations presents a major question. EPA therefore lacks authority to promulgate the rule absent “‘clear congressional authorization’ for the power [EPA] claims.” West Virginia, 142 S. Ct. at 2609 (citation omitted). [EPA-HQ-OAR-2022-0985-1660-A1, p. 12]

CONCLUSION

For all of these reasons, EPA should not and cannot lawfully promulgate the Heavy-Duty rule it has proposed. The proposed rule would far exceed EPA’s statutory authority and is arbitrary and irrational in numerous respects. EPA should abandon this misguided approach and engage meaningfully with stakeholders to develop lawful, empirically supported alternative approaches. [EPA-HQ-OAR-2022-0985-1660-A1, p. 70-71]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

EPA contends President Biden’s Executive Order 14037, “Strengthening American Leadership in Clean Cars and Trucks,” necessitates the proposed changes, but an executive order cannot expand an agency’s statutory authority. Likewise, EPA cannot transform the carrot from Congress to voluntarily incentivize electric and fuel cell vehicle companies in the Inflation Reduction Act and Bipartisan Infrastructure Law into a regulatory stick to require the electrification of the transportation sector. The Proposed Rule far exceeds EPA’s authority under the Clean Air Act. In setting truck standards that diesel-powered trucks cannot meet, EPA is claiming authority to effectively ban ICEVs. However, Congress has never authorized and has specifically rejected legislation to phase out ICEVs. Moreover, EPA fails to account for impacts outside of the Agency's expertise and jurisdiction that would counsel against a ZEV mandate, such as impacts on the economy, the demand and stability of the electric grid, the U.S. refining and petrochemical industry, and national security. While the American Fuel & Petrochemical Manufacturers ("AFPM") supports cost-effective efforts to increase fuel efficiency and reduce the carbon intensity of transportation, we oppose a de facto mandate to a single compliance option—the production of ZEVs. Instead, AFPM endorses a cost-effective, technology-neutral approach for greenhouse gas emission standards that is authorized by Congress. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 1 - 2]

AFPM represents the U.S. refining and petrochemical industries. Our members are committed to sustainably manufacturing and delivering the fuels that power our transportation needs and enable our nation to thrive. We are further committed to finding ways to improve emissions from our nation's fleet of vehicles affordably and reliably. AFPM does not oppose ZEVs, which should be part of a diverse transportation future. AFPM seeks to maintain a level playing field. When considering the available suite of emission control technologies, EPA must pursue policies built on a holistic assessment of a vehicle's cradle-to-grave lifecycle emissions – the carbon intensity of different transportation fuels is only one component of that assessment. This approach requires a complete evaluation of the GHG emissions from heavy-duty vehicles. EPA's Proposed Rule fails to establish standards that take a comprehensive view of all available technologies and their associated environmental impacts. Instead, the Proposed Rule forces heavy-duty automotive electrification in a manner that both exceeds its statutory authority and employs arbitrary and capricious decision-making. [EPA-HQ-OAR-2022-0985-1659-A2, p. 2]

EPA's Proposed Rule must be put in context. The Agency takes this action as part of a "whole-of-government" effort to electrify the entire transportation sector. Contemporaneously to this proposal: (1) EPA published a proposed rule to extend and substantially increase greenhouse gas ("GHG") standards for light-duty vehicles; (2) the Department of Energy ("DOE") published a proposal to revise its regulations regarding calculating a value for the petroleum-equivalent fuel economy of electric vehicles ("EVs") for use in determining compliance with the Corporate Average Fuel Economy program; 4 (3) the Internal Revenue Service proposed regulations regarding the Inflation Reduction Act's New Clean Vehicle Credit; (4) the California Air Resources Board ("CARB") submitted to EPA a preemption waiver for CARB's Advanced Clean Cars II program, which requires all light-duty vehicles be electric, plug-in hybrid, or fuel cell by 2035; and (5) EPA issued waivers for California's Advanced Clean Trucks Regulation, the Zero Emission Airport Shuttle Regulation and the Zero-Emissions Power Train Certification Regulation. These actions represent a coordinated effort to completely transform the transportation sector. [EPA-HQ-OAR-2022-0985-1659-A2, p. 2]

4 88 Fed. Reg. 21525, 21526 (April 11, 2023).

EPA's Proposal Runs Afoul of the Major Question Doctrine

This rule requires 40-percent sales of zero-emission vehicles by 2032, up from 0.1 percent globally for heavy-duty trucks, and 4 percent globally for bus fleets.5 The Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles (Light-Duty Rule) would require close to 67 percent of new vehicles sold in model year 2032 to be ZEVs – a dramatic shift away from ICEVs.6 If promulgated, these proposals will comprehensively convert vehicle and vehicle parts manufacturing, eliminate U.S. refining of liquid fuels (including renewables), overhaul the electricity sector, require construction of a coast-to-coast charging infrastructure system, and nationwide decommissioning of approximately 145,000 fueling stations across the United States.7 The electrification required to implement the Heavy-Duty and the Light-Duty Vehicle proposals profoundly impacts national security by forcing the American truck and engine manufacturing industry to depend on critical minerals coming from foreign suppliers, most notably China - rather than utilize domestically-abundant and secure resources. The transformational shift of our nation's transportation and electricity sectors raise "major questions" of "vast economic and political significance" that must be addressed by Congress.8 As explained in these comments, Congress clearly conveys its preference to decarbonize liquid fuels through the Clean Air Act's Renewable Fuel Standard, and to incentivize, not mandate, ZEVs through the Inflation Reduction Act and the Bipartisan Infrastructure Law. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 2 - 3]

5 Trends in electric heavy-duty vehicles, IEA (2022).

6 Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,329.

7 American Petroleum Institute, Service Stations FAQs. https://www.api.org/oil-and-natural-gas/consumer-information/consumer-resources/service-station-faqs#:~:text=How%20many%20service%20stations%20are,are%20convenience%20stores%20selling%20fuel.

8 West Virginia v. Environmental Protection Agency, 142 S. Ct. 2587 (2022).

The Proposal is Contrary to the Clean Air Act and the Energy Independence and Security Act (EISA).

EPA lacks congressional authorization under the Clean Air Act to impose a single manufacturing-shifting standard to all vehicle classes. Section 202(a) of the Clean Air Act authorizes EPA to only set "standards" for "emission[s]" from "any class or classes of new motor vehicles or new motor vehicle engines, which . . . cause, or contribute to" the emissions of pollutants.9 EPA's emissions standards address solely tailpipe emissions for a single class of vehicles – ICEVs. EPA is authorized under the Clean Air Act to increase emissions standard stringency through lower-polluting fuels and installation or enhancement of vehicle emissions control technology. [EPA-HQ-OAR-2022-0985-1659-A2, p. 3]

9 Clean Air Act, Section 202(a).

EPA suggests a single fleet-wide emissions standard applicable to both ZEV and ICEV classes, but that cannot be met by ICEVs alone. There is nothing in the statute to support EPA's authority to allow averaging across vehicle classes. In fact, the Clean Air Act's regulatory structure contemplates EPA regulating each vehicle class separately. EPA also attempts to circumvent lead time requirements by not providing four full years that manufacturers need to meet new standards. [EPA-HQ-OAR-2022-0985-1659-A2, p. 3]

The Agency also violates the Clean Air Act's requirement to sufficiently evaluate ZEVs' real-world health and safety impacts. The docket is replete with documentation regarding the health effects of tailpipe emissions but is devoid of any discussion of the full lifecycle impact of ZEVs and the safety implications of significantly heavier ZEVs and the risks posed by their batteries. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 3 - 4]

II. Banning the Internal Combustion Engine is a "Major Question" that Congress did not Delegate to EPA.

The Proposed Rule goes beyond setting an appropriate and feasible GHG emissions standard for all vehicle classes; rather, it establishes standards that require the OEMs to sell increasing amounts of ZEVs and ultimately phase out ICEVs. Though EPA contends the proposed standards do not mandate a specific technology (e.g., battery electric vehicles ("BEVs")), it would be impossible for heavy-duty vehicle manufacturers to comply with the proposed standards unless they shift production to ZEVs. Consequently, the Proposed Rule obligates manufacturers to increase the percentage of ZEVs in their fleets at rates well in excess of market forces. EPA predicts that for MY 2032, ZEV adoption rates will be between 15–57% across all regulatory subcategories of vehicles covered by the Proposed Rule.16 This is a tremendous jump from the 0.2 percent of the heavy-duty vehicles ("HDV") that were ZEV certified by EPA in MY 2021.17 As a result, the Proposed Rule transforms the transportation system far beyond the authority delegated to the Agency by Congress. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 7 - 8]

16 U.S. Environmental Protection Agency, "Greenhouse Gas Emissions Standards for Heavy Duty Vehicles: Phase 3, Draft Regulatory Impact Analysis," pg. 245, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf [hereinafter, "RIA"].

17 Proposed Rule, 88 Fed. Reg. at 25,940.

The question of whether the U.S. government will order vehicle manufacturers to shift production to BEVs is a "major question" of economic significance that has not been delegated to any agency, let alone EPA. The "major questions doctrine" holds Congress must "speak clearly when authorizing an agency to exercise [such] powers" of "vast economic and political significance."18 And as EPA is aware, this doctrine applies in the context of environmental regulation. In West Virginia v. EPA, the Supreme Court relied on the major questions doctrine in holding that the EPA exceeded its statutory authority in adopting its Clean Power Plan. That regulation sought to impose GHG caps by requiring utilities and other providers to shift electricity production from coal-fired power to natural gas and then to renewable energy in place of imposing source-specific requirements reflecting the application of state-of-the-art emission reduction technologies.19 [EPA-HQ-OAR-2022-0985-1659-A2, p. 8]

18 Nat'l Fed. Of Indep. Bus. v. Dep't of Labor, 595 U.S. __, slip op. at 6 (Jan 13, 2022); see also Ala. Assoc. of Realtors v. Dep't of Health & Human Servs., 141 S. Ct. 2485, 2489 (2021); Utility Air Regulatory Group v. EPA, 573 U.S. 302, 324 (2014); U.S. Telecom Assoc. v. FCC, 855 F.3d 381, 419-21 (D.C. Cir. 2017) (Kavanaugh, J., dissenting from denial of rehearing en banc) (explaining provenance of "major rules doctrine").

19 West Virginia v. EPA, 597 U.S. __ (2022).

As noted by the Court, EPA "announc[ed] what the market share of coal, natural gas, wind, and solar must be, and then require[d] plants to reduce operations or subsidize their competitors to get there."20 EPA's attempt to devise GHG emissions caps based on a generation-shifting approach would have had major economic and political significance impacting vast swaths of American life and substantially restructured the American energy market; however, EPA's purported authority was only based on a "vague statutory grant" within Section 111(d) of the

Clean Air Act—far from the "clear authorization required by [Supreme Court] precedents."21 [EPA-HQ-OAR-2022-0985-1659-A2, p. 8]

20 Id., slip op. at 33, n.4.

21 Id., slip op. at 24.

EPA's Proposed Rule presents an analogous situation. Mandating a GHG emissions standard requiring a rapid transformation from ICEVs to ZEVs will dramatically reshape the American transportation system. While it is impossible, given the abbreviated public comment period, to quantify the full economic impact of EPA's effort to mandate the conversion of light-, medium-, and heavy-duty ICEVs to ZEVs, it is clear EPA's rulemakings directly impact the entire transportation system and will have collateral effects of "vast economic and political significance" without any congressional authorization. Indeed, as discussed below, Congress expressed its preference for incentives, rather than mandate. [EPA-HQ-OAR-2022-0985-1659-A2, p. 8]

As further discussed herein, the direct compliance costs are enormous – EPA estimates that the cost of vehicle technology (not including the vehicle or battery tax credits) and electric vehicle supply equipment ("EVSE") would be approximately $9 billion and $47 billion respectively, and these figures do not include the enormous investments required by the electric power sector (i.e., upgrades to power generation, transmission, and distribution infrastructure).22 The reach of this proposal is vast. Virtually every product delivered by a heavy-duty vehicle, and the petroleum supply industry (from upstream oil extraction to the retail sale of gasoline), the trucking industry, and agricultural interests will be impacted by EPA's proposal. The Proposed Rule could change what consumers are able to purchase by commanding a market transition to an entirely different product. The Proposed Rule undoubtedly forces manufacturers to meet production lead times that would not exist but for EPA's new ZEV mandate. [EPA-HQ-OAR-2022-0985-1659-A2, p. 9]

22 Proposed Rule at 25,935.

Beyond the obvious impacts to heavy-duty vehicle and utility markets, the Proposed Rule will eliminate American jobs in the refining sector. The Proposed Rule will significantly strain the electric grid, requiring utilities to rapidly increase generation, transmission, and distribution capacity to a degree not fully analyzed by EPA. EPA assumes the Inflation Reduction Act ("IRA") incentives will contribute significant quantities of electricity generated from renewable sources.23 Yet, the U.S. may need to invest $4.5 trillion to fully transition the U.S. power grid to renewables during the next 10-20 years, annual investments exceeding the U.S. defense budget and not fully provided for by the IRA.24 Clearly such expenditures require congressional approval. [EPA-HQ-OAR-2022-0985-1659-A2, p. 9]

23 88 Fed. Reg. at 25,935, n.63.

24 Dan Shreve and Wade Schauer, Deep decarbonization requires deep pockets (June 2019), https://www.decarbonisation.think.woodmac.com/.

And it will have profound impacts on national security by forcing the American truck and engine manufacturing industry to depend on critical minerals coming from foreign suppliers, with geopolitical challenges—most notably, China—rather than a domestically-abundant and secure resource. EPA should, but does not, address the market constraints for foreign sources of critical minerals needed to produce EV batteries and copper for transmission wiring.25 These issues go well beyond EPA's expertise, and the Agency is not positioned to fully grapple with the consequences that such a rapid push for ZEV will have across the nation. EPA can only proceed with the Proposed Rule if Congress bestowed clear authorization to do so. But Congress did not. [EPA-HQ-OAR-2022-0985-1659-A2, p. 9]

25 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions (March 2022), available at https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf; James Fernyhough, Copper Mine Flashes Warning of 'Huge Crisis' for World Supply, Bloomberg News, May 2, 2023.

As with the Clean Power Plan, EPA lacks Congressional authorization in the Clean Air Act to impose a manufacturing shifting standard to a preferred powertrain and effectively order regulated parties to phase out combustion engine technologies. EPA's standard-setting tools are limited to those which Congress provided in Section 202(a) of the Clean Air Act. Here, EPA is only authorized to set "standards" for "emission[s]" from "any class or classes of new motor vehicles or new motor vehicle engines, which . . . cause, or contribute to," potentially harmful air pollution. EPA has elected to focus solely on tailpipe emissions. But ZEV do not have tailpipe emissions of carbon dioxide, the pollutant of concern here, so the operation of such vehicles alone cannot "cause, or contribute to," air pollution within the scope of a tailpipe emissions regulation, especially when EPA does not require vehicle manufacturers to account for the upstream emissions from ZEVs in their compliance calculations. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 9 - 10]

Far from "clear congressional authorization," Section 202(a) provides EPA no authority to set standards that go above and beyond that which could be achieved by improvements to ICEVs alone, such that manufacturers must completely cease to produce the underlying technology governed at the time the Clean Air Act was adopted and amended. Notably, Congress instituted a clean fuel vehicles program with reference to "clean alternative fuel" vehicles, which includes BEVs, in its 1990 updates to the Clean Air Act. In doing so, Congress explicitly distinguished such vehicles from "conventional gasoline-fueled or diesel-fueled vehicles of the same category and model year," dispelling the notion that BEVs and ICEVs can be lumped together to set standards that are designed for the former to eventually displace the latter.26 While EPA points to the clean fuel vehicles program to suggest it has the authority to set standards related to ZEVs,27 EPA does not—and cannot—explain how such authority can be read to regulate ZEVs and ICEVs under a common standard.28 It is no surprise then that until the current Administration, EPA has never claimed the authority to mandate even partial electrification. [EPA-HQ-OAR-2022-0985-1659-A2, p. 10]

26 42 U.S.C. §§ 7581, 7582(b); see also § 7585(a) (defining NOx and non-methane hydrocarbon emission standards for heavy-duty clean-fuel vehicles as a percentage of conventional heavy-duty vehicles).

27 88 Fed. Reg. at 25,950.

28 AFPM does not dispute EPA's authority to regulate ZEV emissions consistent with Title II of the CAA.

Congress clarified that it, not EPA, must make the important policy decisions affecting if, when, and how the American transportation system will transition from ICEVs to ZEVs. In the 116th Congress, for example, Congress introduced 44 bills seeking to reduce petroleum-based fuel consumption and GHG emissions from the transportation sector through customer rebates, vehicle and fuel producer incentives, local funding, development of standards, and research and development. But none went so far as to propose requiring adoption, let alone mass adoption of heavy-duty ZEVs through the phase-out of ICEVs.29 In fact, Congress rejected bills banning the sale of new light duty ICEVs by 204030 and it has consistently disapproved of EPA's efforts to hamstring the vehicle sector with more stringent air pollution standards than are feasible.31 [EPA-HQ-OAR-2022-0985-1659-A2, p. 10]

29 "Alternative Fuel and Vehicles: Legislative Proposals," Congressional Research Service (July 28, 2021).

30 See Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019); Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. (2018); see also 116 Cong. Rec. 19238-40 (1970) (proposed amendment to Title II that would have banned ICE vehicles by 1978).

31 See, e.g., S. J. Res. 11, 118th Cong. (2023) (Although passed only by the Senate thus far, the joint resolution calls for disapproval of the rule submitted by the Administrator of the Environmental Protection Agency relating to "Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards," 88 Fed. Reg. 4296 (January 24, 2023).).

More telling, in April of this year, both houses of Congress passed a Congressional Review Act resolution to rescind EPA's December 2022 heavy-duty NOx standards, sending a strong signal that Congress views EPA's efforts in this space as unnecessary, infeasible, and uninformed in light of economic and energy security concerns.32 It should be no surprise then that in the wake of the Proposed Rule and EPA's parallel proceedings proposing new standards for light-duty vehicles,33 members of Congress requested the Agency to rescind the proposals, asserting they "effectively mandate a costly transition to electric cars and trucks in the absence of congressional direction."34 That Congress intended for it, not EPA, to direct these policy decisions is made all the more clear by the passage of the Bipartisan Infrastructure Law ("BIL")35 and the IRA,36 whereby Congress identified the policy levers it deemed appropriate. Congress could have, but did not, direct EPA to establish a fleet-wide credit trading regime to further drive ZEV development and rapid adoption. The Proposed Rule also stands in opposite to the Renewable Fuel Standard Program, whereby Congress mandated that "gasoline sold or introduced into commerce in the United States" must contain a year-over-year increasing share of renewable fuels37 and, in 2022, must include tens of billions of gallons of renewable fuel.38 There is no similar congressional instruction to EPA directing a shift in transportation technology from vehicles that can operate on increasing volumes of renewable fuel to ZEVs. In fact, such a statutory construction contradicts the Clean Air Act's Renewable Fuel Standard. Consequently, Congress, not EPA, most determine how to regulate electrification of transportation either through market forces influenced by several billion dollars earmarked in the IRA, the mandates such as those EPA proposed, or through some other mechanism. EPA does not have the proper expertise or authority to make this threshold decision.39 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 10 - 11]

32 Senate Resolution S.J. Res. 11, 118th Congress (April 26, 2026); House Resolution H2523 (May 23, 2023); see also Congressional Record, H2523 (May 23, 2023) at 1444, Statement from Mr. Walberg (R-MI) ("From tailpipe emissions regulations that will force people to buy expensive and less practical EVs to new rules on power plants that will threaten the reliability of our electric grid. It seems like the EPA hasn't even thought about the economic and energy security of our constituents."). See also U.S. EPA, Our Nation's Air: Trends Through 2021 (Since 1990, annual concentrations of nitrogen dioxide have fallen by 61%, with 85% of nitrogen dioxide concentrations below the National Ambient Air Quality Standards) in 2021.

33 Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184 (May 5, 2023).

34 Letter from Senator Shelley Capito, et al. to Administrator Michael S. Regan, EPA (May 25, 2023).

35 Public Law 117–58, November 15, 2021.

36 Public Law 117–169, August 16, 2022.

37 42 U.S.C. § 7545(o)(2)(A)(i).

38 Id., § 7545(o)(2)(B); 87 Fed. Reg. 39,600 (July 1, 2022).

39 See “Grassley-Cornyn Bill Pulls Plug on Latest Biden Boon for EVs,” (May 18, 2023), https://www.grassley.senate.gov/news/news-releases/grassley-cornyn-bill-pulls-plug-on-latest-biden-boon-for-evs (discussing proposed legislation entitled “No Fuel Credits for Batteries Act” introduced to “preserve the integrity of the Renewable Fuels Standard” in light of EPA’s proposed E-RINS rule”).

III. The Proposed Rule Contravenes the Clean Air Act and Energy Independence and Security Act.

A. EPA Lacks Statutory Lacks Statutory Authority to Set Fleetwide-Average Emission Standards, and EPA May Not Average In Vehicles that Do Not Emit the Relevant Pollutant.

As set forth in detail in the attached brief, EPA lacks statutory authority under Section 202(a) of the Clean Air Act to set fleetwide emission standards, and even if it had such authority, it could not lawfully use it to force electrification by including vehicles that have no tailpipe emissions in the fleetwide average standard for ICEVs. The Proposed Rule results in fleet-wide standards that cannot be met by ICEVs alone; however, under the Clean Air Act, EPA may only set individual vehicle-level emission standards. Such standards must be for “emission[s]” from “any class or classes of new motor vehicles or new motor vehicle engines, which . . . cause, or contribute to,” potentially harmful air pollution.40 The plain language of this provision authorizes EPA to set standards for classes of individual vehicles or engines that emit air pollutants. [EPA-HQ-OAR-2022-0985-1659-A2, p. 12]

40 42 U.S.C. § 7521(a)(1).

The Clean Air Act does not authorize EPA to create an emissions standard premised on accounting for vehicles that EPA views as emission-less within the constructs of a tailpipe emissions regulation. For HDVs specifically, emission standards must reflect “the greatest degree of emission reduction achievable through the application of technology which the [EPA] determines will be available” during the relevant model year.41 The Supreme Court has noted that similar language in Section 111(d) of the Act generally refers to “measures that would reduce pollution by causing [pollution sources] to operate more cleanly.”42 But ZEVs are not the “technology” contemplated by Congress here. Instead, Congress enabled EPA to increase emission standard stringency through cleaner fuels and improved emissions-related systems to be incorporated into ICEVs such as advances in fuel injection, exhaust gas combustion management, and catalysts to neutralize pollutants of concern.43 By factoring in ZEV performance as a part of its averaging scheme, EPA is ignoring the technological feasibility of emissions-related systems and simply requiring the production of fewer ICEVs. The Proposed Rule does not consider advances to ICE technologies when setting the standard. [EPA-HQ-OAR-2022-0985-1659-A2, p. 12]

41 42 U.S.C. § 7521(a)(3)(A)(i).

42 West Virginia, 142 S. Ct. at 2599.

43 For example, Section 202(m) requires the monitoring of "emission-related systems" such as the "catalytic converter and oxygen sensor." 42 U.S.C. § 7521(m)(l).

And even for criteria pollutants emitted from ICEVs, the Clean Air Act says nothing about averaging across fleets or banking and trading credits across different model years, different vehicle classes, and vehicle manufacturers. While EPA has previously adopted fleetwide averaging, it has also acknowledged that "Congress did not specifically contemplate an averaging program when it enacted the Clean Air Act."44 And "[j]ust as the statute does not explicitly address EPA's authority to allow averaging, it does not address the Agency's authority to permit banking and trading."45 By definition, then, the Act does not address—let alone clearly authorize—the use of averaging, banking, and trading in a manner that mandates electrification of the national vehicle fleet of heavy-duty motor vehicles and motor vehicle engines. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 12 - 13]

44 48 Fed. Reg. 33,456, 33,458 (July 21, 1983).

45 54 Fed. Reg. 22,652, 22,665 (May 25, 1989); see 55 Fed. Reg. 30,584, 30,593 (July 26, 1990) (same).

The structure of the Clean Air Act and its regulatory provisions for standard setting, certification, compliance enforcement, warranties, and penalties also directly conflict with a fleet-wide averaging regulatory regime. Notably, under Section 202(a), EPA "shall test, or require to be tested in such manner as [it] deems appropriate, any new motor vehicle or new motor vehicle engine submitted by a manufacturer" and issue a certificate of conformity "if such vehicle or engine" complies with the standards.46 And EPA must "test any emission control system incorporated in a motor vehicle or motor vehicle engine . . . to determine whether such a system enables such vehicle or engine to conform to the standards required to be prescribe under [Section 202(b)] of the Act."47 Section 202(b)(3) further authorizes EPA to grant waivers from certain nitrogen-oxide emission standards-which, again, are standards "under" Section 202(a), for no "more than 5 percent of [a] manufacturer's production or more than fifty thousand vehicles or engines, whichever is greater."48 This provision would be nonsensical under a fleetwide-averaging regime where, if applied, a manufacturer could essentially give itself a waiver for large swaths of its fleet by over-complying for certain product lines. Taken together, the Clean Air Act regulatory framework contemplates EPA regulating vehicles on an individual basis. But this cannot be accomplished if there is not a clear emission standard applicable to a single vehicle at the start of a model year. [EPA-HQ-OAR-2022-0985-1659-A2, p. 13]

46 42 U.S.C. § 7525(a)(1).

47 42 U.S.C. § 7525(a)(2).

48 42 U.S.C. § 7521(b)(3).

B. EPA Fails to Adequately Evaluate ZEV Safety Risks and Incidental Emissions as Required by Clean Air Act Section 202(a)(4), as well as associated real-world costs.

In setting new emissions standards, EPA must consider whether any technology used to comply with the requirements "will cause or contribute to an unreasonable risk to public health, welfare, or safety in its operation or function" as well as "to what extent the use of any device, system or element of design causes, increases, reduces, or eliminates emissions of any unregulated pollutants."49 The Proposed Rule's health and safety assessment, however, is myopically limited to the health effects of tailpipe emissions. Therefore, it fails to fully account for all the risks posed by more ZEVs on the road. Nor does it account for the emissions impacts from the full life cycle of ZEVs, particularly heavy-duty ZEVs with batteries that may not achieve either "useful life" standards or mandatory emission control technology warranties applicable to other vehicles with emission standards issued under the Clean Air Act. To the extent heavy-duty ZEVs and their batteries have not been demonstrated to achieve useful life standards and minimum emission control warranty requirements, in real-world operation, EPA must include their replacement costs as part of their analysis; EPA has not. Notably, EPA does not consider that ZEVs—particularly BEVs—are heavier than equivalent ICEVs and, therefore, may result in more severe accidents given the additional mass of the battery. As recognized by National Highway Transportation Safety Authority ("NHTSA") Administrator Ann Carlson, "[b]igger is safer if you don't look at the communities surrounding you and you don't look at the other vehicles on the road . . . [i]t actually turns out to be a very complex interaction."50 Yet EPA has not considered this interaction, on safety directly or the associated increase in insurance costs,51 which is all the more critical to the Proposed Rule as commercial trucks are involved in 13 percent of all fatal crashes on U.S. roadways and these trucks will be heavier and faster under the Proposed Rule.52 [EPA-HQ-OAR-2022-0985-1659-A2, p. 14]

49 42 U.S.C. § 7521(a)(4)(A) and (B).

50 Reuters, "U.S. NTSB chair raises safety concerns about heavy electric vehicles," David Shepardson (January 11, 2023) available at https://www.reuters.com/business/autos-transportation/us-ntsb-chair-raises-safety-concerns-about-heavy-electric-vehicles-2023-01-11/.

51 Jason Metz & Michelle Megna, Electric Car Insurance: Why It Costs More (Jan. 4, 2023), https://www.forbes.com/advisor/car-insurance/electric-vehicle/ (explaining that electric vehicles are costlier to insure)

52 U.S. DOT, Federal Motor Carrier Safety Administration, "2020 Pocket Guide to Large Truck and Bus Statistics," available at https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/2020-10/FMCSA%20Pocket%20Guide%202020-v8-FINAL-10-29-2020.pdf.

1. EPA May Not Use the Proposed Rule to Sidestep Regulatory Limits Established under the Energy Independence and Security Act.

Under Section 103 of the Energy Independence and Security Act of 2007 ("EISA"), NHTSA has the exclusive authority to issue fuel efficiency standards for medium and heavy-duty vehicles. Because fuel economy and GHG emissions are two sides of the same coin, EPA issued joint standards with NHTSA in prior Phase 1 and Phase 2 heavy-duty GHG emission standard proposals. But EPA did not do the same for the proposed Phase 3 standards here. If it did, the joint standards would have to comply with the EISA requirement that all new fuel efficiency standards "shall provide not less than 4 full model years of regulatory lead time."56 That means a fuel efficiency standard promulgated in calendar year 2023 cannot be implemented until MY 2028. The Proposed Rule does not meet this standard and, because it effectively promulgates equivalent fuel efficiency standards in the form of greenhouse gas emissions standards, is undercutting Congress's intent in EISA and regulating in a way that is inconsistent with NHTSA's authority.57 Similarly, the joint standards would have to comply with the EISA requirement that NHTSA may not consider the fuel economy of electric vehicles in setting fuel economy standards.58 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 14 - 15]

56 49 U.S.C. 32902(k). In contrast, under the Clean Air Act, new heavy-duty emission standards can begin "no earlier than the model year commencing 4 years after such revised standard is promulgated." 42 U.S.C. § 7521(a)(3)(C).

57 See Massachusetts v. EPA, 549 U.S. 497, 532 (2007) ("The [EPA and NHTSA] obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.").

58 49 U.S.C. 32902(h).

B. The Proposed Rule is Arbitrary and Capricious.

In addition to the fact that the proposal is infeasible, and the data and analysis gaps identified along this section raises additional concerns, that would render EPA's finalization of this proposed rule arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1659-A2, p. 23]

1. EPA Cannot Adequately Substantiate the Need for Regulatory Action

EPA states the "need for regulatory action" is supported by the BIL and the IRA, which "together include many incentives for the development, production, and sale of ZEVs, electric charging infrastructure, and hydrogen, which are expected to spur significant innovation in the heavy-duty sector."88 True, the BIL and IRA support the government-wide approach to reducing emissions through the manufacture, sale, and use of ZEVs. According to EPA, the BIL and IRA will lead to an increase in Class 4–8 ZEV sales anywhere between 13 and 48 percent, with an average of 29 percent by 2029.89 And the IRA alone is anticipated to result in a 32–40 percent decrease in GHG emissions, compared to 2005 levels, over the same period.90 But the BIL and IRA do not empower EPA to promulgate ZEV mandates or phase out the use of ICEVs. Congress could have chosen to mandate ZEVs and instead chose to provide incentives through the BIL and IRA. If Congress desired EPA to phase out ICE and mandate ZEV, it would have said so (and if Congress believed that EPA has existing authority under the Clean Air Act to mandate ZEVs, it may very well have concluded that incentivizing ZEVs via the BIL and IRA was unnecessary). EPA cannot interpret congressional silence in the IRA and BIL as tacit acceptance of its approach here.91 Thus, EPA's reliance on these Acts to underwrite proposed standards' feasibility is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 23 - 24]

88 Proposed Rule at 25,928.

89 Proposed Rule at 25,941.

90 Congressional Research Service, Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change, 2 (Oct. 3, 2022).

91 The BIL and IRA themselves are at risk of recission under a new Administration or Congress. See, e.g., Josh Siegel and Kelsey Tamborrino, Politico, GOP's debt-limit plan would gut Biden's climate law. White House's response: 'Jobs' (Apr. 20, 2023), available at https://www.politico.com/news/2023/04/20/house-gop-debt-limit-plan-inflation-reduction-act-00092891 ("The GOP proposal would revive a prior $7,500 tax credit for qualifying electric vehicles, but would restore that tax break's per-manufacturer limit of 200,000 vehicles. It would entirely repeal the IRA's new incentives for critical battery minerals that are extracted from the U.S. or a close trading partner, and for batteries manufactured or assembled in North America.").

The structure of the Clean Air Act and its regulatory provisions for standard setting also are premised on EPA identifying sources of emissions that cause or contribute to non-attainment with the National Ambient Air Quality Standards ("NAAQS"). However, EPA makes no attempt to outline a baseline scenario whereby all stationary and mobile sources in the country achieve current EPA standards. Such a baseline is necessary because it is the only means by which the agency and the public can compare the marginal costs and benefits of further tightening emission standards and deploying different technologies and alternatives. EPA's failure to conduct either a baseline or marginal analysis (while also failing to account for billions of dollars in costs) is inconsistent with the structure of the Clean Air Act, and good regulatory practice, and makes it impossible to conduct an alternatives analysis, as required under Executive Order 12866 (Regulatory Planning and Review) and OMB Circular A-4; as such, the proposed rule, if finalized, is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1659-A2, p. 24]

2. EPA Fails to Adequately Account for the Lifecycle Emissions of ZEVs.

As discussed above, because EPA may only prescribe standards applicable to vehicles that "cause or contribute" to air pollution, its standards cannot account for ZEVs with no tailpipe emissions. However, if EPA is authorized to promulgate such standards, those standards must account for any upstream emissions from upstream electric generating units ("EGU"), and the mining of battery materials. The failure to do so ignores the policy objectives of the statute and creates an uneven playing field that substantially disadvantages ICEVs and fails to address a major aspect of GHG emission reduction. Indeed, Clean Air Act Section 202(a)(4)(B) requires that EPA calculate these lifecycle emissions impacts. [EPA-HQ-OAR-2022-0985-1659-A2, p. 24]

Organization: American Petroleum Institute (API)

c. Both this proposal and the light- and medium-duty proposal miss the mark.

i. EPA is missing millions of vehicles that will contribute to emissions

API is concerned that this proposal, as well as EPA's light- and medium-duty proposed GHG rule, seriously misses the mark with respect to reducing carbon emissions from the transportation sector. The proposals focus heavily on ZEV technologies, and specifically BEVs, for reductions in the 2027 to 2032 timeframe. Yet, EPA is leaving emissions reductions on the table for existing HD vehicles, given HD vehicles' lifespan, as well as new ICEVs that will be sold between now and 2032. EPA's overly limited focus on ZEV solutions, and specifically BEVs, ignores options that could better accomplish the agency's objectives to achieve greater transportation sector-related emission reductions at lower cost to society. [EPA-HQ-OAR-2022-0985-1617-A1, p. 6]

According to data from the American Trucking Associations (ATA), over 38 million trucks were registered and used for business purposes (excluding government and farm) in 20203, with an additional 400,000-500,000 HD trucks expected to be sold annually, based on data over the past decade4. The proposed rule's focus on new zero-emission vehicles ignores the secondary benefit that a technology-neutral approach could accomplish through reductions from millions of in-fleet vehicles that will contribute to carbon emissions over the life of the program. [EPA-HQ-OAR-2022-0985-1617-A1, p. 6]

3 American Trucking Associations "Economics and Industry Data": https://www.trucking.org/economics-andindustry-data.

4 "ATD Data 2022", North American Dealers Association – American Truck Dealers division (https://www.nada.org/media/5008/download?inline).

ii. EPA failed to address carbon reductions in the existing HDV fleet to help achieve near term emission reductions

Fuel- and vehicle-based carbon reduction solutions are currently available in the marketplace, and could achieve nearer-term emission reductions from the existing HD fleet. A singular focus on future ZEV technologies (some of which may not come to fruition as anticipated) does not seem to meet the stated goals of the proposed program. The proposal would require the use of potential technologies that are unproven at the scale of the current market, would depend on infrastructure that is not yet available, and would be on an extremely challenging (at best) timeline. Meaningful carbon emission reductions are achievable sooner, and potentially at lower cost, via the use of proven and available technology. For example, the U.S. Department of Energy (DOE) Co-Optimization of Fuels & Engines (Co-Optima) initiative examined fuels and engine/vehicle technologies simultaneously.5 The combination of sustainable fuels uncovered by Co-Optima research can reduce the emissions of vehicles now, while enabling a faster transition to net-zero-carbon emissions for on-road transportation in the future. Such an approach could be utilized by EPA to better achieve the stated goals of the proposed Phase 3 program. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 6 - 7]

5 U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, "The Road Ahead Toward a Net-Zero-Carbon Transportation Future Findings and Impact, FY15–FY21" (https://www.energy.gov/sites/default/files/2022-06/beto-co-optima-fy15-fy21-impact.pdf).

1. Technology neutrality – all solutions should be allowed to compete

In the preamble to the proposed rule, EPA states that "[t]he proposed standards do not mandate the use of a specific technology, and EPA anticipates that a compliant fleet under the proposed standards would include a diverse range of technologies, including ZEV and ICE vehicle technologies." (81 FR 25952) EPA further notes that the proposal does not mandate ZEV sales like California's programs. However, we disagree, as the stringency of the proposed standards – and even the technology mixes suggested by EPA in the proposal – essentially forces manufacturers to solely focus development efforts on BEVs. API strongly believes in an all-of-the-above strategy to reducing carbon emissions, and we recommend that EPA adjust the standards to allow all solutions the ability to compete. Further, doing so would provide more time for nascent technologies to be proven with less risk to vehicle original equipment manufacturers (OEMs) and the public if these technologies do not pan out in the proposal's implementation timeframe. [EPA-HQ-OAR-2022-0985-1617-A1, p. 7]

To that end, various studies have highlighted the importance of allowing all technologies to be utilized to reduce emissions faster, more effectively, and at a lower cost.6 7 By limiting the scope to tailpipe emissions, the proposal is inherently not technology neutral. Setting strict tailpipe-only standards results in a limited, prescribed solution set. [EPA-HQ-OAR-2022-0985-1617-A1, p. 7]

6 "Environmental Benefits of Medium- and Heavy-Duty Zero Emission Vehicles Compared with Clean Bio- & Renewable-Fueled Vehicles 2022-2032," prepared for Diesel Technology Forum by Stillwater Associates LLC, July 19, 2022.

7 "Multi-Technology Pathways to Achieve California's Air Quality and Greenhouse Gas Goals: Heavy-Heavy-Duty Truck Case Study," prepared for Western States Petroleum Association by Ramboll US Consulting, Inc., February 1, 2021.

2. Current and future solutions – lower carbon fuels, hydrogen, ICE-based solutions

As previously noted in our comments, lower carbon options currently exist and could be used for near-term reductions as well as the early years of the HD GHG Phase 3 program. Lower carbon fuels are available in the market now, and research and development to bring costs down and improve operability is ongoing. Vehicle-based solutions also currently exist and are being developed, including the development of engines and vehicles to meet EPA's recently finalized HD Low NOx program. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 7 - 8]

g. Legal Concerns.

The Phase 3 proposal is fundamentally different than the Phase 1 and Phase 2 HD GHG rules that preceded it. Rather than continuing to rely exclusively on improved technology for gasoline- and diesel-powered vehicles, the rule instead would establish standards that require a significant portion of new vehicle production and sales to consist of ZEVs (again, most of which EPA projects would be BEVs). While we believe that ZEVs can and should be a choice available to manufacturers and vehicle purchasers, we disagree that EPA should impose a binding mandate for the production of ZEVs and believe that such a mandate exceeds EPA's authority under the Clean Air Act (CAA). [EPA-HQ-OAR-2022-0985-1617-A1, p. 16]

i. EPA does not have authority to impose standards that are only achievable through the use of ZEV technology because there is no clear statement in the Clean Air Act authorizing EPA to mandate a shift away from internal combustion engines.

The Proposed Rule marks a pronounced shift in EPA's approach to regulating greenhouse gas ("GHG") emissions from heavy-duty vehicles. EPA explains in the Proposed Rule, it "did not premise the HD GHG Phase 2 CO2 tractor emission standards on application of hybrid powertrains or ZEV technologies." 88 Fed. Reg. at 25957. But in the current proposal, the Agency "developed technology packages that include both ICE vehicle and ZEV technologies." Id. at 25958. Moreover, the Proposed Rule would do more than just lock in the ZEV sales projected to occur in the absence of this rule. Instead, it would mandate that more ZEVs be sold than otherwise would be the case. Today, ZEVs make up just a tiny fraction of the heavy-duty vehicle fleet and current new heavy-duty vehicle sales. Under the Proposed Rule, EPA projects that, by 2032, ZEVs would comprise 50% of new vocational vehicle sales and 25-30% of new tractor sales. Id. at 26000. [EPA-HQ-OAR-2022-0985-1617-A1, p. 17]

Such a shift from internal combustion engines ("ICE") to ZEVs would be truly transformative. BEVs, which EPA predicts will be the technology that is mostly used to satisfy the proposed ZEV mandate, require fundamentally different vehicle technologies than those used on conventionally fueled vehicles – e.g., electric motors instead of internal combustion engines, batteries to store power rather than on-board fuel tanks. Moreover, BEVs rely on a wholly different infrastructure (e.g., electric power generation and distribution, charging stations, battery manufacturing) – much of which does not yet exist or exists only in limited form. Additionally, switching to BEVs will fundamentally change the manner in which vehicles are used, for example requiring careful scheduling of vehicle operations to accommodate the long periods needed to adequately charge the vehicles. Lastly, a ZEV mandate would produce widespread effects on the national economy, such as the reduced need for oil and gas production, gas processing, changes to petroleum refining, and distribution. Such changes are fundamentally different and far more expansive than those caused by EPA's heavy-duty motor vehicle emissions standards up to now, which worked by requiring changes to ICE drivetrains and vehicles and in the fuels used by these vehicles instead of (as here) forcing a shift to a wholly different powertrain technology. [EPA-HQ-OAR-2022-0985-1617-A1, p. 17]

EPA asserts that the ZEV mandate is authorized under Clean Air Act ("CAA") Sections 202(a)(1) and (2). 88 Fed. Reg. at 25927. EPA explains that these provisions "are technology forcing when EPA considers that to be appropriate." Id. at 25949. EPA further explains that "Section 202 does not specify or expect any particular type of motor vehicle propulsion system to remain prevalent." Id. The Agency points to legislative history to support the notion that Congress understood that powertrain technologies might evolve over time and quotes Representative Pallone as opining that the "recently enacted [Inflation Reduction Act] "reinforces the longstanding authority and responsibility of [EPA] to regulate GHGs as air pollutants under the Clean Air Act," 204 and "the IRA clearly and deliberately instructs EPA to use" this authority by "combin[ing] economic incentives to reduce climate pollution with regulatory drivers to spur greater reductions under EPA's CAA authorities."" Id. at 25050. [EPA-HQ-OAR-2022-0985-1617-A1, p. 17]

But such an expansive claim of authority cannot depend on a generally stated statute, such as CAA §§ 202(a)(1) and (2), or on the views of Members who participated in the development of the CAA or the IRA. The U.S. Supreme Court has concluded that such an "extraordinary" claim of authority exists only when there is "clear congressional authorization." West Virginia v. EPA, 142 S.Ct. 2587, 2609 (2022). At their core, CAA §§ 202(a)(1) and (2) authorize EPA to establish "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [the Administrator's] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Because this provision includes no clear statement that EPA may mandate a fundamental shift in propulsion technology, EPA lacks authority to impose emissions limitations that effectively will require the production and sale of ZEV vehicles. [EPA-HQ-OAR-2022-0985-1617-A1, p. 18]

The lack of a clear statement is particularly notable given that Congress's most recent efforts to address GHG emissions – the Inflation Reduction Act and the Bipartisan Infrastructure Act – almost exclusively consisted of economic incentives and pointedly gave EPA no new or expanded authority to substantively regulate GHG emissions. If Congress had intended EPA to have authority to mandate a fundamental shift in powertrain technology, surely it would have done more than spend money on the issue. Moreover, EPA's claim of authority plainly conflicts with other relevant statutes, such as the Renewable Fuel Program, under which Congress mandated that significant and increasing volumes of renewable fuels should be blended into that national motor fuel supply. In contrast, the Proposed Rule is designed to significantly reduce the amount of motor fuel consumed by the heavy-duty fleet. The Proposed Rule thus would frustrate Congressional intent by reducing rather than expanding the volume of renewable fuel consumed by motor vehicles in the U.S. [EPA-HQ-OAR-2022-0985-1617-A1, p. 18]

It also is telling that EPA has abandoned any pretense of "co-regulating" with NHTSA, the national regulatory authority that actually has been authorized by Congress to establish motor vehicle fuel efficiency standards. Among other things, this is a clear attempt to free EPA from unambiguous statutory obligations that otherwise would constrain a joint rulemaking, such as the requirements that NHTSA must provide a full four years of model year lead time and NHTSA may not regulate more than five years in advance. It is simply not plausible that the general standard-setting authority of CAA § 202(a) can be construed to confer omnibus authority for EPA to effectively rewrite directly relevant statutory directives. [EPA-HQ-OAR-2022-0985-1617-A1, p. 18]

ii. EPA's authority under CAA §§ 202(a)(1) and (2) to prescribe emissions standards for vehicles and engines does not extend to a mandatory shift in powertrain technology.

As explained above, the Proposed Rule would require that a significant proportion of new heavy-duty vehicles must be powered by ZEV drivetrains. That proportion exceeds the level of new vehicle ZEV sales that otherwise would occur. As a result, the Proposed Rule would constitute a mandate to produce ZEV vehicles. [EPA-HQ-OAR-2022-0985-1617-A1, p. 18]

Moreover, ZEVs are not just another form of conventional diesel or gasoline fueled ICE-driven vehicles. For example, a ZEV cannot be produced by modifying a conventional ICE drivetrain (e.g., by changing combustion conditions) or by adding pollution control technology to a conventional ICE drivetrain (e.g., catalytic converter or diesel particulate filter). Rather, ZEVs employ wholly different propulsion technology as compared with conventional ICE drivetrains. The BEVs that EPA predicts will make up the vast majority of the ZEVs that would have to be produced under the Proposed Rule use electricity and batteries rather than liquid fuels stored in fuel tanks and employ electric motors for propulsion rather than ICE engines. In short, ZEVs are a fundamentally different type of drivetrain than conventional ICE drivetrains. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 18 - 19]

EPA asserts that CAA §§ 202(a)(1) and (2) authorize the imposition of a ZEV mandate. But for the following four reasons, EPA does not have authority under CAA §§ 202(a)(1) and (2) or under any other CAA provision to impose such a fundamental and mandatory shift in powertrain technology. [EPA-HQ-OAR-2022-0985-1617-A1, p. 19]

First, EPA may regulate a class of motor vehicles under CAA § 202(a)(1) only if emissions from that class of vehicles "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." EPA treats ZEVs as if they do not emit GHGs for the purposes of this proposal. As a result, under EPA's rationale, ZEVs do not emit the pollutant that is the object of the Proposed Rule and cannot cause or contribute to the endangerment that EPA asserts as the basis for its authority to regulate here under CAA § 202(a)(1). Thus, it is beyond EPA's authority to impose a ZEV mandate. [EPA-HQ-OAR-2022-0985-1617-A1, p. 19]

Second, CAA § 202(e) – entitled "New power sources or propulsion systems" – states that EPA may defer the certification for a new motor vehicle employing a new power source or propulsion system until after the Agency has "prescribed standards for any air pollutants emitted by such vehicle or engine which in [the Administrator's] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger the public health or welfare but for which standards have not been prescribed under [CAA § 202(a)]." Thus, EPA must take two actions when assessing a new power source or propulsion system. EPA first must determine whether emissions from the new power source or propulsion system cause or contribute to air pollution that endangers public health or welfare. If the answer is yes, EPA second must establish new emissions standards for the new power source or propulsion system or, alternatively, determine that appropriate standards have already been established. [EPA-HQ-OAR-2022-0985-1617-A1, p. 19]

ZEVs clearly constitute a new power source or propulsion system. As a result, before certifying any ZEVs, CAA § 202(e) requires EPA determine whether emissions from ZEVs cause or contribute to air pollution that endangers public health or welfare. But, under EPA's rationale, ZEVs do not emit GHGs, which is the pollutant that would be regulated under the Proposed Rule. Consequently, EPA cannot determine that emissions from ZEVs cause or contribute to any endangerment caused by GHG emissions and, therefore, the Agency has no need or authority to impose GHG emissions standards on ZEVs prior to certifying them. [EPA-HQ-OAR-2022-0985-1617-A1, p. 19]

Third, CAA § 202(a)(1) in relevant part authorizes EPA to establish "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines." CAA § 202(a)(1) (emphasis added). This provision requires EPA to define appropriate classes of vehicles for purposes of making the cause/contribute finding and in subsequently establishing emission standards. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 19 - 20]

From the outset of its CAA-based motor vehicle regulatory program, EPA has properly distinguished between fundamentally different powertrain technologies – e.g., regularly developing and issuing separate standards for gasoline-powered vehicles and diesel-powered vehicles. In contrast, EPA here combines all powertrain types into the same classes for purposes of imposing GHG emission standards. That is unreasonable and arbitrary because conventionally powered vehicles have fundamentally different emissions characteristics than electric powered vehicles. See also CAA § 202(e) (requiring EPA to separately evaluate emissions from "a new power source or propulsion system.") [EPA-HQ-OAR-2022-0985-1617-A1, p. 20]

As demonstrated by EPA's Phase 1 and Phase 2 GHG standards for heavy-duty vehicles, there is a wide variety of emissions control techniques that may be applied to conventionally powered heavy-duty vehicles to reduce GHG emissions – including such things as improved engine efficiency, better aerodynamics, and lower rolling resistance. Applying such measures to ZEVs does not affect their GHG emissions profile because, by EPA's definition, ZEVs do not emit GHGs. This shows that conventionally power vehicles and ZEVs should not occupy the same class under these rules because wholly different regulatory approaches are needed to appropriately control GHG emissions from these two fundamentally different types of vehicles. Further to our argument, the Clean Fuel Vehicles program can only be prescribed to areas that have the worst ozone nonattainment and to the pollutants that contribute to ambient ozone levels. [EPA-HQ-OAR-2022-0985-1617-A1, p. 20]

Fourth, EPA's regulatory approach is unlawful because it treats ZEVs as if their powertrain were an emissions control technology and then mandates the use of that purported emission control technology. EPA claims throughout the proposed rule that its proposed standards do not require manufacturers to implement any specific technology and, instead, that they retain flexibility to comply with the rule in whatever manner they deem appropriate. But the proposed rule inescapably will require a significant industry-wide shift from internal combustion to ZEVs. A particular manufacturer may avoid producing a ZEV though creative use of the ABT provisions, but the industry as a whole will have no choice but to produce increasing numbers of ZEVs over time. This is contrary to CAA § 202(a), which authorizes EPA to set emissions standards, but does not authorize EPA to mandate the use of any particular emissions control technology in meeting those standards. [EPA-HQ-OAR-2022-0985-1617-A1, p. 20]

iv. The use of ZEV technology is not an emissions standard under CAA §§ 202(a)(1) and (2).

By factoring ZEVs into the proposed emission standards, EPA effectively is treating ZEVs as an emissions control technology that can form the basis of an emission standard. This exceeds EPA's authority under CAA § 202(a). [EPA-HQ-OAR-2022-0985-1617-A1, p. 22]

EPA is authorized under CAA § 202(a)(1) to prescribe "standards applicable to emissions." In other words, EPA is authorized to prescribe emission standards for motor vehicles. The term "emission standard" means a requirement "which limits the quantity, rate, or concentration of emissions of air pollutants." CAA § 302(k). [EPA-HQ-OAR-2022-0985-1617-A1, p. 22]

The problem with EPA's regulatory approach here is that a ZEV is not an emissions control technology for a conventionally powered vehicle. A ZEV does not limit the "quantity, rate, or concentration" of air pollutant emissions from a conventionally powered vehicle. Rather, a ZEV represents an entirely different type of propulsion system and powertrain. The existence of ZEVs has no bearing on the relative emissions from conventionally powered vehicles. [EPA-HQ-OAR-2022-0985-1617-A1, p. 22]

Consequently, a ZEV powertrain is not an emissions reduction technology applicable to conventionally powered vehicles and cannot form the basis of emission standards applicable to conventionally powered vehicles. [EPA-HQ-OAR-2022-0985-1617-A1, p. 22]

v. The Clean Air Act already expressly provides a regulatory scheme for Clean Fuel Vehicles in Part C of Title II. That regulatory scheme precludes the regulation of ZEVs together with internal combustion engines.

CAA § 242(a) requires EPA to "promulgate regulations under this part containing clean-fuel vehicle standards for the clean-fuel vehicles specified in this part." A clean fuel vehicle is one that is powered by a "clean alternative fuel," which is defined to include electricity. CAA § 241(2). CAA § 245 limits EPA's authority to regulate heavy-duty clean fuel vehicles – specifying that EPA may establish standards for NOx and NMHC, and further specifying that no standards may be promulgated for heavy-duty vehicles of more than 26,000 lbs. gross vehicle weight. The state implementation plan for areas designated in severe or greater nonattainment with ozone National Ambient Air Quality Standards must include a clean-fuel vehicle program. CAA § 182(c)(4). The program must apply to centrally fueled fleets. Id. at § 246. [EPA-HQ-OAR-2022-0985-1617-A1, p. 22]

EPA cites the Clean Fuel Vehicles program as an indication that Congress generally intended to "promote further progress in emissions reductions." 88 Fed. Reg. at 25950. EPA thus points to the Clean Fuel Vehicles program as supporting its proposed interpretation that CAA §§ 202(a)(1) and (2) authorize EPA to mandate the production and sale of ZEVs. But in doing so, EPA fails to address the regulatory program required under the Clean Fuel Vehicles program and fails to reconcile the particular requirements of that program with the CAA § 202(a) general rulemaking authority on which it relies as the primary authority for the Proposed Rule. [EPA-HQ-OAR-2022-0985-1617-A1, p. 22]

The Clean Fuel Vehicles program plainly requires EPA to establish an alternative regulatory scheme for clean fuel vehicles, including electric powered vehicles. For heavy duty vehicles, CAA § 242(b) specifies that such vehicles "shall comply with all requirements of this title which are applicable in the case of conventional gasoline-fueled or diesel-fueled vehicles of the same category and model year." This provision clearly signals that Congress intended EPA to develop emissions standards for ICE-powered vehicles and to apply those standards to clean fuel vehicles (including BEVs). In the very least, Congress's explicit inclusion of electric powered vehicles in the Clean Fuel Vehicles program and its exclusion of any mention of electric powered vehicles in Section 202 must be given meaning. Compare 42 U.S.C. § 7581 with 42 U.S.C. § 7521(a), (e); Bittner v. United States, 143 S. Ct. 713, 720 (2023) ("When Congress includes particular language in one section of a statute but omits it from a neighbor, we normally understand that difference in language to convey a difference in meaning (expressio unius est exclusio alterius).") This Clean Fuel Vehicles Program would be rendered meaningless if, as in the Proposed Rule, EPA were to consider conventionally fueled vehicles together with clean fuel vehicles (including BEVs) in developing and implementing emissions standards. [EPA-HQ-OAR-2022-0985-1617-A1, p. 23]

Moreover, the Clean Fuel Vehicles program is narrowly targeted to the worst ozone nonattainment areas and to the pollutants that contribute to ambient ozone levels. The program also imposes important constraints on how vehicles may be regulated (for example, as explained above, it dictates separate emissions standards for clean fuel vehicles and limits the applicability of those standards to only certain heavy-duty vehicles). These detailed and prescriptive requirements demonstrate that Congress intended EPA to regulate clean fuel vehicles only in particular ways. EPA's claim in the Proposed Rule of omnibus authority to regulate clean fuel vehicles along with conventionally fueled vehicles cannot be reconciled with the targeted and carefully crafted regulatory scheme set out in the Clean Fuel Vehicles program. [EPA-HQ-OAR-2022-0985-1617-A1, p. 23]

Lastly, the Proposed Rule also is flawed because EPA fails to acknowledge the regulatory requirements imposed under the Clean Fuel Vehicles program and fails to explain how it still finds authority to regulate under CAA § 202(a) in the face of the more specific obligations imposed under the Clean Fuel Vehicles program. That violates EPA's procedural obligation to set forth in the Proposed Rule "the major legal interpretations … underlying the proposed rule." CAA § 307(d)(3)(C). [EPA-HQ-OAR-2022-0985-1617-A1, p. 23]

In sum, the CAA clearly instructs EPA as to where and how heavy-duty clean fuel vehicles should be regulated. Those specific requirements displace any authority EPA might otherwise have had to regulate clean fuel vehicles under the general authority of CAA §§ 202(a)(1) and (2). EPA is thus mistaken in asserting that CAA §§ 202(a)(1) and (2) authorize the proposed Phase 3 emissions standards for heavy-duty vehicles. In addition, the Proposed Rule fails to provide adequate notice and opportunity to commenters on the important legal questions surrounding the scope and extent of the Clean Fuel Vehicles program and how the specific regulatory scheme established under that program can be reconciled with EPA's claim of authority under CAA §§ 202(a)(1) and (2). [EPA-HQ-OAR-2022-0985-1617-A1, p. 23]

Organization: Arizona State Legislature

The proposed rule violates the Major Questions Doctrine EPA touts this rule for heavy-duty vehicles and its companion for passenger vehicles as the 'strongest-ever pollution standards for cars and trucks to accelerate transition to a clean-transportation future.'4 Numerous media reports recognize that the goal of the proposed rules is not to reduce emissions on existing vehicles, but to force a transition to new types of vehicles. Or, as the EPA administrator put it, 'usher in a new generation' of clean cars.5 For example:

- The proposed rules ‘could require as much as 67% of all new vehicles sold in the U.S. by 2032 to be all-electric, representing the country’s most aggressive climate regulations to date.’6
- ‘The Biden administration is proposing stiff new automobile pollution limits that would require up to two-thirds of new vehicles sold in the U.S. to be electric by 2032, a nearly tenfold increase over current electric vehicle sales.’7 4
- ‘The proposal for light- and medium-duty vehicles was accompanied by a proposal for heavy-duty fleets to electrify 25 percent of their trucks and half of all new buses to be electric by 2032.’8
- ‘The overarching goal is not just cleaner cars, but the transformation of the auto industry: The EPA would essentially impose regulatory penalties on companies that do not move quickly enough toward electric cars.’9 [EPA-HQ-OAR-2022-0985-1621-A1, pp. 3-4]

4 U.S. EPA, ‘Biden-Harris Administration Proposes Strongest-Ever Pollution Standards for Cars and Trucks to Accelerate Transition to a Clean-Transportation Future,’ Apr. 12, 2023, available at https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-carsand.

5 Camila Domonoske, The big reason why the U.S. is seeking the toughest-ever rules for vehicle emissions, NPR, Apr. 12, 2023, available at https://www.npr.org/2023/04/12/1169269936/electric-vehicles-emission-standards-tailpipesfuel-economy.

6 Emma Newburger, Biden proposes toughest auto emissions rules yet to dramatically boost EV sales, CNBC, Apr. 12, 2023, available at https://www.cnbc.com/2023/04/12/epa-proposes-auto-pollution-limits-to-aggressively-boostev- sales-.html.

7 Matthew Daly and Tom Krisher, Stiff EPA emission limits to boost US electric vehicle sales, ASSOCIATED PRESS, Apr. 12, 2023, available at https://apnews.com/article/biden-electric-vehicles-epa-tailpipe-emissions-climate- 406d74e18459bc135f089c681ba9e224.

8 Aaron Cole, Proposed vehicle emissions standards would be America’s toughest yet, POPULAR SCIENCE, Apr. 12, 2023, available at https://www.popsci.com/technology/epa-electric-vehicle-emissions-targets/.

9 Domonoske, supra note 5.

The former head of EPA’s Office of Transportation and Air Quality recognized the significance of EPA’s proposed rules as ‘the single most important regulatory initiative by the Biden administration to combat climate change and to really reduce the worst outcomes of climate change.’10 They are intended to radically transform America’s entire automotive industry. [EPA-HQ-OAR-2022-0985-1621-A1, p. 4]

10 Matthew Daly and Tom Krisher, Stiff EPA emission limits to boost US electric vehicle sales, ASSOCIATED PRESS, Apr. 12, 2023, available at https://apnews.com/article/biden-electric-vehicles-epa-tailpipe-emissions-climate- 406d74e18459bc135f089c681ba9e224.

The proposed rule violates the Major Questions Doctrine because Congress did not clearly delegate EPA this authority. [EPA-HQ-OAR-2022-0985-1621-A1, p. 4]

But Congress has not delegated to EPA the authority to transform the automotive industry. EPA relies on Clean Air Act section 202(a)(1)-(2) for its authority to issue the proposed regulation. See 88 Fed. Reg. 25,926, 25,927 (Apr. 27, 2023). This portion of Section 202(a) provides in full: (a) Authority of Administrator to prescribe by regulation Except as otherwise provided in subsection (b)-- (1) The Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare. Such standards shall be applicable to such vehicles and engines for their useful life (as determined under subsection (d), relating to useful life of vehicles for purposes of certification), whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control such pollution. (2) Any regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period. 42 U.S.C. 7521(a). [EPA-HQ-OAR-2022-0985-1621-A1, p. 4]

EPA's proposal extends beyond this authority because it seeks to transform the automotive industry. EPA implicitly acknowledges that its emissions standards for carbon dioxide cannot be met exclusively with existing internal combustion engines. See, e.g., 88 Fed. Reg. 25,958 ('And in this rule, we developed technology packages that include both [internal combustion engine] vehicle and [zero-emission vehicle] technologies.') (emphasis added). In addition, EPA's analysis of requisite technology and cost-benefit balancing focuses primarily on production and purchase of electric and hydrogen-powered vehicles. See, e.g., id. at 25,930-931 ('The Opportunity for Clean Air Provided by Zero-Emission Vehicle Technologies'), id. at 25,936 ('[T]he HD industry would save approximately $250 billion in operating costs (e.g., savings that come from less liquid fuel used, lower maintenance and repair costs for [zero-emission vehicle] technologies as compared to [internal combustion engine] technologies, etc.)'). Although EPA uses averaging to avoid requiring a specific percentage of electric and hydrogen-powered vehicles, EPA 'projects that one potential pathway for the industry to meet the proposed standards would be through' 50% zero-emission vehicles for vocational vehicles, 34% zero-emission vehicles for day cab tractors, and 25% zero-emission vehicles for sleeper cab tractors by model year 2032.11 [EPA-HQ-OAR-2022-0985-1621-A1, p. 5]

11 U.S. EPA Fact Sheet, 'Proposed Standards to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles for Model Year 2027 and Beyond,' Apr. 2023, available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P101762L.pdf.

The transformative nature of EPA's proposal is reminiscent of EPA's past attempt to transform power plants, which the Supreme Court struck down under the Major Questions Doctrine last year. See West Virginia v. Env't Prot. Agency, 142 S. Ct. 2587 (2022). As set forth in West Virginia, the Supreme Court presumes that 'Congress intends to make major policy decisions itself, not leave those decisions to agencies.' Id. at 2609 (internal citation omitted). In 'extraordinary cases,' like here with a regulation that seeks to transform the entire automotive industry and entire American vehicle fleet, '[t]he agency instead must point to 'clear congressional authorization' for the power it claims.' Id. (internal citation omitted). [EPA-HQ-OAR-2022-0985-1621-A1, p. 5]

The Court's description of what happened in West Virginia closely resembles what EPA proposes here. 'Prior to 2015, EPA had always set emissions limits under Section 111 based on the application of measures that would reduce pollution by causing the regulated source to operate more cleanly,' explained the Court. Id. at 2610 (internal citation omitted). EPA 'had never devised a cap by looking to a 'system' that would reduce pollution simply by 'shifting' polluting activity ‘from dirtier to cleaner sources.’’ Id. (internal citation omitted). Shifting polluting activity from ‘dirtier’ to ‘cleaner’ sources is exactly what EPA proposes here by forcing a transition from internal combustion engines powered by fossil fuel to zero-emission vehicles powered by electricity or hydrogen fuel cells. [EPA-HQ-OAR-2022-0985-1621-A1, p. 5]

The West Virginia Court also focused on the technology-based approach to individual sources. ‘A technology-based standard, recall, is one that focuses on improving the emissions performance of individual sources.’ Id. at 2611. But ‘[r]ather than focus on improving the performance of individual sources, [EPA] would ‘improve the overall power system by lowering the carbon intensity of power generation.’ And it would do that by forcing a shift throughout the power grid from one type of energy source to another.’ Id. at 2611-12 (internal citation omitted) (emphasis original). With this position, ‘EPA can demand much greater reductions in emissions based on a very different kind of policy judgment: that it would be ‘best’ if coal made up a much smaller share of national electricity generation. And on this view of EPA’s authority, it could go further, perhaps forcing coal plants to ‘shift’ away virtually all of their generation—i.e., to cease making power altogether.’ Id. at 2612. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 5-6]

EPA’s proposed standards here require another massive shift away from current market operations. EPA projects that its proposed standards could be satisfied through a mix of 50% zero-emission vehicles for vocational vehicles, 34% zero-emission vehicles for day cab tractors, and 25% zero-emission vehicles for sleeper cab tractors by model year 2032.12 But in 2021, global sales of electric medium- and heavy-duty trucks totaled just 0.3%, and nearly 90% of electric truck registrations occurred in China.13 Overall, electric trucks and electric buses comprised about 0.1% and 4%, respectively, of the global fleet.14 This is consistent with EPA’s analysis, which reported that heavy-duty battery electric vehicles represented just 0.2% of heavy-duty vehicles certified by EPA for model year 2021. 88 Fed. Reg. 25,940. [EPA-HQ-OAR-2022-0985-1621-A1, p. 6]

12 U.S. EPA Fact Sheet, supra note 11.

13 International Energy Agency, ‘Global EV Outlook 2022,’ 35 (2022), available at https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf.

14 Id.

In West Virginia, ‘EPA decides, for instance, how much of a switch from coal to natural gas is practically feasible by 2020, 2025, and 2030 before the grid collapses, and how high energy prices can go as a result before they become unreasonably ‘exorbitant.’’ West Virginia, 142 S. Ct. at 2612. Here, EPA is deciding how much of a switch from internal combustion engine trucks to zero-emission vehicles or hydrogen-powered vehicles is practically feasible by model years 2027 to 2032. The West Virginia Court found it ‘highly unlikely that Congress would leave to agency discretion the decision of how much coal- based generation there should be over the coming decades.’ Id. at 2613. Instead, ‘[t]he basic and consequential tradeoffs involved in such a choice are ones that Congress would likely have intended for itself.’ Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 6]

The magnitude of EPA’s proposed rule implicates the Major Questions Doctrine. EPA is attempting to use emissions standards for vehicles to force a shift from gasoline-powered vehicles to electric- and hydrogen-powered vehicles. The shift will impact energy production by dropping demand for oil exploration and refineries and increasing demand for electricity generation and mining for rare earth minerals. The rule will cost tens of billions of dollars. 88 Fed. Reg. 25,936. [EPA-HQ-OAR-2022-0985-1621-A1, p. 6]

Under the Major Questions Doctrine, EPA must point to 'clear congressional authorization' to regulate in this manner. West Virginia, 142 S. Ct. at 2614. EPA relies exclusively on Section 202(a), which provides EPA with authority to set vehicle emissions standards for any air pollutant that causes or contributes to air pollution 'which may reasonably be anticipated to endanger public health or welfare.' 42 U.S.C. 7521(a). This terse provision does not vest EPA with authority to determine the types of vehicles manufactures can make or the proper vehicle energy mix in the country. 'A decision of such magnitude and consequence rests with Congress itself, or an agency acting pursuant to a clear delegation from that representative body.' West Virginia, 142 S. Ct. at 2616. [EPA-HQ-OAR-2022-0985-1621-A1, p. 6]

Accordingly, EPA should reject the proposed rule because it violates the Major Questions Doctrine. [EPA-HQ-OAR-2022-0985-1621-A1, p. 6]

The proposed rule violates the Major Questions Doctrine because it conflicts with authority Congress delegated to another agency. [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

In determining that the Clean Power Plan violated the Major Questions Doctrine, the West Virginia Court also emphasized EPA's lack of expertise. West Virginia, 142 S. Ct. at 2612-13. 'When an agency has no comparative expertise in making certain policy judgments, we have said, Congress presumably would not task it with doing so.' Id. (internal quotations omitted). [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

For almost 50 years, Congress has looked to the U.S. Department of Transportation to set vehicle fuel efficiency standards. 49 U.S.C. 32902. Indeed, as recently as 2007, Congress directed the Secretary of Transportation to set a fuel efficiency improvement program for heavy-duty trucks. Id. at 32902(k). Congress prohibited the Department of Transportation from considering electric vehicles when it sets fuel efficiency standards. Id. at 32902(h)(2). [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

When EPA has previously proposed vehicle greenhouse gas emissions standards, it has done so in a joint rulemaking with the Department of Transportation's National Highway Traffic Safety Administration. See Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 76 Fed. Reg. 57106 (Sept. 15, 2011); Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2, 81 Fed. Reg. 73478 (Oct. 25, 2016); see also 88 Fed. Reg. 25,938-939. Yet this time, EPA only 'coordinated' with the Department of Transportation and the National Highway Traffic Safety Administration and did not issue a proposed joint rulemaking. 88 Fed. Reg. 25,939, 25,951. In the preamble, EPA states, 'EPA has similarly concluded that it is not necessary for this EPA proposal to be issued in a joint action with NHTSA.' Id. at 25,951. [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

EPA does not explain why it did not issue a proposed joint rulemaking with the National Highway Traffic Safety Administration. EPA claims there is not 'statutory requirement for EPA to consult with NHTSA' and that its charge to protect public health and welfare is 'wholly independent' of the Department of Transportation's energy efficiency mandate. Id. However, EPA does not reconcile how its independent rulemaking will affect the Department of Transportation's energy efficiency standards. [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

EPA's proposed rule intrudes upon the Department of Transportation's delegated authority to determine energy efficiency standards. Under EPA's stringent standards, manufacturers that are fully compliant with the Department of Transportation's standards will be unable to meet EPA's standards without changing production to non-fossil-fuel-powered vehicles. [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

Congress charged the Department of Transportation with setting energy efficiency standards, not EPA. This is further evidence that the proposed rule exceeds EPA's authority and violates the Major Questions Doctrine. [EPA-HQ-OAR-2022-0985-1621-A1, p. 7]

Organization: BlueGreen Alliance (BGA)

Additionally, manufacturers can leverage a range of fuel and engine efficiency technologies to help bring their fleets into compliance, including high compression ratio engines, waste heat recovery, cylinder thermal insulation, reduced friction losses, aerodynamics, efficient transmissions, cylinder deactivation, high efficiency turbochargers, and micro- and mild hybrids. The EPA's proposed Phase 3 Heavy-Duty Vehicle Emissions Standards are both technology-forcing, and technology-agnostic, which means that manufacturers will need to deploy some zero emission technologies to meet the emissions targets, but their choice of zero emission technology is not prescribed [EPA-HQ-OAR-2022-0985-1605-A1, p. 3]

The range of EPA's proposals effectively advances research, development and deployment of zero-emission technologies like those in battery electric and fuel cell vehicles, while also pushing advanced fuel and engine efficiency technologies for use cases where zero-emission technology is not yet available, affordable, or scalable. The tech-forcing and tech-agnostic nature of EPA's proposals also means that the standards have the potential to create and protect domestic manufacturing jobs in a diverse range of facilities, from those producing battery components for electric transit buses to those making low rolling resistance tires and lightweight sheet metal for tractor trailers (see Figure 2). A standard that advances the deployment of zero emission and fuel efficiency technologies provides manufacturers with ample flexibility as they determine how they will meet the requirements, while also maximizing the standards' potential to create and protect jobs in the domestic automotive supply chain. [EPA-HQ-OAR-2022-0985-1605-A1, p. 3.] [See Figure 2 on page 4 of docket number EPA-HQ-OAR-2022-0985-1605.]

Organization: BorgWarner Inc.

Penetration, however, at the Class 7 and 8 levels seems more challenging. Because of these challenges, we urge EPA to consider as many technology pathways as possible for decarbonizing these larger vehicles. [EPA-HQ-OAR-2022-0985-1578-A1, p. 3]

We recognize the urgency to combat global warming by minimizing greenhouse gas (GHG) emissions as fast as possible. For this reason, all cost-effective technology solutions should be considered to decarbonize the HD fleet in parallel. This effort should not become a competition between technologies that delay or dilute the goal and allow more irreversible damage to our planet. BEVs, hydrogen fuel cells (H2FC), hydrogen combustion (H2ICE), and advanced engine technologies, all have their strengths, and we must enable via regulation every solution possible. [EPA-HQ-OAR-2022-0985-1578-A1, p. 3]

BorgWarner supports performance-based regulations and opposes technology mandates.

We urge regulators to develop standards that are technology neutral, and performance based to encourage innovation.2 All technology pathways with practical applications should be included as potential solutions to assist the U.S. in achieving its environmental goals. Regulations based on the end goals of a clean environment, minimizing CO2 emissions, and preserving resources should not give preferential treatment to a specific technology. Public policies should let innovation and market dynamics determine the most effective solutions. [EPA-HQ-OAR-2022-0985-1578-A1, p. 5]

2 See BorgWarner Comments EPA-HQ-OAR-2019-0055; FRL-7165-03-OAR

BEVs, H2FC, and H2ICE all have strengths depending on the use case, and we must enable every technology solution to reduce GHG emissions as fast as possible. The EPA has demonstrated an enthusiasm for BEV and H2FC technologies and we urge the EPA to include H2ICE in its clean transportation strategy. [EPA-HQ-OAR-2022-0985-1578-A1, p. 5]

Organization: Bradbury, Steven G.

Introduction

With these rules, EPA is proposing to interfere with and displace market forces on a massive and unprecedented scale, and the effects of these regulatory edicts on the American people and the U.S. economy will be disastrous if even one of the EPA's many key supporting assumptions turns out to be incorrect. EPA's notices of proposed rulemaking (NPRMs) discuss the possibility of alternative adjustments to its proposed emissions limits for different pollutants, but those alternatives fall within a narrow band above and below EPA's proposed levels. They do not encompass any true alternative approaches, and they do not even leave room for automakers to rely on the various different powertrain modalities that consumers have shown a greater willingness to embrace, such as hybrid vehicle technologies and bio-fuel options, to achieve improved environmental performance. [EPA-HQ-OAR-2022-0985-2427-A2, p. 3]

It seems apparent that the EPA's primary goal is not to improve environmental performance of new motor vehicles, but rather to force the industry to transform its production processes and to achieve an artificially rapid transition to zero-emission-vehicle platforms, such as fully electric vehicles, to the extent and on the schedule that President Biden and the California Air Resources Board (CARB) have announced as their goals. Thus, the EPA's proposed rules seem to be guided by and aimed at hitting goals that are more aspirational and political in nature; they are not legitimate standards based on an accurate and objective assessment of technological and marketplace realities. [EPA-HQ-OAR-2022-0985-2427-A2, p. 3]

The Proposed Rules Exceed EPA's Statutory Authority

Congress has never voted to cede to the Administrator of the EPA the far-reaching power and discretion the Agency is claiming in these rulemakings. There has been no delegation from the people's elected representatives—let alone a clear and express delegation— of such economy-wide transformational power that could survive analysis under the Major Questions Doctrine. [EPA-HQ-OAR-2022-0985-2427-A2, p. 3]

If finalized as proposed, these rules would exceed the bounds of EPA's statutory authority in two fundamental respects—one relating generally to the Agency's regulation of carbon dioxide emissions from new motor vehicles; the other involving its leveraging of pollution-control authority to force on the American people a hyper-accelerated transition to electric vehicles. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 3-4]

EPA may not use carbon dioxide regulation to displace DOT's exclusive authority over fuel economy standards.

Setting limits on carbon dioxide emissions for gas-powered vehicles and prescribing fuel economy standards for those vehicles are two sides of the same regulatory coin. They cannot be separated, because there is a direct and consistent relationship between the amount of carbon dioxide a vehicle's internal-combustion engine will generate per mile traveled and the number of miles the vehicle will go on a gallon of gas. [EPA-HQ-OAR-2022-0985-2427-A2, p. 4]

The problem for the EPA is that ever since enactment of the Energy Policy and Conservation Act (EPCA) in 1975, which created the fuel economy program, Congress has given the Secretary of Transportation, not the EPA, the sole authority to establish fuel economy standards for new motor vehicles offered for sale to private buyers in the United States8—authority delegated by the Secretary to the National Highway Traffic Safety Administration (NHTSA), a component of DOT. NHTSA consults with EPA and the Energy Department in setting the standards, and EPA is tasked with measuring the automakers' compliance with the standards NHTSA sets, but neither EPA nor any other agency has authority to supersede or interfere with NHTSA's mandate under EPCA. [EPA-HQ-OAR-2022-0985-2427-A2, p. 4]

8 See 49 U.S.C. § 32902, https://www.law.cornell.edu/uscode/text/49/32902.

Congress assigned to DOT the exclusive authority to set fuel economy standards, rather than EPA under the Clean Air Act, because the fuel economy program is not about environmental regulation. Congress wanted to prod the automakers toward the production of more fuel-efficient vehicle models to help lessen America's strategic dependence on foreign oil in the wake of the Arab oil embargoes of the 1970s. [EPA-HQ-OAR-2022-0985-2427-A2, p. 4]

Congress's delegation of authority over the fuel economy program has always been carefully limited.

Initially, Congress specified mileage targets by statute and put a tight collar on DOT's regulatory authority: Any proposed fuel economy standard that fell outside the collar was subject to veto by either House of Congress—a restraint that was nullified when the Supreme Court held legislative vetoes unconstitutional in INS v. Chadha (1983). And from time to time, Congress has put statutory caps on the mileage standards through appropriations riders. [EPA-HQ-OAR-2022-0985-2427-A2, p. 4]

Ultimately, when it allowed broader standard-setting discretion to DOT under EPCA, Congress still did so in a manner designed to ensure that NHTSA's regulatory power would never be used to frustrate Americans' love affair with the automobile or impose disruptions in the traditional automotive industry. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 4-5]

In administering the fuel economy program, NHTSA must (i) respect the practical needs and desires of American car buyers; (ii) take into account the economic realities of supply and demand in the auto markets; (iii) protect the affordability of vehicle options for American families; (iv) preserve the vitality of the domestic auto industry, which sustains millions of good-paying American jobs; (v) maintain highway traffic safety for the country; (vi) consider the nation's need to conserve energy; and (vii) advance the goal of reducing America's strategic dependence on foreign supplies of critical inputs. [EPA-HQ-OAR-2022-0985-2427-A2, p. 5]

And, significantly, EPCA expressly prohibits NHTSA from considering the fuel economy of electric vehicles in setting or amending its standards.9 [EPA-HQ-OAR-2022-0985-2427-A2, p. 5]

9 See id. § 32902(h); see also 49 U.S.C. § 32901(a)(1), (8), (9) & (10), https://www.law.cornell.edu/uscode/text/49/32901.

In sum, NHTSA has no authority to compel the phaseout of internal-combustion engines or to require automakers to use new technologies that are not responsive to consumer demand or that fail to align with the industry's existing production realities. [EPA-HQ-OAR-2022-0985-2427-A2, p. 5]

In Massachusetts v. EPA,10 the Supreme Court concluded that, in theory, there is no necessary conflict between the control of carbon dioxide emissions under section 202 of the Clean Air Act and NHTSA's authority to prescribe fuel economy standards under EPCA.11 But, in practice, whenever EPA actually proposes to impose such emissions controls, it must do so in a manner that avoids displacing NHTSA's authority over fuel economy. [EPA-HQ-OAR-2022-0985-2427-A2, p. 5]

10 549 U.S. 497 (2007), https://www.oyez.org/cases/2006/05-1120.

11 See id. at 532 ("The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.").

It is a basic principle of law that when there is a potential for inconsistent application of two federal statutes, the statutes must be interpreted and applied in harmony, if reasonably possible. The agencies charged with faithfully carrying out those statutory mandates are required to respect and preserve the roles and priorities assigned by Congress. [EPA-HQ-OAR-2022-0985-2427-A2, p. 5]

The Obama administration was the first to confront this issue when it launched the EPA into the business of regulating carbon dioxide emissions from new motor vehicles in 2012. Both the Obama administration and later the Trump administration addressed the requirement for harmonization by having NHTSA and EPA conduct joint rulemakings in the setting of common fuel economy standards and carbon dioxide emissions limits. [EPA-HQ-OAR-2022-0985-2427-A2, p. 5]

But the present administration has broken that mold, and the current proposed tailpipe rules are an egregious example. By acting on its own, in advance of NHTSA, to dictate draconian new reductions in carbon dioxide emissions limits for future model years of vehicles, EPA would render entirely irrelevant NHTSA's judgment about the appropriate fuel economy standards for those same vehicle fleets. If finalized in their current form, the proposed limits on carbon dioxide emissions from new motor vehicles (both for light- and medium-duty vehicles and for heavy-duty trucks) would be an unlawful usurpation by EPA of NHTSA's exclusive statutory role. Any determination by NHTSA to establish fuel economy standards for gas-powered vehicles that would allow for greater carbon dioxide emissions than EPA's proposed rules would have no regulatory effect—it would be a nullity. [EPA-HQ-OAR-2022-0985-2427-A2, p. 6]

Congress has not delegated to EPA the power to force the conversion to electric vehicles.

EPA is very candid about the goal of its proposed rules: The Agency is trying to use tailpipe emissions limits on carbon dioxide and criteria pollutants as a tool to coerce the automotive industry to build far more electric vehicles (EVs) than market demand would currently support. [EPA-HQ-OAR-2022-0985-2427-A2, p. 6]

Right now, EVs account for less than 6 percent of new light-duty vehicle sales in the United States and an even lower percentage of medium- and heavy-duty commercial truck sales. Following the script laid down by President Biden in an executive order,12 the EPA is aiming to force those percentages way up—to 60 percent of light-duty vehicle sales by 2030 and 67 percent by 2032. [EPA-HQ-OAR-2022-0985-2427-A2, p. 6

12 See Executive Order 14037 ("Strengthening American Leadership in Clean Cars and Trucks"), August 5, 2021 (setting goal of 50 percent of U.S. new vehicle sales to be zero-emission vehicles by 2030).

And through these rulemakings, the Agency is proposing to align its regulatory objectives with the zero-emission vehicle, or ZEV, mandates recently issued by CARB, the California Air Resources Board, which are designed to phase out the sale of all gas-powered passenger cars and light trucks by 2035 and all medium- and heavy-duty trucks by 2045. The EPA now appears to be committed to a similar trajectory. [EPA-HQ-OAR-2022-0985-2427-A2, p. 6]

It is not surprising the Agency would act to conform its policies to CARB's, since CARB was able to issue its mandates only because the EPA has granted California a special waiver from preemption under the Clean Air Act. Both sets of rules flow from the policy decisions of the EPA in accordance with directions from the White House. [EPA-HQ-OAR-2022-0985-2427-A2, p. 6]

Where does EPA purport to find this authority in the Clean Air Act?

The logic is as follows: [EPA-HQ-OAR-2022-0985-2427-A2, p. 6]

Because most automakers have announced ambitious timetables for transitioning to the production of EVs going forward and have pledged to make large capital investments to finance this gradual switchover,13 and because Congress has recently approved generous federal subsidies for some EV purchases and charging infrastructure,14 EPA says it can now declare that battery-electric vehicle technology is a "feasible" alternative to the traditional internal-combustion engine (ICE) powertrain.15 And on that basis, EPA is proposing to treat EVs as an available "control technology" for achieving compliance with the tailpipe emissions restrictions under Clean Air Act section 202.16 [EPA-HQ-OAR-2022-0985-2427-A2, p. 7]

13 See 88 FR at 29191, Figure 1 (reproducing a chart prepared by the Environmental Defense Fund depicting the automakers' announced goals for future electrified vehicle sales as a percentage of total sales); id. at 29193-94 (summarizing automakers' announced plans for investments in EV technology).

14 See id. at 29195-96; Infrastructure Investment and Jobs Act, Public Law 117–58, 135 Stat. 429 (2021), https://www.congress.gov/117/plaws/publ58/PLAW117publ58.pdf; Inflation Reduction Act of 2022,

Public Law 117–169, 136 Stat. 1818 (2022), https://www.congress.gov/117/bills/hr5376/BILLS117hr5376enr.pdf.

15 See 88 FR at 29194 (light-duty and medium-duty vehicles); 88 FR at 25972 (heavy-duty trucks).

16 See 88 FR at 29284 (for light-duty and medium-duty vehicles); 88 FR at 26015 (for heavy-duty trucks).

This reasoning obviously depends on a kind of feedback loop. The automakers are pledging to invest in the transition to EVs because governments around the world—like China, the EU, the Biden White House, and Governor Gavin Newsom and his climate regulators in California—are demanding that they do so. But everyone knows there is a large looming impediment to this Green Dream: resistance from American consumers. [EPA-HQ-OAR-2022-0985-2427-A2, p. 7]

The American public is not jumping on the electric bandwagon. EVs are expensive— beyond the reach of many American families—and most Americans remain skeptical that EVs will reliably serve the full range of their needs, that quick and convenient charging stations will be widely available, that EVs will maintain their promised driving range over time or in cold weather, that they will have any significant resale or trade-in value down the road, and that insurance carriers will cover the huge costs of battery replacement when the battery wears out or is damaged in a minor accident.17 [EPA-HQ-OAR-2022-0985-2427-A2, p. 7]

17 See Nick Carey, Paul Lienert, and Sarah McFarlane, "Scratched EV battery? Your insurer may have to junk the whole car," Reuters, March 20, 2023, https://www.reuters.com/business/autostransportation/scratched-ev-battery-your-insurer-may-have-junk-whole-car-2023-03-20/ ("For many electric vehicles, there is no way to repair or assess even slightly damaged battery packs after accidents, forcing insurance companies to write off cars with few miles—leading to higher premiums and undercutting gains from going electric.").

To push the automakers to convert to EV production in the absence of sufficient market demand, EPA plans to ratchet down the emissions limits for carbon dioxide and for the traditional criteria and other pollutants associated with smog (such as unburned hydrocarbons, particulate matter, oxides of nitrogen, and ozone) to super-stringent levels that are technologically impossible for gas-powered vehicles (even hybrids) to satisfy.18 At the same time, EPA is proposing to phase out certain regulatory buffers that allow automakers to report better emissions compliance results, such as "off-cycle credits" for the addition of onboard technologies that improve the fuel efficiency of ICE vehicles.19 [EPA-HQ-OAR-2022-0985-2427-A2, pp. 7-8]

18 See, e.g., 88 FR at 29237-38; id. at 29257-61.

19 See id. at 29249-50.

The automakers' only recourse will be to replace more and more of the ICE vehicles in their fleets (including hybrids) with the "alternative control technology" of battery-electric vehicles. [EPA-HQ-OAR-2022-0985-2427-A2, p. 8]

And here is the trick: For enforcement purposes, EPA applies the emissions limits to each automaker on a fleetwide average basis, and it proposes to reduce these fleetwide averages dramatically each model year from 2027 through 2032 on a ramp rate calculated to achieve the Biden administration's desired percentage mix of EVs in the U.S. auto fleets. [EPA-HQ-OAR-2022-0985-2427-A2, p. 8]

In other words, EPA is now proposing to set fleetwide average tailpipe pollution limits that are intended by design to apply increasingly over time to vehicles that have no tailpipes and that EPA says emit none of the pollutants covered by the regulations.20 [EPA-HQ-OAR-2022-0985-2427-A2, p. 8]

20 Automakers can avoid violating the average emissions limits in certain circumstances with regulatory “credits,” earned by producing vehicles, like EVs, that outperform the limits. Under the EPA’s rules, credits can be “banked” from one model year to another within limits, “transferred” from one fleet to another (for example, from the automaker’s light truck fleet to its passenger car fleet), or “traded” between automakers, which usually involves a privately negotiated purchase. Tesla, which manufactures nothing but EVs and accounts for approximately 70 percent of the U.S. EV market, receives a large portion of its income from selling emissions credits to the other automakers. Predictably, the EPA is proposing to retain this credit system to continue the subsidization of EV manufacturing. See 88 FR at 26245-46.

This scheme bears no resemblance to EPA’s past approach to the regulation of vehicle emissions under the Clean Air Act. [EPA-HQ-OAR-2022-0985-2427-A2, p. 9]

Previously, when EPA has set emissions limits for criteria pollutants under section 202, the available control technologies that EPA has recognized as feasible for achieving compliance have involved cleaner fuels and discrete types of equipment added to the ICE vehicle. This equipment includes, for example, enhanced catalytic converters to capture certain types of pollutants and scrub them out of the vehicle’s exhaust, onboard computers to control more precisely the fuel mixture burned by the vehicle’s engine, vapor-capture systems for refueling, and fuel-injection systems to recycle unburned fuel back into the cylinders. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 8-9]

The use of these types of discrete control technologies has already achieved impressive reductions in smog-producing criteria pollutants. As EPA itself acknowledges, existing control technologies applied under previous regulations have enabled automakers to attain “reductions of up to 80 percent in tailpipe criteria pollutant emissions” from ICE vehicles.21 [EPA-HQ-OAR-2022-0985-2427-A2, p. 9]

21 88 FR at 29188.

But now, in these rules, EPA is proposing to do something radically different. The so-called control technology here is not some discrete equipment added to the ICE vehicle to achieve lower emissions; it is entirely separate replacement technology that uses a new and different powertrain. These are replacement vehicles, not true control technology; they are different vehicles from bumper to bumper, built on entirely different production lines. [EPA-HQ-OAR-2022-0985-2427-A2, p. 9]

The EPA’s current proposals are thus closely analogous to the Clean Power Plan that was struck down by the Supreme Court last year in West Virginia v. EPA:

There, EPA was relying on its Clean Air Act authority to regulate power plant emissions based on the “best system of emission reduction” available to the plant operator. EPA had previously exercised that authority by setting emissions standards that required individual plants to take measures “to operate more cleanly.” But in the Clean Power Plan, EPA concluded that coal-fired power plants could not eliminate enough carbon dioxide emissions to satisfy EPA simply by employing additional measures at the plant. Instead, EPA proposed to require them to choose between greatly reducing their own electricity production (potentially even shutting down the plant) or paying to subsidize increased electricity generation from alternative sources, including natural gas, wind, and solar power (the so-called "generation shifting" concept). The overall goal was to reduce the percentage of national electricity generation supplied by coal and increase the percentage contribution from wind and solar. [EPA-HQ-OAR-2022-0985-2427-A2, p. 9]

The Supreme Court held that the Clean Power Plan implicated the Major Questions Doctrine because EPA was claiming the power to "restructure the American energy market," and this represented a "transformative expansion" in the Agency's exercise of its regulatory authority. The Court was unconvinced that Congress had "implicitly tasked" the EPA "with balancing the many vital considerations of national policy implicated in deciding how Americans will get their energy," or with the authority to decide "how much of a switch from coal to natural gas is practically feasible" for the nation. There was "little reason to think Congress" had assigned matters of such economic and political significance to the EPA's discretion. "The basic and consequential tradeoffs involved" are "ones that Congress would likely have intended for itself." [EPA-HQ-OAR-2022-0985-2427-A2, p. 9]

Everything the Supreme Court said about the Clean Power Plan can be said about the EPA's current proposals for regulating vehicle emissions. As it tried to do with the power market, EPA is now attempting to leverage its authority to set emissions limits for particular types of vehicles into a grand new scheme for shifting and rebalancing the overall mix of ICE, battery-electric, and other powertrains in the national auto fleet—an extravagant role for the Agency to play, and one with enormous economic and political implications. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 9-10]

Indeed, the current proposals represent an even more extreme example of regulatory overreach than the Clean Power Plan. Here, EPA is attempting to coerce the automakers into financing the entire transformation of the manufacturing base of a major industrial sector by converting their own production of ICE vehicles to EVs on a large scale, not simply contributing toward the marginal subsidization of alternative investments by others. [EPA-HQ-OAR-2022-0985-2427-A2, p. 10]

Moreover, in the name of ensuring that its own preferred "control technology" will actually deliver the expected performance as a suitable long-term substitute for ICE vehicles, EPA is also claiming the authority to regulate the design and functionality of battery-electric technology over the entire life cycle of EVs. Like CARB, EPA proposes to adopt and enforce "Global Technical Requirement" (GTR) No. 22, promulgated by the United Nations Economic Commission for Europe, which sets standards and requirements for validating electric battery durability.22 [EPA-HQ-OAR-2022-0985-2427-A2, p. 10]

22 See 88 FR at 29284-85; 88 FR at 26013-15.

Thus, EPA expects to be in the permanent business of regulating EV technologies, which involve no tailpipes at all, let alone tailpipe emissions—all under the aegis of a statute enacted by Congress to address air pollution from vehicle tailpipes. [EPA-HQ-OAR-2022-0985-2427-A2, p. 10]

What is clear is that EPA sees an endless horizon for its new-found power to regulate practically all aspects of the American automotive market. No doubt, for example, the Agency intends to be involved in overseeing the buildout and operation of electric vehicle charging infrastructure around the country—once again, as an incident of the regulators' own expansive conception of their section 202 authority to ensure the adequacy of EPA's chosen control technology. [EPA-HQ-OAR-2022-0985-2427-A2, p. 10]

We can easily imagine that someday this self-assumed mandate will include the power to ration the timing and extent of drivers' access to charging networks, as EPA deems necessary to maintain the general supply of electricity for EVs. California is already doing this. Because the buildout of charging infrastructure will depend critically on government subsidies and approvals, government rationing of access to this infrastructure is a very real prospect, especially given the strains on grid reliability that I discuss below. [EPA-HQ-OAR-2022-0985-2427-A2, p. 10]

The bottom line under the Major Questions Doctrine is that section 202, on which the proposed rules rest, contains no clear and express delegation of any authority that could sustain these massively consequential proposals. As the Court observed in West Virginia v. EPA, "Congress certainly has not conferred [such] authority upon EPA anywhere … in the Clean Air Act." [EPA-HQ-OAR-2022-0985-2427-A2, p. 10]

The Analyses and Assumptions on Which the Proposed Regulatory Actions Are Based Are Arbitrary, Fundamentally Flawed, and Fail to Recognize and Account Properly for the Hugely Negative Consequences that Would Result from These Actions

EPA claims that, despite the coercive power and industry-transforming ambition behind its proposals, these rules will somehow deliver a stupendous bounty of net benefits, ranging at the high end from $1.5 trillion to $2.3 trillion for the light- and medium-duty vehicle rule,23 plus another $180 billion to $320 billion for the heavy-duty truck rule.24 [EPA-HQ-OAR-2022-0985-2427-A2, p. 11]

23 Id. at 29200.

24 88 FR at 25937.

This miracle of regulatory cost-benefit accounting cannot hold up under scrutiny. [EPA-HQ-OAR-2022-0985-2427-A2, p. 11]

Conclusion

If and when the American people feel the true effects of these rules—when they lose the vehicle options they love at the local dealership and find themselves stuck driving older and less safe cars, when the bottom falls out of the job market in the U.S. auto industry, when drivers cannot find convenient charging stations for their electric vehicles—in sum, when American voters realize what the EPA's far-reaching regulatory enterprise has wrought for the nation, they will be angry. [EPA-HQ-OAR-2022-0985-2427-A2, p. 24]

At issue are matters of life, liberty, and prosperity, and the considerations involved are fundamentally political in nature. That is exactly why, under our constitutional republic, it is for Congress, and Congress alone, to make the monumental decisions that EPA is purporting to take upon itself in these proposed rules. For these reasons, EPA should withdraw its proposed tailpipe rules and reconsider the wisdom of these proposals. [EPA-HQ-OAR-2022-0985-2427-A2, p. 24]

Organization: California Air Resources Board (CARB)

U.S. EPA is promulgating the proposed Phase 3 GHG emission standards pursuant to the statutory authority of Title II of the federal CAA, and specifically sections 202(a)(1) and (2), sections 202-209, 216, and 301 (42 U.S.C. 7521 (a)(1) and (2), 7521-7543, 7550, and 7601).19 [EPA-HQ-OAR-2022-0985-1591-A1, p.14]

19 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, Proposed Rules, 88 Fed. Reg., April 27, 2023, page 25948.

CAA section 202(a)(2) [42 U.S.C.§ 7521(a)(2)] provides that "[a]ny regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." [EPA-HQ-OAR-2022-0985-1591-A1, p.14]

Courts interpreting section 202(a) of the CAA have recognized that Congress intended U.S. EPA to rely upon projected future developments and advances in pollution control technology in establishing emission standards and expected U.S. EPA to "press for the development and application of improved technology rather than be limited by that which exists today." Natural Resources Defense Council v. U.S. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981). The Natural Resources Defense Council (NRDC) court noted that a longer lead time "gives the U.S. EPA greater scope for confidence that theoretical solutions will be translated successfully into mechanical realizations,"20 and further stated that "the presence of substantial lead time for development before manufacturers will have to commit themselves to mass production of a chosen prototype gives the agency greater leeway to modify its standards if the actual future course of technology diverges from expectation." (Id.) The court concluded:

We think that the U.S. EPA will have demonstrated the reasonableness of its basis for prediction if it answers any theoretical objections to the [projected control technology], identifies the major steps necessary in refinement of the [projected control technology], and offers plausible reasons for believing that each of those steps can be completed in the time available.21 [EPA-HQ-OAR-2022-0985-1591-A1, pp.14-15]

20 Id. at 329.

21 Id. at 331-32. Accord, Husqvarna AB v. Environmental Protection Agency, 254 F.3d 195, 201 (D.C. Cir. 2001) and National Petrochemical & Refiners Association v. Environmental Protection Agency, 287 F.3d 1130, 1136 (D.C. Cir. 2002).

In this NPRM, U.S. EPA has identified and discussed a broad range of compliance strategies and technologies that vehicle manufacturers may elect to utilize to comply with the Proposed Standards, including technology packages consisting of both internal combustion engine (ICE) vehicle and ZEV technologies that CARB staff concurs will be commercially available and that will enable vehicle manufacturers to comply with the Proposed Standards within the proposed time frames. [EPA-HQ-OAR-2022-0985-1591-A1, p.15]

CARB staff also recommends U.S. EPA assess the impacts of the existing ATC multipliers and expected HD ZEV production from 2023 through 2026 on the Proposed Standards. As a result of the ACT regulation, manufacturers will be building increasing volumes of HD ZEVs in California and Section 177 states beginning as early as 2024. Manufacturers are also expected to produce and sell HD ZEVs in other states at a smaller fraction of sales. Manufacturers are already announcing HD ZEV sales in other state sales, recruiting and training dealers in these areas, and supporting public high power HD charging188 and hydrogen189 infrastructure corridors to promote sales in the Southeast, Texas, Southwest and elsewhere. [EPA-HQ-OAR-2022-0985-1591-A1, p.53]

188 HD charging infrastructure examples. https://www.prnewswire.com/news-releases/introducing-greenlane-daimler-truck-north-americanextera-energy-resources-and-blackrock-forge-ahead-with-public-charging-infrastructure-joint-venture-301811101.html https://www.volvotrucks.us/news-and-stories/press-releases/2022/july/constructing-california-electrifiedcharging-corridor-for-medium-and-heavy-duty-electric-vehicles/ https://www.prnewswire.com/news-releases/pilot-company-and-volvo-group-partner-to-build-chargingnetwork-for-medium—and-heavy-duty-electric-trucks-301678542.html

189 Hydrogen infrastructure examples. https://tankstoragenewsamerica.com/nm-to-be-part-of-clean-freight-corridor/ https://www.nikolamotor.com/press_releases/nikola-announces-additional-hyla-branded-hydrogenrefueling-station-in-california/ https://www.sae.org/news/2023/05/hyundai-fuel-cell-class-8-act-expo

The manufacturer infrastructure efforts are complementary to additional HD corridor efforts by private enterprises.190 An illustration of the business case for HD ZEVs in the other states is a specialty HD BEV manufacturer that has reported already selling over half of their class 8 tractors unassisted by incentives as of 2021.191 These additional HD ZEVs unanticipated in the proposed baseline are most likely to be BEVs which are eligible to earn credits with an ATC multiplier of 4.5. Fuel cell HDVs well beyond California that would contribute to the baseline with the 5.5 multiplier have also been announced.192 Given that U.S. EPA based the standards for the Phase 2 GHG regulation on a scenario with no HD ZEV penetration, there is a significant chance that early proliferation of HD ZEVs will create a credit glut in 2027 which allows manufacturers to defer increased emission reductions (including HD ZEV production) until later years as discussed further in Part I. Section I.1 below, CARB staff's comments on the definition of U.S.-directed production volume. CARB staff urges U.S. EPA to assess the potential for, and impact of, this credit glut and either eliminate the credits earlier or adjust the standards to prevent it or blunt its impact. [EPA-HQ-OAR-2022-0985-1591-A1, pp.53-54]

190 Additional infrastructure efforts from private entities. https://terawattinfrastructure.com/electric-corridor/ https://www.prnewswire.com/news-releases/wattev-to-open-nations-largest-heavy-duty-truck-chargingdepot-at-port-of-long-beach-the-week-of-may-15-301816439.html https://www.prnewswire.com/news-releases/forum-mobility-and-cbre-investment-managementannounce-400-million-joint-venture-and-15-million-series-a-targeting-equitable-electrification-of-heavyduty-port-transit-301721528.html https://zeemsolutions.com/about/

191 Orange EV: Ten Years and Four Million Miles Later, Orange EV Leads Heavy Duty Electric Truck Market, February 16, 2022. https://orangeev.com/orange-ev-news/orange-ev-leads-electric-truck-market/

192 Hyundai's fuel-cell dreams remain Xcie, May 25, 2023. https://www.sae.org/news/2023/05/hyundai-fuel-cell-class-8-act-expo

Organization: Chevron

2. Maximize and accelerate GHG reduction

The heavy-duty proposal does not incentivize GHG reductions from the existing vehicle fleet, thus missing an opportunity to accelerate GHG reduction in the early years of the program. For example, the Ramboll HHDT Case Study showed that a ZEV-only strategy did not achieve the maximum emission reductions possible. A fleet mix that deployed a wider range of technologies, including ZEVs, FCEVs, and low-CI, low-NOx combustion engines, out-performed the ZEV-only deployment strategy in the near-term and achieved equitable emission reductions in the long-term.3 [EPA-HQ-OAR-2022-0985-1552-A1, p.4]

3 Environmental Benefits of Medium- and Heavy- Duty Zero Emission Vehicles Compared with Clean Bio- & Renewable-Fueled Vehicles 2022-2032, Prepared for Diesel Technology Forum by Stillwater Associates LLC, July 19, 2022, https://dieselforum.egnyte.com/dl/MWHPcRW4e6

Recent published research from SUNY5 shows that the time value of carbon is important in evaluating technology pathways to maximize emission reductions from the fleet of heavy-duty trucks that includes new and older trucks in-use. GHG emissions generated by the truck fleet accumulate in the atmosphere and dissipate slowly over time. GHG emissions that may be reduced or eliminated today can be more valuable than future emission reductions given the annual accumulation of emissions. A GHG reduction strategy that focuses on lifecycle emissions, as opposed to tailpipe emissions only, would incentivize near term emission reductions that would create long term environmental benefits. [EPA-HQ-OAR-2022-0985-1552-A1, p.4]

5 Quantifying the comparative value of carbon abatement scenarios over different investment timing scenarios - College of Environmental Science (exlibrisgroup.com)

Ignoring the benefit of these more immediate solutions while focusing on future adoption of zero tailpipe emissions solutions may result in higher cumulative fossil-carbon emissions. A companion research study from SUNY6 analyzes different scenarios for technology adoption that includes existing lower carbon intensity fuels, namely biomass-based diesel, and future adoption of nascent zero tailpipe emission solutions. Biomass-based diesel includes biodiesel and renewable diesel fuel that may reduce emissions up to 86 percent, depending on feedstock type, compared to 100% petroleum diesel fuel. These solutions are already available in the market while heavy-duty truck zero tailpipe emission solutions at scale are still under development. A strategy that encourages the use of lower carbon intensity fuels in the near term, coupled with the gradual replacement of trucks with zero tailpipe emission solutions in future years, results in greater GHG emission reductions compared to the future introduction of zero tailpipe emission options alone. [EPA-HQ-OAR-2022-0985-1552-A1, pp.4-5]

6 "Quantifying and comparing the cumulative greenhouse gas emissions and financial viability of heavy-duty transportation pathways for the Northeastern, United States" Fuel, Jenny Frank, Tristan Brown, HakSoo Ha, Dave Slade, Martin Haverly, Robert Malmsheimer.

3. Broad technology approach

There are a wide variety of vehicle technologies and fuel types that can be used in the substantial number of unique heavy-duty applications. It is unlikely that the market would identify a single vehicle technology that would be appropriate for all different usage categories.

The proposed rule should be broadened to encourage the use of multiple technologies by establishing a neutral, market-based, lifecycle standard. Heavy-duty vehicles powered by biofuels, hybrid technologies, and renewable natural gas leverage the existing infrastructure and are proven to deliver the power, uptime, reliability, and efficiency required for heavy goods transportation. [EPA-HQ-OAR-2022-0985-1552-A1, p.5]

Organization: Clean Air Task Force et al.

1. The Clean Air Act authorizes EPA to rely on zero-emission technologies in standard-setting.

As set forth in detail in the proposal, the Clean Air Act authorizes the Agency to consider zero-emission technologies when setting emission standards and to finalize standards at levels that will lead to greater deployment of ZEVs. See 88 Fed. Reg. at 25948-51 (relying on statutory language, legislative materials, case law, and regulatory history). Sections 202(a)(1)-(2) do not give preference to any particular emission control technology, propulsion system, or powertrain type.31 Congress was intensely interested in electrification and other emerging vehicle technologies in the 1960s and 1970s, and it expected EPA to consider emission reductions that could be achieved through the use of alternative fuels and propulsion systems (including electrification) that control air pollution more effectively than combustion vehicle technologies.32 Both at the tailpipe and on a "lifecycle" basis, ZEVs offer superior emissions reductions compared to combustion vehicles.33 As "complete systems…to prevent" air pollution, 42 U.S.C. § 7521(a)(1), ZEVs fall well within the scope of section 202(a)(1).34 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 13 - 14]

31 EPA Br. 7-10; Oge & Hannon Amicus Br. 17-18; Final Br. of State & Pub. Int. Respondent-Intervenors, Texas v. EPA, Case No. 22-1031 (D.C. Cir. Apr. 27, 2023), ECF No. 1996908, 6-8, 28-29 [hereinafter "State & Pub. Int. Br."]; Br. of Sen. Thomas R. Carper & Rep. Frank Pallone, Jr. as Amici Curiae in Support of Respondents, Texas v. EPA, Case No. 22-1031 (D.C. Cir. Mar. 2, 2023), ECF No. 1988363, 12-16, 19-22 [hereinafter "Carper & Pallone Amicus Br."].

32 See 88 Fed. Reg. at 25947-50; EPA Br. at 7-10, 40-46; State & Pub. Int. Br. at 6-8, 28-29; Carper & Pallone Amicus Br. at 12-16, 19-22.

33 See generally Adrian O'Connell et al., Int'l Council on Clean Transp. (ICCT), A Comparison of the Life-Cycle Greenhouse Gas Emissions of European Heavy-Duty Vehicles and Fuels (2023), https://theicct.org/wp-content/uploads/2023/02/lca-ghg-emissions-hdv-fuels-europe-feb23.pdf; Lu Xu, Life Cycle Greenhouse Gas Emissions of Conventional and Alternative Heavy-duty Trucks: Literature Review and Harmonization (Thesis), at chs. 3-4 (2021), https://hdl.handle.net/1807/108920; Dora Burul & David Algesten, Scania, Life cycle assessment of distribution vehicles: Battery electric vs diesel driven (undated), https://www.scania.com/content/dam/group/press-and-media/press-releases/documents/Scania-Life-cycle-assessment-of-distribution-vehicles.pdf; Georg Bieker, ICCT, A Global Comparison of the Life-cycle Greenhouse Gas Emissions of Combustion Engine and Electric Passenger Cars (2021), https://theicct.org/wp-content/uploads/2021/07/Global-Vehicle-LCA-White-Paper-A4-revised-v2.pdf; Jarod C. Kelly et al., Argonne National Laboratory, Cradle-to-Grave Lifecycle Analysis of U.S. Light-Duty Vehicle-Fuel Pathways: A Greenhouse Gas Emissions and Economic Assessment of Current (2020) and Future (2030-2035) Technologies, at ch. 8 & app. B, (2022), https://publications.anl.gov/anlpubs/2022/07/176270.pdf; Fuels Institute, Life Cycle Analysis Comparison, (2022), https://www.transportationenergy.org/wp-content/uploads/2022/10/FI_Report_Lifecycle_FINAL.pdf; Maxwell Woody et al., Corrigendum: The role of pickup truck electrification in the decarbonization of light-duty vehicles, Env't Rsch. Letters, July 15, 2022, https://iopscience.iop.org/article/10.1088/1748-9326/ac7cfc/pdf; David Reichmuth et al., Union of Concerned Scientists, Driving Cleaner: Electric Cars and Pickups Beat Gasoline on Lifetime Global

Warming Emissions (2022), https://www.ucsusa.org/sites/default/files/2022-09/driving-cleaner-report.pdf; Florian Knobloch et al., Net emission reductions from electric cars and heat pumps in 59 world regions over time (Dec. 1, 2020), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7308170/pdf/EMS85812.pdf (author manuscript; published in final edited form at 3 Natural Sustainability 437 (2020)).

34 Section 202(a)(4), which references an "emission control device, system, or element of design," 42 U.S.C. § 7521(a)(4)(A) (emphasis added), provides further evidence that Congress envisioned that EPA may consider, and that manufacturers may use, a wide variety of emission control technologies and approaches. Electrification is a "system" and an "element of" motor vehicle "design."

Accelerating the deployment of zero-emission technologies through the Phase 3 rule would also build on EPA's long and consistent practice of both considering and incentivizing these technologies in its section 202(a)(1) rulemakings.35 EPA began doing so more than two decades ago when it finalized the "Tier 2" criteria pollutant standards.36 65 Fed. Reg. 6698 (Feb. 10, 2000). That rule required manufacturers to certify all new light-duty vehicles into one of eight emissions profiles, or "bins." Id. at 6734. A sales-weighted average of those bins determined the manufacturer's compliance with the fleet-average NOx standard. Id. Bin 1 was designated for ZEVs. Id. at 6746. EPA recognized that including ZEVs in the fleet average would "provide a strong incentive" for manufacturers to develop and introduce ultra-clean vehicle technologies, serving as "a stepping stone to the[ir] broader introduction." Id. (EPA's prediction has proven correct, as ZEVs have grown to comprise ever-greater portions of the light-duty37 and heavy-duty fleets38 since that time.) Later, in a series of GHG emission rulemakings spanning three presidential administrations, the Agency continued to include ZEVs in fleet average standards for light- and heavy-duty vehicles, as shown in the table below. EPA took the same approach in 2014 for its Tier 3 criteria pollutant standards for light-duty vehicles. 79 Fed. Reg. 23414, 23454, 23471 (Apr. 28, 2014). [EPA-HQ-OAR-2022-0985-1640-A1, pp. 14 - 15.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, page 15, for referenced table]

35 Oge & Hannon Amicus Br. at 14-15, 24-25, 28-30.

36 Even before the Tier 2 standards, EPA included ZEVs in its 1997 National Low Emission Vehicle Program regulation. Those standards, however, were voluntary. 62 Fed. Reg. 31192, 31208, 31211-12, 31224 (June 6, 1997).

37 EPA, The 2022 Automotive Trends Report, at 74, Table 4.1 (2022), https://www.epa.gov/system/files/documents/2022-12/420r22029.pdf (production share by powertrain, showing increasing shares of hybrids, plug-in hybrids, and battery electric vehicles).

38 88 Fed. Reg. at 25939-43.

Finally, we agree with EPA that recent actions by Congress reinforce the Agency's authority to set emission standards that rely on and accelerate the deployment of zero-emission vehicle technologies. See 88 Fed. Reg. at 25950. As members of Congress have emphasized, the BIL and IRA provide "a clear signal of Congress' intent to support vehicle electrification and robust EPA authority to accelerate it." Carper & Pallone Amicus Br. at 29; see generally id. at 29-35. And by significantly lowering the cost and increasing the availability of zero-emission technologies, the BIL and IRA assist EPA in setting standards that will achieve ambitious reductions in GHG emissions.39 EPA should use its clear authority under the Clean Air Act to do so here by finalizing standards more stringent than it has proposed. [EPA-HQ-OAR-2022-0985-1640-A1, p. 15]

39 See Greg Dotson & Dustin J. Maghamfar, The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and the Inflation Reduction Act, 53 Env't L. Rep. 10017, 10018, 10029 (2023).

2. The averaging, banking, and trading program continues to be an important way for manufacturers to maintain flexibility in meeting EPA's greenhouse gas emission standards.

Like its Phase 1 and Phase 2 HD GHG emission standards, and standards for certain criteria HD emissions dating back to 1985, EPA's proposed standards rely on an ABT approach allowing manufacturers to meet the standards by averaging emissions across subcategories of their HD vehicles. EPA has employed similar approaches in certain standards issued under section 202 of the Clean Air Act since 1983, including in its light-duty vehicle GHG standards beginning in 2010. Given its longstanding use of this approach under section 202, EPA's proposal emphasizes that EPA is "not reopening the general availability of ABT" or the general structure of the compliance provisions it uses to enforce and implement the ABT approach. 88 Fed. Reg. at 25952 n.211; id. at 26008 n.567. [EPA-HQ-OAR-2022-0985-1640-A1, p. 16]

We agree with EPA's determination that there is no reason to reopen the question whether it is permissible to use an ABT approach under section 202. EPA has not only repeatedly used ABT in section 202 standards but also repeatedly explained that ABT is consistent with and gives full effect to the requirements of section 202 as well as the Clean Air Act's compliance and enforcement provisions applicable to standards issued under section 202. Under such circumstances, it is eminently reasonable for EPA not to reconsider a question that has been settled for decades. See Growth Energy v. EPA, 5 F.4th 1, 13 (D.C. Cir. 2021). In promulgating its final standards, EPA should refrain from "substantive reconsideration," id. at 21, of whether ABT is a permissible approach under section 202, which might inadvertently suggest, notwithstanding the statements in the proposal, that EPA has reopened the issue. EPA may, of course, express its continued adherence to its previously settled view that section 202 permits standards using ABT without reopening the issue, and it may respond to any unsolicited comments it may receive on the issue. See Banner Health v. Price, 867 F.3d 1323, 1341 (D.C. Cir. 2017) (quoting Kennecott Utah Copper Corp. v. U.S. Dep't of Interior, 88 F.3d 1191, 1213 (D.C. Cir. 1996)). But reexamination and reconsideration of whether ABT is consistent with the Clean Air Act is unnecessary and uncalled-for. [EPA-HQ-OAR-2022-0985-1640-A1, p. 16]

EPA first promulgated a section 202 standard that used averaging when it issued its particulate standards for light-duty diesel vehicles in 1983. See 43 Fed. Reg. 33456 (July 21, 1983). EPA explained at that time that standards employing averaging fell within its "broad authority" under section 202 and were "consistent with the [Clean Air Act's] certification scheme." Id. at 33458. Specifically, the 1983 standard required EPA to certify the conformity of a manufacturer's vehicles with a standard that was established based on a combination of testing of the families of vehicles making up their fleets and planned production volumes. This process would yield a fleet whose average emissions complied with the standard; the certificate would be conditioned on the manufacturer actually "maintain[ing] family production volumes such that the production-weighted average of the manufacturer's family limits indeed meets the standards at year's end." Id. at 33459. As EPA explained, averaging thus accords with the Act's prohibition on the sale of vehicles not covered by a certificate of conformity and allows imposition of appropriate penalties for any violations. [EPA-HQ-OAR-2022-0985-1640-A1, p. 16]

EPA's 1985 standard for NOx emissions from light-duty trucks, as well as for NOx and particulates from HD engines, similarly employed an averaging approach. See 50 Fed. Reg. 10606 (Mar. 15, 1985). EPA's final rulemaking notice again explained that its averaging approach was consistent with the statutory requirement that compliance be certified before vehicles were sold, and that certification was subject to the condition that the certificate would be voided if the manufacturer's production-weighted average emissions did not meet the standard at the end of the model year. See id. at 10633, 10636-37. EPA found that "the averaging concept" was "fully consistent with the technology-forcing mandate of the Act," id. at 10634, while at the same time "eas[ing] the compliance burden" for manufacturers, id. at 10635. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 16 - 17]

The D.C. Circuit rejected arguments that the 1985 standard's averaging approach was unauthorized under the Clean Air Act in NRDC v. Thomas, 805 F.2d 410 (D.C. Cir. 1986). The court observed that "EPA's agreement that averaging will allow manufacturers more flexibility in cost allocation while ensuring that a manufacturer's overall fleet still meets the emissions reduction standards makes sense." Id. at 425. [EPA-HQ-OAR-2022-0985-1640-A1, p. 17]

Thomas noted that there were potential arguments against averaging that it did not address because they had not been raised before the agency, including an argument that an averaging approach might not be consistent with the Act's testing and certification provision, section 206. Id. at 425 n.24. The court suggested that EPA consider this question in future proceedings and provide a further explanation of how averaging conformed to statutory requirements. Id. [EPA-HQ-OAR-2022-0985-1640-A1, p. 17]

EPA took the court up on that invitation in its subsequent 1990 rulemaking proceeding establishing certification programs for banking and trading of NOx and particulate emission credits for HD engines. That rulemaking resulted in an expanded averaging regime, with the addition of provisions for banking and trading of credits generated if manufacturers' production-weighted average emissions were below the requirements of the NOx and particulate standards. See 55 Fed. Reg. 30584, 30584-86 (July 26, 1990). Both in the final rulemaking notice and the proposal for those standards, EPA addressed the issues flagged in Thomas and explained at length how the ABT program conformed with the Clean Air Act's certification requirements. See id. at 30593-94 (final rule); 54 Fed. Reg. 22652, 22665-67 (May 25, 1989) (proposed rule). EPA articulated in detail how its ABT approach entails presale certification of the conformity of each engine or vehicle with the applicable standards based on testing of emissions generated by engine families and projected production estimates, with certification conditioned on a final end-of-model-year determination that a manufacturer's actual production-weighted average emissions comply with the standard. See 55 Fed. Reg. at 30585, 30594, 30600-04. These features of the ABT program, EPA explained, facilitate application of the Act's enforcement and penalty provisions. See id. at 30594, 30603-04. EPA similarly used ABT in its Tier 2 light-duty NOx standards promulgated in 2000. See 65 Fed. Reg. at 6744. [EPA-HQ-OAR-2022-0985-1640-A1, p. 17]

Having determined in these earlier rules that ABT standards are consistent with section 202, EPA employed the ABT approach pioneered in the 1990 HD standards when it first adopted GHG standards for light-duty vehicles in 2010 and HD engines and vehicles in 2011. See 75 Fed. Reg. 25324, 25405 (May 7, 2010); 76 Fed. Reg. 57106, 57127-28 (Sept. 15, 2011). In each case, EPA explained at length how, in implementing ABT standards, it fulfills its statutory obligations to certify conformity of vehicles or engines with the standards before they are introduced into commerce, to require warranties of compliance, and to test for in-use compliance. See 75 Fed. Reg. at 25468-77; 76 Fed. Reg. at 57254-92. EPA also explained how, under an ABT approach, it would give full effect to the statute's provision for calculation of penalties for each nonconforming vehicle in the event of a violation of the standards. See 75 Fed. Reg. at 25482; 76 Fed. Reg. at 57257. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 17 - 18]

Subsequent iterations of GHG and other motor-vehicle emission standards under section 202 for both light-duty vehicles and HD vehicles and engines have likewise used an ABT approach consistent with that used in the 2010 and 2011 GHG standards. See 77 Fed. Reg. 62624, 62788 (Oct. 15, 2012) (light-duty GHG standards); 79 Fed. Reg. at 23419 (light-duty and HD Tier 3 NOx standards); 81 Fed. Reg. 73478, 73495 (Oct. 25, 2016) (HD Phase 2 GHG standards); 85 Fed. Reg. 24174, 25103-04, 25114 (Apr. 30, 2020) (light-duty GHG standards); 86 Fed. Reg. 74434, 74441 (Dec. 30, 2021) (light-duty GHG standards). In none of those rulemaking proceedings did EPA reopen the issue whether section 202 permits use of ABT in standard-setting; the agency treated the option to use ABT under section 202 as a settled matter. [EPA-HQ-OAR-2022-0985-1640-A1, p. 18]

The agency's settled practice of using ABT in section 202 standards from 1990 onward did not generate further legal challenges until the most recent set of light-duty GHG standards. As to the latter standards, however, petitioners challenging the standards have argued in review proceedings pending in the U.S. Court of Appeals for the D.C. Circuit that section 202 permits only the use of standards that specify emissions limits on an individual-vehicle basis, and that standards employing averaging render the Clean Air Act's compliance and enforcement provisions meaningless. See Final Br. for Priv. Petitioners, Texas v. EPA, Case No. 22-1031 (D.C. Cir. Apr. 27, 2023), ECF No. 1996915, at 36-50. EPA rejected those arguments when it considered them in the 1990 rulemaking, and they run counter to the settled construction of the statute on the basis of which EPA has issued standards since that time. EPA's brief in the D.C. Circuit and the brief of the state and nongovernmental organizations supporting EPA explain that challenges to ABT are untimely attempts to challenge determinations made decades ago, but also detail the reasons ABT is consistent with the language and structure of section 202 and the applicable enforcement and compliance provisions of the Act. See EPA Br. 34-39, 62-75; State & Pub. Int. Br. at 3-6, 9-17. [EPA-HQ-OAR-2022-0985-1640-A1, p. 18]

In sum, the proposal's statement that "EPA has long included averaging provisions for complying with emission standards in the HD program" is unquestionably accurate. 88 Fed. Reg. at 25950. Given that EPA long ago addressed and resolved the lawfulness of ABT under section 202, that EPA's use of ABT is consistent with the D.C. Circuit's precedent in Thomas, that EPA has repeatedly explained how the statute's certification, warranty, testing, and enforcement provisions function effectively in the context of ABT, and that the arguments against the use of ABT are essentially the same as those discussed in Thomas and revisited in the round of rulemaking that followed, there is no reason for the agency to reopen these settled questions by reexamining them substantively in this rulemaking (or appearing to do so). The agency should adhere to its statement in the proposal that it is not reopening these issues. [EPA-HQ-OAR-2022-0985-1640-A1, p. 18]

To foster understanding of how the Act's testing, certification, warranty, in-use compliance, and penalty provisions operate in the context of a standard using ABT, it may be useful to include in the final rule's preamble a clear description of how EPA uses testing and manufacturers' production plans to issue certificates of conformity before vehicles or engines are marketed; how manufacturers warrant compliance; how EPA determines in-use compliance; how EPA determines whether a manufacturer's vehicles and engines have met the conditions imposed on their initial certification by ultimately complying with the production-weighted emission standards to which they are subject; and, in the event of noncompliance, how EPA would identify noncompliant vehicles and impose penalties or other remedies. See 88 Fed. Reg. at 25949. If it does so, EPA should make clear that it is describing the operation of the statute and the ABT rules, not reexamining EPA's settled view that its ABT standards and their implementation conform to the Act's requirements. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 18 - 19]

Although the agency need not, and should not, reconsider the lawfulness of ABT standards under section 202, EPA's analysis more than adequately explains the benefits of continuing to use the ABT approach for this latest set of emission standards. EPA's analysis of the benefits ABT provides in this context, see 88 Fed. Reg. at 26001-02, 26008, amply justifies the agency's choice of retaining the ABT approach for this set of standards. As EPA has indicated, the ABT structure allows EPA to require the reductions in GHG emissions that are essential to addressing the endangerment of public health and welfare attributable to those emissions in a manner that best balances the need for significant cuts in emissions with the requirement that standards be feasible and achievable within the time allowed for compliance. The ABT approach "recognize[s] that manufacturers typically have a multi-year redesign cycle and not every vehicle will be redesigned every year to add emissions-reducing technology;" ABT allows manufacturers to keep pace with required improvements by overcomplying with newly designed or redesigned vehicles while other vehicles whose designs are already locked in undercomply. 88 Fed. Reg. at 26002. Thus, "[a]veraging and other aspects of the ABT program … continue to help provide additional flexibility for manufacturers to make necessary technological improvements and reduce the overall cost of the program, without compromising overall environmental objectives." Id. at 26008. These benefits of the ABT approach are recognized by regulators, environmental advocates, and industry alike. See Final Answering Br. for Intervenor Alliance for Automotive Innovation, Texas v. EPA, Case No. 22-1031 (D.C. Cir. Apr. 27, 2023), ECF No. 1996757, at 8-9 (stating that ABT has "been essential to the auto industry's efforts to meet EPA's increasingly ambitious goals for greenhouse gas reduction" and that "the automotive industry has relied for more than a generation" on ABT "to enable cost-effective emissions reductions"). These considerations more than justify EPA's selection of this rulemaking approach for purposes of its latest HD GHG standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 19]

Organization: Clean Fuels Alliance America

XII. Statutory Authority and Legal Provisions

Whether EPA can effectively require manufacturers of heavy-duty vehicles to manufacture dramatically increased proportions of electric vehicles is undoubtedly a "major question."9 The scope of EPA's proposal represents a fundamental regulatory shift that has massive economic consequences. When such a major question is at issue, an agency "must point to clear congressional authorization for the authority it claims."10 [EPA-HQ-OAR-2022-0985-1614-A1, p. 4]

9 See W. Virginia v. Env't Prot. Agency, 142 S. Ct. 2587, 2595 (2022)

10 Id.

Section 202 of the Clean Air Act does not provide the necessary clear authorization for EPA's proposal. Section 202 gives EPA authority to set "standards" that relate to particular air pollutants, not the authority to pick an entire set of vehicles over another.11 But the latter is what EPA proposes—by setting a very low GHG standard while treating EVs as emitting zero grams per mile of GHGs (despite considerable upstream emissions from power plants) and treating all internal combustion engines the same (despite considerable GHG benefits of biofuels like biodiesel and renewable diesel), EPA's proposal ensures that manufacturers will need to convert large portions of their fleets to EVs. That is doing more than setting a standard; it is effectively mandating a shift to an entirely different engine. And that is beyond EPA's Section 202 authority. [EPA-HQ-OAR-2022-0985-1614-A1, p. 4]

11 42 U.S.C. § 7521(a)

Conversely, in the past, users and producers have repeatedly requested that EPA create or expand vehicle incentives for higher biodiesel blends. The goal would be to create a fleet of capable vehicles so that the maximum amount of low carbon fuels can be used. We believe that dual fuel B20 biodiesel blend vehicles can currently benefit from fuel economy credits under NHTSA rules, though thus far no one has taken advantage of them. Indeed, B85 also qualifies for the 0.15 divisor for fuel economy calculations. To utilize these structures B20 and B85 certification fuels may need to be defined as well as F Factors that quantify projected use of the fuels. We would welcome the opportunity to speak further about potential opportunities to create or expand vehicle incentives for higher biodiesel blends. [EPA-HQ-OAR-2022-0985-1614-A1, p. 4]

Lastly, EPA's proposal is inconsistent with another statement by Congress—its express desire for increased blending of biofuels in the 2007 EISA. That statute, which established the Renewable Fuel Standard (RFS) program, requires refiners and importers of petroleum fuels to blend increasing percentages of biofuels into their products.12 Congress also established an explicit minimum amount that must be blended each year for one category of fuel under the program: biomass-based diesel.13 So, Congress has not just declined to provide EPA with authority for a shift entirely away from liquid fuels but explicitly dictated to the contrary. And it has been particularly clear that biomass-based diesel must remain part of our country's solution to decarbonizing the transportation sector. [EPA-HQ-OAR-2022-0985-1614-A1, p. 5]

12 See 42 U.S.C. § 7545(o)

13 Id. § 7545(o)(2)(B)(v)

Organization: Clean Fuels Development Coalition et al.

The proposed rule would set new CO_2 emissions standards for heavy-duty vehicles in the same subcategories at increasing levels of stringency for model years 2027 through 2032. While the proposal does not establish an express electric vehicle mandate, its standards are set in such a way that it would be impossible to meet the standards in many categories without a higher fraction of electric vehicle sales. See 88 Fed. Reg. 25,932, Table ES-3. This, indeed, is the point: the President's explicit goal is to mandate that "50 percent of all new vehicle sales be electric by 2030,"1 specifically "targeting that 100 percent of all new medium- and heavy-duty vehicles sold in 2040 be zero-emission vehicles, with an interim 30 percent sales target for these vehicles in 2030."2 [EPA-HQ-OAR-2022-0985-1585-A1, pp. 1 - 2]

1 FACT SHEET: Biden-Harris Administration Announces New Private and Public Sector Investments for Affordable Electric Vehicles, White House Briefing Room (April 17, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/17/fact-sheet-biden-harrisadministration-announces-new-private-and-public-sector-investments-for-affordable-electricvehicles/.

2 FACT SHEET: Biden-Harris Administration Proposes New Standards to Protect Public Health that Will Save Consumers Money, and Increase Energy Security, White House Briefing Room (April 12, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/12/factsheet-biden-harris-administration-proposes-new-standards-to-protect-public-health-that-will-saveconsumers-money-and-increase-energy-security/.

This endeavor lacks the necessary statutory authority and is plagued with serious legal and factual problems. The vehicle electrification envisioned in EPA's proposed rules represents a "transformative expansion in EPA's regulatory authority" for which the agency has no "clear congressional authorization." Utility Air Regulatory Group v. EPA, 573 U. S. 302, 324 (2014). Indeed, almost everything about these rules is unlawful. EPA lacks the statutory authority to even use fleet-wide averaging in its rules, much less to use fleet-wide averaging to force the transformation of an entire industry. EPA likewise lacks the authority to ignore upstream emissions for electric vehicles. And the proposal's ham-fisted attempts at a de facto electrification mandate are at war with the carefully calibrated structure of the Clean Air Act. [EPA-HQ-OAR-2022-0985-1585-A1, p. 2]

Nor is EPA's factual justification for its rulemaking plausible. The proposal imagines an EPCOT-style "tomorrow land" with hundreds of thousands of electric heavy-duty vehicles trundling along by the decade's end. As a thought experiment, this is no doubt interesting; but as a real-world policy proposal it is far too speculative to pass muster under the Administrative Procedure Act ("APA"). In 2020, a mere 900 total electric heavy-duty vehicles were sold throughout both the U.S. and Canada, 88 Fed. Reg. 25,940, nearly all of which were purchased using taxpayer dollars. And nothing in the proposal gives any persuasive reason for thinking that EPA's desired sea-change could actually take place on anything like the time scale proposed. [EPA-HQ-OAR-2022-0985-1585-A1, p. 2]

Similar problems arise at every turn. As explained in detail below, the proposal has consistently overestimated the factors which tend to make its standards more feasible or cost effective while consistently ignoring the aspects of the problem which indicate that EPA's undertaking is, in fact, unfeasible or cost prohibitive. This violates the APA's requirement for reasoned decision-making, and would render the proposed rule, if finalized, arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1585-A1, p. 2]

The proposal's failures are the result of the Biden's Administration's myopic focus on electric vehicles as the best—and perhaps only—way of meeting its domestic greenhouse-gas emission goals. As this comment will describe, this unrealistic and idealistic effort is foolish. There are far better ways, like incentivizing an increased reliance on renewable fuels, that are within EPA's statutory authority, are feasible, and are cost effective. Commentors submit this letter to urge EPA to withdraw its unlawful and unreasonable proposal, and to try a different approach. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 2 - 3]

I. Electrification of the Heavy-Duty Fleet is a Major Question for which EPA Lacks Clear Statutory Authorization.

Under the major-questions doctrine, agencies may not construe a statute to “authoriz[e] [them] to exercise powers of ‘vast economic and political significance’” unless the statute does so in “clea[r]” terms. Alabama Ass’n of Realtors v. HHS, 141 S. Ct. 2485, 2489 (2021) (quoting Utility Air, 573 U.S. at 324 (2014)). Thus, an agency seeking to exercise such significant powers must identify “something more than a merely plausible textual basis for the agency action.” West Virginia v. EPA, 142 S. Ct. 2587, 2609 (2022) (quoting Utility Air, 573 U.S. at 324). “The agency instead must point to ‘clear congressional authorization’ for the power it claims.” Id. Whether and how to transition the heavy-duty fleet away from internal combustion engines to electric motors and massive batteries is a major question of economic and political importance. EPA therefore needs clear statutory authority. It has none, and that is the end of the matter. [EPA-HQ-OAR-2022-0985-1585-A1, p. 3]

EPA’s proposal is very similar to the Clean Power Plan. Just as in West Virginia v. EPA, the agency is claiming the power to shift the nation’s energy policy by reverse-engineering its preferred balance of fuel sources through emission standards. In West Virginia, EPA attempted to force a shift from coal-fired plants to gas-, wind-, and solar-powered plants. Here, EPA attempts to force a shift from liquidfuel vehicles to electric vehicles. As this proposal and EPA’s sister proposal for lightand medium-duty vehicles show, there’s no stopping point to EPA’s claim of authority. As in West Virginia, with this power EPA “could go further, perhaps forcing [automakers] … to cease making [conventional vehicles] altogether.” 142 S. Ct. at 2612. Whether “the future of the auto industry is electric”3 is—pace President Biden—very much an open question. But whether it is or not, it is not a future that the Executive Branch can mandate by reimagining a decades-old statute. [EPA-HQ-OAR-2022-0985-1585-A1, p. 3]

> 3 FACT SHEET: Biden-Harris Administration Ensuring Future is Made in America, White House Briefing Room (February 8, 2022), https://www.whitehouse.gov/briefing-room/statementsreleases/2022/02/08/fact-sheet-biden-harris-administration-ensuring-future-is-made-in-america/.

A. The proposal claims a power of vast economic and political significance. In assessing the economic and political significance of a rule, courts look to both a rule’s direct effects and the implications of the agency’s underlying claim of authority. For example, in West Virginia, although EPA’s Clean Power Plan only incrementally shifted power generation, the Court reasoned that EPA had asserted the “highly consequential power” to “announc[e] what the market share of coal, natural gas, wind, and solar must be, and then requir[e] plants to reduce operations or subsidize their competitors to get there.” 142 S. Ct. at 2609 & 2613 n.4; see Alabama Ass’n of Realtors, 141 S. Ct. at 2489 (considering the “sheer scope of the [agency’s] claimed authority” in addition to the rule’s “economic impact”). [EPA-HQ-OAR-2022-0985-1585-A1, pp. 3 - 4]

The proposal candidly indicates that that is exactly what EPA is doing here. Table ES–3 describes EPA’s “Projected ZEV Adoption Rates in Technology Packages for the Proposed Standards.” 88 Fed. Reg. 25,932. EPA lays out what it expects (read: requires) “the market share” of “zero-emission vehicles” to be in each year under its new standards. Light-Heavy Duty Vocational Trucks, for example, must be 22 percent electric by 2027, 39 percent by 2030, and 57 percent by 2032. There are effectively none now. This regulatory transformation is exactly the sort of “highly consequential power” that the Supreme Court had in mind in West Virginia. [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

A transition to an electric heavy-duty fleet also implicates policy matters of national importance well outside of EPA's mission and expertise, including "deciding how Americans will get their energy," West Virginia, 142 S. Ct. at 2612, and the national security implications of importing billions of tons of critical minerals from hostile foreign powers like China, see 88 Fed. Reg. 25,966 (recognizing that "most global battery manufacturing capacity is currently located outside the U.S."). [EPA-HQ-OAR-2022-0985-1585-A1, p. 7]

But even the raw "economic impact" of the proposal raises it to a level of significance capable of triggering major question scrutiny. The proposal estimates $56 billion in costs: $9 billion in "vehicle technology costs" and $47 billion in "electric vehicle supply equipment (EVSE) costs." 88 Fed. Reg. 25,936–937 (Apr. 27, 2023). That alone would render this one of the most expensive rules in U.S. history. In 2027 alone, the technology and ESVE will cost the economy $3.3 billion, rising to $4.6 billion by 2032.[4] 88 Fed. Reg. 26,088, Table IX-18. This is comparable to the economic cost of the Clean Power Plan, which triggered the major-questions doctrine in West Virginia. See 142 S. Ct. at 2610; EPA, Regulatory Impact Analysis for the Clean Power Plan Final Rule 3-22 (projecting up to $3 billion in 2025 rising to $8.4 billion in costs in 2030). [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

4 In Table IX-18, EPA misleadingly displays lower total cost numbers ($3 billion by 2027 and $0.86 billion by 2032) by counting some "benefits" in the operating cost column. These "operating costs" can be negative because EPA defines them not as costs, but rather as costs "compared to comparable ICE vehicles." DRIA at 288; see also 88 Fed. Reg. 25,986 ("[W]e are … interested in costs that differ for a comparable diesel-powered ICE vehicle and a ZEV."). In any case, EPA's operating costs analysis ignores crucial aspects of maintenance and is severely underestimated, as described below.

The proposal's political significance is equally vast. The target of EPA's proposal is "the subject of an earnest and profound debate across the country." West Virginia, 142 S. Ct at 2614. The Biden Administration and a small number of states favor an aggressive transition away from the internal combustion engine, while many other states are actively opposing it. See, e.g., State of Iowa, et al v. EPA, et al., D.C. Circuit No. 23-1144 (where Iowa, Alabama, Arkansas, Georgia, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, North Dakota, Ohio, Oklahoma, South Carolina, Utah, West Virginia, and Wyoming are all challenging EPA's approval of California's Advanced Clean Trucks plan, which like EPA's proposed rule here, would force the electrification of the heavy-duty fleet). [EPA-HQ-OAR-2022-0985-1585-A1, p. 7]

While Congress has provided certain taxpayer subsidies, grants, and loans to incentivize electric vehicles, it has never clearly authorized a transition away from the internal combustion engine by agency fiat. Indeed, proposals to impose electric vehicle mandates have never even made it out of committee. See, e.g., Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019); Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. (2018). Such a proposal would be foolish. Congress recognizes that heavy-duty trucking is the circulatory system of the U.S. economy, and a rule that threatens the effectiveness of this system threatens the body politic as a whole. [EPA-HQ-OAR-2022-0985-1585-A1, p. 7]

A transition to an electric heavy-duty fleet also implicates policy matters of national importance well outside of EPA's mission and expertise, including "deciding how Americans will get their energy," West Virginia, 142 S. Ct. at 2612, and the national security implications of importing billions of tons of critical minerals from hostile foreign powers like China, see 88 Fed.

Reg. 25,966 (recognizing that "most global battery manufacturing capacity is currently located outside the U.S."). [EPA-HQ-OAR-2022-0985-1585-A1, p. 7]

That Congress has consistently rejected forced electrification is also evident from the way in which it would conflict with its broader legislative schemes it has enacted. For example, Congress has consistently sought to address greenhouse-gas emissions from the transportation sector by promoting corn ethanol and other renewable fuels, which can be amply supplied domestically. See e.g., Renewable Fuel Standard, 42 U.S.C. § 7545(o)(2)(A)(i); Inflation Reduction Act of 2022, Pub. L. No. 117-169, §§ 13202, 13404, 22003, 136 Stat. 1818, 1932, 1966–1969, 2020 (2022). And it has granted EPA separate—and limited and procedurally cabined—authority to regulate fuels and fuel additives, further indicating that Section 202 is not a broad delegation of authority to phase out liquid-fueled internal combustion engines. See 42 U.S. Code § 7545. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 7 - 8]

Notably, Congress has already disapproved of EPA's attempts to reshape the heavy-duty market. Both the House and the Senate approved a resolution of disapproval under the Congressional Review Act that would have rescinded EPA's heavy-duty NOx rule, had that measure not been vetoed by President Biden. David Shepardson, Biden Vetoes Bill That Would Negate EPA Heavy Truck Pollution Cuts, Reuters (June 14, 2023), https://www.reuters.com/world/us/biden-vetoes-billoverturn- heavy-duty-truck-pollution-cuts-2023-06-14/. The same congressional disapproval is even more likely if these rules are finalized as proposed, and at the very least this bicameral agreement on this issue highlights that EPA is here contending with a question of political significance. [EPA-HQ-OAR-2022-0985-1585-A1, p. 8]

The proposal is also a novel assertion of agency authority. The Supreme Court has explained that skepticism is warranted when an agency asserts an "unheralded power representing a transformative expansion in its regulatory authority." West Virginia, 142 S. Ct. at 2610 (cleaned up). Until this administration, EPA never claimed the authority to mandate even partial electrification. Now it claims the power to transform the entire fleet in just a few years' time. And EPA, unlike NHSTA, has no fuel economy or credit trading authority, but only authority to prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles." 42 U.S.C. § 7521(a)(1). Now EPA seeks to expand that authority by creating from whole cloth regulatory cross-subsidies, spreading costs for one class of heavy-duty vehicles across many classes of heavy-duty consumers. This is audacious and unprecedented. [EPA-HQ-OAR-2022-0985-1585-A1, p. 8]

III. Nothing in the Inflation Reduction Act Grants EPA Additional Authority to Mandate Electrification.

The proposal also suggests that the Inflation Reduction Act (IRA) provides some additional reinforcement to its claims of statutory authority for these sweeping changes. "The recently-enacted IRA 'reinforces the longstanding authority and responsibility of [EPA] to regulate GHGs as air pollutants under the Clean Air Act,' and 'the IRA clearly and deliberately instructs EPA to use' this authority by 'combin[ing] economic incentives to reduce climate pollution with regulatory drivers to spur greater reductions under EPA's CAA authorities.'" 88 Fed. Reg. 25,950 (quoting 168 Cong. Rec. E868–02 (daily ed. Aug. 12, 2022) (statement of Rep. Pallone) and 168 Cong. Rec. E879–02, at 880 (daily ed. Aug. 26, 2022) (statement of Rep. Pallone)). [EPA-HQ-OAR-2022-0985-1585-A1, p. 13]

Not so. The words in a statute must be read in their context to understand how they fit into the overall statutory scheme. Davis v. Michigan Dept. of Treasury, 489 U.S. 803, 809 (1989). In making this determination, consideration must be given to the overall type and purpose of the statute. Dolan v. U.S. Postal Service, 546 U.S. 481, 486 (2006). Here, the relevant context is that the IRA was passed through the reconciliation process under the Congressional Budget and Impoundment Control Act. That act established the congressional budget process giving Congress an expedited process by which it can pass by a majority vote legislation pertaining to revenue, spending, or the debt limit levels. This reconciliation process was intended to be used to reduce the deficit through some combination of spending reductions or revenue increases. Congressional Research Service Report RL30862, The Budget Reconciliation Process: The Senate's "Byrd Rule" (updated Sept. 28, 2022), at 1, available at https://crsreports.congress.gov/product/pdf/RL/RL30862. Legislation passed under this process does not alter other substantive obligations and it must be related to spending, revenue, or the federal debt limit. In other words, "If Congress wants to assign this authority to the EPA or any other federal agency, it cannot do so by way of a budget reconciliation bill such as the IRA." John Dixon, et al., No Inflation Act Boost For EPA Power Over Greenhouse Gases, Law360 (Sep. 19, 2022), https://www.law360.com/articles/1531794/no-inflation-act-boost-for-epa-power-overgreenhouse-gases. [EPA-HQ-OAR-2022-0985-1585-A1, p. 14]

Indeed, nothing in the IRA grants any authority "under the Clean Air Act" at all. Instead, the IRA provides several section-specific definitions of greenhouse gases, that apply only to that section for the purposes of grantmaking. For example, "Definition of Greenhouse Gas.–In this section, the term 'greenhouse gas' means the air pollutants carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride." 136 Stat. 2069. Moreover, none of these various definitional provisions address the EPA's authority under Section 202. See, e.g., 136 Stat. 2069 (applying the term to grants to address air pollution at schools under Section 103 and 105); id. (grants to states under Section 177); id. (grants for "education" and "outreach" about low-emissions electricity generation); id. at 2070 (grants for biofuels under Section 211); id. at 2072 (grants for corporate reporting); id. at 2077–78 (grants for labeling of construction materials); id. at 2083 (same for federal buildings). [EPA-HQ-OAR-2022-0985-1585-A1, p. 14]

These provisions do nothing to change the EPA's ability to regulate greenhouse gas emissions and do not alleviate the many problems the proposal already has under the major questions doctrine. [EPA-HQ-OAR-2022-0985-1585-A1, p. 14]

IV. The Proposed Rule Fails to Adequately Consider Low-Carbon Renewable Fuel Alternatives.

Beneath the complexity of its reverse-engineered system, the proposal's plan for reducing greenhouse gas emissions is remarkably straightforward: electrify the heavy-duty fleet as fast as—or perhaps even faster—than possible. But this narrow vision of pursuing a singular regulatory White Whale entirely neglects other more feasible technological solutions auto manufacturers could adopt to meet the standards if they were properly credited for them: namely the manufacture of vehicles that run on low-carbon, renewable fuels. Agencies are required, as part of any reasoned decision-making process, to consider all "significant and viable and obvious alternatives" to their proposed action. Dist. Hosp. Partners, L.P. v. Burwell, 786 F.3d 46, 59 (D.C. Cir. 2015); see Spirit Airlines, Inc. v. DOT, 997 F.3d 1247, 1255 (D.C. Cir. 2021) ("[T]he failure of an agency to consider obvious alternatives has led uniformly to reversal."). EPA has the authority to consider the carbon reductions that come from these fuels and neglecting this option for compliance violates EPA's duty to give "appropriate consideration to the cost of compliance" with the proposed regulations. 42 U.S.C. § 7521(a)(2). [EPA-HQ-OAR-2022-0985-1585-A1, p. 15]

B. EPA must account for lifecycle emissions and establish new certification fuel pathways to account for the benefits of low-carbon, renewable fuels.

The proposal projects that millions of liquid fueled vehicles will continue to be sold throughout the compliance period and that millions more will remain on the road in the decades to come. There are two ways to reduce the greenhouse gas emissions from this fleet. New vehicles can be improved—albeit only modestly—by improving the fuel efficiency of the engines. But almost all these vehicles could reduce net greenhouse-gas emissions much more significantly if fueled with renewable fuels. Increasing the volumes of renewable diesel and biodiesel blending would have an immediate impact on global greenhouse gas emissions. [EPA-HQ-OAR-2022-0985-1585-A1, p. 16]

While vehicles running on these fuels would emit approximately the same amount of CO2 from their tailpipes, the net CO2 emitted would be substantially reduced. This is because these fuels make use of carbon that was recently sequestered by plants, and thus removed from the atmosphere in the same quantity that it will reenter it. Converting plants to biofuels does not result in any net increase in carbon emissions within this natural cycle. [EPA-HQ-OAR-2022-0985-1585-A1, p. 16]

There are two ways renewable fuels can reduce future greenhouse-gas emissions and improve the feasibility of the rule. First, renewable diesel and biodiesel already play a significant role in our nations fuel fleet. EPA knows this because it administers the Renewable Fuel Standard and has significant data about the volumes of these fuels that are already used by the fleet. EPA also has authority to set those volume standards, and EPA knows that almost all conventional heavy-duty diesel vehicles could immediately accept higher volumes of renewable fuels with minimal change in vehicle performance and dramatically reduced lifecycle emissions. [EPA-HQ-OAR-2022-0985-1585-A1, p. 16]

Second, there are several emerging technologies that promise to make new heavy-duty vehicles capable of running on different and potentially more effective renewable fuels. For example, the Cummins X-15—a 500hp 15L heavy-duty engine discussed in EPA's DRIA—is fuel agnostic and could potentially make use of a variety of low-carbon fuels. ClearFlame Engine Technologies recently completed a test in which a Class 8 diesel truck was converted to run on renewable E98 ethanol. ClearFlame Engine Technologies completes on-road demo of Class 8 truck with Cummins X15 running E98 ethanol, Green Car Congress (Feb. 11, 2022). The current proposal would treat ClearFlame's ethanol-fueled engine as though it is operating on diesel fuel and calculate resulting tailpipe emissions in a way that has no connection to reality. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 16 - 17]

EPA must update its certification pathways to allow vehicles to certify on dedicated alternative fuels, like the various, widely available high ethanol blends. Establishing new pathways for high ethanol blends—like EPA is proposing to do with hydrogen—is the most effective way to rapidly reduce the emissions of the heavy-duty fleet. By failing to consider a lifecycle emissions approach, and the acute safety risks of forced electrification, EPA precludes the most effective way to set and meet its standards. This would violate EPA's statutory duty to consider feasibility or would, at the very least, make the proposed rule arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1585-A1, p. 17]

Organization: Cummins Inc.

It is vitally important to us that EPA carefully considers our comments to ensure that Phase 3 is finalized as a truly performance-based, technology-neutral regulation that provides full emissions crediting of zero fuel carbon emissions and that does not pose greater certification or compliance barriers for some technology solutions versus others. [EPA-HQ-OAR-2022-0985-1598-A1, p. 5]

Organization: Daimler Truck North America LLC (DTNA)

DTNA's impetus for such investment in charging infrastructure is, in part, driven by the significant hurdle to ZEV adoption that we and our customers, the nation's largest fleets, have faced when attempting to deploy BEVs. Between 2018 and 2022, our combined pre-series trucks were placed with nearly 50 different fleets and collectively accumulated more than 1.5 million miles in real-world operation. Recharging needs, even at the depot level (so called behind-the-fence charging), proved a serious limitation to utilization, given the lead times for utility and facilities upgrades and surge(s) in power demand. DTNA's participation in pilot programs like California's Joint Electric Truck Scaling Initiative (JETSI), which seeks to accelerate ZEV adoption along Southern California's freight corridors, also serves as a blueprint for large fleets to electrify at scale. The feedback and data garnered from investments in these early programs, as well as our ongoing commitment to the surrounding ZEV ecosystem, will continue to yield benefits for direct participants and others as we collectively navigate the ZEV transition. [EPA-HQ-OAR-2022-0985-1555-A1, p. 7]

In light of these significant investments and ongoing contributions to the holistic ZEV ecosystem, DTNA is aligned with EPA in supporting proliferation of the low- and zero-emission technologies of the future. In addition, the Company generally supports EPA's approach to this rulemaking, particularly its recognition that the achievability of stringent GHG emission standards for the HD sector will depend in significant part upon future market uptake of HD ZEVs. We also appreciate EPA's recognition that projecting future market developments is a complex undertaking that involves careful consideration of purchasing behavior, costs, incentives, fleet operational needs, infrastructure availability, and other factors. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 7-8]

Further, the Company supports EPA's proposal to shift regulatory focus away from conventional vehicle technologies in the next phase of HD GHG emission regulation and to adopt a technology-neutral approach that will not require changes to ICE vehicles. We also endorse the proposed fleet-based averaging approach to emission compliance, and we appreciate EPA's recognition that continuation of the current emission credit program will be key to many manufacturers' compliance strategies. [EPA-HQ-OAR-2022-0985-1555-A1, p. 8]

DTNA Supports the Core Components of EPA's Proposal.

DTNA generally supports EPA's proposal to retain the basic structure of the Phase 2 standards, namely the establishment of emission standard stringency based upon a fleet average technology mix and use of the averaging provisions of the ABT program for compliance. The Company also appreciates EPA's continued recognition that its GHG emission standards must be suitable for a wide variety of HDV applications with different drive cycles rather than based on a 'one size fits all' approach. The Company supports EPA's decision to allow Phase 2 credits to carry over into the Phase 3 program, subject to the five-year credit life limitation. DTNA agrees with EPA's decision to premise Phase 3 standards on technology packages that include both ICE and ZEV technologies. This structure—including EPA's determination not to increase engine emission standard stringency as part of this rulemaking—will allow manufacturers to focus their resources on ZEV development and to choose whether or not to allocate resources to CO2-reducing technologies for conventional vehicles. [EPA-HQ-OAR-2022-0985-1555-A1, p. 16]

Organization: Delek US Holdings, Inc.

EPA's Proposed Rule eviscerates the free market and imposes a new, overly burdensome regulatory regime for automotive electrification at the expense of the internal combustion engine ("ICE")—all without Congressional authorization2—based on flawed and illogical reasoning. [EPA-HQ-OAR-2022-0985-1561-A1, p. 2]

2 See West Virginia v. Environmental Protection Agency, 142 S. Ct. 2587 (2022) (holding the Clean Air Act did not authorize EPA to devise emissions caps based on the generation shifting approach the Agency adopted in the Clean Power Plan and that the Agency's actions constituted a "major question," reserved for Congress). Like the Clean Power Plan, nowhere in the Clean Air Act did Congress authorize EPA to set standards beyond what could be achieved with a disfavored power source and effectively order regulated parties to phase out that technology. EPA's standard-setting tools are limited to those which Congress provided in Section 202(a) of the Clean Air Act.

EPA's Proposed Rule is, at best, arbitrary and capricious or otherwise not in accordance with the Clean Air Act because it is based on flawed projections for zero emissions vehicles ("ZEVs"), such as battery electric vehicles ("BEVs"), will increase domestic reliance on foreign supply chains, underestimates the lifecycle GHG emissions associated with BEVs, overstates the benefits of the proposal, severely underestimates the costs, and fails to consider the impacts to other industries. Accordingly, Delek urges EPA to abandon or substantially reconsider its proposal. [EPA-HQ-OAR-2022-0985-1561-A1, p. 2]

Organization: Diesel Technology Forum (DTF)

The newest generation of advanced diesel vehicles makes up a growing portion of the total diesel commercial truck population. In 2021, more than half of all diesel commercial vehicles on the road in the United States were the newest generation equipped with the advanced diesel engines in 2011 and later model years. These trucks have near zero emissions of NOx and particulate mater. [EPA-HQ-OAR-2022-0985-1618-A1, p. 1]

While making commercial trucks much lower in emissions, diesel engine and truck manufacturers have also made them increasingly more fuel-efficient. Since 2011, new diesel commercial trucks realized an average 5% improvement in fuel economy, thanks to advanced emissions controls (selective catalytic reduction) than have enabled optimized engine design toward greater fuel efficiency. This translates into petroleum reduction equivalent to 5.8 billion barrels of crude oil. [EPA-HQ-OAR-2022-0985-1618-A1, p. 1]

An owner of a single new Class 8 truck powered by the latest advanced diesel engine can expect to save about 2,200 gallons of fuel each year compared to previous generations of technology. This reduces greenhouse gas emissions by nearly 30 tons. [EPA-HQ-OAR-2022-0985-1618-A1, p. 2]

New diesel vehicles continue to increase their penetration in the marketplace in part, due to fuel efficiency requirements of Phase 1 of the U.S. Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA) Fuel Efficiency standards that went into effect in 2014 and the more stringent Phase 2 rules that started in 2021. The Phase 2 rule is expected to eliminate over 1 billion tons of greenhouse gas emissions from new trucks between 2021 and 2027. More efficient diesel trucks will deliver the overwhelming majority of these benefits even as zero-emissions technologies are expected to gain some market share during the lifetime of the rule. [EPA-HQ-OAR-2022-0985-1618-A1, p. 2]

II. Internal Combustion Engine Vehicles (ICEV) Will Continue to Play a Significant Role for Commercial Vehicles Well into The Future.

While this proposal to establish future GHG emissions standards for heavy duty vehicles focuses substantially on zero emission vehicle technologies, EPA acknowledges that ICEV – including diesel and natural gas -- will continue to play a considerable role in the future of commercial truck transportation. [EPA-HQ-OAR-2022-0985-1618-A1, p. 2]

EPA notes in the proposed rule that

“The proposed standards do not mandate the use of a specific technology, and EPA anticipates that a compliant fleet under the proposed standards would include a diverse range of technologies (e.g., transmission technologies, aerodynamic improvements, engine technologies, battery electric powertrains, hydrogen fuel cell powertrains, etc.). (88 Fed Reg 25952)

The technologies that have played a fundamental role in meeting the Phase 2 GHG standards will continue to play an important role going forward as they remain key to reducing the GHG emissions of HD vehicles powered by internal combustion engines (referred to in this proposal as ICE vehicles). [EPA-HQ-OAR-2022-0985-1618-A1, p. 2]

In developing the proposed standards, EPA has also considered the key issues associated with growth in penetration of zero-emission vehicles, including charging infrastructure and hydrogen production. EPA’s assessment that supports the appropriateness and feasibility of these proposed standards, includes a technology pathway that could be used to meet each of the standards. The technology package includes a mix of ICE vehicles with CO2 -reducing technologies and ZEVs.” [EPA-HQ-OAR-2022-0985-1618-A1, pp. 2 - 3]

Throughout the proposal EPA references a multitude of sources each forecasting varying expectations and analysis of the potential penetration of ZEV technology across different commercial vehicle sectors. [EPA-HQ-OAR-2022-0985-1618-A1, p. 3.] [See Table ES-4 on page 3 of docket number EPA-HQ-OAR-2022-0985-1618-A1.]

These sources include trade press, government agencies, various NGO stakeholders (ICCT, ACEEE, EDF) users, truck and engine manufacturers, electric vehicle charging vendors and others. [EPA-HQ-OAR-2022-0985-1618-A1, p. 3]

An aggregate view of technology packages and projected ZEV adoption rates as show in Table ES-4 above from the proposed rule (88 Fed Reg 25933) indicates clearly that the expectation is that ICEV will continue to power various segments of the trucking sector at 60 to 80 percent of the market share in 2032 and beyond if the strategies in the proposed rule are adopted. [EPA-HQ-OAR-2022-0985-1618-A1, p. 3]

EPA also supports the case for Phase 3 GHG rules with an emphasis on driving a ZEV transition by relying on the anecdotal reports, press announcements and ZEV experience from some of the nation's largest and most visible fleets such as Walmart, Amazon, and others. These companies, while they have considerable resources to explore lesser known and as yet fully unproven fuels and technologies and manage the risk thereof, are not representatives of the majority of trucking industry. As previously noted 99.7% of all trucking companies are fleets of less than 100 vehicles. We question as to whether all of EPA's assumptions and logic in crafting the overall rule and support of the standard apply equally to the large fleets vs. the small carriers. [EPA-HQ-OAR-2022-0985-1618-A1, p. 3]

Considerable uncertainty exists within the forecasts and projections presented by each source, and in some cases the sources are citing each other. EPA makes an extensive case for the impacts of the Inflation Reduction Act (IRA) and the Bipartisan Infrastructure Law (BIL) on facilitating the introduction of more ZEVs into the marketplace.3 Ultimately the adoption of ZEV hinges largely on the timing and availability of infrastructure, costs of ZEV and competing fuels -- petroleum fuel and renewable fuels, and the user readiness, market acceptance and other factors. [EPA-HQ-OAR-2022-0985-1618-A1, p. 4]

3 88 Fed. Reg. 25930

Organization: Energy Marketers of America (EMA)

EMA is concerned over EPA's tailpipe emission standards for heavy-duty vehicles for model year 2027 and beyond which will effectively discourage investment in lower carbon liquid fuels. The focus on EV heavy-duty vehicle production will eliminate an opportunity to provide liquid fuels that immediately lower emissions not only for new trucks, but for the heavy-duty trucks currently on the road. In addition, the proposed rule will limit consumer choice and threaten the viability and jobs of small business energy marketers around the country. [EPA-HQ-OAR-2022-0985-1590-A1, p. 1]

Organization: Environmental Defense Fund (EDF)

EPA has clear authority to establish performance-based emission standards under Section 202(a)(1). EPA's approach, including setting performance-based standards, considering ZEVs, and continuing the longstanding use of averaging, banking, and trading (ABT), is consistent with the text and structure of the Clean Air Act (CAA) and the history of EPA regulation. Moreover, the recent enactment of the IRA strongly reaffirms EPA's authority under the CAA and removes any doubt that EPA's actions here are fully consistent with Congress's will. [EPA-HQ-OAR-2022-0985-1644-A1, p. 10]

a) EPA Has Authority to Consider ZEV Technology in Setting Emission Standards

The language and structure of the CAA clearly show that Congress granted EPA authority to consider all available technologies, including ZEV technologies in setting emission standards under Section 202(a). Relying on this authority, EPA has factored such technologies into its standards for over two decades,11 including in each of its six past GHG rules.12 Accordingly, its decision to do so again in this rule now that ZEV technologies are more widely available is eminently reasonable. [EPA-HQ-OAR-2022-0985-1644-A1, p. 10-11]

11 65 Fed. Reg. 6698 (Feb. 10, 2000) ("Tier 2" criteria pollutant standards).

12 75 Fed. Reg. 25324 (May 7, 2010) (Light-duty model year 2011 and later); 76 Fed. Reg. 57106 (Sept. 15, 2011) (Heavy-duty model year 2014 and later); 77 Fed. Reg. 62624 (Oct. 15, 2012) (Light-duty model year 2017 and later); 81 Fed. Reg. 73478 (Oct. 25, 2016) (Heavy-duty model year 2021 and later); 85 Fed. Reg. 24174 (Apr. 30, 2020) (Light-duty model year 2021 and later); 86 Fed. Reg. 74434 (Dec. 30, 2021) (Light-duty model year 2023 and later).

Section 202(a)(1) directs EPA to set emissions standards applicable regardless of "whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control such pollution."13 This language explicitly rejects limitations to internal-combustion engines or to particular kinds of technologies. It just as clearly includes technology beyond internal combustion engine vehicles (ICEVs), including zero-emission vehicles (ZEVs), which are plainly a "complete system[]" that can "prevent" pollution. [EPA-HQ-OAR-2022-0985-1644-A1, p. 11]

13 42 U.S.C. § 7521(a)(1).

This reading of Section 202 is well supported by its core function and the long history of its interpretation by EPA and the courts. In Section 202, Congress authorized EPA to "project future advances" in technology, and not be confined to pollution-control methods that were currently available.14 Indeed, Congress expected EPA to "adjust to changing technology."15 Based on its clear CAA authority, EPA has factored ZEV technologies (ranging from mild hybrid technologies to fully electric battery-powered vehicles) into its rules for more than two decades.16 EPA first included ZEVs in its fleetwide averages in its 2000 "Tier 2" criteria pollutant standards.17 The agency has continued to consider and incentivize these technologies in every one of its six greenhouse gas (GHG) rules for both light- and heavy-duty vehicles.18 More recent acts of Congress have reaffirmed Congress' intention that EPA consider the emissions-reducing potential of ZEVs in its rules. The IRA and BIL both include myriad provisions that seek to support a transition to ZEV technology through funding of credits for vehicles, components, and critical infrastructure. These laws were passed with the knowledge that EPA was already setting standards under Section 202(a) that would increase ZEV proliferation and an intent to support those regulations.19 Congress' aim with the funding was to "combine[] new economic incentives to reduce climate pollution with bolstered regulatory drivers that will allow EPA to drive further reduction under its CAA authorities,"20 with the expectation that "future EPA regulations will increasingly rely on and incentivize zero-emission vehicles as appropriate."21 Moreover, given that, in setting standards under Section 202(a), EPA must consider the present or probable future availability of effective technologies, as well as the cost of such technologies and the time necessary to apply them, the significant changes of the IRA and BIL will result in accelerating broader availability of ZEV technologies, and reducing their cost, which will necessarily affect EPA's analysis of what emissions standards are appropriate. [EPA-HQ-OAR-2022-0985-1644-A1, p. 11-12]

14 NRDC v EPA, 655 F.2d 318, 329 (1981) (quoting Senate report from 1970 amendments stating EPA was "expected to press for the development and application of improved technology rather than be limited by that which exists today." S. Rep. No. 1196, 91st Cong., 2d Sess. 24 (1970)).

15 S. Rep. No. 89-192, at 4 (1965).

16 For a detailed review of this history, see Brief of Amici Curiae Margo Oge and John Hannon in Support of Respondents, Texas v. EPA, No. 22-1031, 24-31 (D.C. Cir, Mar. 2, 2023), Texas v. EPA, No. 22-1031, 33 (D.C. Cir, Mar. 2, 2023). (Attachment D)

18 Supra note 1212; See also EPA's Answering Brief, Texas v. EPA, No. 22-1031, 15-16 (D.C. Cir, Apr. 27, 2023), https://www.edf.org/sites/default/files/2023-05/Texas%20-%20EPA%20Final%20Brief.pdf. (Attachment E)

19 The BIL was passed after EPA's 2023-2026 light-duty GHG standards, which rely on ZEV technology, had been proposed and the IRA was passed 9 months after they were finalized. Brief of Senator Thomas R. Carper and Representative Frank Pallone, Jr. as Amici Curiae in Support of Respondents, Texas v. EPA, No. 22-1031, 29 (D.C. Cir, Mar. 2, 2023). (Attachment F).

20 168 Cong. Rec. E868-02 (daily ed. Aug. 12, 2022) (statement of Rep. Pallone discussing the IRA).

21 168 Cong. Rec. at 880-02 (daily ed. Aug. 12, 2022) (statement of Rep. Pallone); see also Greg Dotson and Dustin J. Maghamfar, The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and the Inflation Reduction Act, 53 ENV'T L. REP. 10017, 10030 (2023) ("The IRA directs EPA to support zero emission technologies for heavy-duty vehicles and port equipment, to reduce emissions in low-income and disadvantaged communities, as well as to support state ZEV requirements. This is a recognition of the evolving importance and availability of zero emission technologies."), https://www.eli.org/sites/default/files/files-pdf/53.10017.pdf. (Attachment G)

Additionally, several provisions in the IRA directly affirm EPA's authority to consider ZEVs under Section 202(a). Section 60106 of the law provides $5 million for EPA "to provide grants to States to adopt and implement greenhouse gas and zero-emission standards for mobile sources pursuant to section 177 of the [CAA]."22 Section 177 allows other states to adopt California's vehicle emission standards, which must be at least as protective as the federal standards and meet certain other statutory requirements.23 Thus, as members of Congress stated in an amicus brief supporting EPA's MY 2023-2026 light-duty GHG standards, "Congress's explicit endorsement of states' use of Section 177 to enact 'greenhouse gas and zero-emission standards' clearly demonstrates its comfort with and support for state and federal standards that contemplate compliance through zero-emission vehicle manufacturing."24 [EPA-HQ-OAR-2022-0985-1644-A1, p. 12-13]

22 Inflation Reduction Act of 2022, P.L. 117-1698, 136 Stat. 2068-69 (2022).

23 42 U.S.C. § 7507, 7543(b).

24 Brief of Senator Thomas R. Carper and Representative Frank Pallone, Jr. as Amici Curiae in Support of Respondents, Texas v. EPA, No. 22-1031, 33 (D.C. Cir, Mar. 2, 2023), https://www.edf.org/sites/default/files/2023-03/Texas%20-%20Members%20of%20Congress%20%28Sen.%20Carper%20and%20Rep.%20Pallone%29.pdf; see also Greg Dotson and Dustin J. Maghamfar, The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and the Inflation Reduction Act, 53 ENV'T L. REP. 10017, 10030 (2023) ("[I]t is a necessary precondition [of the IRA's funding for zero-emission standards under section 177] that . . . EPA can establish zero emission standards pursuant to the CAA."), https://www.eli.org/sites/default/files/files-pdf/53.10017.pdf.

The IRA also made amendments to the CAA affirming that Congress regards programs incorporating ZEV technology as an important aspect of EPA's mission to reduce air pollution under the law.25 Those amendments include adding a definition of “zero-emission vehicle” into the newly added CAA Section 132, which consists of a program of EPA grants and rebates towards the purchase of zero-emission heavy duty vehicles.26 In passing the IRA, Congress made clear that it “recognizes EPA’s longstanding authority under CAA Section 202 to adopt standards that rely on zero emission technologies.”27 [EPA-HQ-OAR-2022-0985-1644-A1, p. 13]

25 Brief of Senator Thomas R. Carper and Representative Frank Pallone, Jr. as Amici Curiae in Support of Respondents, Texas v. EPA, No. 22-1031, 32 (D.C. Cir, Mar. 2, 2023) (“By incorporating these new programs into the Act’s existing air pollution control framework, Congress clearly demonstrated that clean energy and zero-emission vehicle programs are central to the Act’s implementation going forward.”), https://www.edf.org/sites/default/files/2023-03/Texas%20-%20Members%20of%20Congress%20%28Sen.%20Carper%20and%20Rep.%20Pallone%29.pdf.

26 42 U.S.C. § 7432(d)(5); see also Inflation Reduction Act of 2022, P.L. 117-1698, 136 Stat. 2064-65 (2022) (creating new CAA section 133 to provide grants for “zero-emission port equipment or technology.”).

27 168 Cong. Rec. E879–02, at 880 (daily ed. Aug. 26, 2022) (statement of Rep. Pallone).

Organization: Lubrizol Corporation (Lubrizol)

Lubrizol believes that vehicle owners and fleets in the heavy-duty vehicle sector will use a range of fuels and technologies to meet their future operational and environmental needs. Thus, we are pleased to see EPA acknowledge that it expects to see Original Engine Manufacturers (“OEMs”) use an array of technologies to meet the requirements of the Final Rule. Lubrizol strongly encourages EPA to promulgate a Final Rule that will advance all three strategies highlighted in the Biden administration’s Transportation Decarbonization Blueprint (the “Blueprint”), i.e., Sustainable Liquid Fuels (“SLFs”), Battery-Electric Vehicles (“BEVs”), and Hydrogen.2 While there is exciting progress being made to develop heavy-duty engines and vehicles that will operate on electricity and hydrogen, the majority of new heavy-duty vehicles will continue to use internal combustion engines (“ICE”) for many years to come. This will be especially true in the heavier vehicle classes in the heavy-duty vehicle market.3 [EPA-HQ-OAR-2022-0985-1651-A2, p. 2.]

2 The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation (the “Blueprint”). Accessed on June 11, 2023 at The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation | Department of Energy. See, e.g., page 5, Figure B and similar references elsewhere in the Blueprint.

3 Lubrizol notes that, even in California and the other states that adopt California’s Advanced Clean Transportation (“ACT”) rule (collectively, the “ACT States”), most new trucks sold in 2035 will still be ICE vehicles fueled by petroleum diesel fuel, absent any further changes in state or federal fuel policy. More specifically, manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines will be required to sell zero-emission trucks as an increasing percentage of their annual sales in the ACT States from 2024 to 2035. By 2035, zero-emission truck/chassis sales will need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales in the ACT States.

Organization: Lynden Incorporated

Lynden values the goal of cleaner air and cleaner trucks, however the proposed Phase 3 emissions standards for heavy trucks limits innovation and puts other viable options to reduce emissions in the near-term out of reach. Rules with such a broad-reaching impact on the freight industry on which the American economy depends and which ultimately impacts the cost of goods essential to every individual, requires a substantially broader view than strictly focusing on tailpipe emission standards. [EPA-HQ-OAR-2022-0985-1470-A1, p. 5]

This is outside the scope of the EPA and should be addressed by Congress. [EPA-HQ-OAR-2022-0985-1470-A1, p. 5]

Organization: Manufacturers of Emission Controls Association (MECA)

Several engine and powertrain technologies have evolved to be commercially viable since the Phase 2 standards were finalized and may be deployed by OEMs to meet the proposed CO2 emission limits. Technologies such as cylinder deactivation, advanced driven turbochargers, hybrid powertrains, vehicle electrification and hydrogen internal combustion engines should be considered in EPA's analysis. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 2 - 3]

The portfolio of technology options available to reduce GHG emissions from heavy-duty trucks and engines is continually growing in response to federal GHG standards. A review of heavy-duty engine certifications from 2002 to 2023 shows that once emission control and efficiency improving technologies were required on engines in 2010-2011, the inverse relationship between CO2 and NOx emissions at the tailpipe was overcome and both were reduced simultaneously (see Figure 1 below). Several engines certified since 2010 have shown the ability to achieve 0.1 g/bhp-hr or lower NOx emissions over the composite FTP certification cycle, which is 50% below the current standard. Of those engines, several have demonstrated the ability to meet future Phase 2 GHG regulation limits for vocational engines that go into effect in 2021, 2024 and 2027. Setting stringent emission targets for both CO2 and NOx through realistic regulations has caused engine calibrators to expand their toolbox from the engine to the powertrain to enable simultaneous NOx reductions and engine efficiency improvements. [EPA-HQ-OAR-2022-0985-1521-A1, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1521-A1, page 4, for Figure 1.]

These technologies represent only a few of the potential pathways available to OEMs to reduce CO2 from commercial engines and vehicles. It is MECA's recommendation that EPA expand their analysis of potential compliance pathways, beyond only battery electric or fuel cell powertrains, to include improvements in engine and powertrain efficiency and incorporate them into a more robust final rule. [EPA-HQ-OAR-2022-0985-1521-A1, p. 9]

Organization: MEMA

The Final Rule Must Reflect Regulatory Certainty Paired with Technology Neutrality

EPA must provide sufficient regulatory certainty to manufacturers and consumers to ensure the most favorable outcome of this ambitious market transformation. The final rule must contain an effective mix of feasible, demonstrable technology along with emerging technology, and leverage all available options to improve emissions reductions in today's advanced propulsion designs. At the same time, the final rule must encourage innovation in clean transportation, including more advanced low- and zero-emissions technology. MEMA opposes a 100% ZEV mandate. A ZEV mandate stifles innovation and would disallow technologies that could address the urgent need to decarbonize applications for HD and MD vocational vehicles. [EPA-HQ-OAR-2022-0985-1570-A1, p. 4]

Technology neutrality pairs with Regulatory Certainty The proposed rule disproportionally favors battery electric propulsion, which in turn discourages high-efficiency diesel and other internal combustion technology, including carbon-neutral renewable fuels. Emerging innovations and recent technologies offer significant reduction in emissions from ICE vehicles. [EPA-HQ-OAR-2022-0985-1570-A1, p. 4]

Technology forcing regulations that foster innovation aligned with policy, rather than regulations that mandate a narrowly defined technology path, will lead to a more positive national outcome. The chassis in the scope of this rule are not only expected to carry heavy loads long distances, but also perform work during and after transit. [EPA-HQ-OAR-2022-0985-1570-A1, p. 5]

MEMA recognizes that the proposal attempts a performance-based standard, and the agency makes forecasts that estimate a variety of technology combinations in future fleets. At the same time, the supplier industry projects more time is needed for innovation of nonelectric technology than EPA has estimated. By accepting the potential for technologies other than battery electric and hydrogen fuel cell, EPA can make a more immediate, widespread, positive impact on nationwide emissions reductions. Therefore, EPA must incent the development and deployment of advanced technology options to include advanced internal combustion (ICE) technologies and renewable fuels. These incentives will assist in accelerating the necessary infrastructure improvements needed to support advanced technology vehicles. [EPA-HQ-OAR-2022-0985-1570-A1, p. 5]

The proposal should be more technology-neutral and provide added regulatory certainty by fairly assessing carbon content of vehicle's technologies, their production and where vehicle charging electricity comes from. At this time, there is no review of carbon content of components or vehicles in the Draft Regulatory Impact Analysis (DRIA). We understand the complexity of this endeavor, but EPA unfairly tilts the balance toward battery electric vehicles by a selectively narrow focus on tailpipe emissions. We agree with EPA statements that its authority stems from Congressional directives to reduce tailpipe emissions. Electric vehicles have no tailpipe, and thus no tailpipe emissions. If EPA is determined to regulate zero-emissions vehicles, EPA should address lifecycle carbon content of vehicles in scope of this rule to better balance technology vs. tailpipe. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 5 - 6]

Recommendation: EPA to move beyond tailpipe emissions and examine lifecycle carbon assessment to compare and evaluate vehicles in scope of this rule. [EPA-HQ-OAR-2022-0985-1570-A1, p. 6]

Recommendation: EPA to act decisively to further encourage and incent the development and deployment of advanced clean ICE technologies, including renewable fuels and H2ICE. [EPA-HQ-OAR-2022-0985-1570-A1, p. 6]

Organization: Missouri Farm Bureau (MOFB)

We write today to express our opposition to the proposed rule. MOFB's member-adopted policy states: 'We oppose increased restrictions on vehicle emissions, including mandates on greenhouse gas emissions.' [EPA-HQ-OAR-2022-0985-1584-A1, p. 1]

In conclusion, MOFB believes EPA's proposed rule is ill-conceived and, as currently written, will not achieve its purported purpose. We call upon EPA to immediately withdraw the proposed rule and to work with transportation stakeholders, like MOFB, to better allow for emission reductions from a variety of vehicles and fuels technologies that will support the American economy, rather than those of foreign countries, and not cripple our essential transportation sector we so heavily depend on. [EPA-HQ-OAR-2022-0985-1584-A1, p. 3]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

EPA's Proposed Rule Is a 'Major Question' Reserved for Congress.

EPA's GHG standards should not favor one technology over another. The Proposed Rule, however, goes beyond favoritism and signals the agency's intention to phase out non-EV technologies, such as ICE vehicles. Despite EPA's assertions to the contrary, the Proposed Rule mandates non-ICE technologies because OEMs cannot comply with the standards through the sale of ICE vehicles alone. And EPA explicitly anticipates EV adoption rates high and above current market rates to achieve these standards. By MY 2032, EPA predicts an EV adoption rate between 15–57% across all regulatory subcategories of vehicles.27 At minimum (e.g. a 15% adoption rate), this is a 7,400% increase over the number of HD electric vehicles certified by EPA in 2021.28 The Proposed Rule will therefore introduce a transformational shift in the automotive industry—including the fuel retail industry—far beyond that which EPA has authority to mandate as delegated by Congress. Whether this shift is necessary and how best to achieve such a shift are 'major questions' reserved for Congress and Congress alone. [EPA-HQ-OAR-2022-0985-1603-A1, p. 10]

27 U.S. Environmental Protection Agency, 'Greenhouse Gas Emissions Standards for Heavy Duty Vehicles: Phase 3, Draft Regulatory Impact Analysis,' 245, available at https://www.epa.gov/system/files/documents/2023-05/420d23004.pdf [hereinafter, 'DRIA'].

28 Proposed Rule, 88 Fed. Reg. at 25,940.

Consistent with the 'major questions doctrine,' Congress must 'speak clearly' to authorize an agency to exercise powers of 'vast economic and political significance.'29 Overreaching environmental regulatory programs like the Proposed Rule fit precisely into this doctrine. In West Virginia v. EPA, the Supreme Court invoked the doctrine when it held that EPA had exceeded its statutory authority in adopting the Clean Power Plan.30 Through the Clean Power Plan, EPA sought to reduce emissions by requiring utilities and other power generators to transition from coal-fired power to natural gas and, ultimately, renewable energy sources rather than by imposing source-specific requirements reflective of the best available emission reduction technologies, as it had done in the past.31 Through the Clean Power Plan, EPA announced 'what the market share of coal, natural gas, wind, and solar must be, and then require[d] plants to reduce operations or subsidize their competitors to get there.'32 The Supreme Court struck down the proposed program, concluding that EPA's relied upon 'vague statutory grant' within the Clean Air Act was far from the 'clear authorization required' for a regulatory program that would have major economic and political significance, impacting vast swaths of American life, and substantially restructuring the American energy market.33 [EPA-HQ-OAR-2022-0985-1603-A1, pp. 10-11]

29 Nat'l Fed. Of Indep. Bus. v. Dep't of Labor, 595 U.S. __, slip op. at 6 (Jan 13, 2022); see also Ala. Assoc. of Realtors v. Dep't of Health & Human Servs., 141 S. Ct. 2485, 2489 (2021); Utility Air

Regulatory Group v. EPA, 573 U.S. 302, 324 (2014); U.S. Telecom Assoc. v. FCC, 855 F.3d 381, 419-21 (D.C. Cir. 2017) (Kavanaugh, J., dissenting from denial of rehearing en banc) (explaining provenance of 'major rules doctrine').

30 West Virginia v. EPA, 597 U.S. __ (2022).

31 Id.

32 Id., slip op. at 33, n. 4.

33 Id., slip op. at 24.

EPA's Proposed Rule presents an analogous situation. Mandating a rapid shift from ICE to EV technology will reshape the American automotive market with profound and far-reaching collateral effects, thus encroaching on an issue of 'vast economic and political significance.' These standards are contrary to natural market forces and would vastly alter what consumers are able to purchase by indirectly requiring the production of a product different from that currently being purchased (e.g., ICE HD vehicles). The Proposed Rule forces both the manufacturer's and consumer's hand in requiring rapid scaling to meet production lead times and adoption rate requirements that would not exist but for EPA's electrification mandate. [EPA-HQ-OAR-2022-0985-1603-A1, p. 11]

Beyond the obvious impacts to consumer automotive markets, the Proposed Rule will also greatly affect fuel retailers across the country. It will require utilities to rapidly increase generation, transmission, and distribution capacities to meet needs not fully assessed by EPA. Forcing the American automotive industry to shift reliance from domestically abundant and secure oil and gas to foreign-supplied critical minerals will have profound impacts on national security. These are only a few of the critical effects of the Proposed Rule that go well beyond EPA's expertise. The Agency is not situated to fully analyze the consequences resulting from such a rapid shift to EVs, if feasible at all—and the Agency has not done so. [EPA-HQ-OAR-2022-0985-1603-A1, p. 11]

Similar to the Supreme Court's finding in West Virginia, EPA lacks congressional authorization in the Clean Air Act to impose a shifting manufacturing standard to a preferred powertrain and effectively require regulated manufacturers to phase out combustion engine technology. EPA's authority to impose emissions standards is limited to that provided in Section 202(a) of the Clean Air Act. EPA's authority is limited to setting 'standards' for 'emission[s]' from 'any class or classes of new motor vehicles or new motor vehicles engines, which … cause or contribute to,' potentially harmful air pollution. ZEVs do not have tailpipe emissions of GHGs, though. Thus, operating such vehicles alone cannot 'cause, or contribute to,' air pollution. In stark contrast to 'clear congressional authorization,' Section 202(a) of the Clean Air Act provides EPA no authority to set standards beyond that which could be achieved by improvement to ICE vehicles and eventually phase out the only technology contemplated when the Act itself was adopted and amended. [EPA-HQ-OAR-2022-0985-1603-A1, p. 11]

Further evidencing EPA's lack of authority, the Proposal attempts to sidestep regulatory requirements established by the Energy Policy and Conservation Act of 1975 ('EPCA')34 and the Energy Independence and Security Act ('EISA'). Pursuant to these authorities, the National Highway Transportation Safety Authority ('NHTSA') has the authority to issue fuel efficiency standards for medium- and heavy-duty vehicles. Because fuel economy and GHG emissions are two sides of the same coin, EPA issued joint standards with NHTSA in prior Phase 1 and Phase

2 heavy-duty GHG emission standard proposals. But EPA did not do the same for the proposed Phase 3 standards here. If it did, the joint standards would have to comply with the EISA requirement that all new fuel efficiency standards 'shall provide not less than 4 full model years of regulatory lead-time,' so that new GHG standards are tethered to achievable vehicle technology.35 That means a fuel efficiency standard promulgated in calendar year 2023 cannot be implemented until MY 2028. The Proposed Rule does not meet this standard and, because it effectively promulgates equivalent fuel efficiency standards in the form of GHG emissions standards, is undercutting Congress' intent in EISA and regulating in a way that is inconsistent with NHTSA's authority as well as its own.36 [EPA-HQ-OAR-2022-0985-1603-A1, pp. 11-12]

34 Pub. L. 94-163, 89 Stat. 871 (Dec. 22, 1975).

35 49 U.S.C. 32902(k). In contrast, under the Clean Air Act, new heavy-duty emission standards can begin 'no earlier than the model year commencing 4 years after such revised standard is promulgated.' 42 U.S.C. 7521(a)(3)(C).

36 See Massachusetts v. EPA, 549 U.S. 497, 532 (2007) ('The [EPA and NHTSA] obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.').

Moreover, EPA has never before claimed authority to mandate even partial electrification—similar to EPA's reliance on Section 111(d) of the Clean Air Act for the promulgation of the Clean Power Plan. Congress has made clear that it, not EPA, must make policy decisions—or, rather, answer the 'major question'—regarding if, when, and how the American automotive industry will transition from ICE vehicles to EVs. In the 116th Congress (2019–21), Congress introduced 44 bills seeking to reduce petroleum-based fuel consumption and GHG emissions from the transportation sector through customer rebates, vehicle and fuel producer incentives, local funding, development of standards, and research and development.37 But none went so far as to propose the mass adoption of heavy-duty ZEVs through the phase-out of ICE vehicles.38 In fact, Congress rejected one bill that would have banned the sale of new light-duty ICE vehicles by 2040,39 and it has continuously disapproved of EPA's efforts to hamstring the automotive sector with more stringent air pollution standards than are feasible.40 [EPA-HQ-OAR-2022-0985-1603-A1, p. 12]

37 CONGRESSIONAL RESEARCH SERVICE, 'Alternative Fuel and Vehicles: Legislative Proposals' (July 28, 2021).

38 Id.

39 See Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019); Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. (2018); see also 116 Cong. Rec. 19238-40 (1970) (proposed amendment to Title II that would have banned ICE vehicles by 1978).

40 See, e.g., S. J. Res. 11, 118th Cong. (2023). (Although passed only by the Senate thus far, the joint resolution calls for disapproval of the rule submitted by the Administrator of the Environmental Protection Agency relating to 'Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards,' 88 Fed. Reg. 4296 (January 24, 2023).)

Congress intended to direct these policy decisions, as evidenced by the passage of the bipartisan infrastructure law41 and the Inflation Reduction Act ('IRA')42 whereby Congress identified the policy levers it deemed appropriate. Congress could have, but did not, direct EPA to establish a fleet-wide credit trading regime to further drive EV development and rapid adoption. Instead, the Proposed Rule stands in direct contrast to other legislation, such as the

Renewable Fuel Standard Program, whereby Congress mandated that 'gasoline sold or introduced into commerce in the United States' must contain a year-over-year increasing share of renewable fuels43 and, in 2022, must include tens of billions of gallons of renewable fuel.44 An EPA-mandated shift in transportation technology from vehicles that can operate on increasing volumes of renewable fuel to ZEVs does not square with such requirements. Consequently, Congress, not EPA, should determine how to regulate electrification of transportation and the many industries affected thereby. [EPA-HQ-OAR-2022-0985-1603-A1, pp. 12-13]

41 Public Law 117–58, November 15, 2021.

42 Public Law 117–169, August 16, 2022.

43 42 U.S.C. 7545(o)(2)(A)(i).

44 Id., 7545(o)(2)(B); 87 Fed. Reg. 39,600 (July 1, 2022).

Organization: National Association of Manufacturers

Emissions Standards Should Be Technology-Neutral

Commercial vehicle manufacturers have been making historic investments to ensure that zero emissions vehicles will have a growing place on America's roads. In finalizing the rule, the NAM urges the Environmental Protection Agency to remain technology-neutral, allowing market forces to determine which technologies work best for specific sectors. A technology-neutral approach provides the greatest flexibility and opportunities for manufacturers to meet the administration's zero emissions goals. [EPA-HQ-OAR-2022-0985-1649-A2, p. 1]

Organization: Neste US

III. PROPOSED RULE IS INCONSISTENT WITH STATUTORY REQUIREMENTS OF THE RENEWABLE FUEL STANDARD

While EPA has insisted this proposed rule is technology neutral, it is worth noting that any EV mandate would be inconsistent with the statutory mandate of the Renewable Fuel Standards (RFS), which incorporates the congressional assumption that decarbonization of liquid fuel will remain a cornerstone of the United States' climate policy for the foreseeable future. Because Congress directed EPA to implement 6 the RFS program, EPA cannot promote the substantial or exclusive use of another technology that will frustrate Congress' RFS goals. Indeed, by adopting the suggestions offered in these comments, the Agency would be ensuring these standards work hand-in-glove with the RFS in the most efficient and logical path to addressing GHG emissions from heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1615-A1, p. 3]

6 Americans for Clean Energy v. EPA, 864 F.3d 691, 697 (D.C. Cir. 2017) (quoting the Energy Independence and Security Act, Pub. L. No. 110-140, 121 Stat. 1492 (2007) (noting that Congress enacted requirements in the Renewable Fuels Program in order to "move the United States toward greater energy independence and security, [and] to increase the production of clean renewable fuels").

Organization: Natural Gas Vehicles for America (NGVAmerica)

EPA Must Take Steps to Address the Damage Caused by Its Uneven Treatment of Low Carbon Technologies

EPA's prior notice as part of the Clean Truck Initiative was extremely frank about the reasons that the agency had provided significant regulatory credits for electric vehicles.12 Pertinent parts of that discussion are included here:

As stated in the HD GHG Phase 2 rulemaking, our intention with these multipliers was to create a meaningful incentive to those considering adopting these qualifying advanced technologies into their vehicles. The multipliers are consistent with values recommended by California Air Resources Board (CARB) in their supplemental HD GHG Phase 2 comments. (footnote omitted). CARB's values were based on a cost analysis that compared the costs of these technologies to costs of other conventional GHG-reducing technologies. Their cost analysis showed that multipliers in the range we ultimately promulgated would make these technologies more competitive with the conventional technologies and could allow manufacturers to more easily generate a viable business case to develop these technologies for heavy-duty vehicles and bring them to market at a competitive price. [EPA-HQ-OAR-2022-0985-1522-A1, p. 10]

As we stated in the 2016 HD GHG Phase 2 final rule preamble, we determined that it was appropriate to provide such large multipliers for these advanced technologies at least in the short term, because they have the potential to provide very large reductions in GHG emissions and fuel consumption and advance technology development substantially in the long term. However, because the credit multipliers are so large, we also stated that we should not necessarily allow them to continue indefinitely. Therefore, they were included in the HD GHG Phase 2 final rule as an interim program continuing only through MY 2027.

The above passages appear on pages 17594 and 17595 of the March 28, 2022, Federal Register notice. [EPA-HQ-OAR-2022-0985-1522-A1, p. 10]

It is noteworthy that EPA acknowledges the credits are not based on emission benefits. The credits are based on cost with the intent on making electric vehicles "more competitive" with conventional technologies. It is noteworthy that the notice in this rulemaking contains virtually the exact word for word explanation regarding the incentives for electric vehicles.13 [EPA-HQ-OAR-2022-0985-1522-A1, pp. 10 - 11]

13 See 87 FR at 26010 – 26011.

NGVAmerica believes that by its own admission EPA has sought to create an unlevel and anti-competitive advantage for electric vehicles over other technologies including NGVs. Natural gas vehicles involve significant cost due to their low-volume and the cost of the storage vessels and systems. Like electric vehicles, natural gas vehicles when powered by RNG deliver significant greenhouse emission reductions and therefore should have been similarly encouraged. Thus, EPA has every reason to treat natural gas vehicles like electric vehicles when providing regulatory incentives – moreover, since natural gas vehicles have largely not qualified for these incentives, it is reasonable to extend similar size incentives for natural gas technology at least for a short-period of time to allow natural gas trucks to increase in market share. [EPA-HQ-OAR-2022-0985-1522-A1, p. 11]

Thus, in addition to proposing a mechanism for crediting biofuels based on their upstream emissions, EPA must provide equal treatment with respect to any future incentives offered to manufacturers to assist them in overcoming market hurdles, and, moreover, EPA should take corrective action to address the harm that has been done by its past actions. [EPA-HQ-OAR-2022-0985-1522-A1, p. 11]

Organization: Owner-Operator Independent Drivers Association (OOIDA)

EPA OVERREACH

The Phase 3 rule is simply another improper attempt by EPA to surpass the authority provided by Congress in the Clean Air Act. As recently as June 2022, the U.S. Supreme Court has held that EPA actions like the Phase 3 rule violate the major questions doctrine involving the principles of separation of powers and understanding legislative intent because they clearly exceed the power provided to the EPA by Congress in the Clean Air Act. [EPA-HQ-OAR-2022-0985-1632-A1, p. 6]

Like the EPA's previous efforts, the EPA lacks "clear congressional authorization" from Congress to implement the Phase 3 rule. As in the cases before the Phase 3 rule, "there is every reason to hesitate before concluding that Congress meant to confer on the EPA the authority it claims." The U.S. Supreme Court has a recent and repeated history of finding similar EPA actions unconstitutional. Today, there is no reason to believe that any different result would be reached. The Phase 3 rule clearly does not fall within the power provided to the EPA by Congress under the Clean Air Act. [EPA-HQ-OAR-2022-0985-1632-A1, p. 6]

This latest EPA emissions proposal once again discounts the contributions of our nation's truckers. The agency must consider EPA must consider a more achievable implementation timeline that would provide reliable and affordable heavy-duty vehicles for consumers, particularly small trucking businesses and individual owner-operators. This can be accomplished through an approach that protects consumer choice. [EPA-HQ-OAR-2022-0985-1632-A1, p. 6]

Organization: POET

The Proposed Rule is also deficient in another critical way that EPA could remedy by crediting renewable fuels. EPA's proposed standards rely on optimistic projections showing a rapid rollout of heavy-duty zero-emissions vehicle ('ZEV') technologies at scale. EPA's standards assume that the market will adapt to EPA's standards and adopt those technologies at the pace EPA predicts primarily because heavy-duty ZEVs are technologically feasible. While EPA cites the incentive programs supporting those technologies, and industry commitments to adding more ZEVs to their fleets, EPA's modeling omits any rigorous consideration of the significant supply-chain and infrastructure developments that will be necessary to support the hundreds of thousands of new heavy-duty ZEVs needed to meet EPA's proposed standards. EPA is projecting that ZEVs will make up nearly 50 percent of new vocational vehicles by model year ('MY') 2032.2 EPA's modeling largely ignores the significant infrastructure needed to support those ZEVs and provides no evidence that it will in fact be ready in time. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 2-3]

2 See U.S. EPA, Proposed Rule, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 26001 (Apr. 27, 2023).

This analytical gap could doom the Proposed Rule. As EPA knows, courts will invalidate rules if the agency has 'entirely failed to consider an important aspect of the problem' or 'offered an explanation for its decision that runs counter to the evidence before the agency.'3 Here, the evidence suggests that the supply-chain and infrastructure needs threaten the technology pathways EPA's proposal relies on. West Virginia v. EPA faulted EPA for exercising Clean Air

Act authority to 'substantially restructure the American energy market' in a way that 'Congress had conspicuously and repeatedly declined to enact itself.'4 By pressing for the rapid deployment of heavy-duty ZEVs without thoroughly evaluating its feasibility and the infrastructure issues, the Proposed Rule could fall prey to similar criticism. Yet by adding renewable fuels, which have long been incentivized by the Clean Air Act to reduce and replace fossil fuels, EPA's rule would build on historical carbon-reducing policies. It would not be, as the West Virginia Court put it, a 'transformative expansion of' the agency's 'regulatory authority.'5 [EPA-HQ-OAR-2022-0985-1528-A1, p. 3]

3 Motor Vehicles Mfrs. Ass'n v. State Farm Mutual Automobile Ins. Co., 463 U.S. 29, 43 (1983).

4 142 S. Ct. 2587, 2610 (2022) (quotation omitted).

5 Id. at 2595.

POET Generally Supports Aggressive Emissions Reduction Standards for Heavy-duty Vehicles.

Heavy-duty vehicles are the second largest contributor to GHG emissions from the transportation sector, behind light-duty vehicles.6 They account for 25 percent of all GHG emissions from transportation, even though they represent only a tiny fraction of all vehicles on the road.7 They are also essential for shipping goods across the country and keeping the economy running. Those factors make heavy-duty vehicles an important target for cutting GHG emissions. POET stands behind technology-neutral standards that will achieve this objective. EPA should leverage all available technologies to begin reducing carbon emissions from the heavy-duty sector as promptly as is technologically feasible. [EPA-HQ-OAR-2022-0985-1528-A1, p. 3]

6 See 88 Fed. Reg. at 25928.

7 Id.

EPA's rule purports to be technology neutral, but its standards rely mostly on just two technologies: battery-electric vehicles ('BEVs') and hydrogen fuel cell electric vehicles ('FCEVs'). EPA has focused on BEVs and FCEVs because they emit no carbon when operating. The administration also considers BEVs to be a keystone in its climate policies. Yet as POET will explain, EPA should not omit other technologies, such as renewable fuels, that avoid many of the problems facing BEVs and FCEVs and can immediately begin reducing heavy-duty vehicle emissions on a lifecycle basis. EV developers and others in the EV supply chain might one day reduce the significant upstream emissions associated with EVs. But for the next several years, and perhaps decades, BEVs and FCEVs will be running on electricity or hydrogen that is produced, at least in significant part, using fossil fuels. At the same time, the greenhouse gas impacts of renewable liquid fuels are also declining, meaning that renewable fuels may remain superior or competitive with 'ZEV' technologies in terms of greenhouse gases for years to come. For these reasons, EPA's standards should additionally credit renewable fuels along with other carbon-reducing technologies. [EPA-HQ-OAR-2022-0985-1528-A1, p. 4]

Organization: ROUSH CleanTech

PROPOSED EMISSIONS STANDARDS AND CREDITING

- Roush does not support EPA's approach to include BEVs and FCEVs in the target setting for SI and CI engines while also limiting the rule solely to tailpipe emissions. We believe EPA should recognize that BEV and FCEV's represent new powertrain choices for vehicles, and therefore should have specific standards applicable to their technology. We believe that EPA first implemented the practice of separate vehicle targets based on the powertrain targets in the Phase 1 rule for HD pickups and vans. This approach was justified then as follows:
    - To calculate a manufacturer's HD pickup and van fleet average standard, the agencies are proposing that separate target curves be used for gasoline and diesel vehicles…. These reductions are based on the agencies' assessment of the feasibility of incorporating technologies (which differ significantly for gasoline and diesel powertrains) in the 2014–2018 model years, and on the differences in relative efficiency in the current gasoline and diesel vehicles. The resulting reductions represent roughly equivalent stringency levels for gasoline and diesel vehicles, which is important in ensuring our proposed program maintains product choices available to vehicle buyers1. [EPA-HQ-OAR-2022-0985-1655-A1, p.2]

1 Federal Register Vol. 75, No. 229, 74194-74195

This approach of applying separate standards, driven by the technology, was carried into the Phase 2 vocational vehicle standards, and has provided the desired effect of ensuring SI and CI powered vehicles receive continuous efficiency improvements based on the technology adoption feasible to that powertrain, while ensuring that there was no regulatory incentive for SI or CI products to exit the market which would negatively impact fleets. The Phase 2 rule was largely able to avoid the issue of electric and hydrogen fuel cell powered vehicles as they were assumed to be insignificant to setting the standard, but the Phase 3 rule obviously cannot ignore BEV's and probably should not ignore FCEV's. We believe that following EPA's established practice of setting GHG objectives based on equivalent stringency and ensuring product choices remain available to vehicle buyers remains the correct path, allowing commercial fleet buyers to determine which vehicles meet their needs. The proposed approach will almost certainly lead to backsliding on many of the vehicle efficiency gains seen in Phase 1 and Phase 2, as there is no incentive to include these technologies on BEV/FCEV's, and reduced incentive to include them on ICE vehicles (it is far cheaper to subsidize a few extra small-battery BEV sales knowing they'll never be driven than it is to implement hybrid drivetrains). We recommend an alternate approach consistent with the Phase 1 and Phase 2 programs:

- Continue to set vehicle standards for SI and CI powered vehicles which are reduced over time, but only apply to vehicles with an SI or CI engine installed. Among other technologies, urban vocational vehicles are ripe for hybridization, allowing recovery of braking energy, downsizing of the ICE engine, use of lower carbon fuels, etc. ICE trucks are not going away any time soon and will be in use well past 2050; we should be ensuring we continue to improve them.
- Set new vehicle standards (based on kWhr/ton-mile or other energy efficiency metric) for BEV's and FCEV's (kgH2/ton-mile or similar fuel efficiency standard). It may be that this is implemented in the NHTSA program only if EPA does not have authority to regulate efficiency for non-emitting vehicles, but that still accomplishes the goal. These standards could initially be simple but would provide a basis for future efficiency improvements to minimize electrical power usage as industry EV deployment increases.

- Credits remain tradeable only within these categories as today, although a carefully designed (or capped) cross trading program could also be useful. Main goal is to ensure that higher or lower adoption of one technology does not substantially impact the requirements for another technology.

- We recognize this approach does not result in EPA forcing BEV/FCEV adoption. This is a positive, not a negative. We believe that EPA should not be forcing any specific technology adoption, and the rule as proposed is clearly ripe for legal challenge and delay on these grounds. This would be unfortunate as the Phase 3 rule is unnecessary to achieve the BEV/FCEV adoption rates desired by the administration; as EPA's own forecasting shows, this adoption will happen through normal market forces (supplemented by the IRA/BIL, ACT/ACF, etc.) with no forcing action from EPA required. [EPA-HQ-OAR-2022-0985-1655-A1, pp.2-3]

Organization: South Carolina Trucking Association

[*From Hearing Testimony, May 3, 2023*] The trucking industry really is an eclectic mix of industries, the wheels of the supply chain. And I'm not a commercial motor vehicle operator. I'm charged with keeping a pulse on these essential and interconnected sectors as we together and individually plot routes to successfully serve. Without comprehensive experience in our diesel world, it's understandable how one might imagine a better way, but previous incremental emissions improvement initiatives achieved their goals and fuel savings with real-world proven technologies. This proposed regulation's different. It's more than just premature. It's ill-advised. This one steps in and picks technology winners and losers. It's a de facto adoption mandate of EV technology that's at early-stage development. There remain severe limitations facing batteries and even more with hydrogen fuel cells. What could work the passenger cars will not work for heavy-duty trucking. In setting standards, EPA must account for this diversity. What works for last-mile package and delivery vans will vary greatly with on-highway tractor trailers, and so it goes with every unique niche sector in between. Basic real-world fleet factors must be accounted for, like it'll take more EV CMVs to do what fewer diesels can. Current parent electric truck prices are 3 times higher than a clean diesel, and, if mandated, they will surely stubbornly remain higher, especially for small businesses. True costs, ROI, for fleets, including charging and owning that infrastructure, is unknown. Regardless, won't we need a dependable diesel fleet and all that goes with it as a backup? That forces decisions and planning, like how to deploy in response, how to house it, how to fuel it, how to maintain it, how to pay for it all. All OEMs in all sectors are studying engineering and design possibilities while employing cost-effective measures to date. At this initial phase, for successful adoption, charging and alternative fueling infrastructure must be at the center. We urge no mandate but to allow this process, as it should, as a partnership with free market forces. Thank you for this opportunity. [EPA-HQ-OAR-2022-0985-2666, Public Hearing Testimony, Day 2]

Organization: South Dakota Department of Agriculture and Natural Resources (DANR)

Lack of Clear Authority

EPA's fact sheet states the proposed standards would contribute "toward the goal of holding the increase in the global average temperature to well below 2 degrees Celsius .... " The U.S. Supreme Court has consistently told EPA it may not expand its federal regulatory reach beyond what Congress has given it authority to implement. The U.S. Congress has not established this 2 degrees Celsius goal under the requirements of Clean Air Act, and this goal is not found in a promulgated regulation. Using this standard for justification for the proposed regulations falls under the Supreme Court's major questions doctrine. It is evident that EPA lacks clear authority from Congress to require a generation-shifting approach to reduce vehicle emissions. Therefore, DANR does not think EPA has clear authority to implement these proposed emission standards and views this effort as federal overreach. [EPA-HQ-OAR-2022-0985-1639-A2, p. 1]

Organization: Tesla, Inc. (Tesla)

Legal Authority

The Clean Air Act (CAA), and Section 202(a), is directed at protecting public health and welfare. See 42 U.S.C. 7401 (identifying the Act's purpose as to 'protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population.'); 42 U.S.C. 7521(a)(1) (providing that the Administrator shall prescribe and from time to time revise 'standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.'). The Proposed Rule recognizes that the purpose of adopting standards under CAA section 202 is to address air pollution that may reasonably be anticipated to endanger public health and welfare. Indeed, reducing air pollution has traditionally been the focus of such heavy-duty standards.'164 As courts have recognized, given the overriding goal of the statute to protect public health and welfare, EPA may 'plac[e] primary significance on the 'greatest degree of emission reduction achievable,'' and consider other factors such as 'cost . . . energy and safety factors as important but secondary factors.'165 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 22-23]

164 88 Fed. Reg. at 25929.

165 Husqvarna AB v. EPA, 254 F.3d 195, 200 (D.C. Cir. 2001).

Further, there should be no doubt, in view of recent amendments to the Clean Air Act and Congressional ratification accomplished by the IRA,166 that EPA has ample authority to address the regulation of greenhouse gas pollutants, from motor vehicles, through electrification, and in the heavy- duty sector.167 [EPA-HQ-OAR-2022-0985-1505-A1, p. 23]

166 Pub. L. No. 117-169, 136 Stat. 1818 (2022).

167 See Greg Dotson and Dustin J. Maghamfar, The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and the Inflation Reduction Act, 53 ELR 10017 at 10019, 10032 (2023) (discussing Clean Air Act sec. 137 and other revisions) available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4338903

Tesla Supports More Stringent GHG Emission Standards

However, even though the proposed rule asserts that 'in consideration of the environmental impacts of HD vehicles' there is a need for 'significant emission reductions,' the proposal's level of stringency is not sufficient to align with the protective nature of the Act and Section 202.168 [EPA-HQ-OAR-2022-0985-1505-A1, p. 23]

168 88 Fed. Reg at 26007.

For the U.S. to meet its decarbonization goals and to mitigate the public health and welfare impacts from climate change, EPA's proposal should be amended to meet increasingly more stringent regulatory requirements that incentivize all vehicle manufacturers to rapidly scale up delivery of high-quality BEVs. As previously described, BEV technology in the medium- and heavy-duty vehicle classes is increasing at a rapid pace.169 Further, Tesla agrees with technology assessment that BEV technologies are feasible and suitable for most, if not all applications in the trucking space, and asserts that it can be deployed at rates faster than EPA indicates supports the proposed levels of emissions reduction. [EPA-HQ-OAR-2022-0985-1505-A1, p. 23]

169 88 Fed. Reg. at 25940.

The Clean Air Act is designed to be 'technology-forcing' and heavy-duty manufacturers are poised to meet significant new emission reduction performance standards.170 The Clean Air Act is 'intended to be a 'drastic remedy to . . . a serious and otherwise uncheckable problem.' . . . Subsequent legislative history confirms that the technology-forcing goals of the 1970 amendments are still paramount in today's Act.'171 As courts have recognized in the specific context of CAA section 202(a)(1) and as the preamble to the proposal appropriately acknowledges, 'Congress intended the agency to project future advances in pollution control capability. It was 'expected to press for the development and application of improved technology rather than be limited by that which exists today.''172 [EPA-HQ-OAR-2022-0985-1505-A1, p. 23]

170 Union Elec. Co. v. EPA, 427 U.S. 246, 258 (1976); Train v. NRDC, 421 U.S. 60, 90 (1975).

171 Whitman v. American Trucking Ass'n, 531 U.S. 457, 491-92, (Breyer, J. concurring), citing Union Elec. 427 U.S. at 256.

172 NRDC v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981).

Consistent with this approach, EPA appropriately states 'While standards promulgated pursuant to CAA section 202(a) are based on application of technology, the statute does not specify a particular technology or technologies that must be used to set such standards; rather, Congress has authorized and directed EPA to adapt its standards to emerging technologies.'173 As previously noted, supra, Tesla anticipates production levels of a Class 8 Day Cab tractor at 50,000 per year with significant production volumes beginning in late-2024.174 Reaching the 50,000 annual production level would amount to 20% of all annual sales in MY 2027. This means Tesla's production goal alone would far exceed the 5% BEV sales deployment EPA anticipates in 2027 from its Class 8 short-haul tractor subcategory and the 0% long-haul tractors in the long-haul sub-category.175 As the Phase 3 regulations phase-in, Tesla will not be the only manufacturer of BEV in this class. Indeed, as EPA notes other manufacturers are already producing such vehicles.176 In combination, this indicates that the proposed Class 8 standard are not ambitious enough. As a result, Tesla strongly encourages the agency to align the MY 2027-2032+ Tractor CO2 emission standards at grams/ton-mile standard that are lower than proposed and are consistent with reaching the BEV deployment levels found in ACT and evident in the rulemaking record. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 23-24]

173 88 Fed. Reg. at 25930 (emphasis added).

174 Wall Street Journal, Tesla Doesn't See Higher-Volume Production for Electric Semi Truck Until Late 2024 (June 13, 2023) available at https://www.wsj.com/articles/tesla-doesnt-see-higher-volume-production-

for-electric-semi-truck-until-late-2024-b49f639f?st=ajhtk9smx9hdm3t&reflink=mobilewebshare_permalink

175 88 Fed. Reg. at 25933 (Table ES-4).

176 Draft RIA at 45-51.

Organization: Texas Public Policy Foundation (TPPF)

Both Tailpipe Rules Are Likely Unconstitutional

In the recent landmark West Virginia v. EPA decision, the Supreme Court ruled that the EPA did not have the power to 'substantially restructure the American energy market' by regulation under the CAA. 142 S. Ct. 2587, 2610 (2022). That case dealt with the EPA's attempt to establish carbon dioxide ('CO2') emissions limits for new and existing coal-fired power plants under the Clean Power Plan, through regulations requiring plant operators to shift energy generation to cleaner sources. The EPA based the regulation on a misguided and overbroad reading of 42 U.S.C.7411 ('Section 111'). The Supreme Court informed the EPA that a scheme of regulations that restructures the national energy market to shift towards renewable energy did not qualify as the 'best system of emission reduction' under Section 111, because Congress had not clearly delegated the 'sweeping and consequential authority' to force vast energy market change by EPA regulation. See id. at 2608. [EPA-HQ-OAR-2022-0985-1488-A1, p. 2]

Yet that is exactly what the EPA seeks to do with these Tailpipe Rules. As the EPA's own press release states, the Tailpipe Rules are intended to 'accelerate the ongoing transition to a clean vehicles future and tackle the climate crisis.' Biden- Harris Administration Proposes Strongest-Ever Pollution Standards for Cars and Trucks to Accelerate Transition to a Clean-Transportation Future, ENVIRONMENTAL PROTECTION AGENCY (Apr. 12, 2023), https://www.epa.gov/newsreleases/biden-harrisadministration-proposes-strongest-ever-pollution-standards-cars-and. [EPA-HQ-OAR-2022-0985-1488-A1, p. 2]

The EPA has no constitutional authority to make these regulatory changes. They have the power, and indeed the duty, to promulgate 'standards which reflect the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology.' 42 U.S.C. 7521(a)(3)(A)(i). Nothing in this grant of authority allows the EPA to regulate in a way that pushes the use of electric vehicles over internal-combustion vehicles. The EPA did the same thing when it tried to force power producers to adopt so-called clean energy solutions through the Clean Power Plan, which the Supreme Court rightly rejected. [EPA-HQ-OAR-2022-0985-1488-A1, pp. 2-3]

Furthermore, carbon dioxide, the most plentiful greenhouse gas, is a natural substance essential to life on Earth. It is everywhere and in everything, yet EPA claims the power to regulate it. Congress could not possibly have intended to grant the EPA such wide-ranging regulatory power when it passed the Clean Air Act. Courts analyzing grants of authority to executive agencies must consider 'whether Congress in fact meant to confer the power the agency has asserted.' West Virginia v. EPA, 142 S. Ct. 2587, 2608 (2022). In West Virginia, the Supreme Court affirmed that when 'the history and breadth of the authority that the agency has asserted, and the economic and political significance of that assertion' are large and weighty, courts have ‘reason to hesitate’ before concluding Congress meant to delegate such power. Id. (cleaned up). At the very least, the Court ‘expect[s] Congress to speak clearly if it wishes to assign to an agency decisions of vast economic and political significance.’ Util. Air Regulatory Grp. v. EPA, 573 U.S. 302, 324 (2014) (cleaned up). Because EPA’s interpretation of the CAA to regulate CO2 ‘would bring about an enormous and transformative expansion in EPA’s regulatory authority without clear congressional authorization,’ it is ‘patently unreasonable’ for EPA to seize such authority. Id. [EPA-HQ-OAR-2022-0985-1488-A1, p. 3]

Organization: Transfer Flow, Inc.

If the EPA passes sensible, rational, and feasible regulations, those regulations will stand regardless of administration changes. [EPA-HQ-OAR-2022-0985-1534-A1, p. 2]

Despite the considerable opposition industry is expressing towards technology-forcing regulations, there is a universal sentiment that the environmental consequences associated with pollution prevention and mitigation are an important issue that must be dealt with as quickly and efficiently as possible. Industry is offering real-world, proven solutions that the industry is willing and ready to adopt. Hopefully, EPA staff does not ignore the well-thought-out solutions coming from people who have been working in the field their entire careers. Failing to recognize that ZEVs are not feasible in many applications and may never be feasible for some applications only serves to undermine the goal the EPA is trying to achieve. A lack of a technology-neutral approach to reducing emissions serves as a backstop to the continued use of fossil fuels while waiting for a lengthy and expensive build-out of electric infrastructure which may not go as smoothly as planned. [EPA-HQ-OAR-2022-0985-1534-A1, p. 3]

Technology-forcing regulations serve to stymie other clean technologies. One of the major contributing factors to the devastating wildfires affecting California over the last several years is, besides climate change, decades of forest mismanagement leading to unhealthy forests filled with rotting biomass. A healthy forest is a carbon sink, and an unhealthy forest is a carbon source. In 2022, UC Berkeley published a study that the best way to clean up these unhealthy forests would be to convert that rotting biomass into renewable drop-in gasoline.20 If the EPA were to focus on viable current technologies to meet emission goals instead of draconian regulatory measures, industry, and public interests could be supported while working to reduce vehicle emissions. [EPA-HQ-OAR-2022-0985-1534-A1, p. 4]

20 https://bof.fire.ca.gov/media/mn5gzmxv/joint-institute-forest-biofuels_final_2022_ada.pdf

Organization: Valero Energy Corporation

IV. EPA lacks statutory authority—much less clear congressional authorization—to support the proposed action.

As EPA acknowledges in the proposal, when EPA set CO2 standards in the HD GHG Phase 2 rule, EPA did not premise the standards on ZEV technologies such as BEV and FCEVs because EPA determined that the technologies were not yet available in the HD market. This proposal is the first time EPA proposes standards for HDVs relying on the availability of ZEV technologies.237 In fact, EPA’s reliance on ZEV technologies for HDVs is a massive and unprecedented shift in the transportation sector on which interstate commerce and the U.S. economy depends. For this dramatic change, EPA must have clear congressional authority. Yet

EPA has failed to identify clear authority for the standards and the electrification mandate. Instead, EPA relies on general authority and congressional statements that do not provide clear authority for the proposed action. To the contrary, EPA's references in the proposal demonstrate that Congress had many opportunities to provide clear authority but declined to do so. [EPA-HQ-OAR-2022-0985-1566-A2, p. 52]

237 Because the adoption of ZEVs contemplated by EPA in the proposal consists primarily, if not exclusively, of electric vehicles, these comments focus on the proposal's forced electrification of the Nation's HDV fleet; however, it should be noted that EPA's definition of ZEVs also includes other technologies, such as hydrogen fuel cell vehicles, which face even greater hurdles to widespread adoption and, more importantly, are equally unauthorized by Congress.

A. The proposed action addresses a major question for which EPA must have clear congressional authority.

Under the major-questions doctrine, a court may not construe a statute to "authoriz[e] an agency to exercise powers of 'vast economic and political significance'" unless the statute does so in "clea[r]" terms.238 Thus, an agency seeking to exercise such significant powers must identify "something more than a merely plausible textual basis for the agency action."239 "The agency instead must point to 'clear congressional authorization' for the power it claims." Id. [EPA-HQ-OAR-2022-0985-1566-A2, p. 52]

238 Alabama Ass'n of Realtors v. HHS, 141 S. Ct. 2485, 2489 (2021) (quoting Utility Air Regulatory Grp. v. EPA, 573 U.S. 302, 324 (2014)).

239 West Virginia v. EPA, 142 S. Ct. 2587, 2609 (2022) (quoting Utility Air, 573 U.S. at 324).

In assessing the economic and political significance of a rule, the Supreme Court has considered both the rule's direct effects and the implications of the agency's underlying claim of authority. For example, in West Virginia, although EPA's Clean Power Plan only incrementally shifted power generation, EPA had asserted the "highly consequential power" to "announc[e] what the market share of coal, natural gas, wind, and solar must be, and then requir[e] plants to reduce operations or subsidize their competitors to get there."240 An agency cannot avoid the need for clear backing from Congress by claiming an awesome power but exercising only a little of it in the first instance. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 52 - 53]

240 142 S. Ct. at 2609 & 2613 n.4; see Alabama Ass'n of Realtors, 141 S. Ct. at 2489 (considering the "sheer scope of the [agency's] claimed authority" in addition to the rule's "economic impact").

If EPA were to finalize this proposal, just as in West Virginia, EPA would be claiming the power to effect a wholesale shift in energy policy: moving the Nation's heavy duty vehicle ("HDV") fleet from vehicles powered by internal-combustion engines ("ICEs") that use liquid fuels to vehicles powered by battery-operated electric motors. The only difference is that EPA is waving its wand over motor vehicles instead of power plants. At a more specific level, the Supreme Court in West Virginia identified several clues from the statutory and regulatory scheme indicating that EPA needed clear congressional authorization for its Clean Power Plan. Those same clues are present here in spades. The lesson should be unavoidable: EPA needs clear support from Congress to redefine the source and replace the kind of vehicles America drives on its roads and uses for work and delivery of goods that keep the economy running. In this proposal, EPA claims power to radically change numerous sectors in the economy that depend on HDVs, including long-haul truck services that delivers goods, supplies and equipment throughout the country.241 [EPA-HQ-OAR-2022-0985-1566-A2, p. 53]

241 Of course, the proposed rule electrifying HD vehicles is only part of the current administration's broader plan to electrify the entire fleet of the nation's vehicles. See E.O. 14307, 88 Fed. Reg. 43,583 (Aug. 5, 2021) ("50 percent of all new passenger cars and light trucks sold in 2030 be zero-emission vehicles, including battery electric, plug-in hybrid electric, or fuel cell electric vehicles.") ("Given the significant expertise and historical leadership demonstrated by the State of California with respect to establishing emissions standards for light-, medium-, and heavy-duty vehicles, the Administrator of the EPA shall coordinate the agency's activities … with the State of California as well as other States that are leading the way in reducing vehicle emissions, including by adopting California's standards."); EPA Finalizes Greenhouse Gas Standards for Passenger Vehicles, Paving Way for a Zero-Emissions Future (Dec. 20, 2021), https://bit.ly/3wJFsTD (EPA Administrator declaring the rule "a giant step forward" in "paving the way toward an all-electric, zero-emission transportation future."); https://joebiden.com/climate-plan/# (promising to "use the full authority of the executive branch to make progress and significantly reduce emissions" by "developing rigorous new fuel economy standards aimed at ensuring 100% of new sales for light- and medium-duty vehicles will be electrified." EPA's claimed authority to mandate EVs in place of ICE vehicles is the same for Light Duty, Medium Duty, and Heavy Duty vehicles; therefore, it is appropriate to consider (for purposes of the major question issue) not just the effects of this proposed rule but the effect of the entire "whole of government" approach to electrify all vehicles.

1. EPA claims a power of vast economic significance.

At the threshold, the rule's economic significance is staggering, in both its direct effects and the implications of the authority EPA claims. Several considerations underscore the rule's enormous economic cost. [EPA-HQ-OAR-2022-0985-1566-A2, p. 53]

Transformation of the HD Vehicle Market. EPA makes no secret of its approach to setting the standards for HDVs - the standards require replacing ICE HDV with BEV or FCEVs. The result of this transition has dramatic consequences, as described more fully in these comments and by others, such as the American Truck Association.242 Such consequences for the long-haul truck industry include increased trucks on America's highways, heavier trucks on the highway, long charging times changing how trucks can deliver goods, reduced payloads per truck, increased tire wear, and adverse consequences of the need to have more trucks. There are many other sectors that rely on HDVs, each with transition issues of greater or lesser degree than the trucking industry. But EPA has not acknowledged the obstacles and burdens that will be on the trucking industry and others or considered whether those obstacles or burdens can be reasonably overcome. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 53 - 54]

242 https://www.trucking.org/news-insights/heavy-dose-reality-electric-truck-mandates ("A new, clean-diesel long-haul tractor typically costs in the range of $180,000 to $200,000. A comparable battery-electric tractor costs upwards of $480,000. That $300,000 upcharge is cost-prohibitive for the overwhelming majority of motor carriers. More than 95% of trucking companies are small businesses operating ten trucks or fewer.") ("Weight factors are another inconvenient truth. Battery-electric trucks, which run on two approx. 8,000-lb. lithium ion batteries, are far heavier than their clean-diesel counterparts. Since trucks are subject to strict federal weight limits, mandating battery-electric will decrease the payload of each truck, putting more trucks on the road and increasing both traffic congestion and tailpipe emissions.") ("After one trucking company tried to electrify just 30 trucks at a terminal in Joliet, Illinois, local officials shut those plans down, saying they would draw more electricity than is needed to power the entire city. A California company tried to electrify 12 forklifts. Not trucks, but forklifts. Local power utilities told them that's not possible.").

In West Virginia, the Court explained that EPA had sought to "substantially restructure the American energy market." 142 S. Ct. at 2611. With this proposal, EPA seeks to "substantially restructure" the American HD vehicle market, and with it, many sectors and supply chains in the U.S. economy. As discussed above, the overall cost and economic impact of this proposed restructure is staggering—despite EPA's gross understatements to the contrary. And EPA's failure to consider the full extent of this economic impact is indicative of its limited authority; if Congress truly meant to grant such an awesome power to EPA, it would not have restricted EPA's cost considerations to vehicle manufacturers only. [EPA-HQ-OAR-2022-0985-1566-A2, p. 54]

Indeed, the effects of EPA's rule would extend well beyond the truck manufacturing industry. As described previously in these comments, the rule will impact the trucking hauling industry, how it operates, and how it delivers goods around the country. This will have ripple effects throughout the economy, both with regard to increased transportation costs and, ultimately, increased costs to consumers. Moreover, many industries dependent upon the refining sector, such as the asphalt and sulfur industries, will see their supply chains reduced and prices increased to the extent the proposal reduces liquid fuel demand and, consequently, impacts refining. [EPA-HQ-OAR-2022-0985-1566-A2, p. 54]

By any relevant economic measure—"the amount of money involved for regulated and affected parties, the overall impact on the economy, [or] the number of people affected," U.S. Telecom Ass'n v. FCC, 855 F.3d 381, 422 (D.C. Cir. 2017) (Kavanaugh, J., dissenting from denial of rehearing en banc)—EPA's asserted power to force a transition from diesel-powered HD vehicles to electric ones represents "an enormous and transformative expansion in [its own] regulatory authority," affecting "a significant portion of the American economy." Utility Air, 573 U.S. at 324. [EPA-HQ-OAR-2022-0985-1566-A2, p. 54]

2. EPA claims a power of vast political significance.

The rule's political significance is just as vast. In West Virginia, the Court identified several considerations that are equally present here. [EPA-HQ-OAR-2022-0985-1566-A2, p. 54]

Ongoing Policy Debate. The target of EPA's rule—to say nothing of climate change more generally243—is "the subject of an earnest and profound debate across the country." West Virginia, 142 S. Ct. at 2614. While California is moving aggressively to accelerate electrification by regulatory fiat,244 other States oppose efforts to shift energy-investment and generation from petroleum to other sources, see, e.g., Act Relating to Financial Institutions Engaged in Boycotts of Energy Companies, 2022 W. Va. Legis. Ch. 235. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 54 - 55]

243 See West Virginia, 142 S. Ct. at 2625 (Gorsuch, J., concurring) ("As the dissent observes, the agency's challenged action before us concerns one of 'the greatest … challenge[s] of our time.' If this case does not implicate a 'question of deep economic and political significance,' King, 576 U.S. at 486, 135 S. Ct. 2480 (internal quotation marks omitted), it is unclear what might."

244 See, e.g., Cal. Code Regs. Tit. 13, § 1962.4 (Zero-Emission Vehicle Standards for 2026 and Subsequent Model Year Passenger Cars and Light-Duty Trucks); California Air Resources Board Final Regulation Order, "Advanced Clean Fleets Regulation: 2036 100 Percent Medium and Heavy Duty Zero Emissions Vehicle Sales Requirements," https://ww2.arb.ca.gov/rulemaking/2022/acf2022.

Congress itself is debating this very issue, which makes EPA's claim to policymaking authority "all the more suspect." West Virginia, 142 S. Ct. at 2614; see FDA v. Brown & Williamson Tobacco Corp., 529 U.S. 120, 155 (2000). Congress has yet to reach an answer and instead remains in factfinding mode as it considers the benefits and risks of electrification. Congress enacted the Infrastructure Investment and Jobs Act of 2021, which requires several agencies—notably not EPA—to prepare three separate reports for Congress on the implications of electrifying the Nation's vehicle fleet. Pub. L. No. 117-58, §§ 25006, 40435, 40436, 135 Stat. 429, 845-49, 1050 (2021) (requiring reports on "the cradle to grave environmental impact of electric vehicles" and "the impact of forced labor in China on the electric vehicle supply chain," among other things). [EPA-HQ-OAR-2022-0985-1566-A2, p. 55]

Balancing National Policy Considerations. In West Virginia, the Court found it significant that EPA's rule would put the agency in the position of "balancing the many vital considerations of national policy implicated in the basic regulation of how Americans get their energy." 142 S. Ct. at 2612. The Court was concerned that the agency would decide "how much of a switch from coal to gas" the grid could tolerate, and "how high energy prices [could] go" before becoming "exorbitant." Id. Here, too, EPA's rule puts it in the position of deciding "how much of a switch" to electrification the nation's power grids can tolerate, and how high vehicle and electricity prices can climb without being "exorbitant." [EPA-HQ-OAR-2022-0985-1566-A2, p. 55]

Lack of Agency Expertise. To force electrification, EPA would need to understand and weigh "many vital considerations of national policy." West Virginia, 142 S. Ct. at 2612. The policy judgments here involve not only climate impacts but millions of jobs, the restructuring of entire industries, the Nation's energy independence and relationship with hostile powers, and supply-chain and electric-grid vulnerabilities. EPA does not have any expertise in those matters. The judgments here are not ones "Congress presumably would" entrust to "an agency [with] no comparative expertise," but are "ones Congress would likely have intended for itself." West Virginia, 142 S. Ct. at 2612-13. [EPA-HQ-OAR-2022-0985-1566-A2, p. 56]

Prior Rejections by Congress of Similar Policies. As evidence that the judgments here belong to Congress rather than the Executive, both Houses of Congress have previously "considered and rejected" multiple bills with effects similar to EPA's rule. West Virginia, 142 S. Ct. at 2614 (quoting Brown & Williamson, 529 U.S. at 144). Congress even rejected one bill that would have mandated a level of electric-vehicle penetration roughly equal to the 50%-by-2030 target EPA embraces in the companion rule for light/medium-duty-vehicles. See, e.g., Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019); Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. (2018); see also 116 Cong. Rec. 19238-40 (1970) (proposed amendment to Title II that would have banned internal-combustion vehicles by 1978). Congress's "consistent judgment" against the very sorts of mandates imposed by EPA undercuts any claim of congressional authorization. Brown & Williamson, 529 U.S. at 147-48, 160; accord West Virginia, 142 S. Ct. at 2614. The fact that the current administration has been required to rely on executive actions to force electrification of the vehicle fleets demonstrates the lack of congressional authority. [EPA-HQ-OAR-2022-0985-1566-A2, p. 56]

Indeed, the U.S. House and Senate recently passed a joint resolution245 nullifying EPA's companion rule on HDVs relating to air pollution, including ozone and particulate matter. The resolution was subsequently vetoed by President Biden,246 which only further confirms that EPA's recent attempts to alter the Nation's HDV fleet is unsupported by Congress and instead driven by the current administration's agenda. [EPA-HQ-OAR-2022-0985-1566-A2, p. 56]

245 Heavy Duty Truck rule Congressional Review Act joint resolution (S.J. Res. 11)("A Joint resolution providing for congressional disapproval under chapter 8 of title 5, United States Code, of the rule submitted

by the Environmental Protection Agency relating to "Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards").

246 https://www.whitehouse.gov/briefing-room/statements-releases/2023/06/14/message-to-the-senate-on-the-presidents-veto-of-s-j-res-11/

To be sure, with regard to this proposal on HDVs, as well as EPA's related proposal for LDVs and MDVs, 151 members of the House submitted a letter247 to EPA urging the rescission of the proposals, citing such concerns as the proposal being "unworkable," "impractical," a "deliberate market manipulation to prop up EVs," a benefit to the Chinese Communist Party ("as China has a stranglehold on the critical minerals supply chain and manufacturing of EV batteries"), "not necessarily better for the environment in terms of emissions reductions," and "worst of all," a burden on Americans and their families, forcing them to pay "an excessive amount for a car they do not want and cannot afford." Similarly, 26 senators issued a letter248 to EPA requesting withdrawal of the LDV, MDV, and HDV proposals, which "effectively mandate a costly transition to electric cars and trucks in the absence of congressional direction." (emphasis added). The Senate letter further cited the proposal's increased burden on the electric grid, the lack of supporting charging infrastructure, safety risks associated with EVs, roadway lifespan impacts and planning, consumer choice and affordability, domestic job losses, national security, and questionable cost metrics as concerns with, and flaws under, the proposal and also emphasized the application of the major questions doctrine and EPA's lack of clear authority:

If finalized, these proposals will effectively require a wholesale conversion from powering vehicles with widely available liquid fuel to charging BEVs off our nation's electric grid. This is a major, multi-billion dollar, policy-driven technology transition mandate to be imposed on American consumers by your Agency, without any semblance of the clear and direct statutory authority required by the ruling in West Virginia v. EPA. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 56 - 57]

247 https://d1dth6e84htgma.cloudfront.net/DRAFT_05_22_23_EPA_Tailpipe_Letter_af5a5b04a5.pdf?updated_at=2023-05-19T17:01:36.343Z; see also https://mccaul.house.gov/media-center/press-releases/mccaul-mcmorris-rodgers-demand-epa-end-effort-dictate-cars-americans.

248 https://www.epw.senate.gov/public/_cache/files/4/c/4c8a1ccf-a225-4e7b-b028-f4674c12bdaf/0EBFAF9F23EC0CCA86DDFCBBCF6044F8.05.25.2023-capito-letter-to-epa-on-tailpipe-standards.pdf; see also https://www.capito.senate.gov/news/press-releases/capito-colleagues-urge-epa-to-withdraw-recent-vehicle-emissions-rules-.

In short, Congress has rejected not only a mandatory shift to EVs in general, but also this precise proposal. [EPA-HQ-OAR-2022-0985-1566-A2, p. 57]

Conflict with Congress's Broader Design. EPA's rule is also inconsistent with the broader statutory scheme and Congress's plan for tackling climate change. See Utility Air, 573 U.S. at 321. When Congress has sought to address greenhouse-gas emissions from the transportation sector, it has done so by promoting corn ethanol and other biofuels, which are used in conventional vehicles and which—unlike electric-vehicle components—are in abundant domestic supply. See, e.g., Inflation Reduction Act of 2022, Pub. L. No. 117-169. §§ 13202, 13404, 22003, 136 Stat 1818, 1932, 1966-69, 2020 (2022). Indeed, Congress has consistently legislated against the background expectation that conventional vehicles powered by liquid fuels will remain on the market. The Renewable Fuel Standard program is designed to promote, not diminish, renewable fuel demand. [EPA-HQ-OAR-2022-0985-1566-A2, p. 57]

For example, in Title II's Renewable Fuel Standard Program, Congress mandated year-over-year increases in renewable fuel. EPA is thus working at cross-purposes with Congress, which has required increases in liquid renewable fuels at the same time that EPA is seeking to eliminate vehicles that use such fuels.249 The obvious reason for the mismatch is that Congress has not decided to mandate electrification—nor has it placed that power in EPA's hands. See West Virginia, 142 S. Ct. at 2633 (Kagan, J., dissenting) (noting that when the agency's "action, if allowed, would have conflicted with, or even wreaked havoc on, Congress's broader design" it should not be allowed based on normal statutory interpretation of a broad delegation of authority). [EPA-HQ-OAR-2022-0985-1566-A2, pp. 57 - 58]

249 87 Fed. Reg. 80582, "Renewable Fuel Standard (RFS) Program: Standards for 2023-2025 and Other Changes" (December 30, 2022).

3. EPA claims an unheralded power with staggering implications.

In asserting the sweeping power to mandate increasingly high levels of electrification, EPA claims to have "discover[ed] in a long-extant statute an unheralded power to regulate 'a significant portion of the American economy.'" Utility Air, 573 U.S. at 324 (quoting Brown & Williamson, 529 U.S. at 159). The novelty and broad implications of the agency's approach are powerful clues that Congress never authorized it. [EPA-HQ-OAR-2022-0985-1566-A2, p. 58]

Novel Assertion of Agency Authority. Skepticism is warranted when an agency asserts an "unheralded power representing a transformative expansion in its regulatory authority." West Virginia, 142 S. Ct. at 2610 (internal quotation marks omitted). In prior rules setting greenhouse-gas emission standards, EPA has treated electric vehicles as a compliance "option" or "flexibility." In fact, for the 2021 GHG standards for LDVs, EPA argues that electrification was not mandated but was an option, that manufacturers could comply without using EVs. However, for the proposed HDV rule, EPA does not claim that electrification is an option and EPA's model clearly demonstrates that EPA expects BEVs and FCEVs to replace HD ICEs to comply with the proposed standard. Indeed, forced electrification has never before even been on the table for HDVs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 58]

Future Implications of the Agency's Claimed Power.

EPA has made no secret of the significance of the power it proposes to exercise here. In its proposed rule, EPA asserts the authority to force electrification as an "emission control technology" and notes that "[t]he proposed standards were developed based on a more in-depth analysis of the potential for electrification of the heavy-duty sector…." 88 Fed. Reg. at 25954; see id. at 26016 ("[T]he high-voltage battery and the powertrain components that depend on it are emission control devices critical to the operation and emission performance of HD vehicles, as they play a critical role in reducing the vehicles' emissions and allowing BEVs and FCEVs to have zero tailpipe emissions.") And as described above, this proposal is only part of a greater "whole of government" approach to mandate electrification at the Biden Administration's direction. By claiming the power of mandating some electrification of the Nation's HDV fleet, EPA is claiming the authority to mandate 100% electrification as well. As in West Virginia, there is no reason to believe that EPA will stop here. "[O]n this view of EPA's authority, it could go further, perhaps forcing" HDV manufacturers to "cease making" internal-combustion vehicles altogether. 142 S. Ct. at 2612. [EPA-HQ-OAR-2022-0985-1566-A2, p. 58]

In fact, this is exactly where EPA is headed. When EPA announced its proposal, it stated that the standards would "accelerate the ongoing transition" to an all-electric future, "delivering on" the Biden-Harris Administration's climate agenda.250 And in a related rulemaking, EPA authorized California to adopt its own greenhouse-gas emission standards in its Advanced Clean Trucks program—an authority California is already citing to ban new combustion-engine vehicles and require 100-percent electrification of the HDV fleet by 2036 via its Advanced Clean Fleets program. See 88 Fed. Reg. 20,688. Both parts of EPA's strategy reveal the agency's goal to convert America to electric vehicles. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 58 - 59]

250 https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-cars-and. (emphasis added).

Given the vast economic and political significance of EPA's proposal, it "must point to 'clear congressional authorization' for the power it claims." West Virginia, 142 S. Ct. at 2609. There is not one word in the Clean Air Act about a nationwide agency-led transition from conventional internal-combustion vehicles to electric vehicles, or any other so-called ZEV. To be sure, EPA has the power to set emission standards for air pollutants from motor vehicles, just as EPA had the power in West Virginia to set emission standards for air pollutants from power plants. But what EPA claims here for the first time is the authority to set standards in such a way that manufacturers can comply only by abandoning HD internal-combustion vehicles in favor of HD electric vehicles. And nothing in the Clean Air Act authorizes that. [EPA-HQ-OAR-2022-0985-1566-A2, p. 59]

B. The Clean Air Act's general grants of authority and EPA's new interpretations of the same do not authorize the proposal's mandatory shift in the Nation's HDV fleet.

Not only does EPA lack the clear congressional authorization necessary to support the proposal's wholesale shift in energy policy pursuant to West Virginia, but the text, structure, and legislative history of the Clean Air Act demonstrate that it also lacks general statutory authority to force the electrification of HDVs. The proposed standards thus exceed EPA's statutory authority, even absent application of the major-questions doctrine. [EPA-HQ-OAR-2022-0985-1566-A2, p. 59]

1. EPA has incorrectly interpreted the text of the Clean Air Act provisions cited as a general authorization to mandate ZEVs.

EPA claims that Section 202(a) of the CAA authorizes it to force a change in technology. But the cases EPA cites as authoritative are not based on Section 202(a), and Section 202(a) does not provide EPA clear authority to force technology, especially not in this situation where it is forcing a nascent and essentially non-existent technology intended to mandate a major transition to HD ZEVs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 59]

EPA makes several additional critical errors in its interpretation of its authority to conclude that the Clean Air Act authorizes EPA to set standards that mandate increasing percentages of sales of HDV ZEVs. To set these standards, EPA first assumes that the standards can regulate any "motor vehicles," including electric vehicles, even if it has deemed such vehicles to not emit the relevant pollutant. Second, EPA characterizes electrification, more specifically BEVs and

FCEVs, as a "pollution control device or system" that would apply to motor vehicles. Third, EPA assumes authority to use fleetwide averaging rather than to set standards for individual vehicles and engines. Fourth, EPA ignores other sections of the Clean Air Act, which are inconsistent with the proposal's forced shift in energy. Finally, EPA relies on a novel and highly revisionist spin on legislative history to support its authority to mandate electrification. EPA errs with each of these steps. [EPA-HQ-OAR-2022-0985-1566-A2, p. 59]

a) The statutory text demonstrates that the vehicles covered by the standards must emit the relevant pollutant.

Section 202(a)(l) provides that EPA shall prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(l). The statute, of course, does not expressly specify which vehicles are to be included in any average emission standard because, as discussed below, it does not contemplate averaging in the first place. But to the extent averaging is permissible, the text makes clear that the vehicles included in such averaging must, in EPA's judgment, actually emit the relevant pollutant. [EPA-HQ-OAR-2022-0985-1566-A2, p. 60]

To begin with, EPA improperly relies on a broad definition of "motor vehicle," as the statute focuses on standards for the "emission" of an air pollutant, which immediately indicates Congress's focus on vehicles deemed to actually "emi[t]" the relevant pollutant. 42 U.S.C. § 7521(a)(l) (emphasis added). Here, EPA's proposal stipulates that electric vehicles are to be treated for averaging purposes as if they emit no carbon dioxide (even when they pull electricity from a grid that is powered by carbon-emitting sources and rely on batteries whose production, disposal, and recycling emits carbon).251 EPA has thus decided that electric vehicles as a class do not "emi[t]" the relevant pollutant. 42 U.S.C. § 7521(a)(l). And given the textual focus on harmful emissions, EPA cannot include vehicles it determines to be non-emitting in the standards that EPA calculates and imposes. [EPA-HQ-OAR-2022-0985-1566-A2, p. 60]

251 See, e.g., 88 Fed. Reg. 25,928.

Next, the statute is explicit that the things for which EPA sets standards must "in [EPA's] judgment, cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(l). The key textual question is thus what exactly EPA must "judg[e]" to "cause, or contribute to" potentially dangerous air pollution. The grammatical structure of the provision offers only two plausible options. Because the verbs "cause" and "contribute" are in the plural form, their subject must be plural as well. See Scalia & Garner, supra, at 140 ("Judges rightly presume . . . that legislators understand subject-verb agreement."). The only plural nouns that could plausibly "cause" or "contribute" to pollution are either the "new motor vehicles or new motor vehicle engines," or the "class or classes" of those vehicles or engines. [EPA-HQ-OAR-2022-0985-1566-A2, p. 60]

Under either reading, all of the covered vehicles must emit the relevant pollutant. If it is the "vehicles" or "engines" that EPA must judge to "cause, or contribute to, air pollution," then Section 202(a) authorizes EPA to set standards only for "new motor vehicles or new motor vehicle engines which in [EPA's] judgment cause, or contribute to" potentially dangerous pollution. In other words, EPA may set standards only for motor vehicles that in its judgment actually emit the regulated pollutant—here, combustion-engine vehicles that emit carbon dioxide. The converse is equally true: Section 202(a) does not authorize EPA to set standards for vehicles that it deems not to cause or contribute to harmful pollution. [EPA-HQ-OAR-2022-0985-1566-A2, p. 60]

That is the natural reading of the statute under the "grammatical 'rule of the last antecedent,"' which provides that a "limiting clause or phrase ... should ordinarily be read as modifying only the noun or phrase that it immediately follows." Barnhart v. Thomas, 540 U.S. 20, 26 (2003). Here, the relevant limiting phrase is: "which in [EPA's] judgment cause, or contribute, to air pollution." And the immediately antecedent phrase is "new motor vehicles or new motor vehicle engines." The rule of the last antecedent thus indicates that it is the "vehicles" in the class that must "cause, or contribute" to the pollution, and not the "class" as a whole. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 60 - 61]

Courts have also adopted that natural reading. The D.C. Circuit Court of Appeals, for example, has observed that Section 202(a) "requires the EPA to set emissions standards for new motor vehicles and their engines if they emit harmful air pollutants." Truck Trailers Mfrs. Ass'n v. EPA, 17 F.4th 1198, 1201 (D.C. Cir. 2021) (emphasis added); see NRDC v. EPA, 954 F.3d 150, 152 (2d Cir. 2020) (Section 202(a) "requires EPA to regulate emissions from new motor vehicles if EPA determines that the vehicles 'cause, or contribute to,' [potentially dangerous] air pollution") (emphasis added). [EPA-HQ-OAR-2022-0985-1566-A2, p. 61]

Alternatively, if it is the "class or classes" of vehicles or engines that must "cause, or contribute to, air pollution," the result is the same. When we refer to a class of objects that does something, the ordinary and accurate meaning is that all the members of the class do that thing. For example, when a doctor warns a patient about a "class of medications that cause drowsiness," the class does not include non-drowsiness-inducing medicines. And that is the best way to read the statute here: a class that causes pollution is most naturally defined to include only those vehicles that cause pollution. EPA has broad leeway to group those pollution-emitting vehicles into classes how it sees fit. See NRDC v. EPA, 655 F.2d 318, 338 (D.C. Cir. 1981). But the vehicles must actually be pollution-emitting in EPA's judgment. [EPA-HQ-OAR-2022-0985-1566-A2, p. 61]

In short, under either plausible reading of the statute, when EPA sets an emission standard for a pollutant, it must consider only the vehicles that it judges to emit the relevant pollutant. Even if fleetwide averaging were allowed as a general matter, averaging would be permissible only among types of vehicles that "emi[t]" the harmful pollutant and that, "in [EPA's] judgment cause, or contribute" to harmful air pollution. If EPA determines that a particular category of vehicle is not "emi[tting]" the relevant pollutant or "caus[ing], or contribut[ing] to" the resulting pollution, it makes no sense to include that category in calculating the emission standard. That is not really "averaging" at all, as it does not help EPA arrive at a technologically feasible threshold for pollutant-emitting vehicles. [EPA-HQ-OAR-2022-0985-1566-A2, p. 61]

EPA has adopted such a faux "average" here. The agency proposes a carbon-dioxide emission target for HDVs that "averages" in a category of vehicles that it deems not to emit carbon dioxide. EPA treats electric vehicles as "zero-emission vehicles," and assumes they contribute "zero (0) grams/mile" of carbon dioxide.252 Setting aside the flaws in that assumption, if EPA chooses to treat electric vehicles as "zero emission," it must abide by the statutory consequences of that decision: the electric-vehicle category cannot textually or logically be "averaged" into the emission standards under Section 202(a). [EPA-HQ-OAR-2022-0985-1566-A2, p. 61]

252 88 Fed. Reg. 25,993.

This error is not new. The Supreme Court recently rejected parallel reasoning in West Virginia. There, a similar provision of the Clean Air Act authorized EPA to guide States in “establish[ing] standards of performance for any existing [power plant] for any air pollutant.” 42 U.S.C. § 7411(d)(l). The Court explained that authorization to “establish[] standards of performance for existing source[s]” does not equate to the power “to direct existing sources to effectively cease to exist.” West Virginia, 142 S. Ct. at 2612 n.3 (quoting42 U.S.C. § 7411(d)) (second alteration in original). The same logic applies to Section 202(a): in empowering EPA to set emission standards for “vehicles” or “classes” of ‘‘vehicles” that “cause, or contribute to, air pollution,” Congress did not permit EPA “to direct [conventional vehicles] to effectively cease to exist.” Id. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 61 - 62]

b) EVs and ZEVs do not constitute “emission control devices or systems,” rather, they are different technologies altogether.

EPA next claims that Congress gave it clear authority to require automotive manufacturers to use ZEVs as “emission control devices or systems” to prevent or control the emission of greenhouse gases from HDV tailpipes.253 EPA first asserted this novel argument in response to litigation challenging its attempt to force electrification in its Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 FR 74434. See EPA’s Answering Brief in Texas v. EPA (D.C. Cir. 22-1031), pp. 40-47. In that case, EPA claimed that when 42 U.S.C. §7521(a)(1), which allows it to prescribe pollution-emission standards to vehicles whether they are “designed as complete systems or incorporate devices to prevent or control such pollution,” is read in conjunction with subsection (a)(2), which prohibits EPA from prescribing such standards until “the requisite technology” can be developed and applied in a cost-efficient manner, Congress provided EPA “clear authorization” to mandate electric vehicles. EPA’s Answering Brief at pp. 40-41, 47. In other words, EPA reads the limiting language in (a)(2) to somehow expand the authority granted in (a)(1), which as described above does not apply to ZEVs deemed not to emit the relevant pollutant. But neither the plain language nor the statutory history provides EPA with newfound authority to replace ICEVs with ZEVs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 62]

253 88 Fed. Reg. at 26,016; id. at 25,949.

Not only does the statute not mention EVs or any other type of purported ZEVs, which one would expect if Congress were providing EPA clear authority to force electrification of the nation’s vehicle fleet, but ZEVs are also not even “systems” or “devices” that “prevent or control” pollution; they are just different kinds of vehicles that EPA states do not emit the relevant pollutant in the first place. [EPA-HQ-OAR-2022-0985-1566-A2, p. 62]

ZEVs are not “designed as complete systems” to prevent or control harmful pollution, because they do not have “built-in pollution control” or prevention. Truck Trailer Mfrs. Ass’n, Inc. v. EPA, 17 F.4th 1198, 1202 (D.C. Cir. 2021). To “prevent” something means to “keep [it] from happening” or “impede” it. American Heritage Dictionary 1038 (1st ed. 1969). To “control” means to “hold in restraint” or “check.” Id. at 290. Thus, a vehicle with “built-in pollution control” or prevention is one that has a self-contained mechanism to block or capture pollution that would otherwise be emitted. This is consistent with EPA’s own definition of “emission control system,” as “a unique group of emission control devices, auxiliary emission control devices, engine modifications and strategies, and other elements of design designated by the Administrator used to control emissions of vehicles." 40 C.F.R. §86.1803-01 (emphasis added). ZEVs, on the other hand, are designed to run on an entirely different power system, not to limit or control pollution from a carbon-dioxide-emitting engine. To draw an analogy, it would not be natural to refer to an iPod as "a system that prevents or controls record skips." An iPod is not a record player with some built-in method of impeding or reducing record skips; it is a different technology altogether. [EPA-HQ-OAR-2022-0985-1566-A2, p. 62]

Nor do electric vehicles incorporate "add-in devices for pollution control" or prevention. Truck Trailer Mfrs., 17 F.4th at 1202. The component parts of ZEVs, such as their batteries, are not merely add-in devices that block the emission of pollution or minimize pollution that would otherwise occur. They are integral to the basic functioning of the vehicle, which does not emit the relevant pollutant in the first place. [EPA-HQ-OAR-2022-0985-1566-A2, p. 63]

EPA also notes that the statutory definition of "motor vehicles" is "broad" and includes the phrase "any self-propelled vehicle." CITE. But the statutory history refutes any implication that this definition was intended to cover EVs. The relevant "motor vehicle" definition was introduced to the Clean Air Act in 1965 and has remained unchanged since. Pub. L. No. 89-272, § 101, 79 Stat. 992, 995 (1965). In 1965, the ordinary vehicle on the road had an internal-combustion engine, so there was no need for Congress to specify that the term meant anything else. By contrast, for example, Congress added the reference to "nonroad vehicles" in 1990, when other types of power were being explored and it made sense to clarify which type of engine was covered. See Pub. L. 101-549, § 223, 104 Stat. 2399, 2503 (1990); see also id. § 229, 104 Stat. 2511 (establishing pilot program for "clean fuel vehicles" including those powered by "electricity"). There is nothing to read into Congress's omission of that qualifier 25 years earlier. [EPA-HQ-OAR-2022-0985-1566-A2, p. 63]

2. The statutory structure of the Clean Air Act further confirms that EPA is not authorized to mandate the sale of ZEVs.

i. The statutory structure confirms Congress' focus on technologically achievable emission controls.

Several provisions of Section 202 of the Clean Air Act confirm that Congress focused on technologically feasible standards for vehicles deemed to emit pollutants that actually cause or contribute to pollution. Section 202(a)(2) requires EPA to provide manufacturers with lead time to comply with the standards, in order "to permit the development and application of the requisite technology." 42 U.S.C. § 7521(a)(2). Similarly, Section 202(a)(3)(A)(i) provides that EPA's HDV standards for certain criteria pollutants should reflect the "greatest degree of emission reduction achievable through the application of technology which the [EPA] determines will be available" during the relevant model year. Id. § 7521(a)(3)(A)(i). Those provisions contemplate that technological feasibility will meaningfully constrain the emission standards that EPA sets under Section 202(a). EPA cannot ignore technological feasibility and simply decide to require production of fewer internal combustion vehicles. [EPA-HQ-OAR-2022-0985-1566-A2, p. 63]

Other provisions show the type of "technology" that Congress contemplated vehicle manufacturers would develop to meet those standards. Section 202(m) requires EPA to command manufacturers to install on "all" new light-duty vehicles and trucks "diagnostic systems" that identify "emission-related systems deterioration or malfunction ... which could ... result in failure of the vehicles to comply with emission standards established under this section." 42 U.S.C. § 7521(m)(l). The required diagnostic systems must monitor, "at a minimum, the catalytic converter and oxygen sensor." Id. [EPA-HQ-OAR-2022-0985-1566-A2, p. 63]

In other words, to ensure compliance with emission standards under Section 202(a), Congress required "emissions-related systems" and accompanying "diagnostic systems" on each vehicle—again underscoring Congress's view that the vehicles subject to an emission standard actually emit the relevant pollutant in EPA's judgment. [EPA-HQ-OAR-2022-0985-1566-A2, p. 63]

As the statutory structure demonstrates, EPA may set standards that are "technology-forcing," because they require manufacturers to adopt nascent technology that may not yet be "adequately demonstrated." NRDC, 805 F .2d at 419. EPA's rules thus have promoted the development of "automotive technologies, such as on-board computers and fuel injection systems" that improve emissions from combustion engines. 86 Fed. Reg. at 74,451. But the statute does not permit what EPA proposes here: enacting "average" standards divorced from technologically achievable limits on emitting vehicles, which instead force manufacturers to produce a different type of supposedly non-emitting vehicle altogether. [EPA-HQ-OAR-2022-0985-1566-A2, p. 64]

i. Legislative History

Lacking in direct authority, EPA resorts to non-textual, legislative history, emphasizing that at various times Congress has made clear it "expected the Clean Air Amendments to force the industry to broaden the scope of its research—to study new types of engines and new control systems." Under the major questions doctrine, however, only a clear textual statement is sufficient to grant such sweeping and consequential authority as contemplated by the proposal. Yet even in the absence of the major questions doctrine, each source of legislative history relied on by EPA is irrelevant to the question of whether Congress authorized EPA to mandate electrification of the Nation's HDV fleet. [EPA-HQ-OAR-2022-0985-1566-A2, p. 71]

First, EPA cites five days of public hearings regarding "electric vehicles and other alternatives to the internal combustion engine" held by the Senate Committee on Commerce and Public Works in 1967 as evidence that "ICE vehicles might be inadequate to achieve the country's air quality goals." (emphasis added). These standalone statements regarding the potential benefits of the electric car as an additional technology are not only wholly unrelated to the enactment of the Clean Air Act and its amendments, but they also do not speak to EPA's emission standards, much less indicate a grant of authority to EPA to mandate such vehicles nationwide through such standards. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 71 - 72]

EPA's citation to a statement made by President Nixon in 1970 regarding a program to develop "an unconventionally powered, virtually pollution free automobile" likewise fails to support EPA's asserted authority to mandate vehicles that it purports are zero-emitting. Not only is this statement made by the executive, rather than legislative, branch, but the mere announcement of a research program is also a far cry from a delegation of authority to mandate wholesale policy changes for the nation. For this same reason, EPA's claimed authority to "fund the development" of low emission alternatives, to certify low emission vehicles and encourage federal purchases of such vehicles, and to institute a clean fuel vehicles program are also irrelevant to EPA's authority for the proposed rule; researching and incentivizing electric vehicles is simply not equivalent to mandating them—far from it. [EPA-HQ-OAR-2022-0985-1566-A2, p. 72]

EPA next states that, in 1970, when Congress amended the Clean Air Act to target criteria pollutants, it considered "unconventional" technologies like steam and natural-gas piston. EPA relies on a Senate Report that addressed emissions associated with those sources. See S. Rep. No. 91-1196, at 27 (1970). But again, the report nowhere suggested that EPA would have authority to require automakers to shift to those technologies. Moreover, according to the report, all of those technologies emitted some pollutants. Id. So EPA's resort to legislative history as a means to replace ICE vehicles with vehicles it deems to have zero emissions proves nothing. [EPA-HQ-OAR-2022-0985-1566-A2, p. 72]

EPA's resurrection of 50-year-old dicta255 in International Harvester Co. v. Ruckelshaus, 478 F.2d 615 (D.C. Cir. 1973), as the basis for its authority to replace the combustion engine as an emission-control technology also fails, as the court was discussing legislative history, not text requiring electric vehicles. [EPA-HQ-OAR-2022-0985-1566-A2, p. 72]

> 255 EPA claims that International Harvester "held" that the legislative history indicates that Congress authorized EPA to replace ICEVs. The only holding in International Harvester was that EPA erred when it denied the automakers' request for a one-year suspension of the 1975 emissions standards prescribed by Congress. Id. at 649-50.

As a final attempt to find Congressional authorization, EPA turns to more recent legislation, which of course has nothing to do with any purported authority of EPA under the Clean Air Act. The Inflation Reduction Act, like all appropriations bills which "have the limited and specific purpose of providing funds," Tennessee Valley Auth. v. Hill, 437 U.S. 153, 190 (1978), cannot be construed to provide any agency authority and, even then, merely incentivized rather than mandated the use of electric vehicles. [EPA-HQ-OAR-2022-0985-1566-A2, p. 72]

Ultimately, Congress's limited approval of electric vehicles hurts EPA's position. Where Congress has sought to increase the usage of electric vehicles, it has done so only through incentives; as explained previously, each time a proposal to mandate the sale of electric vehicles has been presented in Congress, it has failed to even make it out of committee. And when Congress chose to set standards focused on electric vehicles, it did so on a regionally targeted, pilot basis only. It did not bury a nationwide program in Section 202, at EPA's sole discretion. [EPA-HQ-OAR-2022-0985-1566-A2, p. 72]

VI. The proposal may violate other constitutional provisions and principles.

Finally, EPA's proposal may violate other constitutional provisions and principles, which EPA should consider in making its final rule. These include, but may not be limited to, the Takings Clause of the Fifth Amendment, which precludes the taking of private party (or the elimination of entire industries) for public use without just compensation, as contemplated by the proposal with regard to liquid fuels and related industries (e.g., asphalt, sulfur, etc.), as well as the following to the extent the final rule relies on and/or incorporates state ZEV mandates: the Dormant Commerce Clause, which prohibits state regulations that improperly discriminate against out-of-state commercial interests or that unduly burden interstate commerce (such as by increasing transportation and logistics costs, disrupting entire supply chains and industries, and effectively requiring other states to adopt electric vehicles that would not otherwise be adopted); the dormant foreign affairs preemption doctrine under the Supremacy Clause, which preempts state laws that intrude on the exclusive federal power to conduct foreign affairs (such as by creating two separate HDV fleets on either side of the U.S.-Mexico border, thereby increasing the cost of conducting international business and disrupting international trade and supply chains); the equal sovereignty doctrine, which constrains the federal government from treating States disparately (such as by allowing California alone to dictate national transportation policy); the Import-Export Clause, which prohibits any State from imposing “any Imposts or Duties on Imports or Exports, except what may be absolutely necessary for executing” its “inspection Laws,” Art. I, § 10, cl. 2, see Nat’l Pork Producers Council v. Ross, 143 S.Ct. 1142, 1175 (2023) (Kavanaugh, J., concurring in part and dissenting in part) (“In other words, if one State conditions sale of a good on the use of preferred farming, manufacturing, or production practices in another State where the good was grown or made, serious questions may arise under the Import-Export Clause.”); the Privileges and Immunities Clause, which provides that the “Citizens of each State shall be entitled to all Privileges and Immunities of Citizens in the several States,” Art. IV, § 2, cl. 1, see Nat’l Pork Producers Council, 143 S.Ct. 1175 (“Under this Court’s precedents, one State’s efforts to effectively regulate farming, manufacturing, or production in other States could raise significant questions under that Clause.”); and the Full Faith and Credit Clause, which requires each State to afford “Full Faith and Credit” to the “public Acts” of “Every other State,” Art. IV, § 1, and prevents States from adopting any policy of hostility to the public Acts of another State, see Nat’l Pork Producers Council, 143 S.Ct. 1175 (“A State’s efforts to regulate farming, manufacturing, and production practices in another State (in a manner different from how that other State’s laws regulate those practices) could in some circumstances raise questions under that Clause”). [EPA-HQ-OAR-2022-0985-1566-A2, p. 75]

EPA Summary and Response:

General Summary:

Many commenters expressed support for EPA’s longstanding technology-neutral approach in setting new standards and indicated that they felt this proposal was a mandate for one technology at the expense of others. Specifically:

- AVE noted that petroleum and natural gas will continue to be the main sources of energy through 2050 and suggested EPA should include pathways that “incentivize the increased use of renewable fuels, advanced emission control technologies, and new internal combustion platforms” that are available today to provide emission reductions.
- BorgWarner suggested EPA should “not give preferential treatment to a specific technology.” Specifically, BorgWarner encourages EPA to include H2-ICE in its rulemaking strategy.
- MEMA commented that the final rule should consider a broader range of technologies and “opposes a 100% ZEV mandate” that “would disallow technologies” that could quickly decarbonize vocational vehicles.
- NAM encouraged EPA to remain technology neutral in the final rule and to let market forces determine the best technologies for specific sectors.
- POET cautioned EPA against relying on BEVs and FCEVs for their upstream emissions, and encouraged the agency to consider a more technology-neutral approach that includes renewable fuels as a means to “reduce heavy-duty vehicle emissions on a lifecycle basis.”

- ROUSH suggested EPA should set BEV and FCEV standards that are separate from other powertrain standards, and referred to EPA's approach for setting HD pickup and van standards using separate target curves for gasoline- and diesel-fueled under the Phase 1 and 2 rules. ROUSH notes that, because BEV and FCEV are "non-emitting vehicles", perhaps NHTSA would implement the BEV and FCEV program.
- Transfer Flow commented that industry understands the importance of pollution prevention and is "offering real-world, proven solutions" that EPA should consider. They also suggested EPA should recognize that ZEVs are "not feasible in many applications and may never be feasible for some applications" and that technology-forcing regulations "serve to stymie other clean technologies", including renewable options, that could reduce vehicle emissions while the electric infrastructure develops.
- NGVAmerica stated that the 4.5 x multiplier Advanced Technology Credit for ZEVs creates an unequal playing field unrelated to actual vehicular emissions.

Other commenters indicated that EPA's proposal was technology neutral, including:

- BGA that noted manufacturers have a "a range of fuel and engine efficiency technologies" to meet the standards and the proposal will incentivize advanced technologies for battery electric and fuel cell vehicles, as well as advanced fuel and engine technologies. BGA also notes the potential for economic benefits such as domestic job creation.
- CARB that commented in support of EPA's authority to project future technologies in setting emission standards and that EPA's proposal included "a broad range of compliance strategies and technologies" manufacturers can use to meet the standards. Further comments to this effect, along with the Agency's responses, are found in RTC 2.4 concerning feasibility. Responses concerning ABT may be found in RTC 10.2.

AmFree et al, AFPM, API, Arizona State Legislature, Steven G. Bradbury, Delek, Lynden, NACS, NATSCO, and SIGMA, Neste, TPPF, and Valero provided adverse comments on the technology and fuel neutrality of the proposed rule citing legal concerns, which we summarize in as follows:

Many commenters asserted that the proposed rule exceeds the authority delegated to EPA by Congress in section 202 (a)(1) and (2), invoking the Major Question Doctrine. Commenters maintained that the proposed rule had features of the Clean Power Plan, vacated by the Court in West Virginia v. EPA, and therefore triggers the Major Question Doctrine. They assert that the doctrine applies, and that there is no clear statement of Congressional intent authorizing the proposed standard. One commenter (Valero) presented these same arguments as a matter of statutory construction, arguing that the proposal is not authorized simply considering the statutory text. These comments are summarized in detail and responded to below.

<u>Summary of Comments Concerning the Major Questions Doctrine</u>

<u>Summary of Comments Claiming the Proposal Is a "ZEV Mandate"</u>

A predicate for commenters' arguments on the Major Question doctrine is that EPA's proposal amounts to (or is) a 'ZEV mandate" (or, "EV mandate'). Commenters made the following assertions:

- The proposal is based "solely" on ZEVs (API), that is its sole "focus" (POET), or the mandate is "implicit" (Ariz. State Legislature);
- EPA has ignored other compliance pathways (ICCT, Blue Green Alliance);
- The proposal would increase ZEV penetration beyond what would occur in the market without a rule (API, Am Free);
    - The proposal would decree ZEV market share;
    - By projecting an increase in ZEV market penetration from 0.2% to 57% in some cases, EPA is effectively mandating their use (Amer Fed. of Petrol. Mfr's);
- Pronouncements of non-agency Administration figures indicate that the rule is intended to be a ZEV mandate (Valero).
- The proposal reflects a novel and unprecedented use of a statutory provision (Valero)

<u>Summary of Comments Claiming the *Proposal is the Subject of "Intense" Political Debate*</u>

Commenters claim that the proposed rule is the subject of intense political debate, and reflects a policy Congress has failed to enact (Valero; Nat'l Ass'n of Convenience Stores)

<u>Summary of Comments Alleging the Proposal is Inconsistent with Structure of the CAA</u>

Commenters noted that the proposed rule is inconsistent with the Act's structure. In particular, a) it is inconsistent with the Renewable Fuel Standards provisions, whereby Congress sought to encourage use of liquid fuels in internal combustion engines, while the proposed rule would necessarily limit such use (Neste, Valero, API, AFPM); b) it is inconsistent with the Clean Fuels provisions (CAA section 241-244), where Congress authorized only limited consideration of electrification (e.g. Amer. Fed. of Petroleum Manufacturers, Valero, API (invoking the canon of construction 'expressio unius est exclusio alterius'); (this comment is summarized again, and responded to, in RTC 10.2.1.e).

<u>Summary of Comments Alleging EPA Lacks Authority for Averaging, Banking, and Trading</u>

Commenters similarly maintained that EPA lacks authority to include averaging, banking and trading (ABT) in section 202 (a)(1) emission standards, reiterating many of the points above regarding the provision's inapplicability to motor vehicles that do not emit air pollutants, and further arguing that the Act does not explicitly authorize ABT, and that the statute contemplates vehicle-by-vehicle standards, citing provisions dealing with vehicle certification, warranty, remediation, and penalty. (e.g. Valero, API). Commenter AFPM maintained that ABT cannot be authorized absent a specific authorization from Congress. Other commenters asserted that EPA's historic use of ABT in its Title regulatory programs is well within its delegated authority, and has been upheld multiple times by the D.C. Circuit. (EDF). These comments are summarized in full, and responded to in full, in section 10.2 of this RTC.

<u>Summary of Comments Claiming the Proposed Rule Would Restructure the Automotive and Petroleum Industries</u>

Commenters assert that the proposed rule would restructure the automotive and petroleum industries. Specifically, commenters allege that the proposal:

- is transformational in that it fundamentally restructures both automotive and petroleum industries (e.g. API, Am Free, Clean Fuels Dvl Coalition); some commenters support this argument by maintaining that the proposal allocates market share (Amer. Fed. of Petroleum Manufacturers; Arizona State legislature), or mandates a wholesale shift in energy policy (Valero); others note that the claimed authority encompasses a rule requiring 100 % ZEVs (Valero, API)

- has vast economic significance, shown both by the cost of the rule but by collateral effects throughout the economy, including job losses in petroleum production and petroleum retail sales (e.g., AmFree, Amer. Federation of Petroleum Manufacturers, Nat'l Ass'n of Convenience Stores). Clean Fuels Dvl. Corp. Maintains that consideration of nationwide impact requires consideration of vehicle prices, insurance, maintenance, cross-subsidies to purchasers, build out of factories to produce batteries and vehicles, construction and maintenance costs for any electrical distribution support network, cost of any public charging network, cost of federal subsidies and other funding, and "the elimination of American jobs."

Commenters also speculated that the costs of the rule will dramatically increase the costs of freight transportation. Commenters also mention potential losses for the petroleum industry but fail to mention that is true for all of EPA's motor vehicle GHG rules, which have continually been premised on reducing petroleum consumption.[2] Indeed, as shown in Table 2 of this response, the Phase 2 rule was anticipated to cause even greater reductions in petroleum consumption. And commenters fail to grapple with the fact that increased demand for fossil fuels is associated with adverse impacts to US energy security.

<u>Summary of Comments Alleging the Proposal Implications Geopolitical and National Security Concerns</u>

Commenters maintained that the proposed rule implicates issues of policy, including geopolitical policy in the form of forcing reliance on critical materials to unfriendly foreign sources, which are outside EPA's core areas of expertise (e.g. AFPM, Nat'l Ass'n of Convenience Stores)

Some commenters asserted that the proposed rule raises geopolitical issues of access to critical materials in the hands of unfriendly foreign entities, as well as the energy security issues associated with those geopolitical issues (Valero. AFPM, CFDC)

One commenter claims that EPA's asserted authority also implicates another key "consideration[] of national policy": national security. NHTSA has acknowledged that the United States "has very little capacity in mining and refining any of the key raw materials" for electric vehicles. 86 Fed. Reg. 49,602, 49,797 (Sept. 3, 2021). And unlike biofuels and petroleum, most of the supply of critical components of batteries and motors for electric vehicles is controlled by hostile or unstable foreign powers, in particular China. Shifting to electric vehicles would thus make the American automotive industry critically dependent on one of the Nation's primary geopolitical rivals. [EPA-HQ-OAR-2022-0985-1566-A2, p. 55]

<u>Summary of Comments Claiming EPA is Balancing National Policy Surrounding Energy</u>

Commenters assert that the proposed rule puts EPA in the position of balancing national policy considerations surrounding the electric grid and electricity prices. Specifically, commenters assert that, "In West Virginia, the Court found it significant that EPA's rule would

[2] Commenters also neglect to note that the vast majority of such reduced consumption (estimated by EPA as 94.8%) would come from reduced net imports, with only the remaining small fraction linked to reduced domestic production. See RTC 22.

put the agency in the position of "balancing the many vital considerations of national policy implicated in the basic regulation of how Americans get their energy." 142 S. Ct. at 2612. Here, too, EPA's rule puts it in the position of deciding "how much of a switch" to electrification the nation's power grids can tolerate, and how high vehicle and electricity prices can climb without being "exorbitant." (Valero)

Some commenters asserted that the proposed rule implicates EPA in considerations of national energy usage (how much energy increase the national grid can accommodate), and geopolitical issues of access to critical materials in the hands of unfriendly foreign entities, as well as the energy security issues associated with those geopolitical issues (Valero. AFPM, CFDC)

Summary of Comments Claiming EPA Should Account for Lifecyle Emissions

Many commenters in this section 2.1 and RTC section 17.1 indicated EPA should account for lifecycle emissions. AFPM specifically stated that "Clean Air Act Section 202(a)(4)(B) requires that EPA calculate these lifecycle emissions impacts" and that EPA must account for more than tailpipe emissions or ZEVs, which have no tailpipe emissions, cannot cause or contribute to air pollution and the rule creates an "uneven playing field that substantially disadvantages ICEVs."

Summary of Specific Comments Related to Other Congressional Actions:

- The BIL and IRA cannot be invoked to convey substantive authority both because they are reconciliation bills, and because they are post-enactment legislation (e.g. Clean Fuels Coalition, API). Commenter claims these bills show Congressional intent to incentivize electrification, not to mandate it by rule (Valero). Other commenters view provisions from these statutes, as well as their legislative history, as supporting the proposed rule (CATF, EDF);

- The commenter disputes that references to electrification in 1967 legislative history, the 1970 Senate Report, and dicta from the D.C. Circuit *International Harvester* opinion support a claim of authority, or the requisite clear statement (Valero);

Response to Comments Concerning the Major Questions Doctrine

In Section 202(a), Congress directed EPA to regulate motor vehicle emissions based on its consideration of available technologies, their costs, and lead-time. In the final Phase 3 rule, consistent with its earlier rules, EPA considered updated data on pollution control technologies. The agency found that a range of technologies—including certain zero-emissions vehicle (ZEV) technologies which prevent motor vehicle emissions—could be produced at a reasonable cost during the years affected by this rule, model years 2027-32. Based on the agency's evaluation of all available technologies, EPA decided to strengthen the existing GHG standards.

Commenters asserted that EPA lacks authority to adopt the final standards because the agency's approach raised a major question and the statute is not sufficiently clear in granting EPA the necessary authority. Notwithstanding the plain statutory language in section 202(a) and EPA's consideration of ZEV technologies since the beginning of the motor vehicle GHG program in 2010, commenters newly contended that the statute limited the agency to considering only technologies applicable to vehicles with specific types of engines—namely gasoline and diesel internal combustion engine (ICE) vehicles—or only encouraging the adoption of ZEV technologies at some lower level.

Commenters' arguments are misplaced. As we discuss in preamble I.A-B and part I below, the statute provides clear Congressional authorization for EPA to consider updated data on all types of pollution control technologies—including BEV and FCEV technologies—and to determine the emission standards accordingly. In section 202(a), Congress made the major policy decision to regulate air pollution from motor vehicles. Congress also prescribed that EPA should accomplish this mandate through a technology-based approach, and it plainly entrusted to the Administrator's judgment the evaluation of available pollution control technologies and the consequent determination of the emission standards. In the final rule, the Administrator determined that a wide variety of technologies exist to further control GHGs from HD vehicles—including various ICE, hybrid, and ZEV technologies such as BEVs and FCEVs—and that such technologies could be applied at a reasonable cost to achieve significant reductions of GHG emissions that contribute to the ongoing climate crisis. These subsidiary technical and policy judgments were clearly within the Administrator's delegated authority. Because the meaning of the statutory text, read in its context, is unambiguous, there is no need to evaluate whether a major question exists.

In any event, EPA does not agree that this rule implicates the major questions doctrine as elucidated by the Court in *West Virginia* and related cases. The Court has made clear that the doctrine is reserved for extraordinary cases involving assertions of highly consequential power beyond what Congress could reasonably be understood to have granted.[3] The Court considers whether the agency's exercise of power is consistent with prior precedents or whether it claims "to discover in a long-extant statute an unheralded power representing a transformative expansion in [its] regulatory authority."[4] This is not such an extraordinary case in which congressional intent is unclear. Here, EPA is acting within the heartland of its statutory authority and faithfully implementing Congress's precise direction and intent. As we explain in part II, the final Phase 3 rule does not invoke a novel and transformative exercise of agency authority. Rather, the agency is acting in its traditional area of expertise, as it has for decades, to promulgate emission standards for motor vehicles. The rule maintains the fundamental regulatory structure of the existing program and iteratively strengthens the GHG standards from its predecessor Phase 2 rule. In part III, we assess the consequences of the rule. While the Phase 3 rule is a significant regulation of the motor vehicle industry, the nature and impacts of the rule are similar in kind to prior rules. On some important metrics, its impacts are smaller than Phase 2. We also address commenters' reliance on alleged indirect impacts—on areas like national security, grid reliability, and the viability of fossil fuel companies—to claim that this rule creates extraordinary consequences. We do not agree that these indirect impacts are relevant to assessing the consequential nature of this rule. The statute does not direct EPA to consider indirect

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[3] *West Virginia*, 142 S. Ct. at 2607–08 (cleaned up).

[4] *West Virginia*, 142 S. Ct. at 2610 (citing Util. Air Regul. Grp. v. E.P.A., 573 U.S. 302, 324 (2014)) (alterations in original); id. at 2596 ("This view of EPA's authority was not only unprecedented; it also effected a "fundamental revision of the statute, changing it from [one sort of] scheme of ... regulation' into an entirely different kind."); Biden v. Nebraska, 143 S. Ct. 2355, 2372 (2023) (applying the doctrine upon noting that "past waivers and modifications issued under the Act have been extremely modest and narrow in scope"). But see Biden v. Missouri, 595 U.S. 87, 94, 95 (2022) (declining to apply the major questions doctrine in light of the "longstanding practice of Health and Human Services in implementing the relevant statutory authorities," even though "the vaccine mandate goes further than what the Secretary has done in the past").

impacts, the legislative history indicates that Congress intended for EPA to regulate despite them, and they are the routine consequence of agency regulation and thus unsuitable for identifying extraordinary exercises of power. Even if these indirect impacts were relevant, EPA has comprehensively assessed these issues, often in consultation with other expert agencies, and found that the final rule does not cause significant indirect harms as alleged by commenters and on balance creates net benefits for society.

In part IV, we consider several additional factors, which we find also weigh against application of the major questions framework: the agency's assertion of authority does not create an unworkable conflict with any other statutory provision; the action does not significantly alter the balance of Federal and state power or the power of government over private property; and notwithstanding ongoing political interest in motor vehicle GHG regulation, the weight of statutory and legislative evidence supports EPA's authority.

I. The Statute Provides Clear Congressional Authorization.

As we explain in great detail in preamble I.B, the statute clearly authorizes EPA to consider ZEV technologies in setting emission standards under section 202(a). Section 202(a) requires the Administrator to establish emission standards for classes of motor vehicles based on the "development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period."[5] "Motor vehicles" are defined broadly to mean "any self-propelled vehicle designed for transporting persons or property on a street or highway."[6] Zero-emission vehicle technologies are "technologies" that reduce emissions and apply to "motor vehicles." Thus, EPA may consider such technologies in determining the emissions standards. The statutory context, purpose, and history, as well as administrative precedent, support this conclusion. Indeed, the statute unambiguously mandates EPA to consider ZEVs on this record, as they are highly effective pollution control technologies available during the timeframe of this rule and at a reasonable cost.[7] In preamble I.C. and RTC 2.1 and 10.2.1.f, we further address related statutory interpretation comments, including that ZEVs cannot belong to the same "class" of vehicles as ICE vehicles and that ZEVs are not "complete systems" or "devices" that "prevent or control" air pollution under section 202(a)(1).

We make three additional observations here in support of our argument that the statute provides clear Congressional authorization: (1) in section 202(a), Congress made the major policy decision to regulate air pollution from motor vehicles and appropriately delegated to EPA the interstitial judgments of identifying available pollution control technologies—like ZEV technologies—and the level of the standards; (2) the statutory language is clear, and does not rely on modest or vague terms; and (3) the statutory provision is central to controlling motor vehicle emissions, not some ancillary or backwater enactment.

First, in enacting Section 202(a), Congress itself made the relevant major policy decision: to regulate dangerous air pollution from motor vehicles—a term which Congress broadly defined to include "any self-propelled vehicle designed for transporting persons or property on a street or

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[5] CAA section 202(a)(1), (a)(2).
[6] CAA section 216(2).
[7] See Guedes v. ATF, 45 F.4th 306, 313 (D.C. Cir. 2022) (When "traditional tools of statutory interpretation" show that the agency's interpretation is "the best one," the court can uphold the interpretation without resorting to deference principles.).

highway."[8] Granting the Executive Branch such authority was a decision of enormous import. To that point, Congress's prior forays into air pollution control had largely focused on research, funding, and study. Motivated by recent environmental crises and a growing awareness of the dangers of air pollution to public health and welfare, Congress in 1965 conferred upon the agency authority to regulate motor vehicle emissions.[9]

Congress also made the key policy decision that motor vehicle emissions control would be achieved through a technology-based approach: EPA is to identify the available control technologies and establish emissions standards based on the performance of such technologies, their costs, and the lead-time necessary for their development and application. It charged the agency with technical determinations and policy judgments of an interstitial nature: what kind of pollution is harmful to public health and welfare, which classes of motor vehicles cause or contribute to such pollution, what technologies exist to mitigate such pollution, the rate and costs at which such technologies can be adopted, the appropriate stringency of the emissions standards in light of findings on technology and costs, and how such standards should be complied with and enforced.[10] Congress conferred on the Administrator the authority to make these subsidiary, but also significant, judgments, recognizing both his expertise in this area, as well as the need to confer "regulatory flexibility" absent which "changing circumstances and scientific developments would soon render the Clean Air Act obsolete."[11] These sorts of technical and policy determinations were well within Congress's power to delegate, and such delegations are ubiquitous throughout the Clean Air Act.[12]

In subsequent amendments to the Act, Congress made clear the reach of section 202(a): it could be used to drive not merely modest reductions in motor vehicle emissions, but order-of-magnitude reductions. For example, in the 1970 Clean Air Act Amendments, Congress mandated that the Administrator issue regulations to reduce emissions of certain pollutants by 90% over a five-year period.[13] The 1990 Amendments required 100% phase-in of a new set of demanding

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[8] CAA section 216(2).

[9] Motor Vehicle Air Pollution Control Act, Pub. L. 89-272 (1965). See generally Arthur C. Stern, History of Air Pollution Legislation in the United States, 32 Journal of the Air Pollution Control Association 44 (1982), available at https://www.tandfonline.com/doi/abs/10.1080/00022470.1982.10465369.

[10] See CAA section 202(a)(1) (delegating authority to determine what "air pollution which may reasonably be anticipated to endanger public health or welfare," which emissions of air pollutants from any class of motor vehicles "cause, or contribute" to such air pollution, and to establish standards to control such emissions), CAA section 202(a)(2) (delegating authority to determine the "period … necessary to permit the development and application of the requisite technology" to control such emissions and the "cost of compliance," and to balance these factors in determining the emissions standards), CAA sections 203-208 (delegating authority to determine the manners of compliance and enforcement).

[11] Massachusetts v. E.P.A., 549 U.S. 497, 532 (2007); see also Nat. Res. Def. Council, Inc. v. U.S. Env't Prot. Agency, 655 F.2d 318, 322 (D.C. Cir. 1981).

[12] See, e.g., CAA section 108, 109, 111, 112, 169A, 202.

[13] See Clean Air Act Amendments of 1970, Pub. L. 91-604, at sec. 6, 84 Stat. 1676, 1690 (Dec. 31, 1970) (amending section 202 of the CAA and directing EPA to issue regulations to reduce carbon monoxide and hydrocarbons from LD vehicles and engines by 90 percent in MY 1975 compared to MY 1970 and directing EPA to issue regulations to reduce NOx emissions from LD vehicles and engines by 90 percent in MY 1976 when compared with MY 1971). Subsequent factual developments led to relaxation of the standards, see CAA section 202(b)(1); however, the 1970 statute nonetheless illustrates the breadth of EPA's statutory authority to mandate rapid emissions reductions. See also generally preamble I.B (discussing the statutory numeric standards in section 202(b), (g)-(j), which required dramatic and rapid reductions in emissions).

standards over a six to seven model year period.[14] Congress further clarified that EPA should not view even such enormous reductions as the full extent of Congress's pollution-control intentions, but expressly empowered the agency to go still further.[15]

Commenters do not seriously question that the final rule implements the major policy decision Congress made: regulating air pollution from motor vehicles. Nor do commenters raise any plausible argument against the fact that Section 202(a)(1)-(2) entrusts to the Administrator's judgment the evaluation of pollution control technologies, their costs, and their rate of adoption. Rather, commenters disagree with how the Administrator has considered specific pollution control technologies (i.e., ZEV technologies such as BEV and FCEV technologies) in determining the standards. But the evaluation of pollution control technologies is fundamentally an interstitial decision well within EPA's authority.[16]

Commenters fail to seriously question this beyond suggesting that the final rule is unlawful absent an explicit legislative command to consider ZEVs or (conversely) to only consider technologies applicable to ICE vehicles.[17] But Congress did not limit EPA's authority to ICE vehicles. Instead, it made the major policy decision here to control motor vehicle pollution via a technology-based approach and delegated to the Administrator the responsibility to implement that policy. Were this not so, any time a significant new pollution control technology has come along—and many have over the years—Congress would need to pass a new statute. While some commenters may prefer this outcome, they articulate no good reason for why Congress must turn into a perpetual monitor of new technological developments in the field of motor vehicle emissions control, as opposed to delegating such technical matters to the expert agency.

Second, the statutory language is clear, and does not use modest words, vague terms, or subtle devices.[18] As explained above and in preamble I.A-B, the statute is replete with clear language. Among other things, section 202(a) directs the Administrator to regulate emissions from "motor vehicles," which the statute defines as "any self-propelled vehicle designed for transporting persons or property on a street or highway."[19] Unlike other statutory provisions, Congress intentionally abstained from using limiting language such as "internal combustion engine"[20] or "gasoline" or "diesel" engine vehicles.[21] Section 202(a)(2) then directs EPA to establish the

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[14] See CAA section 202(g).
[15] See, e.g., CAA section 202(b)(1)(C) ("The Administrator may promulgate regulations under subsection (a)(1) revising any standard prescribed or previously revised under this subsection…. Any revised standard shall require a reduction of emissions from the standard that was previously applicable."), (i)(3)(B)(iii) ("Nothing in this paragraph shall prohibit the Administrator from exercising the Administrator's authority under subsection (a) to promulgate more stringent standards for light-duty vehicles and light-duty … at any other time thereafter in accordance with subsection (a).")
[16] See *West Virginia*, 142 S. Ct. 2587, 2601, 2602, 2611 (2022) (under statutes that provide for a technology-based approach to pollution control, noting with approval EPA's determination that "more traditional pollution control measures" include "efficiency improvements, fuel-switching," and "add-on controls").
[17] But see *Nebraska*, 143 S. Ct. 2355, 2378 (2023) (Barrett, J., concurring) (concluding that none of the Court's cases "requires an unequivocal declaration from Congress authorizing the precise agency action under review").
[18] *West Virginia*, 142 S. Ct. at 2609.
[19] CAA section 216(2).
[20] See CAA section 216(10) (definition of nonroad engine).
[21] See generally preamble I.B. Compare also, e.g., CAA section 202(a)(1)-(2) (granting general power to the Administrator to establish emission standards for "any class or classes of new motor vehicles or new motor vehicle engines"), with section 202(a)(3)(B)(ii) (addressing regulations under section 202(a)(1) for certain "gasoline and

standards based on the "development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period," and does not confine the agency to consider any specific technology, but rather contains explicitly expansive language on the types of eligible technology.[22] Again, Congress made the major policy decision to regulate air pollution from motor vehicles and entrusted the means of achieving such regulation to the Administrator's judgment. "The broad language of § 202(a)(1) reflects an intentional effort to confer the flexibility necessary to forestall such obsolescence."[23]

Third, section 202(a) is not a mere "ancillary" or backwater provision,[24] but rather has been the cornerstone of motor vehicle emissions regulation since its enactment in 1965. Section 202(a)(1) confers on EPA the "general regulatory power" to regulate motor vehicle emissions.[25] Additionally, over the course of the Clean Air Act Amendments of 1970, 1977, and 1990, Congress directed EPA to exercise this authority to promulgate many specific and stringent standards for controlling motor vehicle emissions.[26] Congress also enacted numerous other provisions providing for compliance with and enforcement of such standards.[27] Since section 202(a)'s enactment, EPA has also regularly exercised this authority to promulgate highly consequential motor vehicle emission standards, including numerous criteria pollutant and GHG standards.[28]

II. The Final Rule Does Not Assert a Transformative Expansion in Agency Power.

A. The Phase 3 Standards Represent an Iterative Strengthening of the Existing Program.

The final Phase 3 rule is an iterative strengthening of the existing Phase 2 emission standards, not "an unheralded power representing a transformative expansion in [the agency's] regulatory authority" or a "fundamental revision of the statute, changing it from one sort of scheme of regulation into an entirely different kind."[29] The rule asserts the same authority as asserted in earlier GHG rules, and it is premised on technical and policy judgments regarding motor vehicle pollution control that lie in the heartland of EPA's expertise.

As a preliminary matter, we emphasize the real-world context antecedent to this rulemaking: the industry is making a significant shift to ZEVs. EPA's determination of what emissions

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diesel-fueled" vehicles), 202(h) tab. H (same), (i)(1) (same), (k) (addressing regulation of "all gasoline-fueled motor vehicles").

[22] See CAA section 202(a)(1) ("Such standards shall be applicable to such vehicles and engines for their useful life … whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control such pollution.").

[23] *Massachusetts*, 549 U.S. 497, 532 (2007); see also Nat. Res. Def. Council, Inc. v. U.S. Env't Prot. Agency, 655 F.2d 318, 322 (D.C. Cir. 1981) (characterizing section 202(a)(1) as a "general regulatory power" to establish "technology-based" standards for motor vehicles); S. REP. NO. 89-192, at 4 (1965) and H.R. REP. NO. 89-899, at 4 (1965) (House and Senate reports on 1965 legislation indicating the agency should adjust to changing technology in setting standards).

[24] *West Virginia*, 142 S. Ct. at 2610.

[25] *NRDC*, 655 F.2d 318, 322 (D.C. Cir. 1981).

[26] See, e.g., CAA section 202(b), (g)-(j), (l).

[27] See, e.g., CAA section 202(d), 203-08; see also CAA sections 209(b)(1)(C) (imposing consistency with section 202(a) as a condition for granting a waiver of preemption), 213 (modeling nonroad provisions on section 202).

[28] See preamble I.A; see also EPA, Emission Standards Reference Guide for On-road and Nonroad Vehicles and Engines, https://www.epa.gov/emission-standards-reference-guide.

[29] *West Virginia*, 597 U.S. 697, 724, 728 (2022)

reductions are feasible and appropriate is based first on its assessment of the future market for HD vehicles. EPA's assessment of the record—including technical information, manufacturer plans, third-party projections, and other relevant data—indicates that advancements in technology, together with the support provided by the BIL, IRA, and other government programs, will lead to significantly greater adoption of ZEV technologies even absent new standards. For example, EPA anticipates that, absent this rule, ZEVs will represent over 30% of new light HD vehicles by MY 2032.[30] Some commenters may anticipate somewhat higher or lower figures than EPA's projection, but it is clear that increasing numbers of HD ZEVs will be produced regardless of EPA rulemaking. This fact is understood by the regulated community; for instance, the leading trade group representing HD vehicle manufacturers states: "EMA member companies agree that [HD] ZEVs are and should be the future of the commercial trucking industry."[31] The final rule builds on these technological advancements, Congressional support, and industry trends.

As discussed in preamble I.B-C, the final rule aligns with decades of the agency's exercise of its CAA section 202(a) authority and enacts an iterative strengthening of the HD GHG standards established in the earlier Phase 1 and Phase 2 rule.[32, 33] Since the 1970s, EPA has relied on its CAA section 202(a) authority to set emissions standards for classes of new motor vehicles. EPA first promulgated GHG standards for medium- and heavy-duty vehicles and engines in 2011, which set standards for model years 2014 through 2018 and later, and which we commonly refer to as the "Phase 1" standards.[34] In 2016, EPA promulgated "Phase 2" GHG standards for medium- and heavy-duty vehicles and engines, which set standards applicable to model years 2021 through 2027 and later.[35] The final HD Phase 3 standards build upon these earlier rulemakings to further reduce emissions of CO_2 from heavy-duty vehicles. EPA has also consistently set GHG emission standards applicable to light-duty vehicles pursuant to CAA section 202(a).[36]

The Phase 3 final rule exercises the same basic authority as previously asserted. The HD GHG rules are similar in six fundamental ways: they (1) are promulgated pursuant to the same statutory authority, CAA section 202(a)(1)-(2), (2) address the same endangerment finding (the 2009 GHG endangerment finding for motor vehicles), and (3) impose the same basic regulatory requirement to meet more protective, performance-based GHG standards to reduce GHG

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[30] See preamble table II-34.
[31] See, e.g., EMA comment 1 ("Importantly, EMA members are investing billions of dollars to develop, manufacture and deploy HDOH zero-emission vehicles (ZEVs), and fully support the efforts of the federal (and state) government to support and expand the market for ZEV trucks. EMA member companies agree that HDOH ZEVs are and should be the future of the commercial trucking industry.").
[32] See also Brief of Amici Curiae Margo Oge and John Hannon in Support of Respondents, Texas v. EPA (D.C. Cir. No. 22-1031) (discussing the history of motor vehicle pollution control and EPA's emissions standards).
[33] We note that no party sought judicial review of the Phase 2 GHG standards that EPA is strengthening today. Some parties did seek review of other aspects of the Phase 2 rule, notably the regulation of trailers as well as a provision relating to competitive racing. See Truck Trailer Manufacturers Association v. EPA, 17 F.4th 1198 (D.C. Cir. 2021); Racing Enthusiasts & Suppliers Coal. v. Env't Prot. Agency, 45 F.4th 353 (D.C. Cir. 2022).
[34] 76 FR 57106, 57108 (Sept. 15, 2011).
[35] 81 FR 73478, 73500 (Oct. 25, 2016).
[36] See 75 FR 25324 (May 7, 2010) (setting GHG standards applicable to model year 2012-2016 LD vehicles); 77 FR 62624 (Oct. 15, 2012) (setting GHG standards for model year 2017-2025 LD vehicles and "building on the success of the first phase of the National program for these vehicles"); 86 FR 774434 (Dec. 30, 2021) (revising GHG standards for model year 2023 and later light-duty vehicle).

emissions from motor vehicles,[37] on (4) the same parties (manufacturers of new HD vehicles); are (5) based on the same basic kind of technical justification, as required by 202(a)(2), namely a demonstration that the standards can be met, within the timeframe of the rule, through the "development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period"; and (6) consider the ability of a manufacturer to average the emissions performance of different vehicles across its HD fleet, which enables manufacturers to achieve emissions reductions more rapidly and for lower cost.[38] Similar characteristics are also shared by many other motor vehicle rules, including GHG rules regulating the light- and medium-duty sectors and rules regulating criteria pollutants dating back to the 1980s.[39]

Not only is the nature of the power asserted the same as in earlier rules, but the final rule also involves making the same kinds of technical and policy judgments that lie in the heartland of EPA's traditionally delegated authority, matters in which the agency has clear expertise. As in prior CAA section 202(a)(1)-(2) rulemakings, EPA assessed the availability of potential technologies to reduce the pollutant at issue, lead time necessary for development and deployment of those technologies, cost of compliance with the standards, cost to purchasers, and broader societal and economic impacts. And as in those prior rules, EPA exercised its policy judgment and technical expertise to determine the final standards giving due consideration to the statutory and other relevant criteria. For example, in this rulemaking, EPA evaluated the HD vehicles industry and the wide array of tasks that such vehicles perform; the control technologies to further control GHGs from such vehicles, their feasibility, and effectiveness at controlling GHGs; and the availability of infrastructure to support such technologies (RIA 1). EPA designed and applied its state-of-the-art model, called Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS), for assessing the rate of technology adoption (RIA 2).[40] EPA calculated cost metrics, including costs of compliance to regulated entities, costs to purchasers, and social costs (RIA 3), as well as other economic impacts (RIA 6). The agency analyzed emissions impacts, including based on the agency's longstanding MOtor Vehicle Emission Simulator (MOVES) (RIA 4),[41] and evaluated the health and welfare impacts of the emission reductions

[37] Commenters suggest in passing that the rule raises a major question because EPA failed to consider lifecycle emissions impacts associated with ZEVs. EPA has considered certain lifecycle impacts, including GHG emissions from both EGUs and oil refineries, in setting the standards. See preamble V. Further, to the extent that commenters are concerned about the rule asserting a transformative and unprecedented exercise of power, EPA fails to see how an expansive consideration of GHG impacts across the entire vehicle and fuels supply chain—e.g., farms, mines, and factories, both domestic and foreign—would mitigate that concern. We further respond to comments about lifecycle emissions impacts in RTC 17.

[38] Averaging provides compliance flexibilities for manufacturers, allowing them to decide how and when to redesign specific vehicles and to deploy new technologies, and to balance these considerations in the way that makes the most sense for their individual vehicle fleets. This flexible structure is consistent with previous vehicle GHG rules and is effectively designed to reflect the diverse nature of the heavy-duty vehicle industry. For further discussion of averaging, as well as banking and trading, please see RTC 10.2.1, and sections I.C and III.A of the preamble.

[39] For example, the 1985 HD criteria pollutant rule shares similar features, albeit with some differences, e.g., criteria pollutant standards for heavy-duty vehicles are in response to different endangerment findings than the GHG endangerment finding, and they are also subject to the additional requirements in CAA section 202(a)(3)(A)(i).

[40] The HD TRUCS evaluates 101 representative vehicles cover the full range of weight classes within the scope of the final standards (i.e., Class 2b through 8 vocational vehicles and tractors), considering manifold technical factors such as the work performed by such vehicles and their energy and power demands, the additional weight and size associated with pollution control technologies, the costs of technologies relative to the baseline vehicle, the need for and costs of electric charging and hydrogen refueling infrastructure, the rate and costs of fuel consumption, the costs of producing and operating such vehicles, and more.

[41] The agency also conducted peer review for both MOVES and the inputs used for HD TRUCS.

(RIA 5). EPA also monetized certain benefits associated with emissions reductions and energy security (RIA 7) and performed a cost-benefits analysis (RIA 8). Finally, the agency exercised its policy judgment to determine the emissions standards based on its assessment of technological feasibility, lead-time, costs, and other factors (preamble II.G). Although the specific facts surrounding each rule vary, these are all among the kinds of considerations that EPA regularly evaluates in its motor vehicle rules, including in all of EPA's prior GHG rules: the nature of the industry and the regulated vehicles, the availability of control technologies, costs, emissions impacts, health and welfare impacts, economic and other impacts, cost-benefits analysis,[42] and of course the resulting emission standards.[43]

While the Phase 3 rule is more stringent than its predecessors, this difference is premised not on any transformative assertion of agency power, but rather on changing circumstances, most notably technological advances that permit greater GHG reductions, as well as BIL and IRA funding that support ZEVs.[44] As required by the statute, each rule incorporates an updated technical analysis, including of feasibility, lead time, and costs, for HD technologies that control emissions of GHGs. As we explain in preamble section I.B, there are more effective control technologies—particularly ZEV technologies such as BEV and FCEV technologies—available at a reasonable cost for the Phase 3 timeframe (MY 2027-32) than for the earlier years covered by Phase 1 and Phase 2. The agency also considered updated data on ICE vehicle technologies that are also available to reduce emissions.[45] On balance, we determined that the potential for increased adoption of control technologies, including ICE vehicle and ZEV technologies, warranted strengthening the GHG standards.

Phase 3's iterative strengthening of the emission standards thus presents an ordinary exercise of agency power and is in no way "a transformative expansion" of EPA's regulatory authority as commenters would suggest. Instead, it is yet another action in a long list of EPA's exercises of its standard-setting authority under CAA section 202. Considerable precedent holds that merely strengthening an existing regulatory program does not amount to an extraordinary assertion of power.[46]

Commenters nonetheless claim that EPA's assertion of power here augurs a future where the agency might require the complete elimination of tailpipe pollution from motor vehicles and is therefore transformative. EPA agrees that the *statute* contemplates the possibility of completely

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[42] As discussed in RTC chapter 23, in addition to the statutory factors, EPA also evaluated additional factors, including factors to comply with E.O. 12866. Our assessment of these additional factors lends further support to the final rule.

[43] See, e.g., the final rule preamble and RIA for the HD Phase 2 and Phase 1 rules, and the 2021, 2020, 2012, and 2010 LD GHG rules. As we explain in part IV.C below, the agency also consulted with numerous other expert agencies in formulating its judgments.

[44] There are some other differences between the rules which also do not rise to an extraordinary and novel assertion of authority. See, e.g., preamble III.A (describing updated compliance provisions).

[45] See preamble II.F.4.

[46] See *West Virginia*, 142 S. Ct. 2587, 2610 (2022) (distinguishing EPA's Mercury Rule, 90 Fed. Reg. 28616 (2005), from the Clean Power Plan and noting that "[t]he Mercury Rule . . . is one more entry in an unbroken list of prior [CAA] section 111 rules"); *Missouri*, 595 U.S. 87, 95 (2022) ("Of course the vaccine mandate goes further than what the Secretary has done in the past to implement infection control. But he has never had to address an infection problem of this scale and scope before. In any event, there can be no doubt that addressing infection problems in Medicare and Medicaid facilities is what he does."); *Utility Air*, 573 U.S. 302, 332 (2014) (declining to apply the major questions doctrine where the regulation "moderately increas[es] the demands EPA (or a state permitting authority) can make of entities already subject to its regulation")

preventing motor vehicle tailpipe pollution which contributes to endangerment, where that result is supportable under the statutory criteria and the record.[47] The natural outcome of Congress's major policy decision to control air pollution from motor vehicles is that such pollution might one day be eliminated. Nowhere does the statute afford a perpetual safe harbor for the production of vehicles that emit pollutants that contribute to air pollution which is endangering public health and welfare when pollution-free vehicles are available at a reasonable cost. This was Congress's, not the Administrator's, decision. In any event, this rule does not require the elimination of GHGs from HD vehicles; such a result is not justified on the current record.

The regulated community also supports EPA's authority to consider ZEVs in establishing the standards, further confirming their unremarkable nature.[48] One would expect that a transformative exercise of agency power would be met by sharp opposition from the regulated community, as typically is true in major-questions cases. But while regulated entities filed comments regarding, for instance, the available lead-time and rate at which the emissions standards should be strengthened, they support the agency's statutory authority to consider ZEVs in establishing the standards. The Truck and Engine Manufacturers Association (EMA), the major trade group representing entities regulated by the final rule, "is generally supportive of the intent of the proposed rulemaking – to accelerate the deployment of zero-emission trucks"[49] and recognizes as "certainly true that EPA has the authority to set lower emission standards as advancements in technology allow, even down to zero."[50] Major HD vehicle manufacturers also filed similarly supportive comments, demonstrating both their intention to produce ZEV products and support for EPA's consideration of ZEVs in setting the standards.[51]

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[47] Indeed, an analogous result—of completely preventing a type of emissions—was achieved as early as 1966. The Department of Health, Education, and Welfare (HEW), the agency then in charge of administering section 202, determined that a different type of emissions—crankcase emissions—could be completely prevented from certain motor vehicles. See 31 FR 5171 (Mar. 30, 1966) ("No crankcase emissions shall be discharged into the ambient atmosphere from any new motor vehicle or new motor vehicle engine subject to this subpart.").

[48] *Missouri*, 595 U.S. 87, 95 (2022) (regulated communities' "support suggests that a vaccination requirement under these circumstances is a straightforward and predictable example of the health and safety regulations that Congress has authorized the Secretary to impose").

[49] EMA comment at 1.

[50] EMA comment at 17.

[51] See Volvo comment at 2 ("We have made major capital investments to equip our factories for growing electric truck production volumes…."), 3 ("The Volvo Group supports EPA's proposed structure of performance-based standards predicated solely on zero-emission Battery Electric and Fuel Cell Electric vehicle adoption ("BEV" and "FCEV" respectively)."); DTNA comment at 2 ("DTNA supports EPA's general objective in the Proposed Rule to encourage increased ZEV penetration in the HD sector. Specifically, the Company supports EPA's proposal to carry over key components of the Phase 1/Phase 2 GHG standard structure, its determination to shift regulatory focus away from conventional vehicle technologies in the next phase of HD GHG emission regulation … and its acknowledgment that compliance flexibilities—in particular emissions averaging, banking, and trading (ABT)—are integral to manufacturer compliance plans."); PACCAR, comment at 2 ("The trucking industry is on the verge of a major shift toward zero-emission vehicles (ZEVs) notwithstanding a tremendous amount of uncertainty, which underscores why EPA must ensure its ZEV analyses and GHG-related agency actions include complete, accurate, and up-to-date information…. PACCAR is working diligently to develop ZEVs for the future"); Navistar comment at 2 ("Navistar supports a cleaner, more sustainable future, and believes ZEVs are the future of commercial vehicle transportation…. Navistar supports a uniform national framework for emission rules that will support early adoption of zero-emission trucks in commercial applications best suited for longer charging periods as the infrastructure is built out."); Ford comment at 1 ("Ford is all-in on electrification."), 2 ("Ford supports the 2032 endpoint in the main proposal of the Phase 3 Proposal, including the numeric standards which may result in 50 percent of new heavy-duty

B. Key Aspects of the Final Rule are Not Transformative.

Commenters' assertions that certain aspects of this rule—its regulation of GHGs, evaluation of electric technologies, and consideration of the ABT compliance provisions—are nonetheless so transformative as to implicate the major questions doctrine are misplaced. First, commenters wrongly suggest that any significant regulation of the HD sector to address climate change creates a major question. But *Massachusetts* considered and rejected a similar argument—"that climate change was so important that unless Congress spoke with exacting specificity, it could not have meant the Agency to address it" under section 202(a).[52] While the Court had occasion to revisit that conclusion in *American Electric*, *Utility Air*, and *West Virginia*, it did not. And since *Massachusetts*, EPA has promulgated 6 motor vehicle GHG rules including 2 HD GHG rules—there is nothing new here.[53]

Second, commenters erroneously claim that EPA's consideration of electric technologies as a basis for the standards is novel. As we explain in preamble I.B, electric technologies are at the heart of motor-vehicle pollution control. They are used by all new motor vehicles produced today. Electric technologies are fundamental to key emissions control technologies currently in use, including catalytic converters, selective catalytic reduction, particulate filters, and engine and powertrain electrification. Without electric technologies, no motor vehicle would be able to start, or operate, or control emissions. Congress also recognized "electronic emission control units," a kind of electric technology, as a specified major emissions control device in CAA section 207(i)(2). EPA has also repeatedly considered engine and powertrain electrification, including ZEV, technologies in its prior rules, as shown in Table 1 of this response and discussed in preamble I.B. and in greater detail below.

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vocational vehicles being zero-emission vehicles."); Stellantis comment at 1 ("Stellantis is Committed to Developing the Needed Electrified Products"), 2 ("Stellantis is committed to electrification and rulemakings reflecting an industry transformation based on realistic market conditions."); see also Cummins comment at 2-3 ("The launch of Accelera is a significant step forward in Cummins' efforts to achieve its Destination Zero strategy, focused on evolving Cummins technologies to reach zero emissions across its product portfolio.… Accelera is now a global leader in zero-emissions technologies, providing battery electric and fuel cell electric solutions across commercial and industrial applications.…").

[52] *Massachusetts*, 549 U.S. 497, 512, 530-31 (2007) (distinguishing *Brown & Williamson*, 529 U.S. 120).

[53] These rules are the 2010, 2012, 2020, and 2021 LD GHG rules, and the 2011 and 2016 HD GHG rules.

Table 1. EPA's Prior GHG Rules and their Consideration of Averaging in Standard-Setting, ABT, and Electrification Technologies

Rule	Averaging in Standard-Setting	ABT	Considering Electrification Technologies
2010 LD (MY 2011 and later), 75 FR 25324 (May 7, 2010)	25405/1, 25412/1-3	25412/3	25328/3, 25456 (tbl. III.D.6-3)
HD Phase 1 (MY 2014 and later), 76 FR 57106 (Sept. 15, 2011)	57119/1	57238/2-39/1	57204/3-05/2, 57220/1-21/2, 57224/3-25/1, 57246/1
2012 LD (MY 2017 and later), 77 FR 62624 (Oct. 15, 2012)	62627/3-28/1	62628/1-2	62705/1-06/1, 62852/2-61
HD Phase 2 (MY 2021 and later), 81 FR 73478 (Oct. 25, 2016)	73730/2-3, 73733/2-34/1	73495/2-3, 73568/2-69/3	73751/1-3
2020 LD (MY 2021 and later), 85 FR 24174 (Apr. 30, 2020)	24246/3-47/3	25206/3-07/1, 25275/1-76/2	24320/1, 24469/1-524/3
2021 LD (MY 2023 and later), 86 FR 74434 (Dec. 30, 2021)	74446/3-51/1	74453/1-56/1	74493/1-94/3, 74484/2-87/3

Within the HD GHG program, EPA has considered the role of electrification since the Phase 1 rule in 2011. In that rule, EPA stated that "[t]echnologies such as hybrid drivetrains, advanced bottoming cycle engines, and full electric vehicles [were] promoted in this first step through incentive concepts . . . but we believe[d] that these advance technologies [would] not be necessary to meet the final standards."[54] However, we "expect[ed] these advanced technologies to be an important part of the regulatory program and [would] consider them in setting the stringency of any standards beyond the 2018 model year."[55] In 2016, when EPA promulgated the HD Phase 2 GHG standards, EPA considered and included certain electrified technologies, including improved transmissions (including mild hybrid powertrains) as part of the technology package supporting the feasibility of the HD vocational vehicles standards as well as non-hybrid ICE vehicle electrified components (i.e., electrified accessories) as part of technology packages supporting Phase 2 standards.[56] In that same rule, EPA also continued to look toward further electrification in the future because "we [had] found only one all-electric heavy-duty vehicle manufacturer that [had] certified through 2016."[57]

[54] 76 FR 57106, 57133 (Sept. 15, 2011).
[55] Id.
[56] 81 FR 73478 (Oct. 25, 2016). See also discussion regarding Phase 2 vocational vehicles technologies in preamble II.C.
[57] 81 FR 73478, 73500 (Oct. 25, 2016).

As electrified HD vehicles have become available in the market in the intervening years and with more HD electric vehicles under development, EPA's most recent rulemaking for the HD sector in 2023 again included consideration of HD electric vehicles.[58] This rulemaking finalized emission standards for NOx, PM, and other pollutants for model years 2027 and later HD vehicles. EPA explained that we developed "performance-based final standards" that allow "manufacturers [to] choose from any number of technology pathways to comply with the final standards (e.g., alternative fuels, including biodiesel, renewable diesel, renewable natural gas, renewable propane, or hydrogen in combination with relevant emissions aftertreatment technologies, and *electrification, including plug-in hybrid electric vehicles, battery-electric or fuel cell electric vehicles*)."[59]

EPA's history of considering electrification is even longer with regard to the light-duty fleet. In 1998, EPA published regulations for the voluntary National Low Emission Vehicle (NLEV) program that allowed LD motor-vehicle manufacturers to comply with tailpipe standards for cars and light-duty trucks more stringent than that required by EPA in exchange for compliance credits for such low emission and zero emission vehicles.[60] In 2000, EPA built upon progress made in the NLEV program in the light-duty Tier 2 criteria pollutant rule to set standards that "help pave the way for greater and/or more cost effective emission reductions from future vehicles . . . provid[ing] a strong incentive for manufacturers to maximize their development and introduction of the best available vehicle/engine emissions control technology, and . . . provid[ing] a stepping stone to the broader introduction of this technology soon thereafter."[61] EPA stated that "we believe it is appropriate to provide inducements to manufacturers to certify vehicles to very low levels and that these inducements may help pave the way for greater and/ or more cost effective emission reductions from future vehicles."[62] Accordingly, EPA adopted a "multiplier" to allow BEVs to be counted more than once in compliance calculations for the standards and allowed manufacturers to "propose HEV contribution factors for NOx to EPA . . . [to] be used in the calculation of a manufacturer's fleet average NOx emissions and . . . provide a mechanism to credit an HEV for operating with no emissions over some portion of its life.[63]

EPA built on this technological approach in 2010 when it first adopted standards controlling emissions of GHG, stating we "expect[ed] that automobile manufacturers will meet these standards by utilizing technologies that will reduce vehicle GHG emissions . . . [including] increased use of hybrid and other advanced technologies, and the initial commercialization of electric vehicles and plug-in hybrids."[64] As technology advanced by the time of the 2012 LD GHG Rule, EPA continued to expand its consideration of electrification technology, including electric power steering/electro-hydraulic power steering, improved accessories (such as electrically driven water pumps and cooling fans), 12-volt stop-start, higher voltage stop-start/belt integrated starter generator, integrated motor assist/crank integrated starter generator, P2 hybrid (transmission integrated electric motor placed between engine and a gearbox or

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[58] 88 FR 4296, 4330–31 (Jan. 24, 2023).
[59] 88 FR 4296, 4330–31 (Jan. 24, 2023) (emphasis added).
[60] 63 FR 926 (Jan. 7, 1998).
[61] 65 FR 6698, 6698, 6746 (Feb. 10, 2000).
[62] 65 FR 6746.
[63] 65 FR 6793.
[64] 75 FR 25324, 25328 (May 7, 2010) ("Although many of these technologies are available today, the emissions reductions . . . finalized in this notice will involve more widespread use of these technologies across the light-duty vehicle fleet.").

continuously variable transmission), 2-mode hybrid, power-split hybrid, plug-in hybrid electric vehicles, and electric vehicles with all-electric drive.[65] In 2014, EPA adopted the Tier 3 rule, coordinating its criteria pollutant standards with the recently adopted GHG standards. EPA projected that manufacturers would choose to meet the criteria pollutant standards with an increase in electric vehicle sales.[66]

In 2020, EPA continued to consider the above technologies in the context of "electric paths [which] include a large set of technologies that share the common element of using electrical power for certain vehicle functions that were traditionally powered mechanically by engine power. Electrification technologies thus can range from electrification of specific accessories . . . to electrification of the entire powertrain."[67] In the 2021 light duty vehicle rule, covering vehicles from MY 2023 to 2026, EPA explained that "[t]he technological readiness of the auto industry to meet the final standards . . . is best understood in the context of the decade-long light-duty vehicle GHG emission reduction program . . . . . [M]anufacturers have access to a wide range of GHG-reducing technologies, many of which were in the early stages of development at the beginning of EPA's program in 2012, and which still have potential to reach greater penetration across all new vehicles."[68] We noted that, "[i]n addition to the technologies that were anticipated by EPA in the 2012 rule . . . recent technological advancements and successful implementations of electrification have been particularly significant and have greatly increased the available options for manufacturers to meet more stringent standards."[69] As in prior rules, EPA continued to consider electrified vehicles of all kinds alongside every other form of propulsion available and anticipated in light-duty vehicles.

In sum, there is nothing novel about EPA's consideration of electric technologies, including ZEVs, in promulgating the standards. To the contrary, were EPA to ignore ZEV technologies in establishing the Phase 3 standards as these commenters suggest, that would be an unprecedented and extraordinary break from the agency's consistent historical practice. The resulting standards under such an approach would also bear little correlation with the regulated community's own plans for reducing GHGs. For example, some commenters suggest that EPA—lacking authority to consider the emissions performance of ZEV and ICE vehicles in the same class—could instead adopt a more stringent GHG standard specifically for ICE vehicles alone, while ignoring electrification technologies. Such an approach would likely lead to a significant loss in emissions reductions, and by eliminating manufacturers' ability to use ABT, also increase the costs of compliance. And given the enormous investments that the regulated community has made in ZEVs and their support for the agency's consideration of ZEVs in setting the standards, such a shift would create enormous regulatory uncertainty and undermine significant reliance interests.[70]

[65] 77 FR 62706 (Oct. 15, 2012).
[66] Tier 3 RIA, Tables 2-42 and 2-43.
[67] 85 FR 24174, 24320 (Apr. 30, 2020).
[68] 86 FR 74434, 74493 (Dec. 30, 2021).
[69] Id.
[70] Encino Motorcars, LLC v. Navarro, 579 U.S. 211, 222 (2016) ("longstanding policies may have engendered serious reliance interests that must be taken into account. In such cases … a reasoned explanation is needed for disregarding facts and circumstances that underlay or were engendered by the prior policy. It follows that an unexplained inconsistency in agency policy is a reason for holding an interpretation to be an arbitrary and capricious change from agency practice. An arbitrary and capricious regulation of this sort is itself unlawful ….").

As we detail in preamble ES and II, and as the manufacturers themselves state in their comments,[71] manufacturers have already shifted their research and development programs and selected ZEVs as a principal, and in some cases the exclusive, long-term GHG emissions reduction strategy. To now prohibit manufacturers from complying through fleet-average emissions reductions achieved through ZEVs and instead force them to deliver cleaner ICE vehicles would upend the industry's plans. Indeed, it bears noting that many manufacturers identified ZEVs as a key part of their GHG compliance strategy long before today's final rule: in response to the 2016 Phase 2 rule.[72]

The agency appreciates that some commenters, especially those representing or supporting oil and biofuel companies, do not favor ZEV technologies as ZEVs do not demand the liquid fuels these companies produce. But the purpose of section 202(a) is to reduce air pollution from motor vehicles, not to preserve the market share of any particular type of fuel or drivetrain. In light of the statutory language as described in preamble I, ZEVs being highly effective technologies available for controlling GHG emissions during MY 2027-32, the agency's longstanding practice of considering such technologies, and the regulated community's reliance on such technologies to achieve emissions goals, the agency can identify no reasoned justification for ignoring ZEV technologies in establishing the standards. As we explain in preamble I.B, such an approach is impermissible under the statute; it would also be arbitrary and capricious.

Commenters raise some sub-flavors of their argument that consideration of electric technologies is novel. They claim, for example, that consideration of electrification technologies that reduce or eliminate the use of liquid fossil fuels, or that prevent pollution from being generated entirely as opposed to controlling it after the fact, are novel. However, to date, there has been no commercially viable technology that blocks or controls carbon pollution in motor vehicles after such pollution has been created. Rather, all motor vehicle GHG technologies, including all technologies that can be applied to ICE vehicles, result in the reduction of liquid fossil fuel consumption. All of these technologies also prevent pollution from being generated in the first place, for example by increasing engine efficiency, improving aerodynamics, or relying on fuel-switching (to electricity or hydrogen). These technologies, moreover, prevent not only GHGs, but criteria pollution.[73] We address this issue elsewhere in RTC 2.1 and further discuss these technologies in RTC 4.1, 5-5.1, and 9.

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[71] See part II.A supra (summarizing comments from EMA, Volvo, DTNA, PACCAR, Navistar, Ford, and Stellantis).

[72] See, e.g., PACCAR comments at 9 ("Since [the Phase 2 rule], OEMs have designed their product portfolios and compliance plans accordingly, including by increasing ZEVs…."); Navistar comments at 6 ("Navistar has relied on the certainty of the [Phase 2] GHG standards in engineering and manufacturing ZEV trucks."); DTNA comments at 74 (indicating that "many manufacturers," including DTNA "have relied upon the availability of [ZEV] credit multipliers to plan their compliance strategies" for Phase 2, and urging the Agency to not eliminate such credit multipliers "out of concern that the incentives they provided to develop clean technologies may have led to the introduction of more ZEVs than EPA intended").

[73] Criteria pollutants have historically been controlled by both systems that treat pollution after it has been created (such as catalytic converters) as well as by systems that prevent pollution from being created in the first place. Examples of criteria pollution prevention technologies include exhaust gas recirculation (EGR) and other combustion chamber improvements that lead to a cleaner combustion process. See, e.g., 66 FR 5002, 5035 (explaining that as of time of the 2001 HD rule, "the emission control development work for diesels has concentrated on improvements to the engine itself to limit the emissions leaving the combustion chamber"), 5055

Some commenters, recognizing EPA's authority to consider ZEVs, nonetheless claim that the *extent* to which EPA is basing the standards on increased adoption of ZEVs, or increased electrification generally, is novel. EPA agrees that ZEV technologies will be available in greater quantities and at lower costs during the timeframe for this rulemaking relative to earlier years, and that manufacturers will likely significantly increase their adoption of ZEV technologies. These are new factual developments since our earlier rules, which we detail in preamble ES and II, and these changing facts support more stringent standards. But regulation responsive to changing facts is part and parcel of the normal course of agency administration, not the sort of transformative action that gives rise to a major question.[74] Just as questions about the appropriate level of stringency of a standard are not extraordinary, so too questions about the penetration rates of a given technology that may be expected to occur under different stringencies are not extraordinary.

Commenters also wrongly claim that EPA's consideration of ABT is novel, whether in isolation or specifically with respect to how EPA considers ABT and ZEVs in determining the stringency of the standards. As shown in Table 1 of this response, ABT is not at all novel: EPA has employed ABT throughout all its GHG rules, and the use of averaging, both as a compliance provision and in standard-setting, dates back to 1985.[75] EPA did not even reopen the ABT program in this rule (excepting certain discrete changes discussed in preamble III.A). Regulated entities also strongly support ABT and have come to rely on it as a cost-effective way to comply with the standards. By contrast, it would be an extraordinary break from precedent to now cease the GHG ABT program or considering the availability of averaging in determining the stringency of the standards. We further address comments regarding ABT in RTC 10.2.1.

In sum, the final rule does not assert an unprecedented and transformative expansion of agency power, but merely iterates on the existing Phase 2 program. The nature and scope of the agency's authority is the same as in prior rules. The rule is premised on technical and policy judgments that lie in the heartland of EPA's traditionally delegated authority. And the agency's consideration of electrification and ABT in setting the standards follows decades of precedent.

("non-catalyst related improvements to gasoline emission control technology include higher speed computer processors which enable more sophisticated engine control algorithms and improved fuel injectors providing better fuel atomization thereby improving fuel combustion"), 5092 (expecting certain vehicles to meet the standards through various technologies, including EGR and other combustion process improvements).

[74] See, e.g., Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 42 (1983) ("[W]e fully recognize regulatory agencies do not establish rules of conduct to last forever and that an agency must be given ample latitude to adapt their rules and policies to the demands of changing circumstances.… there is no more reason to presume that changing circumstances require the rescission of prior action, instead of a revision in or even the extension of current regulation."); *Missouri*, 595 U.S. 87, 94, 95 (2022) ("Of course the vaccine mandate goes further than what the Secretary has done in the past to implement infection control. But he has never had to address an infection problem of this scale and scope before. In any event, there can be no doubt that addressing infection problems in Medicare and Medicaid facilities is what he does.").

[75] See 50 FR 10606 (Mar. 15, 1985). The availability of averaging as a compliance flexibility has an even earlier pedigree. See 48 FR 33456 (July 21, 1983) (EPA's first averaging program for mobile sources); 45 FR 79382 (Nov. 28, 1980) (advance notice of proposed rulemaking investigating averaging for mobile sources).

III. The Final Rule Does Not Impose Unprecedented Consequences.

A. The Phase 3 Standards Impose Similar Regulatory Costs to Earlier Rules.

In evaluating whether a regulation is of vast economic and political significance, the Supreme Court has typically compared the effects of the current rule with those of prior exercises of the agency's authority.[76] In particular, the Court has paid special attention to the number of directly affected entities and the costs of complying with the regulation[77]—whether in the form of dollars or other economic consequences such as forced plant closures or permitting delays.[78] In some cases, the Court has also considered the costs to customers of the regulated entity.[79]

Table 2 of this response presents a comparison of the impacts of the Phase 3 rule with the Phase 2 and Phase 1 rules. We highlight some key observations here. First, the Phase 3 rule regulates the same community of regulated entities as earlier rules: HD vehicle manufacturers.[80] Congress provided explicit textual authorization for regulating these entities, which EPA has been doing for five decades,[81] and they comprise "a relative handful of large sources capable of shouldering heavy substantive and procedural burdens" of section 202(a) regulation,[82] and a far cry from the millions of regulated entities that the Court found to give rise to major questions in other cases.[83]

[76] The Court has not viewed vast consequences, in isolation, as sufficient to warrant departure from the traditional principles of statutory interpretation. See Brianne J. Gorod et al., "Major Questions Doctrine: An Extraordinary Doctrine for 'Extraordinary' Cases," 19 Wake Forest L. Rev. (forthcoming) 19 ("in no case has economic significance or political controversy alone been enough to trigger application of the MQD"), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4419602.
[77] See, e.g., *Nebraska*, 143 S. Ct. 2355, 2372 (2023) ("43 million borrowers from their obligations to repay $430 billion in student loans"); *West Virginia*, 142 S. Ct. 2587, 2604 (2022); id at 2622 (Gorsuch, J., concurring); *Alabama Association*, 141 S. Ct. 2485, 2489 (2021); *Utility Air*, 573 U.S. 302, 322 (2014).
[78] *West Virginia*, 142 S. Ct. 2587, 2604 (2022) (closures of coal power plants); *Utility Air*, 573 U.S. 302, 322 (2014) (permitting delays).
[79] *West Virginia*, 142 S. Ct. 2587, 2604 (2022) (noting the impact of EPA's EGU regulation on "retail electricity prices").
[80] Specifically, all three rules regulate manufacturers of HD tractors and vocational vehicles. Both the Phase 1 and Phase 2 rules also regulated manufacturers of HD pickups and vans. EPA is now regulating HD pickups and vans as "medium-duty vehicles" through a separate rulemaking, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 FR 29184 (proposed May 5, 2023). The Phase 2 rule also regulated HD engines and trailers. EPA did not reopen the HD GHG engines regulations in this rulemaking, and those regulations continue to apply. EPA is removing our regulations regarding trailers in this action in response to the D.C. Circuit's mandate in *Truck Trailer Manufacturers Association v. EPA*, 17 F.4th 1198 (D.C. Cir. 2021).
[81] See CAA sections 202, 203, 216.
[82] As part of our compliance with Paperwork Reduction Act requirements, EPA estimates there are 77 heavy-duty vehicle manufacturers regulated by the Phase 3 rule. See preamble X.B.
[83] *Utility Air*, 573 U.S. 302, 322 (2014).

Table 2. Comparison of the Impacts of the HD Phase 1, 2, and 3 Rules.

Rulemaking	**Phase 1**	**Phase 2**	**Phase 3**
Publication Date	August 2011	August 2016	March 2024
Regulated Entities	HD Vehicle Manufacturers	HD Vehicle and Engine Manufacturers	HD Vehicle Manufacturers
Phase-In Schedule (MY)	2014–18	2021–27[84]	2027–32
Costs of Compliance for Manufacturers, Total (PV 3%, billion 2022$) [a, b]	63[85]	110[86]	-3.2[87]
Average Per-Vehicle Costs of Compliance at Full Phase-In, Tractors (2022$) [a, c]	3,165–11,100[88]	12,750–17,125[89]	3,200–10,800[90]
Average Per-Vehicle Costs of Compliance at Full Phase-In, Vocational Vehicles (2022$) [d]	289-506[91]	1,860–7,090[92]	-650 to -2900[93]
Net GHG Reductions, Final Year (million metric tons CO2e)	108[94]	199[95]	61 [96]
Reduction in Oil Consumption (million barrels)	261[97]	314[98]	150[99]
Net Benefits, Final Year (billion 2022$) [a, d]	56[100]	110[101]	32[102]
Net Benefits (PV 3%, billion 2022$) [a, d]	554[103]	781[104]	280[105]

[84] The Phase 2 rule had a separate phase-in schedule for trailers, which is not relevant here.
[85] 76 FR 57346 ($47.4 billion (2009$)).
[86] 81 FR 73895 ($87.8 billion (2013$)).
[87] Preamble Table VIII-8.
[88] 76 FR 57213 ($2364–$8,291 (2009$)). In the Phase 1 rule, EPA also calculated an average per-vehicle cost for all tractors of $6,215 (2009$) ($8,321 when converted to 2022$).
[89] 81 FR 73621 ($10,235–13,749 (2013$)).
[90] Preamble II.G.2.
[91] 76 FR 57127, 57237 ($216-378 (2009$)).
[92] 81 FR 73718 ($1,486–5670 (2013$)).
[93] Preamble II.G.2.
[94] 76 FR 57294, 57324.
[95] 81 FR 73832.
[96] Preamble Table V-11.
[97] 76 FR 57339 (calculated by multiplying 0.566 million barrels/day (mmbbl/day) by 365 to estimate annual reductions). This is equivalent to 10.96 billion gallons (assuming 42 gallons/barrel).
[98] 81 FR 73888 (calculated by multiplying 0.861 mmbbl/day by 365 to estimate annual reductions). This is equivalent to 12 billion gallons (assuming 42 gallons/barrel).
[99] This is equivalent to 6.3 billion gallons (assuming 42 gallons/barrel).
[100] 76 FR 57346 ($42,100 million (2009$)).

[a] **Comparing Values:** We present all dollar values in constant 2022$ to facilitate ease of comparison between the rules. We adjusted values from prior rules for inflation. Where values have been adjusted, the original values are noted in footnotes. For total costs of compliance and net benefits, we note there are differences in the methodologies used to present and estimate these values across the rules, including updates in certain modeling and monetization approaches (e.g., updates to MOVES and SC-GHG). Nonetheless, as EPA estimated these figures at the time of each rule, they appropriately reflect the impacts of the agency's exercise of authority in each such rule. Thus, these figures are suitable for evaluating the scope of the agency's exercise of authority in this rule compared to prior rules.

Specifically with respect to net benefits, for the Phase 1 and Phase 2 rules, we present net benefits using a 3% average social cost of carbon (SC-GHG) figure, based on the social cost of carbon methodology developed and recommended by the IWG on the SC-GHG, as described in the RIAs for those rules. For this rule, we present the climate benefits associated with the SC-GHG estimates under the 2-percent near-term Ramsey discount rate. See RIA 7.1 for a discussion of changes to the methodology for monetizing the social cost of carbon. Were EPA to apply the methodology developed and recommended by the IWG on the SC-GHG for calculating the social cost of carbon, the net benefits of this rule would appear smaller. See RIA Appendix C.

More generally, we note there are differences in how values are presented across the preambles for various rules. For example, in some cases, we highlight the impacts of the program through 2050 or 2055, whereas in other cases we highlight the impacts during the years of the phase-in. We compare like values to the fullest extent possible. For example, with regard to total costs of compliance and net benefits, we compare the 3% net present value over the full program (through 2050 or 2055). See also note d below on Final Year. Detailed discussion of the approach to calculating costs and benefits for each rule may be found in that rule’s RIA.

[b] **Costs of Compliance:** The costs of compliance for manufacturers represents the total vehicle technology costs for the program relative to the regulatory baseline for each rule. We note that for this rule, the value presented is taken from the summary table of costs and benefits and does not include the battery tax credit, which reduces the costs of compliance to manufacturers below that stated in the table. As shown in RIA 8.2 Table 8-10, the value of the battery tax credit is $1.3 billion (3% PV).

[c] **Average Per-Vehicle Costs of Compliance:** This row refers to the average per-vehicle cost for tractors and vocational vehicles for the year of full-phase in for the program, i.e., the last year shown on the phase-in schedule row for each rule. The range of per vehicle costs for each rule reflects costs at the regulatory grouping level within the vocational vehicle sector and within the tractor sector.

[d] **Final Year**: For this table, the “Final Year” for prior rules refer to 2050, and for this rule refers to 2055. These years approximate when most of the regulated fleet will consist of vehicles subject to the relevant standards due to fleet turnover.

As for the costs of compliance, the costs of the Phase 3 rule are not so vast as to be unprecedented or transformative relative to earlier rules. To the contrary, EPA determined that the costs would overall be negative, i.e., result in a cost savings to manufacturers. This is due to various factors, most notably the decreasing costs of producing ZEVs relative to ICE vehicles that meet the prior Phase 2 standards, and also the tax incentives that Congress enacted in the IRA.[106] The costs of compliance are also smaller than those of the predecessor Phase 1 and 2 rules. In addition, when we assess the fleet average costs of compliance per HD vehicle during the year in which the program is fully phased-in, we also find similar or lower costs compared to both Phase 1 and Phase 2. Notably, costs for vocational vehicles are lower than for both Phase 1

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[101] 81 FR 73482 ($87.6 billion (2013$)).
[102] Preamble Table ES-8.
[103] 76 FR 57346 ($413,700 million (2009$)).
[104] 81 FR 73896 ($696.4 billion (2013$)).
[105] Preamble Table ES-8.
[106] We note that the value presented in the table does not include the battery tax credit, which further reduces the costs of compliance to manufacturers. As shown in RIA 8.2 Table 8-10, the value of the battery tax credit is $1.3 billion (3% PV).

and 2, while costs for tractors are similar to Phase 1 but lower than for Phase 2. The per vehicle costs, moreover, are small relative to what Congress itself accepted in enacting section 202.[107]

Nor does the rule impose the kinds of other economic disruptions that the Supreme Court has noted in prior cases. For example, the rule does not require, legally or practically, any HD vehicle manufacturers to shut down or even to reduce their production. Nor does the rule create excessive, or any, delays in their ability to continue to produce vehicles—we expect that the certification process for HD GHG compliance will continue entirely uninterrupted.

As for purchaser costs, the statute does not require consideration of such costs.[108] Congress, of course, recognized that pollution control would entail costs, and the technologies used to meet EPA's motor vehicle emission standards have historically increased costs for purchasers. There are a subset of pollution control technologies, however, that "pay back" the increased upfront costs to purchasers through operating savings. When such technologies are available, they will obviously be of greater interest to purchasers, especially given that businesses that operate HD vehicles are typically under competitive pressure to reduce costs. In the final rule, EPA considered the upfront costs associated with purchasing cleaner vehicles, including the costs of any charging infrastructure where applicable, as well as the costs of operating such vehicles over their lifetime. EPA also evaluated whether the incremental upfront cost would "pay back" over time through operating savings, which we find to be a particularly useful metric for ascertaining willingness to purchase. We find that the standards, and specifically ZEV technologies, do pay back within the usual period of first ownership of the vehicle, consistent with the technologies we considered in the Phase 2 rule.[109]

We also carefully designed the final rule to avoid other kinds of disruptions to purchasers. For example, we recognized that HD vehicles represent a very diverse array of vehicles (e.g., buses, cement trucks, long-haul tractors, etc.), and that even within a single subcategory, there are a diversity of use cases (e.g., some medium HD vocational vehicles may need to carry greater load and operate for longer periods of time than others). We carefully tailored the standards to the technologies available for each subcategory to preserve purchaser choice to purchase the types of HD vehicles they need.[110] Furthermore, we recognize that HD vehicles require supporting infrastructure (e.g., fueling and charging stations) to operate, and we accounted for sufficient

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[107] Compare preamble II.G.2 ("Furthermore, the estimated MY 2032 costs to tractor manufacturers represent less than about six percent of the average price of a new heavy-duty tractor today (conservatively estimated to be $140,000 for day cab tractors and $190,000 for sleeper cab tractors in 2023). This is likewise within the margin that EPA considered reasonable in Phase 2." (footnotes omitted)), with Motor & Equip. Mfrs. Ass'n, Inc. v. E.P.A., 627 F.2d 1095, 1118 (D.C. Cir. 1979) ("Congress wanted to avoid undue economic disruption in the automotive manufacturing industry and also sought to avoid doubling or tripling the cost of motor vehicles to purchasers.").

[108] See Motor & Equipment Mfrs. Ass'n Inc. v. EPA, 627 F. 2d 1095, 1118 (D.C. Cir. 1979) ("Section 202's cost of compliance concern, juxtaposed as it is with the requirement that the Administrator provide the requisite lead time to allow technological developments, refers to the economic costs of motor vehicle emission standards and accompanying enforcement procedures. It relates to the timing of a particular emission control regulation rather than to its social implications."); Int'l Harvester Co. v. Ruckelshaus, 478 F.2d 615, 640 (D.C. Cir. 1973) ("as long as feasible technology permits the demand for new passenger automobiles to be generally met, the basic requirements of the Act would be satisfied, even though this might occasion fewer models and a more limited choice of engine types. The driving preferences of hot rodders are not to outweigh the goal of a clean environment.").

[109] See preamble II.G.4.

[110] See preamble II.G.4, II.F.1. As part of this, we also determined that certain specialized types of vehicles (e.g., emergency vehicles and concrete mixers) certified to certain optional custom chassis regulatory subcategories should not be subject to more stringent standards than the corresponding Phase 2 optional custom chassis standards.

lead-time for the development of that infrastructure, including private depot charging, public charging, and hydrogen refueling infrastructure.[111] We also identified numerous industry standards and safety protocols to ensure the safety of HD vehicles, including BEVs and FCEVs.[112]

EPA acknowledges that on some metrics, the Phase 3 rule is more impactful than earlier rules. For example, the average costs per vehicle are higher for some regulatory groupings in Phase 3 than in Phase 1. These metrics must be considered in light of the overall context (e.g., Phase 3 overall creates cost savings for manufacturers), but even these metrics reflect an iterative strengthening of the program, not the kind of unprecedented and transformative change that gives rise to a major question. They are a far cry, for instance, from the multiple order-of-magnitude increases in the number of regulated entities and in costs that the Court found in *Utility Air*.[113] The changes in Phase 3 reflect nothing more than an ordinary fluctuation in the impacts of regulation in response to changed circumstances.[114]

Commenters generally failed to acknowledge the analog between the Phase 3 and prior rules. In some cases, they focused on the absolute size of the rules' impacts. But as we explain above, the major questions doctrine cases have evaluated the consequential nature of the regulation relative to prior exercises of agency power. And many regulations with large absolute impact, by virtue of their continuity with earlier assertions of authority, are not subject to major questions scrutiny.[115] The size of the impacts, moreover, is largely a product of the large size of the HD market,[116] as well as EPA's choice to assess impacts through 2055, which allows the agency to consider the long-term impacts of the rule in light of the gradual turnover of the motor-vehicle fleet.

B. The Final Rule Does Not Impose a ZEV Mandate.

Commenters also claim that the final rule imposes vast economic and political consequences because it effectively mandates specific pollution control technologies—namely ZEVs—and effectively bans ICE vehicles. As an initial matter, commenters fail to explain why they believe establishing standards based on particular pollution control technologies imposes vast economic and political consequences inconsistent with congressional intent. More importantly, the rule

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[111] See preamble II.G.4, II.F.1-2; RIA 1.
[112] See preamble II.G.4, II.D; RIA 1.
[113] See, e.g., *Utility Air*, 573 U.S. 302, 322 (2014) ("Under the PSD program, annual permit applications would jump from about 800 to nearly 82,000; annual administrative costs would swell from $12 million to over $1.5 billion…. The picture under Title V was equally bleak: The number of sources required to have permits would jump from fewer than 15,000 to about 6.1 million; annual administrative costs would balloon from $62 million to $21 billion; and collectively the newly covered sources would face permitting costs of $147 billion.")
[114] See Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 42 (1983); *Missouri*, 595 U.S. 87, 94, 95 (2022); All. for Fair Bd. Recruitment v. Sec. & Exch. Comm'n, 85 F.4th 226, 256-58 (5th Cir. 2023).
[115] Compare, e.g., *Missouri*, 595 U.S. 87 (2022) (declining to apply the major questions doctrine), with id. at 104 (Thomas, J., dissenting) (arguing the rule should be applied because it "is undoubtedly significant—it requires millions of healthcare workers to choose between losing their livelihoods and acquiescing to a vaccine they have rejected for months"); see also, e.g., Becerra v. Empire Health Found., 142 S. Ct. 2354 (2022); EPA v. EME Homer City Generation, L.P., 572 U.S. 489 (2014)).
[116] The heavy-duty industry is rapidly expanding and expected to gross over $105 billion annually by 2032. https://www.precedenceresearch.com/heavy-duty-trucks-market

does not require manufacturers to follow a particular technology pathway.[117] The rule is not a ZEV mandate or ICE ban.

To begin with, commenters do not explain why emissions standards based on a specific pollution control technology run afoul of EPA's authority. *West Virginia v. EPA* addressed an analogous issue. In *West Virginia*, the Supreme Court reviewed the legality of EPA's Clean Power Plan, which regulated GHGs from the power sector by requiring a shift from regulated sources—coal fired plants—to completely different facilities—natural gas and renewable power plants. The agency determined that a coal fired power plant operator could comply by reducing its own production of electricity, building a new natural gas or renewable power facility, investing in another entity's such facility, or buying allowances generated by such facilities.[118] The Court applied the major questions doctrine to hold that this generation shifting scheme exceeded the agency's statutory authority under CAA section 111(d) to establish standards based on the "best system of emission reduction." By contrast, the Court noted a "technology-based" approach to regulation traditionally "focuses upon the control technologies that are available to industrial entities and *requires the agency to ensure that regulated firms adopt the appropriate cleanup technology*."[119] The Court observed that a wide range of technologies could fall under this approach, including "more traditional air pollution control measures" such as "efficiency improvements, fuel-switching," and "add-on controls."[120]

The final rule is unlike the generation shifting that the Court condemned, but rather a prototypical example of the traditional technology-based approach. The statute authorizes EPA to regulate pollutant emissions from motor vehicles. Unlike the Clean Power Plan, the final rule does not require any manufacturer to reduce its production of motor vehicles; rather, as with all prior section 202(a) rules, manufacturers can produce as many vehicles as they want, so long as their fleet meets the GHG standards.[121] The rule also does not require manufacturers to build, invest in, or otherwise support any other forms of transportation, or any strategies to reduce transportation-sector GHGs, besides producing cleaner motor vehicles—for example, we do not require motor vehicle manufacturers to build or invest in railroads, public transportation, bicycles, or smart zoning. The rule does not decree that "it would be best if [trucks] made up a much smaller share of national [freight transportation]," [122] or prescribe that only X% of freight transportation can be accomplished by truck, while Y% must occur via lower emitting modes such as rail or boat..[123] Nor does the final rule even require manufacturers to shift production

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[117] But see Engine Mfrs. Ass'n v. S. Coast Air Quality Mgmt. Dist., 541 U.S. 246, 252-53 (2004) (noting "the use of 'standard' throughout Title II of the CAA…to denote requirements such as numerical emission levels with which vehicles or engines must comply… or emission-control technology with which they must be equipped.").
[118] *West Virginia,* 142 S. Ct. at 2603.
[119] *West Virginia*, 142 S. Ct. 2587, 2601 (2022) (emphasis added); see also id. at 2610 (describing that the Mercury and Air Toxics Rule, which was "no precedent for the Clean Power Plan" but only "one more entry in an unbroken list of prior Section 111 rules," as one where EPA "set the cap based on the application of particular controls, and regulated sources could have complied by installing them.").
[120] *West Virginia*, 142 S. Ct. 2587, 2611 (2022) (citing 80 Fed. Reg. 64784); see also id. at 2602 ("high-efficiency production processes and carbon capture technology" (citing 80 Fed. Reg. 64512)).
[121] Cf. *West Virginia,* 142 S. Ct. 2587, 2610 (2022) ("[O]ur traditional interpretation ... has allowed regulated entities to produce as much of a particular good as they desire provided that they do so through an appropriately clean (or low-emitting) process." (citing 80 Fed. Reg. 64726, 64738)).
[122] *West Virginia*, 142 S. Ct. 2587, 2612 (2022).
[123] We offer these other forms of transportation for illustrative purposes only, not to suggest any finding regarding their relative GHG emissions.

within the HD vehicle category toward subcategories that can achieve greater emissions reductions. Rather, EPA recognizes the diverse needs of consumers, and has set separate standards for each regulatory subcategory,[124] including in some cases leaving the Phase 2 standards in place.[125] The final rule thus enacts no "sector-wide shift" in transportation.[126] The agency is not seeking to "improve the overall [transportation] system by lowering the carbon intensity of [transportation]."[127]

Rather, EPA is requiring manufacturers who make motor vehicles to produce vehicles that pollute less. The final standards are based on the application of pollution control technology to such vehicles: "traditional air pollution control measures" such as "efficiency improvements" that allow vehicles to consume less fuel and therefore produce fewer GHGs and "fuel-switching" including from gasoline and diesel to fuels such as electricity and hydrogen.[128] To be clear, the final rule does require manufacturers to apply some additional control technology, but it does not mandate any particular technology. As a legal matter, the rule imposes performance-based standards, not a specific technology mandate. So although EPA accounted for ZEV technologies along with other technologies in determining the level of the standards, there is no requirement for any manufacturer to produce a certain number of ZEVs, ICEs, or any particular kind of vehicle. This is in significant contrast to other programs that commenters refer to, such as California's ACT program or the Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019), both of which are ZEV sales mandates.

Commenters are correct that EPA considered available technologies, including ZEV technologies, in assessing the feasibility of the standards; thus, the standards are based on our assessment of various technologies. But this kind of technological assessment is what the statute requires. Section 202(a)(1) commands EPA to set technology-based standards, considering among other things the time "necessary to permit the development of the requisite technology" and the "cost of compliance." To do so, EPA must necessarily identify potential control technologies, evaluate the rate the technology could be introduced, and its cost.[129] In setting the Phase 3 standards, EPA has accordingly investigated potential compliance pathways, considering technological feasibility, costs, and lead time. Having identified a means of compliance, EPA's task is to "answer[] any theoretical objections" to that means of compliance, and to "offer[] plausible reasons for believing that each of those steps can be completed in the time

[124] For example, EPA determined that light HD vocational vehicles could adopt ZEV technology and achieve emissions reductions more rapidly than heavy HD vocational vehicles. See preamble II.F.1 table II-24.
[125] The Phase 3 rule does not establish more stringent optional custom chassis categories standards for coach buses, concrete mixers, emergency vehicles, recreational vehicles, and mixed use vehicles. See preamble II.F.1.
[126] While the final rule does allow for credit trading, credits are generated solely by manufacturers of HD vehicles, not by other kinds of sources, like railroad, bike, or fitness product manufacturers. In other words, as with the MATS trading program that the Court recognized as falling within EPA's authority, "EPA set the cap based on the application of particular controls, and regulated sources could have complied by installing them." *West Virginia*, 142 S. Ct. 2587, 2610 (2022). Below, we further explain why the ABT program does not implicate a major question.
[127] *West Virginia,* 142 S. Ct. at 2611.
[128] *West Virginia,* 142 S. Ct. 2587, 2611 (2022). Cf. also CAA section 241(2) (defining "clean alternative fuel" to mean any fuel including specifically "hydrogen" and "electricity").
[129] See NRDC v. EPA, 655 F. 2d 321, 328 (D.C. Cir. 1981) (noting that in order to provide a reasoned explanation for its section 202(a)(1) standards, EPA must "include[] a defense of the methodology for arriving at numerical estimates").

available."[130] That is what EPA has done here, and indeed, what it has done in all of the emission standard rules implementing section 202(a) of the Act.[131]

EPA's technical assessment supports that the final standards are feasible without manufacturers producing additional ZEVs for compliance. EPA's modeling of a potential compliance pathway in preamble II.F.1 does show an increasing penetration of ZEVs. But this is just one possible path for manufacturers to comply. In preamble II.F.4, EPA presents several additional example potential compliance pathways for attaining the standards, based on other technologies, including improvements in aerodynamics and tire rolling resistance in ICE tractors, to the use of lower carbon fuels like CNG and LNG, to hybrid powertrains (HEV and PHEV), and hydrogen ICE technologies.[132] In RIA Chapter 2.11 EPA further discusses the technical feasibility, lead-time, costs of compliance, and purchaser costs and payback associated with the additional example potential compliance pathways EPA assessed. Manufacturers have the discretion to comply according to any of these vehicle mixes, or any other vehicle mix they choose, so long as they meet the numerical standards.

Further, even under the modeled potential compliance pathway reflecting increased ZEV penetration,[133] the rate at which ZEVs enter the overall onroad HD fleet is gradual. This is largely due to the lengthy operational lives of HD vehicles, which can remain in operation for hundreds of thousands of miles and many years. Our modeling for this pathway shows that ZEVs constitute 1% of the fleet in model year 2027 and 7% by 2032, when the program is fully phased-in, an increase of just over 1% per year.[134] In other words, in 2032, 93% of HD vehicles on the road will remain ICE vehicles under the modeled potential compliance pathway. This is a far cry from the commenters' claims of 100% electrification.[135]

Historical precedent shows that EPA's performance-based standards have provided real choices to manufacturers. For example, for the HD Phase 2 rule, EPA projected compliance pathways for each of the HD subcategories.[136] To date, of the approximately 415,000 successful

[130] NRDC v. EPA, 655 F. 2d at 332.
[131] See, e.g., 77 FR 62624, 62777 (Oct. 15, 2012) (light duty vehicle GHG standards predicated on a mix of potential technologies to improve engine and vehicle fuel economy); 66 FR 5002, 5035–36 (Jan. 18, 2001) (standards for PM and NOx from heavy duty diesel engines predicated on use of catalysed diesel particulate traps and NOx adsorbers, respectively)
[132] Tables II-47 through II-49 shows a scenario where the reference case (i.e., no-action baseline absent this rule) includes ZEVs that would be produced for other reasons, e.g., for economic reasons as the costs of ZEVs decline and driven by the incentives in the IRA, and also in response to State-level ZEV standards. In this scenario, no additional ZEVs beyond the baseline are produced.
[133] Preamble II.F.1.
[134] See preamble II.F.1. Even by 2040, ZEVs constitute just 22 percent of the fleet.
[135] Commenters point to various aspirational statements about achieving 100% ZEVs, such as those made by the White House press office and the Joe Biden Presidential campaign, often citing to dead hyperlinks. While the President did direct EPA to initiate consideration of more stringent motor vehicle GHG standards, the Administrator is promulgating this final rule under his own statutory authority in section 202(a) based on his policy judgment and the voluminous technical record developed by EPA's technical experts. Aspirational statements made in White House press releases and campaign promises are not the basis for the final rule, and in any event, cannot alter the authority Congress granted in section 202(a).
[136] See, e.g., 81 FR at 73620–21 (technology packages in support of numerical GHG standard for class 7 and 8 tractors).

certifications showing compliance with the Phase 2 standards, not one has utilized the exact mix of technologies that EPA analyzed in its potential compliance pathways.

Manufacturers may also adopt entirely different strategies than what EPA anticipated. For example, in 1985, EPA set HD PM standards that were anticipated to require the use of particulate filters.[137] Manufacturers chose not to adopt such filters but rather to address the combustion process instead.[138] In 2001, EPA set HD NOx standards. We analyzed the feasibility of selective catalyst reduction (SCR) and concluded that "there [were] significant barriers to" the use of SCR, [139] such that the NOx adsorber would "be the only likely broadly applicable technology choice by the makers of engines and vehicles for the national fleet in this timeframe."[140] Manufacturers instead chose to implement SCR to achieve the standards.

To provide another example, in promulgating the 2010 LD GHG rule, EPA modeled a technology pathway for compliance with the MY 2016 standards. In actuality, manufacturers significantly diverged from EPA's projections across a wide range of technologies, instead choosing their own technology pathways best suited for their fleets.[141] For example, EPA projected 62 percent dual clutch transmissions, but in practice less than 3 percent of the MY 2016 vehicles used them; by contrast, EPA projected 28 percent 6 speed automatic transmissions, but in actuality 55 percent of vehicles used them. Looking specifically at electrification technologies, start-stop systems were projected at 45 percent and were used in 10 percent of vehicles, while strong hybrids were projected to be 6.5 percent of the MY 2016 fleet and were actually only 2 percent.[142] Notwithstanding these differences between EPA's projections and actual manufacturer decisions, the industry as a whole was not only able to comply with the standards during the period of those standards (2012-2016), but to generate substantial additional credits for overcompliance.[143]

In contrast, in other cases, manufacturers did uniformly choose to adopt a single technology—for example, manufacturers have installed catalytic converters on all new ICE vehicles. But this is not because EPA mandates catalytic converters, but rather because manufacturers have themselves chosen that technology as the most effective way to comply with the performance-based standards.

Commenters' subsidiary argument—that even if EPA could drive ZEV adoption, the agency has done so at too rapid a rate—fails for similar reasons: EPA is not mandating any manufacturer to adopt ZEVs at any rate. In addition, the rate at which EPA projects uptake of ZEV technologies in its modeled potential compliance pathway is consistent with, and often significantly smaller relative to uptake of new technologies projected in prior rules. Table 3 of

[137] 50 FR 10606, 10629-30 (Mar. 15, 1985).
[138] See 66 FR 5002, 5035-36 (Jan. 18, 2001).
[139] Id. at 5053.
[140] Id. at 5036; see also id. at 5049.
[141] *See* EPA Memorandum to the docket for this rulemaking, "Comparison of EPA CO2 Reducing Technology Projections between 2010 Light-duty Vehicle Rulemaking and Actual Technology Production for Model Year 2016".
[142] Although in 2010, EPA overestimated technology penetrations for strong hybrids, in the 2012 LD GHG Rule, we underestimated technology penetrations for PEVs, projecting only 1 percent penetration by MY 2021, while actual sales exceeded 4 percent. Compare 2012 Rule RIA, table 3.5-22 with 2022 Automotive Trends Report, table 4.1.
[143] *See* 2022 Automotive Trends Report, Fig. ES-8 (industry generated credits each year from 2012-2015 and generated net credits for the years 2012-2016).

this response presents projected technology adoption rates for the modeled potential compliance pathway for Phase 3, Phase 2, and two prior HD criteria pollutant rules. For example, assuming manufacturers rely exclusively on increasing ZEV adoption to meet the standards, EPA predicts technology adoption rates of between 0-18% within 2 model years (by MY 2027) and 5-60% within 7 model years (by MY 2032), depending on the regulatory subcategory.[144] This is well within the range of rate of increase in technology penetration rates evaluated in prior rules (e,g., Phase 2 advanced transmission predicting 55% adoption rate withing 4 model years (by MY 2021) and 90% adoption rate within 8 model years (by MY 2027)).

[144] Preamble II.F.

Table 3. Technology Penetration Rates for Phase 3 and Prior HD Rules

Rulemaking (Year)[145]	Technology	Penetration Rate		
		Baseline Technology (MY)[146]	Projected (First MY of Phase-in)	Projected (Final MY of Phase-in)
Phase 3 (2024)	ZEV (BEV or FCEV)	0% (2027)[147]	0-18% (2027)[148]	5-60% (2032)[149]
Phase 2 (2016)	High Roof Sleeper Cab Tractors (Advanced aerodynamic package (Bin V)	0% (2017)[150]	10% (2021)[151]	50% (2027)[152]
Phase 2 (2016)	Sleeper and Day Cab Tractors Advanced Transmissions (Automated manual, automatic, and dual clutch transmissions)	0% (2017)[153]	55% (2021)[154]	90% (2027)[155]
HD 2027 (2023)	Diesel Technology Package (Next gen catalyst formulations in dual SCR catalyst configuration & cylinder deactivation)	0% (2018-2022)[156]	100% (2027)[157]	–
HD 2027 (2023)	Diesel Technology Package (Closed crankcase)	32.5% (2018-2022)[158]	100% (2027)[159]	–
HD 2007-2010 NOx Standards (2001)	Diesel Technology Package (Diesel oxidation catalyst, Diesel particulate filters, NOx adsorber catalysts)	0% (2000)[160]	50% (2007)[161]	100% (2010)[162]
HD 2007-2010 PM Standards (2001)	Diesel Technology Package (Diesel oxidation catalyst, Diesel particulate filters)	0% (2000)[163]	100% (2007)[164]	–

[145] The year indicated here is the date of publication of the rulemaking in the Federal Register.
[146] The Baseline Technology column reflects the level of technology adoption projected by EPA for the MY indicated, prior to the promulgation of the rulemaking at issue for that row. Generally, this is the "baseline technology" or "baseline vehicle" in that rulemaking, which is the theoretical baseline engine or vehicle that meets the existing standards for the indicated model year and which EPA uses to evaluate costs and effectiveness of additional technologies and standards in the rulemaking at issue's technology packages. This column is provided to give an indication of then-current baseline adoption of the technologies at the time of each rulemaking.
[147] The baseline vehicle for the Phase 3 standards is the theoretical vehicles that match the Phase 2 MY 2027 technology packages, which does not include ZEV technologies (i.e., 0%). See RIA Chapters 2 and 3; see also 81 FR 73610-73611 (tractors) and 81 FR 73714-73715 (vocational vehicles). See also Section E.S. of the preamble, explaining ZEV production volumes in MY 2022 based off of EPA certification data, which are approximately 0.6% adoption rate for MY 2022.
[148] Preamble II.F.
[149] Preamble II.F.1 presenting projected percentage of ZEVs by regulatory group. Note that this figure does not include optional custom chassis standards.
[150] See the Phase 2 rulemaking preamble, describing that the baseline tractor for the Phase 2 tractor standards was a theoretical vehicle that met the MY 2017 existing standards and which for high roof sleeper cab tractors did not include advanced aerodynamic package (Bin V). 81 FR 73588; see also Phase 1 MY 2017 high roof sleeper cab tractors technology package (76 FR 57211).
[151] 81 FR 73608.
[152] 81 FR 73610.

Indeed, premising protective emission standards on rapid technology adoption has been a mainstay of section 202(a) regulation since the earliest days of the Act. In 1971, EPA finalized standards for MY 1975, just three model years away, based on catalytic converter technology.[165] At the time of the final rule, catalytic converters were not yet in widespread commercial production.[166] Faced with the ongoing air pollution crisis, EPA nonetheless established stringent standards premised on a technology that the agency believed would become available in the lead-time permitted. Many in the industry argued that the technology would not be ready in time and sought extensions, including based on testing data showing that many vehicles were not expected to meet the standards. The Administrator denied those requests.[167] By MY 1975, automakers began installing catalytic converters on their vehicles that achieved 85% reductions in emissions.[168] Over time, greater use of electrification technologies to control and monitor the performance of catalytic converters further increased their efficacy. Today, the catalytic

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[153] See the Phase 2 rulemaking preamble, describing that the baseline tractor for the Phase 2 tractor standards was a theoretical vehicle that met the MY 2017 existing standards and which for sleeper and day cab tractors did not include advanced transmissions (automated manual, automatic, and dual clutch transmissions). 81 FR 73588; see also 76 FR 57203, explaining that we did not include such technologies in our Phase 1 standards setting or compliance model.

[154] 81 FR 73608.

[155] 81 FR 73611.

[156] 88 FR 4343-44 (describing that EPA's baseline technology assessment used data provided by manufacturers in the heavy-duty in-use testing program, certification data, and testing of three then-modern engines); HD2027 RIA Chapter 1.1.1 (describing then-current (MY 2018-2022) heavy-duty diesel exhaust aftertreatment systems).

[157] 88 FR 4333, 4340.

[158] 88 FR 4339 (explaining approximately one-third of then-current highway heavy-duty diesel engines have closed crankcases); HD2027 RIA Chapter 3.1.4.2 (describing that an estimated 32.5 percent of then-current (MY 2018-2022) heavy-duty diesel engines already have closed crankcase systems).

[159] 88 FR 4333, 4340.

[160] See, e.g., 66 FR 5047-48, 5049.

[161] 66 FR 5036.

[162] 66 FR 5036.

[163] See, e.g., 66 FR 5047-48.

[164] 66 FR 5036.

[165] 36 FR 12652 (1971); 36 FR 12657 (1971).

[166] See Glenn Rifkin, John Mooney, a father of the catalytic converter, dies at 90, Washington Post (June 26, 2020), https://www.washingtonpost.com/local/obituaries/john-mooney-a-father-of-the-catalytic-converter-dies-at-90/2020/06/26/afbd87da-b7b4-11ea-aca5-ebb63d27e1ff_story.html (describing "the development of the first wave of production catalytic converters in 1973" in response to "new requirements for reduced auto emissions in the Clean Air Act of 1970").

[167] See generally Aaron Robinson, Fifty years ago, the government decided to clean up car exhaust. It's still at it., HAGERTY (Oct. 7, 2020), https://www.hagerty.com/media/magazine-features/fifty-years-ago-the-government-decided-to-clean-up-car-exhaust-its-still-at-it/ 7, 2020), https://www.hagerty.com/media/magazine-features/fifty-years-ago-the-government-decided-to-clean-up-car-exhaust-its-still-at-it/; EPA, EPA: A Retrospective, 1970-1990 (Nov. 29, 1990), https://www.epa.gov/archive/epa/aboutepa/epa-retrospective-1970-1990.html ("The Agency's strong stand led to strict enforcement of the Clean Air Act. Ruckelshaus refused to grant extensions requested by automobile manufacturers to meet hydrocarbon and carbon monoxide standards. In effect, he forced the adoption of the catalytic converter."); EPA, Hearings Set on Automobile Pollution Control (Mar. 4, 1971), https://www.epa.gov/archive/epa/aboutepa/hearings-set-automobile-pollution-control.html;

[168] Dennis C. Williams, The Guardian: EPA's Formative Years, 1970-1973 (Sept. 1993), https://www.epa.gov/archive/epa/aboutepa/guardian-epas-formative-years-1970-1973.html ("By 1973, EPA and auto manufacturers had agreed to adopt the catalytic converter as a means to reduce automobile emissions by 85% in 1975 year model cars.").

converter “is considered to be one of the great environmental inventions of all time.”[169] This history dating back to the very beginning of the Clean Air Act further reflects that the major questions comments, notwithstanding their citation to recent court cases, reflect fairly ordinary concerns. We emphasize, however, a critical difference between EPA’s 1971 rules and this rule: unlike the catalytic converter, which was unproven at the time of the 1971 rule, ZEV technology has developed and been applied for over two decades. EPA’s rule is supported by a modeled potential compliance pathway that includes application of an existing commercialized technology to new applications, and in that respect it is far less transformative than the agency’s earliest CAA section 202(a) rulemakings.

The size of emissions decreases also reflect a rule that is in line with its predecessors. For example, Table 2 shows that the net GHG emissions reductions in the final year of the program are smaller than the Phase 1 and 2 rules. The statute also contemplates steep emissions reductions. As noted in Part I above, the Clean Air Act Amendments of 1970 required emissions decreases of 90% over a five model year period, the 1990 Amendments required a 100% phase-in of demanding standards over a six to seven year period, and Congress expressly preserved the Administrator’s authority to promulgate even more stringent standards.

C. The Final Rule’s Indirect Impacts Do Not Give Rise to a Major Question.

Commenters claiming the existence of a major question generally did not grapple with the considerable similarities between the Phase 3 rule and its predecessors. Rather, they focused on the rule’s alleged impacts on third parties beyond the regulated entities and their customers, which we refer to here as “indirect impacts.” They cite considerations as diverse as how demand for critical minerals could implicate US-China geopolitics, increased consumption of electricity to operate BEVs could destabilize the electric grid, decreased oil consumption could cause oil companies to fail, and so on. They claim that the proposal’s costs grossly underestimate the rule’s “true costs,” based on their assertion that the proper metric is “aggregate cost” for the rule’s significance to the “national economy.” But commenters fail to identify any precedent holding that mere indirect impacts on unregulated entities give rise to a major question.[170] To the contrary, legal and technical reasons provide weighty reasons to hesitate before relying on indirect impacts to ascertain the existence of a major question.

First, the statute here does not require consideration of such indirect impacts, suggesting that their presence should not limit the agency’s statutory authority. Section 202(a) mandates the Administrator to regulate emissions from motor vehicles, upon making the endangerment finding, subject to considerations of feasibility, lead-time, costs of compliance, and safety. While EPA is authorized to consider other factors and has in this rulemaking considered certain indirect impacts, as described in Part III.E below, consideration of other factors is not mandated by

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[169] EPA, Accomplishments and Successes of Reducing Air Pollution from Transportation in the United States (Jan. 3, 2024), https://www.epa.gov/transportation-air-pollution-and-climate-change/accomplishments-and-successes-reducing-air

[170] See, e.g., *West Virginia*, 142 S. Ct. 2587 (2022) (considering the consequential nature of a regulation of electric generating units with regard to its direct burdens on that sector), 2613 (noting “an obvious difference between (1) issuing a rule that may end up causing an incidental loss of coal's market share, and (2) simply announcing what the market share of coal, natural gas, wind, and solar must be, and then requiring plants to reduce operations or subsidize their competitors to get there”).

law.[171] As such, while the agency's consideration of these additional impacts could be subject to arbitrary and capricious review, they do not limit the agency's authority.

Second, the statutory context and legislative history supports not relying on indirect impacts to gauge the limits of statutory authority. For example, with respect to employment, Congress in enacting the 1977 Clean Air Act Amendments debated the employment impacts associated with the addition of new control technology for motor vehicles, with some Members projecting job increases of up to 180,000 new jobs and others projecting job losses in the tens of thousands.[172] Nonetheless, Congress enacted stringent statutory standards for motor vehicle emissions control. Congress in the 1990 Clean Air Act Amendments chose to further address labor dislocations through funding and training. It added Clean Air Employment Transition Assistance provisions to the Job Training Partnership Act. The added provisions provided funding for "training, adjustment assistance, and employment services to [eligible dislocated workers] adversely affected by compliance with the Clean Air Act" and for "needs-related payments to such individuals."[173] In short, Congress was well aware that impacts to employment were a possibility and provided funding and training for affected workers; but it did not prohibit the agency from further regulation on the basis of employment.

To take another example, in enacting the CAA Amendments of 1990, Congress recognized the need for the critical mineral rhodium for the production of catalytic converters (a ubiquitous motor vehicle pollution control technology) and that South Africa was home to the vast majority of the world's then-known rhodium deposits.[174] While Congress acknowledged concerns with South Africa's human rights record, it nonetheless proceeded to significantly strengthen the motor vehicle emissions standards, such that the production of the necessary technologies could require dependence on South African rhodium supplies. Thus, Congress understood that the nation may need to look to other countries for critical materials where necessary to improve motor vehicle emissions control technology, but mandated emissions reductions regardless. At the same time, Congress also mandated that EPA study the appropriateness of even stronger standards and expressly reserved the agency's authority to promulgate such standards without including critical minerals as a specific factor to consider.[175]

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[171] Motor & Equip. Mfrs. Ass'n, Inc. v. E.P.A., 627 F.2d 1095, 1118 (D.C. Cir. 1979); see also id. ("There is no indication that Congress intended section 202's cost of compliance consideration to embody social costs of the type petitioners advance," and holding that the statute does not require EPA to consider antitrust concerns); Coal. for Responsible Regul., Inc. v. E.P.A., 684 F.3d 102, 128 (D.C. Cir. 2012) (holding that the statute "does not mandate consideration of costs to other entities not directly subject to the proposed standards"); *Massachusetts*, 549 U.S. 497, 534 (2007) (impacts on "foreign affairs" are not sufficient reason for EPA to decline making an endangerment finding under section 202(a)(1)).

[172] 123 Cong. Rec. 18182 (1977).

[173] Pub. L. 101-549, at sec. 1101, amending the Job Training Partnership Act, 29 U.S.C. 1501 et seq. (since repealed). *See also* 136 Cong. Reg. H12911-01 (Oct. 26, 1990) (statement of Representative William D. Ford) ("When a business closes or lays off workers as a consequence of this act, because demand for its products or services is adversely affected, because a product is banned, or because its production processes have become uneconomical, State government, substate grantees, employers, employer associations, and representatives of employees may apply to the Secretary of Labor for funds to help laid off workers find new employment.").

[174] See 136 Cong. Rec. 5102-04 (1990). The 1990 CAA Amendment are not the first time that Congress wrestled with potential dependence on South Africa for rhodium. Congress also recognized this issue when developing the 1977 CAA Amendments. See 123 Cong. Rec. 18173-74 (1977).

[175] See CAA section 202(i), (i)(3)(B).

Third, indirect impacts are often subject to greater uncertainties, and in many cases are not reasonably foreseeable, particularly when separated from the agency's action by a lengthy causal chain. Thus for instance, while EPA has assessed indirect impacts in calculating the rule's costs and benefits—and the presence of positive net benefits supports the rationality of the Administrator's judgment—we do not rely on cost-benefit calculations, with their uncertainties and limitations, in identifying the appropriate standards. [176] Some other impacts are so tenuously linked that they are not amenable to estimation at all, such as—to provide one example raised by a commenter—how the final rule might impact child labor in Congo, a matter which the final rule does not regulate and which, to the extent the United States has any influence, would involve matters of trade and foreign policy outside the scope of the CAA.[177]

Finally, regulations routinely have wide-ranging indirect impacts, so such impacts cannot practically be relied on to identify "extraordinary" cases. For example, EPA's motor vehicle rules generally impose costs on industry, and as such may affect the economics of the regulated entities as well as their employees, suppliers and customers; fuel producers, distributors, and retailers; and generally the global supply chains to manufacture vehicles, parts, and raw materials. The same can be said for every major regulation, such that relying on indirect effects would offer no limiting principle in determining the existence of major questions.

As such commenters' assertions about the myriad indirect effects do not reflect the rule's extraordinary nature, but rather the ordinary state of the global supply chain associated with motor vehicles. For instance, although commenters criticize US motor vehicles manufacturers' reliance on China for certain critical minerals used in manufacturing batteries, they fail to acknowledge that reliance on foreign trade is not unique to ZEVs; rather manufacturers rely on imports from China and other nations for a wide range of inputs used in production of ICE vehicles,[178] and such reliance is continuously adapting to changing market and regulatory

[176] To provide a more specific example, the agency has modeled the impacts of the final rule on grid reliability and found that grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with increasing use of BEVs. Yet, as the agency explains in the Resource Adequacy and Grid Reliability Technical Memo, any potential reliability impacts would not be a direct result of this rule but rather of the compliance choices source owners, operators, ISOs and RTOs may pursue, none of which are directly regulated under the final rule. This is a critical difference between this rule and the rule under review in *West Virginia*, where EPA did directly regulate EGUs, and is why grid reliability impacts are of limited relevance to ascertaining the existence of a major question here.

[177] The commenter claims that EPA's final rule will increase demand for cobalt, the Democratic Republic of the Congo controls large reserves of cobalt, and therefore the final rule will aggravate the human rights concerns associated with Congolese child labor as well as geopolitical risks with China, which owns and refines a significant portion of Congolese cobalt output. But the final rule does not regulate battery manufacturers, much less the labor practices at Congolese critical minerals mines, or Chinese ownership of Congolese companies, rendering any such associated impacts highly speculative. (The same, of course, can be said in relation to critical minerals used in ICE vehicles emissions control technologies—e.g., the final rule does not regulate the labor practices of those mines either.) We also note that future technological developments may diminish the use of cobalt in vehicle batteries, which provides another reason not to place weight on the extended chain of hypothetical causation raised by the commenter. See Chen et al., "A Layered Organic Cathode for High-Energy, Fast Charging, and Long-Lasting Li-Ion Batteries" *ACS Cent. Sci.* 2024 (demonstrating "the operational competitiveness of sustainable organic electrode materials [derived from earth-abundant elements] in practical batteries"), available at https://pubs.acs.org/doi/epdf/10.1021/acscentsci.3c01478.

[178] See, e.g., David Coffin, China's Growing Role in U.S. Automotive Supply Chains, Office of Industries of the U.S. International Trade Commission (USITC) Working Paper ID-060 (Aug. 2019).

forces.[179] For example, a 2018 EPA case study of Ford found that Ford has "approximately 11,000 suppliers in over 60 countries."[180] Such reliance is not unique to the motor vehicle industry. Aluminium, for instance, is an important raw material used in motor vehicle manufacturing and numerous other industrial applications. It is largely imported, and such imports can have potential national security implications.[181] To provide another example, Apple's supply chain comprises "more than 400 facilities across 180 regions in nearly 30 countries."[182] Overcoming supply chain vulnerabilities is a key component of managing any significant manufacturing operation in today's global world.[183]

Turning to infrastructure, although commenters take aim at the need for new electric charging and hydrogen refueling infrastructure to supply BEVs and FCEVs, they fail to mention that ICE vehicles depend on extensive infrastructure for their operation too, and that infrastructure has changed considerably over the decades in response to environmental regulation. Important changes include the elimination of lead from gasoline, the provisioning of diesel exhaust fluid (DEF) at truck stops to support selective catalytic reduction (SCR) technologies, and the introduction of low sulfur diesel fuel to support diesel particulate filter (DPF) technologies.[184] Each of these changes required establishment of new manufacturing and distribution systems to ensure these fuels and DEF were available to drivers across the country.

Commenters also speculated that the costs of the rule will dramatically increase the costs of freight transportation; but all pollution control technologies impose upfront costs. And commenters neglected to mention that ZEV technologies are actually expected to save purchasers money due to their lower operating expenses,[185] such that the economic costs of transporting goods are likely to decrease. Commenters also complain about the potential losses for the petroleum industry but fail to mention that is true for all of EPA's motor vehicle GHG

[179] For example, the US motor vehicle industry relies on the global supply chain for semiconductors. The recent shortage in semiconductors caused significant impacts on the motor vehicle industry. See, e.g., Jeanne Whalen, Semiconductor shortage that has hobbled manufacturing worldwide is getting worse, https://www.washingtonpost.com/us-policy/2021/09/23/chip-shortage-forecast-automakers/. The shortage was due to numerous factors, ranging from impacts of pandemic lockdowns on semiconductor production and international trade; the impacts of the pandemic in increasing demand for automobiles and other electronics that use semiconductors; natural disasters that shuttered production facilities; trade conflicts between the US, China, Korea, and Japan; and the Russia-Ukraine conflict. See Russia-Ukraine war: Impact on the semiconductor industry, https://kpmg.com/ua/en/home/insights/2022/05/russia-ukraine-war-impact-semiconductor-industry.html; Esther Shein, Global Chip Shortage: Everything You Need to Know, https://www.techrepublic.com/article/global-chip-shortage-cheat-sheet/.

[180] https://www.epa.gov/climateleadership/success-stories-case-studies-supply-chain-engagement

[181] See, e.g., A Proclamation on Adjusting Imports of Aluminum Into the United States (Feb. 24, 2023), https://www.whitehouse.gov/briefing-room/presidential-actions/2023/02/24/a-proclamation-on-adjusting-imports-of-aluminum-into-the-united-states-4/.

[182] https://www.bloomberg.com/graphics/2023-opinion-apple-supply-chain-climate-change/

[183] See, e.g., Willy C. Shih, Global Supply Chains in a Post-Pandemic World, https://hbr.org/2020/09/global-supply-chains-in-a-post-pandemic-world; KPMG, Vulnerable supply in Automotive, https://kpmg.com/xx/en/home/insights/2022/05/vulnerable-supply-in-automotive.html

[184] See, e.g., 88 FR 4376 (inducement requirements associated with SCR and DEF); 79 FR 23414 (low sulfur fuel and advanced control technologies for gasoline vehicles); 66 FR 5002 (low sulfur fuel and diesel particulate filters); CAA 218 (Prohibition on production of engines requiring leaded gasoline).

[185] See preamble II.G.4.

rules, which have continually been premised on reducing petroleum consumption.[186] Indeed, as shown in Table 2 of this response, the Phase 1 and 2 rules were anticipated to cause even greater reductions in petroleum consumption. And commenters fail to grapple with the fact that increased demand for fossil fuels is associated with adverse impacts to US energy security.

D. EPA Has Expertise in Assessing Indirect Impacts of Its Environmental Regulations.

To the extent indirect impacts are relevant, EPA has relevant expertise in assessing such impacts, particularly in consultation with other expert agencies. In addition to the agency's principal expertise in pollution control, EPA also has broad expertise in evaluating the indirect impacts of its actions, both independently and in consultation with other expert agencies.

Congress itself recognized that EPA's CAA actions could have a wide range of non-environmental impacts and entrusted the Administrator with regulating notwithstanding such impacts.[187] For example, in section 202(a)(3)(A), Congress directed EPA to establish motor vehicle emission standards "giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology." Congress also authorized EPA, in administering the motor vehicle emissions standards, to "exempt any new motor vehicle or new motor vehicle engine" from certain statutory requirements "upon such terms and conditions as he may find necessary … for reasons of national security."[188] Congress further directed EPA to promulgate emissions standards not only for domestically produced vehicles, but also vehicles imported into the United States from foreign nations.[189] Thus, while we agree that EPA is not the exclusive or principal Federal agency charged with regulating energy, safety, national security, international trade, and so forth, Congress nonetheless vested EPA with authority, and EPA possesses sufficient expertise, to evaluate concerns in these and other areas in relation to its motor vehicle emissions control program. It bears mentioning, moreover, Congress directed EPA alone—not in consultation with or subject to the agreement of any other agency—to evaluate the above effects, indicating Congress's decision to entrust such judgments to EPA's expertise.

More generally, Congress has also recognized the agency's general expertise in considering the "public health and welfare" implications of air pollution.[190] In addition to EPA's authority to act on its own, Congress further directed EPA, in consultation with other agencies, to conduct a "comprehensive analysis of the impact of this chapter on the public health, economy, and

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[186] Commenters also neglect to note that the vast majority of such reduced consumption (estimated by EPA as 94.8%) would come from reduced net imports, with only the remaining small fraction linked to reduced domestic production. See RTC 22.

[187] See generally Am. Elec. Power Co. v. Connecticut, 564 U.S. 410, 427, 428 (2011) ("As with other questions of national or international policy, informed assessment of competing interests is required. Along with the environmental benefit potentially achievable, our Nation's energy needs and the possibility of economic disruption must weigh in the balance. The Clean Air Act entrusts such complex balancing to EPA in the first instance, in combination with state regulators…. Congress designated an expert agency, here, EPA, as best suited to serve as primary regulator of greenhouse gas emissions.").

[188] CAA section 203(b)(1).

[189] CAA section 203(a)(1); see also, e.g., CAA section 216(1).

[190] See, e.g., CAA section 202(a)(1) (requiring EPA to promulgate standards for emissions from motor vehicles "which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare"), 202(a)(4)(A) (precluding the use of any emissions control device that creates "unreasonable risk to public health, welfare, or safety in its operation or function").

environment of the United States."[191] The statute also requires EPA to establish emission standards for electric generating units, including based on consideration of "the energy. . . impacts of compliance."[192] These statutory provisions further indicate that Congress believed EPA had sufficient expertise to evaluate manifold indirect impacts.[193] Moreover, EPA has in numerous prior rulemakings considered the indirect impacts of its motor vehicle regulations on factors like employment, national security, and the electric grid.[194]

E. EPA Determined that the Final Rule Does Not Cause Significant Indirect Harms and Has Large Net Benefits.

EPA carefully assessed the indirect impacts of the final rule, pursuant to its own expertise and in consultation with many expert agencies. The agency projects that the final rule accrues positive net benefits for society and will not cause significant indirect harms, such as to national security, grid reliability, or employment. The rule also creates the potential for positive benefits in these and other areas, including through mitigating climate change, reducing dependence on foreign oil, and creating regulatory certainty for the manufacturing of advanced pollution control technologies and the development of electric charging and hydrogen refueling infrastructure.

In promulgating the final rule, EPA applied its own considerable expertise in motor vehicle pollution control as well as assessing related environmental and economic impacts. Further, the agency engaged in extensive consultation both during the interagency review process pursuant to Executive Order 12,866 and outside of that process.[195] EPA consulted with numerous Federal agencies and workgroups[196] with a wide range of expertise, including in the availability of critical minerals, battery and fuel-cell technologies, charging and hydrogen refueling infrastructure, grid reliability, employment, safety, foreign trade, national security, and more.

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[191] CAA section 312(a) (directing EPA to conduct a "comprehensive analysis of the impact of this chapter on the public health, economy, and environment of the United States").

[192] See, e.g., CAA section 169A(b), (g)(2) (requiring EPA to determine best available retrofit technology for existing "fossil-fuel fired generating powerplant[s]," giving consideration to factors including "the energy and nonair quality environmental impacts of compliance").

[193] See also, e.g., CAA section 202(l)(2) ("noise, energy, and safety factors"), 211(o)(2)(B)(ii)(II) ("energy security"), (IV) ("the infrastructure of the United States, including deliverability of materials, goods, and products other than renewable fuel, and the sufficiency of infrastructure to deliver and use renewable fuel"), (VI) ("job creation, the price and supply of agricultural commodities, rural economic development, and food prices").

[194] See, e.g., HD Phase 2 RIA, 8.8 (Petroleum, Energy and National Security Impacts), 8.10 (Employment Impacts); HD Phase 1 RIA, 9.7 (Petroleum, Energy and National Security impact), 9.9 (Employment Impacts); 2021 LD RIA, 3.2 (energy security impacts); 8.2 (employment); 2021 LD RTC 12-83 (grid reliability), 19-18 (national security); see also EPA, Power Sector Modeling, https://www.epa.gov/power-sector-modeling (describing EPA's IPM model of the power sector, which the agency applies in its rulemaking affecting that sector and listing numerous rules that have applied the model).

[195] See preamble ES.E.

[196] National Highway Traffic Safety Administration (NHTSA) at the Department of Transportation (DOT), Department of Energy (DOE) including several national laboratories (Argonne National Laboratory (ANL), Lawrence Berkeley National Laboratory (LBNL), National Renewable Energy Laboratory (NREL), and Oak Ridge National Laboratory (ORNL)), United States Geological Survey (USGS) at the Department of Interior (DOI), Joint Office of Energy and Transportation (JOET), Federal Energy Regulatory Commission (FERC), Department of Commerce (DOC), Department of Defense (DOD), Department of State, Federal Consortium for Advanced Batteries (FCAB), and Office of Management and Budget (OMB).

The agency also consulted with State and regional agencies with relevant expertise.[197] And EPA conducted extensive engagement with a diverse range of stakeholders, including vehicle manufacturers, labor unions, technology suppliers, dealers, utilities, charging providers, environmental justice organizations, environmental organizations, public health experts, tribal governments, and other organizations. EPA also carefully considered the input it received through the public hearing and written comments, including 172,567 comments representing diverse stakeholders.

EPA finds that this rule creates $13 billion in annualized net benefits (2022$ 2% AV). The rule's positive net benefits support the rationality of the Administrator's judgment. But the agency did not rely on the cost-benefit calculations, with their uncertainties and limitations, in identifying the appropriate standards. We recognize that some commenters claimed this large net benefits figure itself amounted to vast economic and political consequences. We do not agree for the reasons stated above in Part III.C. It would also be particularly perverse, given Congress's grant of authority in section 202(a) to control motor vehicle air pollution, to conclude that where an agency action is accomplishing what Congress directed the agency to do and achieves large benefits, for those benefits to somehow call into question EPA's authority for the action in the first place. Even were the size of the net benefits to be relevant, as we show in Table 2 of this response, the Phase 3 rule has smaller net benefits than its Phase 1 and 2 predecessors.

Throughout the preamble, RIA, and RTC, EPA further addresses specific impacts, including those of particular concern to these commenters, including electric charging infrastructure and grid reliability (e.g., preamble II.D.2.iii, RIA 1.6, 2.6, RTC 6-7); hydrogen refueling infrastructure (e.g., preamble II.D.3.v, RIA 1.8, RTC 8); oil imports and energy security (e.g., preamble VI.F, RIA 6.5, 7.3, RTC 22); critical minerals (e.g., preamble II.D.2.ii.c, RIA 1.5.1, RTC 17.2); and employment (e.g., preamble VI.E.4, RIA 6.4, RTC 19). We summarize some key observations here.

Based on our review of the extensive evidence in the administrative record, we project that there will be adequate electric charging and refueling infrastructure to support the standards, with sufficient depot charging and supporting distribution grid buildout beginning in MY 2027 and sufficient public charging and hydrogen refueling beginning in MY 2030; based on public comments and our updated analysis, EPA also adjusted the stringency of the standards to account for the greater lead time anticipated for the installation of charging and hydrogen refueling infrastructure. Grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with HD BEV charging, and managed charging strategies can be applied to further decrease grid impacts.[198] We expect sufficient supplies of critical minerals to support battery production, given both global supplies as well the significant government efforts through the BIL and IRA as well as private investments to develop domestic mining and processing capacity. Furthermore, the rule is projected to significantly reduce the consumption of petroleum, whether through increased adoption of ZEVs or other advanced ICE vehicle technologies that reduce petroleum use; we expect the vast majority of this decrease (94.8%) to

[197] California Air Resources Board (CARB), and other States, including members of the National Association of Clean Air Agencies (NACAA), the Association of Air Pollution Control Agencies (AAPCA), the Northeast States for Coordinated Air Use Management (NESCAUM), and the Ozone Transport Commission (OTC).

[198] Specifically, EPA assessed the cumulative impacts of BEV charging in response to the combined impact of this rule and the final light- and medium-duty multi-pollutant rule. Taken together, these rules are associated with a modest and manageable increase in electricity demand, and are not expected to adversely impact grid reliability.

reflect decreased net imports, which yields significant positive benefits for energy security, with relatively limited impacts on domestic refining. We find the potential for employment shifts between industries (e.g., from ICE and ICE vehicle manufacturing to ZEV, battery, and fuel cell manufacturing); and while we do not have sufficient data to quantify employment impacts, there is evidence that—assuming production of electric vehicles and their power supplies are done in the US at the same rates as ICE vehicles—US employment is likely to increase in response to increased ZEV adoption.

Moreover, as we explain in preamble II, EPA has also made various conservative assumptions in making predictive judgments associated with increased ZEV adoption, such that there is a realistic likelihood that the market moves even more quickly toward ZEV adoption and achieves greater emissions reductions at a lower cost than we anticipate. At the same time, the standards do not mandate a specific level of ZEV technologies—or any increased production of ZEVs to meet the standards at all —such that in the event the barriers to ZEV adoption are greater than we project, manufacturers have the flexibility to adopt other technologies and mitigate the need for ZEV-related critical minerals, infrastructure, and so forth.

Furthermore, as discussed in preamble ES and throughout the RIA, many ongoing efforts help ensure the smooth implementation of the final rule. Significant initiatives by the Federal government (such as the BIL and IRA), State and local government, and private firms, complement EPA's final rule, including initiatives to reduce the costs to purchase ZEVs; support the development of domestic critical mineral, battery, and ZEV production; and accelerate the establishment of charging and hydrogen refueling infrastructure. As discussed in RTC 2.9, EPA is also monitoring industry's performance in complying with mobile source emission standards, including the final rule, as well as the availability of supporting infrastructure. We commit to actively engage with stakeholders and monitor both manufacturer compliance and the major elements of the HD ZEV infrastructure. Based on these efforts, as appropriate and consistent with CAA section 202(a) authority, EPA may decide to issue guidance documents, initiate a future rulemaking to consider modifications to the Phase 3 rule, or make no changes to the Phase 3 rule program.

Moreover, commenters raising major questions concerns unduly focused on the potential for negative indirect impacts associated with the final rule, while neglecting the negative impacts of inaction. Put differently, they ignored the rule's potential to create positive impacts, which—as many other stakeholders noted—are many and great. Foremost, the positive impacts include the beneficial impacts of mitigating air pollution—the primary purpose of section 202(a)—here carbon pollution, which poses catastrophic risks for human health and the environment, water supply and quality, storm surge and flooding, electricity infrastructure, agricultural disruptions and crop failures, human rights, international trade, and national security.[199] Other positive impacts include reduced dependence on foreign oil and increased energy security and independence; increased regulatory certainty for encouraging domestic production of advanced pollution control technologies and their components (including ZEVs, batteries, fuels cells, battery components, and critical minerals) and for the development of electric charging and hydrogen refueling infrastructure, with attendant benefits for employment and US global

[199] See preamble II.A.

competitiveness in these sectors; and increased use of electric charging and potential for vehicle-to-grid technologies that can support electric resource adequacy and grid reliability.[200]

In sum, the final rule does not create vast economic and political consequences of an unprecedented kind. The rule builds upon the market's transition to ZEVs—in response to emerging technological developments, Congress's support in the IRA, and other factors—and strengthens the GHG standards. Its direct impacts are analogous to, and in key respects less impactful than, its predecessors. And contrary to what commenters claim, the final rule is not a ZEV mandate as a manufacturer can comply with the standards without producing additional ZEVs. As for indirect impacts, there is nothing different in kind about those impacts of the final rule compared to the impacts of prior rules; the presence of such impacts merely reflects the ordinary nature of the global supply chain for motor vehicles. Even were the agency to consider indirect regulatory impacts, the final rule causes no significant indirect harms of the kinds that commenters allege, has the potential for positive impacts, and on balance provides positive net benefits to society.

IV. Additional factors counsel against application of the major questions doctrine.

Additional factors present further evidence that the major questions doctrine does not apply: the agency's assertion of authority does not create an unworkable conflict with any other statutory provision, the action does not significantly alter the balance of Federal and state power or the power of government over private property, and notwithstanding political interest in motor vehicle GHG regulation, the weight of statutory and legislative evidence supports EPA's authority.

First, the final rule is not in conflict with other statutory provisions. As an initial matter, commenters' attempts to wrap their many statutory interpretation challenges in the major questions cloth are misplaced. Ordinary claims of statutory inconsistency, even when "multiple Federal statutes" are allegedly in conflict, are governed by the "traditional rules of statutory interpretation."[201] For example, in *Utility Air*, the Court deferred to EPA's interpretation of the statute notwithstanding petitioners' arguments that the agency's approach was "fundamentally unsuited" given the statutory context, because such approach was not "so disastrously unworkable, and need not result in such a dramatic expansion of agency authority."[202] Here, the commenters' allegations of inconsistency with other statutory provisions[203] are basically run-of-the-mill interpretive disputes that can be resolved under traditional principles of interpretation, and in any event, lack merit. We generally respond to commenters' statutory interpretation

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[200] EPA did not rely on these other positive impacts, or the net benefits calculations, in identifying the level of the standards. Nonetheless, the potential for such positive impacts as well as the presence of positive net benefits support the rationality of the standards.
[201] POM Wonderful LLC v. Coca-Cola Co., 134 S. Ct. 2228, 2236 (2014); cf. also Dep't of Agric. Rural Dev. Rural Hous. Serv. v. Kirtz, No. 22-846, 2024 WL 478567, at *11 (U.S. Feb. 8, 2024) ("we approach federal statutes touching on the same topic with a strong presumption they can coexist harmoniously…. Where two laws are merely complementary—as is undisputedly the case here—our duty lies not in preferring one over another but in giving effect to both.").
[202] *Utility Air*, 573 U.S. 302, 332 (2014)
[203] In some cases, commenters do not even identify an actual conflict, but base their argument primarily on the *expressio unius* canon. We offer specific responses regarding the application of *expressio unius* in RTC 2 and 10.2.1.e.

arguments throughout preamble section I.C and RTC 2 and 10. In this section, we summarize a few of the responses specifically as they pertain to the major questions doctrine.

Commenters assert that EPA's averaging, banking, and trading (ABT) program is inconsistent with various compliance and enforcement provisions in the statute, e.g., CAA sections 203-207, and specifically criticize EPA's decision to assess the feasibility of the standards based on an average of the emissions performance of ZEVs and ICE vehicles. We respond to the statutory interpretation arguments against ABT in RTC 10.2.1. We also do not see how ABT gives rise to a major question either as to its own validity or to EPA's use of averaging as part of the process of determining stringency of the standards.

Congress has decided the major question here: EPA must control air pollution from motor vehicles. ABT is a compliance mechanism to achieve that aim. ABT recognizes the practical realities of the motor vehicle industry and its strategies for reducing GHGs: manufacturers do not redesign every vehicle in every single year, any given manufacturer may find it cheaper to reduce emissions on one kind of vehicle versus another, certain manufacturers may be more cost effective at reducing emissions than other ones, and advanced pollution control technologies are typically phased in over a period of time as opposed to all at once. ABT thus enables EPA to ensure emissions reductions from the class of motor vehicles, while providing manufacturers with greater flexibility in innovating new technologies, developing their products, and achieving emissions reductions at lower cost. ABT also has a lengthy pedigree—beginning (with the averaging component) in 1985 and being applied in every single motor vehicle GHG rule. It would be extraordinary for an interstitial compliance mechanism that EPA has implemented for nearly forty years to suddenly become a major question.[204]

Commenters claim there is a conflict between the final rule and the statute's Clean Fuel Vehicles provisions.[205] But the Clean Fuel Vehicle provisions, which are contained in a separate Part of the statute, have little bearing on the scope of EPA's section 202(a) authority.[206] That program was a pilot project to advance alternative fuels and technologies.[207] The program prescribes more stringent criteria pollutant standards for certain years (e.g., MY 1998 and later for HD vehicles)[208] in some ozone nonattainment areas, relative to the standards applicable nationwide.[209] There is an obvious mismatch between these requirements and EPA's section 202(a) authority, under which we are setting GHG standards applicable to the entire nation for

[204] *West Virginia*, moreover, suggests this is not a major question. In describing the cap-and-trade program for the Mercury and Air Toxics Rule, the Court noted that there, "EPA set the cap based on the application of particular controls, and regulated sources could have complied by installing them." *West Virginia*, 142 S. Ct. 2587, 2610 (2022). This case is analogous. EPA sets the final standards based on technical factors such as feasibility, leadtime, and costs, see section 202(a)(1)-(2), comparable to the "scientific, objective criterion" the Court noted with favor, not "wherever the Agency sees fit" based on vague notions of societal welfare.
[205] See generally Guidance for Fulfilling the Clean Fuel Fleets Requirement of the Clean Air Act, EPA-420-B-22-027 (June 2022).
[206] As we explain in preamble I.B, however, we do think the Clean Fuel Vehicles program supports interpreting the statutory term "motor vehicle" to include electric vehicles. CAA section 241(2).
[207] See H. Rep. No. 101-490, pt. 1, at 283 (1990), 1990 WL 1222133, at *65-66 (Congress wanted "to encourage a broad range of vehicles," including those using electricity, and break the "chicken and the egg" supply-and-demand problem among automakers, consumers, and fuel producers).
[208] CAA section 245(a).
[209] Compare, e.g., clean fuel vehicle statutory numeric standards in CAA sections 243 and 245, with those applying to conventional vehicles in CAA section 202(g)-(i).

MY 2027-32. Moreover, the specific provision on which commenters place most weight, section 242(b), actually says that clean fuel vehicles and "conventional gasoline-fueled or diesel fueled vehicles" may be part of the "same category" of vehicles.[210] Finally, commenters erroneously presume that the distinction between clean fuel and conventional vehicles is a distinction between electric vehicles and gasoline and diesel vehicles. Clean fuel vehicles as a category include all kinds of vehicles, including those fueled by diesel, reformulated gasoline, ethanol, hydrogen, electricity, and so on.[211]

Commenters also allege a conflict between the final rule and the Energy Policy and Conservation Act (EPCA). The Supreme Court has already rejected a similar argument as EPCA and the CAA are two different statutes that impose independent duties.[212] If anything, the fact that EPCA precludes DOT from considering battery electric vehicles in exercising certain regulatory powers, and the CAA contains no similar limitation, suggests that Congress knew how to limit EPA's authority but intentionally declined to do so. Further, no practical inconsistency exists as NHTSA is not at this time establishing new standards for HD vehicles, and EPA has also consulted with NHTSA in establishing the final standards here. We address the consistency of this rule with NHTSA's authority later in this section.

As for the Renewable Fuel Standards (RFS) program, the statute explicitly states that the RFS provisions do not limit EPA's other authorities to regulate GHGs.[213] Commenters, moreover, erroneously claim that the increasing statutory biofuel volumes in the RFS program suggest that any future GHG decreases from the transportation sector must come from renewable fuels; but actually, the statute imposes no such requirement. Moreover, beginning in 2023, there are no increasing statutory biofuel requirements, and the only statutory biofuel volume is a requirement that biomass-based diesel not be less than the volume in 2012.[214] We further address this comment in RTC 10.2.1.e and 22, finding among other things that the final rule is consistent with EPA's recently promulgated RFS "Set" rule, under which EPA exercised its discretion to mandate increased renewable fuel volumes.

Second, the final rule does not intrude upon areas traditionally reserved for State police power. While Congress recognized the importance of cooperative Federalism in the Clean Air Act, it intended for regulation of motor vehicle emissions to be principally the domain of the Federal EPA. As such, section 209(a) preempts most State and local standards "relating to the

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[210] CAA section 242(b) says that clean fuel vehicles "shall comply with all requirements of this subchapter…which are applicable in the case of conventional gasoline-fueled or diesel fueled vehicles of *the same category* and model year" (emphasis added).
[211] CAA section 241(2).
[212] *Massachusetts*, 549 U.S. 497, 532 (2007) ("that DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public's "health" and "welfare," 42 U.S.C. § 7521(a)(1), a statutory obligation wholly independent of DOT's mandate to promote energy efficiency. See Energy Policy and Conservation Act, § 2(5), 89 Stat. 874, 42 U.S.C. § 6201(5). The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency").
[213] CAA section 211(o)(12) ("Nothing in this subsection, or regulations issued pursuant to this subsection, shall affect or be construed to affect the regulatory status of carbon dioxide or any other greenhouse gas, or to expand or limit regulatory authority regarding carbon dioxide or any other greenhouse gas, for purposes of other provisions (including section 7475) of this chapter….").
[214] See CAA section 211(o)(2)(B)(ii), (v).

control of emissions from new motor vehicles or new motor vehicle engines."[215] Moreover, motor vehicles are instruments of interstate commerce, the air pollutants they emit readily travel over state lines, and the same manufacturers produce motor vehicles for sale nationwide, such that regulation of motor vehicle emissions is eminently suitable for the Federal government.

Third, the final rule does not "significantly alter the balance … the power of the Government over private property."[216] Pursuant to section 202(a), EPA has imposed emissions standards on the motor vehicle industry since the 1970s, and we have regulated GHG emissions from HD vehicles since 2011. The final rule continues regulation of the same regulated community, manufacturers of HD vehicles, by implementing iteratively more protective GHG standards.

Fourth and finally, commenters erroneously claim that the presence of earnest political debate gives rise to a major question here. Notwithstanding ongoing political interest in motor vehicle GHG regulation, the weight of statutory and legislative evidence strongly favors EPA's authority. EPA summarizes in preamble I.B the considerable Federal statutory enactments and legislative history that support the agency's consideration of ZEVs.[217] Without restating that history, we note that Congress has declared a policy of supporting electric vehicles. 15 USC 2501(b)(4) states that it is "the policy of Congress" to "support accelerated research into, and development of, electric and hybrid vehicle technologies", to "facilitate, and remove barriers to, the use of electric and hybrid vehicles in lieu of gasoline- and diesel-powered motor vehicles, where practicable", and "promote the substitution of electric and hybrid vehicles for many gasoline- and diesel-powered vehicles…." IRA Section 60106 provides $5 million for EPA "to provide grants to States to adopt and implement greenhouse gas and zero-emission standards for mobile sources pursuant to section 177 of the [CAA]."[218] The legislative history accompanying the IRA states: "Congress recognizes EPA's longstanding authority under CAA Section 202 to adopt standards that rely on zero emission technologies, and Congress expects that future EPA regulations will increasingly rely on and incentivize zero-emission vehicles as appropriate."[219] The statutory and legislative history unquestionably tilts in favor of Congress viewing electric and ZEVs as important technologies for pollution control, supporting EPA's authority to consider such technologies in establishing emissions standards.

In light of this substantial history in favor of ZEV technologies, we think the various legislative history materials cited by commenters are of little relevance. Commenters point to a few failed bills. But failed legislation "offers a particularly dangerous basis on which to rest an

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[215] Section 209(b) creates an exception for "any State which has adopted standards (other than crankcase emission standards) for the control of emissions from new motor vehicles or new motor vehicle engines prior to March 30, 1966." The only State to meet this requirement is California, which has developed its own motor vehicle emissions program, subject to EPA's waivers of preemption. In addition, other States may adopt programs identical to the California program under section 177, but they may not establish their own programs. We note that California strongly supports EPA's further regulation of GHGs from motor vehicles.
[216] *Alabama Ass'n of Realtors v. Dep't of Health and Human Servs.*, 141 S. Ct. 2485, 2489 (2021).
[217] See also Greg Dotson, Comments to Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles; Greg Dotson & Dustin Maghamfar, *The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and the Inflation Reduction Act*, 53 ENVIRONMENTAL LAW REPORTER 10017, 10030-32 (2023).
[218] Inflation Reduction Act of 2022, P.L. 117-169 ,136 Stat. 2068-69 (2022).
[219] 168 Cong. Rec. E879-02, at 880 (daily ed. Aug. 26, 2022) (statement of Rep. Pallone, Chairman of the House Energy and Commerce Committee).

interpretation of an existing law a different and earlier Congress" adopted.[220] Especially where, as here, Congress has passed laws regarding a topic, failed bills are of questionable relevance. Moreover, the specific failed bills that commenters cite sought to impose different regulatory outcomes than the Phase 3 final rule. For example, the Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019), which applied to light-duty vehicles, "sets a schedule for increasing the percentage of zero-emission vehicles a vehicle manufacturer delivers for sale, culminating in a requirement to sell only zero-emission vehicles from 2040 on."[221] The final rule, however, does not apply to light-duty vehicles, require increasing sales of ZEVs, or require manufacturers to only sell ZEVs from 2040 on.

Separately, the commenters claim Congress's support for research and incentives for ZEVs undermines its Clean Air Act authority. But such efforts do not constitute a "distinct regulatory scheme"[222] that displaces the agency's authority. Rather, "[c]ollaboration and research do not conflict with any thoughtful regulatory effort; they complement it."[223] And as we explain in preamble II, the considerable incentives and other funding that Congress has provided for ZEVs and their infrastructure support EPA's ability to establish strong emission standards accounting for the availability of such technologies. Besides, Congress's recent enactment of ZEV incentives in the Bipartisan Infrastructure Law and the Inflation Reduction Act occurred not "against a regulatory backdrop of disclaimers of regulatory authority,"[224] but rather with Congress's full knowledge that EPA was actively regulating motor vehicle GHG emissions; indeed the legislative history to the IRA shows affirmative Congressional support for EPA's efforts.[225]

Commenters also identify some letters from Congressional Members that criticized EPA's proposed rule. Member letters obviously have no legal effect on the agency's statutory authority.[226] To the extent they are relevant, many other Members of Congress sent letters supporting EPA's further regulation of GHGs from motor vehicles.[227] Some commenters also pointed to a Congressional Review Act resolution to rescind a different EPA rule regarding HD

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220 Bostock v. Clayton County, 140 S.Ct. 1731, 1747 (2020) (internal quotation marks omitted).
221 https://www.congress.gov/bill/116th-congress/house-bill/2764. The similarly named Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. (2018), is similar to the 2019 act and differs from this final rule for similar reasons. See https://www.congress.gov/bill/115th-congress/senate-bill/3664?s=1&r=59 The proposed amendment to the 1970 CAA at 116 Cong. Rec. 19238-40 (1970) sought to ban ICE vehicles by 1978, but this final rule does not ban ICE vehicles and also regulates the industry nearly five decades later in the face of completely different facts.
222 Food & Drug Admin. v. Brown & Williamson Tobacco Corp., 529 U.S. 120, 144 (2000)
223 *Massachusetts*, 549 U.S. 497, 530 (2007).
224 *Massachusetts*, 549 U.S. 497, 531 (2007).
225 168 Cong. Rec. E879-02, at 880 (daily ed. Aug. 26, 2022) (statement of Chairman of House Energy and Commerce Committee Rep. Pallone).
226 See U.S. Const. Art. 1 § 7.
227 See, e.g., Padilla, Colleagues Lead Bicameral Letter Urging EPA to Impose Strong Emissions Standards for Heavy-Duty Vehicles (letter from 75 Members urging the agency to finalize the strongest feasible greenhouse gas emission standards for heavy-duty vehicles (HDVs) as part of their Phase 3 rule), available at https://www.padilla.senate.gov/newsroom/press-releases/padilla-colleagues-lead-bicameral-letter-urging-epa-to-impose-strong-emissions-standards-for-heavy-duty-vehicles/; Lawmakers lead 91 colleagues in pushing for robust light- and medium-duty vehicle emission standards to protect public health, benefit climate and economy (letter from 91 members urging the EPA to finalize the strongest feasible multi-pollutant vehicle emission standards for light- and medium-duty vehicles before the end of this year), available at https://matsui.house.gov/media/press-releases/matsui-clarke-markey-padilla-urge-epa-finalize-strongest-possible-light-and

criteria pollutant standards, although that resolution was ultimately vetoed by the President.[228] Not only does a failed CRA resolution on a different rule offer no value to understanding the statutory authority for this rule, the CRA expressly prohibits courts and agencies from inferring "*any* intent of the Congress" with regard to a rule or related statute when Congress has failed to enact a joint resolution.[229]

We also give little weight to the commenters' claims about State-level political debates. As already explained, this rule relates to an area—control of emissions from new motor vehicles—where Congress has placed primary authority in the Federal government. To the extent State political action is relevant, the statute permits only certain State motor vehicle emissions regulation that is more stringent than the Federal regulation. Such regulations, moreover, can only be adopted in the first instance by California, and certain other States may then follow suit.[230] State regulation that is less stringent than the Federal program is expressly forbidden by the statute. So even if a State thinks less stringent motor vehicle emission standards are better, that State cannot legally require that result. And notwithstanding the diversity of perspectives on ZEVs, all states are actively taking actions to support ZEVs. Among other things, all States are actively implementing plans for vehicle electrification infrastructure through the National Electric Vehicle Infrastructure (NEVI) Program.[231] And localities within all States have sought and obtained funds to replace existing school buses with zero-emission and clean school buses under EPA's Clean School Bus Program.[232]

V. Conclusion

There is clear Congressional authorization for the final rule. In section 202(a) Congress made the major policy decision to control air pollution from motor vehicles and directed EPA to do so

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[228] S.J. Res. 11, 118 Cong. (2023); H. Res. H2523, 118 Cong. (2023).

[229] 5 U.S.C. 801(g) (emphasis added) ("If the Congress does not enact a joint resolution of disapproval under section 802 respecting a rule, no court or agency may infer any intent of the Congress from any action or inaction of the Congress with regard to such rule, related statute, or joint resolution of disapproval.").

[230] Section 209(b) allows the Administrator to waive preemption for the State of California where California's "standards will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards," while section 177 allows certain other States to adopt a program identical to that of California.

[231] https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/ See also, e.g., West Virginia National Electric Vehicle Infrastructure (NEVI) Deployment Plan (July 2023), https://transportation.wv.gov/highways/programplanning/NEVI/ Documents/WV%20NEVI%20PLAN_9-28-23%20Final.pdf; *West Virginia* Code §17-30-1. Department of Transportation to develop electric vehicle plan, available at https://code.wvlegislature.gov/17-30-1/; Team Kentucky Cabinet for Economic Development, Kentucky: Leading the Way Toward an Electric Future, https://ced.ky.gov/LP/electric_vehicle (asserting that "Kentucky is the premier location in the United States to manufacture electric vehicles and their parts," and there have been "$22.9 billion announced in investments by automotive-related facilities since 2014"); Ohio First State in Nation to Activate NEVI Chargers, https://governor.ohio.gov/media/news-and-media/ohio-first-state-in-activate-nevi-chargers (statement from Ohio Governor) ("Electric vehicles are the future of transportation, and we want drivers in Ohio to have access to this technology today."); Letter from Gov. Greg Abbott to Mr. Marc D. Williams (directing Texas Department of Transportation to develop a plan to "ensure that every Texan can access the infrastructure they need to charge an EV"), https://ftp.txdot.gov/pub/txdot/get-involved/statewide/EV%20Charging%20Plan/040422-Letter%20from%20Governor%20on%20Electric%20Vehicle%20Charging.pdf.

[232] https://www.epa.gov/cleanschoolbus/clean-school-bus-program-awards See also https://afdc.energy.gov/fuels/laws/ELEC (cataloguing additional state laws and incentives to support EV and EVSE infrastructure); https://afdc.energy.gov/fuels/laws/HY (hydrogen)

through a technology-based approach. The determination of what technology is available for achieving this policy is a subsidiary technical and policy judgment that Congress plainly entrusted to the Administrator's expertise. The statutory text of section 202(a), read in its context, is clear. And decades of legislative and administrative precedent specifically support the Administrator's authority to consider ZEVs, a highly effective pollution control technology.

Even were the Court to apply the major questions framework, no major question exists. The final Phase 3 rule represents an iterative strengthening of the HD GHG standards based on the agency's evaluation of updated data within its technical expertise. The impacts of the Phase 3 rule are analogous to, and in many instances, less significant than its predecessor. And while the indirect impacts of the rule are not a suitable basis for assessing a major question, the agency performed a comprehensive assessment of such effects, finding that the final rule does not cause significant indirect harms, has the potential for indirect benefits, and creates net benefits for society. Additional factors considered by the courts also counsel against application of the major questions doctrine.

In the final rule, the Administrator did what he has been doing for over fifty years: evaluate updated data on pollution control technologies and set emissions standards accordingly. The agency recognizes that some stakeholders are unhappy with the increasing availability of ZEV technologies, and they would prefer weaker standards, while others prefer stronger standards. But these are garden variety disputes amenable to arbitrary and capricious review. This rule is not an extraordinary and unprecedented assertion of agency power that implicates the major questions doctrine.

<u>Summary of Comments Alleging that ZEVs are Not Systems or Devices to Prevent or Control Pollution</u>

Some commenters further suggest that ZEVs are beyond the scope of regulation under section 202(a) because the provision does not specifically mention ZEVs, and because they view the clause at the end of section 202(a) which requires standards to be applicable for the useful life of vehicles "whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control pollution" as not describing ZEVs. Other commenters argue that ZEVs are best considered a design feature related to the control of emissions which should be considered in determining fleet average standards in order to achieve the goals and requirements of the Clean Air Act, and that ZEVs constitute vehicles designed as a "system" within the meaning of section 202.

<u>Response to Comments Alleging that ZEVs are Not Systems or Devices to Prevent or Control Pollution</u>

EPA disagrees with these comments. First, section 202(a)(1) directs EPA to regulate emissions from motor vehicles, and ZEVs are motor vehicles as defined in section 216(2) of the Act. Second, in the 2009 Endangerment Finding, EPA identified the classes of motor vehicles subject to GHG regulation as including HD vehicles, without any distinction as to whether or not they emit or their powertrain. Once EPA made the endangerment finding for the class, EPA was required to set emission standards for vehicles in that class to address the contribution to endangerment. Third, the last clause in section 202(a)(1)—"whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control pollution"— does not alter the scope of vehicles subject to regulation under the Act. It does, however, confirm the broad scope of Congressional intent of the kinds of technologies that EPA may consider in establishing the standards, including "complete systems" and technologies that "prevent" pollution, which describe ZEVs. We reject the commenters' subsidiary arguments, including that ZEVs are beyond the scope of regulation because they do not control pollution from a carbon-dioxide emitting engine, they are not designed for emissions control, or they do not block or capture pollution.

First, as we explain in preamble I.B, ZEVs unambiguously fall under the statutory definition of motor vehicles in section 216(2), and the statute also unambiguously allows EPA to consider electrified technologies, including ZEVs, in establishing section 202(a)(1) standards. Section 202(a)(1) applies to the "emission of any air pollutant from any class … of new motor vehicles …. which … cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Vehicles with electric powertrains, including ZEVs, are indisputably "motor vehicles," since they are "self-propelled" and are "designed for transporting persons or property on a street or highway."[233]

Commenters wrongly suggest that despite the very broad statutory definition of motor vehicles, which remained untouched through repeated revisions of Title II, Congress could not have possibly intended to include ZEVs in that definition simply because most vehicles in 1965 were gasoline. It is worth noting that "[a]t the beginning of the 20th century, 40 percent of American automobiles were powered by steam, 38 percent by electricity, and 22 percent by gasoline,"[234] and as noted in the preamble and by other commenters, by the 1960s Congress was actively considering the potential role of EV technology is reducing motor vehicle pollution.[235] In any case, as the Supreme Court has held, "the Congresses that drafted § 202(a)(1) … did understand that without regulatory flexibility, changing circumstances and scientific developments would soon render the Clean Air Act obsolete. The broad language of § 202(a)(1) reflects an intentional effort to confer the flexibility necessary to forestall such obsolescence."[236] Just as greenhouse gases "fit well within the Clean Air Act's capacious definition of 'air pollutant,'"[237]so too ZEVs fit well within the definition of motor vehicles. And as we explain in the preamble, the Administrator appropriately considered ZEVs in establishing the standards as they are a highly effective technology for reducing vehicle emissions and available at a reasonable cost during the timeframe of the rulemaking.

Second, as we explain in RTC 10.2.1.f, EPA identified the classes of vehicles subject to GHG regulation in the 2009 Endangerment Finding. The classes identified included "heavy-duty trucks" without exception as to their level of emissions or powertrain. ZEVs are included in the

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[233] CAA section 216(2).
[234] Britannica, *Early Electric Vehicles*, https://www.britannica.com/technology/automobile/Early-electric-automobiles; see also Amicus Brief of Margo Oge and John Hannon in *Texas v. EPA* (D.C. Cir. No. 22-1031) at 9, 16-17.
[235] For example, in 1967, Congress was working on research-and-development programs for vehicle electrification. See S. Rep. No. 90-403, at 59-61 (1967). As part of that effort, Congress held hearings on "electric vehicles and other alternatives to the internal combustion engine." Joint Hearings Before the Committees on Commerce and Public Works for S. 451 and S. 453, 90th Cong. 297 (1967). Later that year, a Senate report approvingly noted that electrified vehicles could comprise one third of the market by 1985. S. Rep. No. 90-403, at 60 (1967). A few years later, Congress amended the Clean Air Act to create a research program for new vehicle technology, including "low emission alternatives to the present internal combustion engine." CAA section 104 (a)(2).
[236] *Massachusetts v. EPA*, 549 U.S. 497, 532 (2007).
[237] *Id.*

class of vehicles. Once EPA made the endangerment finding for the class, EPA is required to set emission standards for vehicles in that class to address the contribution to endangerment.

Third, contrary to what commenters argue, the final clause of section 202 (a)(1) does not change the class of vehicles for which EPA must promulgate emission standards. That clause states that the standards "shall be applicable to those vehicles for their useful life whether such vehicles … are designed as complete systems or incorporate devices to prevent or control such pollution." This language requires that the standards apply to vehicles over their useful life, as opposed to, for example, only at the certification stage. The final standards do this.

As we explain in preamble I.A-B, this statutory language also confirms the breadth of Congress's intent with regard to the technologies that EPA may consider. We think it is clear that ZEVs fall under this language as they are designed as complete systems. It is also reasonable to view ZEVs as incorporating devices (e.g., batteries and e-motors) that prevent pollution from being created. Either way, ZEVs clearly fall within the statutory text.

The commenters' arguments to the contrary are all misplaced. Commenters suggest that EPA cannot consider ZEVs in establishing the standards because ZEVs are designed to run on an entirely different power system, not to limit or control pollution from a carbon-dioxide-emitting engine. The argument first of all ignores the statutory language in section 202(a)(1), which speaks to EPA establishing emissions standards for classes of motor vehicles that contribute to dangerous air pollution, not for classes of "carbon-dioxide emitting engines." Moreover, the argument proves far too much. Many GHG and criteria pollution control technologies are "designed" for or have other purposes beyond merely pollution control. For instance, many of the technologies on which the GHG emissions standards are predicated – e.g. improved engines and transmissions, low rolling resistance tires, aerodynamic improvements, lightweighting, improved accessories, mild and strong hybrids[238]—also improve vehicle functionality (e.g. turbocharging and engine downsizing, high efficiency automatic transmissions, electrified power steering) and fuel economy. The same is true for criteria pollutant technologies that improve the combustion process, such as exhaust gas recirculation, which beyond improving emissions performance, also can improve knock resistance, reduce the need for high load fuel enrichment, and so on.[239]

Commenters similarly maintain that ZEVs are not designed as complete systems because they lack a self-contained mechanism to block or capture pollution that otherwise would be emitted. This argument lacks a statutory basis and is premised on an incorrect understanding of how pollution control technology works. The statute speaks to vehicles "designed as complete systems or incorporate devices to prevent or control such pollution." [240] Preventing pollution includes reducing or eliminating pollution at the source, as opposed to merely blocking or

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[238] 81 FR at 73747-753.

[239] See Hannu Jääskeläinen & Magdi K. Khair, Exhaust Gas Recirculation (May 2022), https://dieselnet.com/tech/engine_egr.php.

[240] EPA notes that some commenters, both those that read section 202(a) as authorizing consideration of electrification technologies in setting vehicles standards and those that do not, appear to read the last phrase of section 202(a)(1), "to prevent or control pollution," as modifying "designed as complete systems." An alternate reading would be to construe "to prevent or control pollution" as solely modifying "incorporate devices." EPA finds it is unnecessary to resolve this interpretive issue because either way BEVs do prevent pollution.

capturing the pollution after it has been emitted.[241] Relatedly, controlling pollution could mean blocking or capturing pollution that otherwise would be emitted, but could also mean using chemical processes to transform air pollutants into harmless compounds. Technologies to address GHG emissions work by preventing pollution, e.g., by making the vehicle lighter or more aerodynamic or by increasing engine efficiency, so as to reduce fuel consumption and associated emissions, or by relying on a different fuel (e.g., natural gas, hydrogen, or electricity) that inherently creates and emits less pollution from the motor vehicle. To date, no motor vehicle GHG add-on control or aftertreatment technologies have become widely available. Criteria emissions technologies can also prevent pollution—for example by increasing the efficiency of the fuel combustion process or by fuel-switching—or control it—for example by a catalyst transforming pollutants into less harmful compounds.

The commenters' reading is implausible for another obvious reason. It reads the statute as disallowing technologies which are best suited to "prevent" the emissions which contribute to endangerment. Instead of preventing and controlling the emissions which contribute to endangerment, the commenter's reading would preclude EPA from considering highly effective technologies for reducing emissions, with the result of perpetuating emissions that contribute to dangerous air pollution. This result is antithetical to the statutory goal of using emission standards to prevent endangerment from "maturing into concrete harm."[242]

The commenters' reliance on *Truck Trailer Manufacturers Association v. EPA*, 17 F. 4th 1198, 1202 (D.C. Cir. 2021) is misplaced. The case involved whether trailers were "motor vehicles," not which emissions control technologies are permissible under the statute. The commenter seizes on language in the decision stating that section 202(a)(1) creates two categories of complete motor vehicles: those with built-in pollution control, and those with add-on devices for pollution control. Nothing in this language supports a reading that ZEVs are not "complete systems" or "devices." Indeed, ZEVs can be regarded as "built-in pollution control," since the pollution control system is integral to the vehicle design, as opposed to being an add-on. In this way, ZEVs are similar to many other of the pollution prevention technologies described above. For example, improved vehicle aerodynamics, lightweighting, ICE engine and transmission improvements, are integral aspects of the vehicle that can also be regarded as "built-in pollution control." By contrast, for example, an aftertreatment system can be seen as an "add-on device." Thus, to the extent *Truck Trailer* is relevant to the issue, we think it, like the statutory language it glosses, confirms the breadth of technologies Congress intended for EPA to consider and further supports our decision to consider ZEV technologies in setting the standards.

Further, as discussed in preamble section 1, EPA does not mandate which vehicles a manufacturer may produce or how a manufacturer may choose to design individual vehicles or their overall fleet composition to meet emission standards. Without technological controls, including add-on devices and complete systems, all of the vehicles EPA regulates under section 202(a) have the potential to emit dangerous pollution.[243] Therefore, EPA establishes standards for the entire class of vehicles, based upon its consideration of all available technologies. Once

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[241] See CAA section 101(a)(3) ("air pollution prevention (that is, the reduction or elimination, through any measures, of the amount of pollutants produced or created at the source)").

[242] *Coal. for Responsible Regulation*, 684 F. 3d at 122.

[243] As noted above, manufacturers in some cases choose to offer different models of the same vehicle with different levels of electrification. And it is the manufacturer who decides whether a given vehicle will be manufactured to produce no emissions, low emissions, or higher emissions controlled by add-on technology.

EPA promulgates the emission standards, it is then incumbent upon manufacturers to determine which technology or mix of technologies, whether that be add-on devices or complete systems, to use to meet the standards for their individual fleets. Accordingly, and consistent with the text of section 202(a), EPA has authority to set standards for an entire class of motor vehicles—and must have this authority—irrespective of how manufacturers ultimately comply. It would be absurd for EPA to set standards for a class of motor vehicles, in this case heavy-duty motor vehicles, only for EPA to lose its authority to regulate those very same vehicles based on how manufacturers ultimately choose to comply after EPA has issued its standards. And it is only after EPA issues standards, and manufacturers begin to produce vehicles to meet those standards, that the Agency can know with certainty what technologies manufacturers are using to meet the standards, and it is only after the manufacturers have applied those technologies to vehicles in actual production that the pollution is prevented or controlled.

Summary of Specific Comments Related to Section 202(e)

API commented that section 202(e) indicates that EPA may delay certification of vehicles with new power or propulsion systems if EPA finds that such vehicles cause or contribute to air pollution which endangers. Since ZEVs "clearly constitute a new power source or propulsion system" and do not emit pollutants, "EPA cannot determine that emissions from ZEVs cause or contribute to any endangerment caused by GHG emissions and, therefore, the Agency has no need or authority to impose GHG emissions standards on ZEVs prior to certifying them."

Response to Specific Comments Related to Section 202(e)

One commenter points to section 202(e) as support for their view that ZEVs should not be treated as part of the same class as other vehicles, and argues that any new propulsion system must be evaluated by the Administrator under section 202(e) before being certified. However, that provision is mostly notable for the specific circumstances under which it applies and is entirely permissive as an optional additional source of authority for the Administrator regarding certification.

Section 202(e) clarifies that if a vehicle or engine with a novel power source or propulsion system would meet currently applicable emissions requirements but would emit air pollutants which the Administrator judges are harmful but for which EPA has not yet established standards, the Administrator may postpone certifying the vehicle for sale (notwithstanding the fact that the vehicle nominally meets the currently applicable emissions standards) until standards to address the novel pollutants are issued.

For example, in 1975 an inventor sought, and in 1977 was issued, a US Patent (No. 4,006,595) for a "refrigerant-powered engine."[244] In explaining the need for such an engine, the patent states, "[p]erhaps the most serious problem facing this generation is the creation of air pollution as a result of the by-products of the automobile internal combustion engine," and thus there "exists a need for a practical alternative to the internal combustion engine."[245] The engine in question would use Freon vapor to drive a turbine (the Freon would then be collected in a sealed system and reused).

[244] The patent also discloses a prior patent, filed in 1973, which likewise uses Freon in a piston-reciprocating engine.
[245] *Id*. at 7

Were a manufacturer to develop such an engine today (using Freon or a chemical with similar characteristics), it would appear that no standards would apply to leaks of the chemical from the powertrain of the vehicle. In the absence of section 202(e), the Administrator might be required to issue a certificate of conformity allowing the vehicles to be sold, even if the leaks of the chemical were expected to have serious, long-lasting adverse impacts on the environment. Section 202(e) authorizes the Administrator to delay issuing certificates to such vehicles until appropriate standards can be established to protect public health and the environment.

Thus, this provision simply confirms the breadth of EPA's authority to regulate any self-propelled vehicles—regardless of their form of propulsion (be it internal combustion, external combustion, electric, or a technology unknown to Congress in 1970 or the agency today). Notably the provision has no potential application where a vehicle does not emit novel air pollutants (i.e., those for which an endangerment finding has not been made), and the provision certainly does not limit EPA to classifying vehicles according to their fuel or method of propulsion. As a discretionary power regarding certification, the provision also does not limit EPA's standard-setting authority in any way.

Summary of Comments Alleging Goal of Rule is to Limit Global Temperature Increases

Commenters allege that the rule is directed at the goal of limiting global temperature increase to 2 degrees Celsius (South Dakota Dept. of Agriculture).

Response to Comments Alleging Goal of Rule is to Limit Global Temperature Increases

Regarding the comment that the rule is directed at the goal of limiting global temperature increase to 2 degrees Celsius, the final rule is not predicated on any global temperature-specific metric. EPA is acting consistent with our CAA statutory authority and the applicable statutory factors in CAA sec. 202(a) to limit GHG emissions from heavy-duty motor vehicles which contribute to air pollution that endangers public health and welfare. For further discussion of EPA's statutory authority and the legal basis for this action, please see Response to Comments Concerning the Major Questions Doctrine above and preamble section II.G.

Summary of Specific Comments Related to the Energy Independence and Security Act (EISA)

AFPM, API, and NACS et al commented that EPA is acting inconsistently with the Energy Independence and Security Act (EISA) which makes the Department of Transportation the proper entity to regulate. At the least, EISA has lead time and stability requirements which would make the 2028 model year the first year of standard applicability. In addition, DOT's mandate to regulate fuel efficiency under EISA does not allow consideration of electrification (49 USC section 32902 (k)).

AFPM and Arizona State Legislature commented that EPA has failed to issue a joint rule with NHTSA as it did with the Phase 1 and 2 rules, and has even failed to consult with its sister agency.

Response to Specific Comments Related to the Energy Independence and Security Act (EISA)

EPA disagrees with the view that it is required to engage in joint rulemaking with NHTSA, that its legal authority with respect to establishing section 202 standards changes in any way if it does engage in joint rulemaking with NHTSA, or that EISA in any way constrains the scope of EPA's authority to set standards under section 202.

EPA issued its earlier HD GHG rules jointly with the National Highway Traffic Safety Administration. However, from the beginning the two agencies have recognized their standards have different statutory mandates and that each agency must set its standards according to its respective statute, which has always resulted in the agencies' standards being varied in certain ways. In the very first joint HD GHG rule, EPA and NHTSA explained at length the distinct statutory authority of each agency and the areas in which they were similar and in which they were different, and the ways in which the agencies would coordinate their standard-setting and the ways in which the standards would diverge.[246] EPA thus has never viewed joint rulemaking as altering the scope of its authority. As discussed in the Executive Summary of the preamble, EPA has continued to coordinate closely with NHTSA in setting GHG standards even when not proceeding through joint rulemaking.

EPA continues to believe that EPA and NHTSA can and should each implement their respective statutory authorities while avoiding inconsistency. However, EPA does not believe that in order to avoid inconsistency EPA must, or can, ignore technological developments that enable significant advances towards necessary pollution reductions.

Specifically, we do not agree that the EISA provisions dealing with fuel efficiency serve as a bar to EPA's exercise of its independent authority under the Clean Air Act to issue GHG emission standards for heavy duty motor vehicles. As the D.C. Circuit has held with respect to the analogous issue for fuel economy standards: "[t]he plain text of section 202 (a)(1) ... negates Industry Petitioners' contention that EPA had discretion to defer the Tailpipe Rule on the basis of NHTSA's authority to regulate fuel economy. The Supreme Court dismissed a near-identical argument in Massachusetts v. EPA, rejecting the suggestion that EPA could decline to regulate carbon-dioxide emissions because the Department of Transportation ... had independent authority to set fuel-efficiency (sic) standards." Coal. for Resp. Regulation, 684 F. 3d at 127. For similar reasons, the EISA provisions on lead time do not restrict EPA's independent obligation to assess needed lead time under section 202 (a)(1), and likewise do not compel EPA and NHTSA to issue fuel efficiency and heavy-duty GHG emission standards simultaneously. Likewise, although NHTSA is required to consult with EPA before issuing fuel efficiency standards (see 49 U.S.C. section 32902 (k)(2)), there is no reciprocal requirement for EPA. 88 FR at 25952.

Need for Standards to Adequately Protect Public Health and Welfare

Commenters claimed that the purpose of CAA section 202 is to reduce threats to public health and welfare and supported standards more stringent than the final standards, with some comments supporting zero emissions standards. Some commenters commented that stringent emissions standards are needed to ensure state and local air agencies can meet their statutory obligations to timely attain and maintain NAAQS. Other commenters pointed to the standard-setting provisions of CAA section 202(a)(3), which apply to criteria pollutant standards for heavy duty vehicles.

As discussed in section I and elsewhere in the preamble, EPA agrees with commenters that the purpose of the Clean Air Act is to reduce emissions of air pollutants that have been judged to contribute to dangerous air pollution, and Congress expected and directed that EPA would consider a full range of available technologies (not only internal combustion engine

[246] *See* 76 FR 57106.

technologies) in carrying out that statutory purpose. As we explain in RTC 2.3, however, EPA is promulgating the final standards under section 202(a)(1)-(2), not section 202(a)(3)(A), which only applies to certain HD criteria pollutant standards.

EPA agrees with commenters who pointed out that federal mobile source standards are critically necessary to reduce harmful air pollution. While the final GHG standards directly control GHGs, they also will lead to decreases of non-GHG emissions, including criteria pollutant emissions. As we explain in preamble II.G, EPA considers our analysis of the impact of the final CO_2 emission standards on vehicle and upstream emissions for non-GHG pollutants as supportive of the final standards. We expect that these reductions in criteria pollution will assist states to come into attainment with the NAAQS.

Some commenters supported standards even more stringent that the proposed (or final) standards, including zero emission standards. Some commenters suggested that standards should be set by determining what reductions are necessary to attain the NAAQS or achieve other public health goals. EPA finds, for the reasons explained in section II.G of the preamble, that more stringent standards would not be appropriate under section 202(a). In particular, EPA finds that zero emissions standards (e.g., no emissions of GHGs from any HD vehicles) would not be feasible or appropriate for these model years, taking into consideration cost and lead time. Although EPA recognizes that emissions reductions are the primary focus and purpose of section 202, and has adopted standards to achieve significant reductions in emissions, EPA disagrees that standards must be set by first identifying a specific amount of reductions needed, and then setting the standards to achieve those reductions. Section 202(a) directs EPA to achieve reductions in air pollutants, but does not suggest that the level of the standard must be tied to achieving a particular amount of reductions. Rather, section 202(a) requires EPA to consider technological feasibility, including cost of compliance. This approach enables EPA to achieve significant reductions which are critical to achieving public health goals, but there is nothing in section 202(a) that directs EPA to set standards based on achieving a specific quantity of emissions reductions and EPA disagrees that such an approach is required under section 202(a). Moreover, the final standards are GHG standards. Therefore, while EPA considered criteria pollution benefits as supportive of the final standards, the standards do not directly control criteria pollution, and it would not be appropriate to identify the level of the GHG standards based on achieving NAAQS for criteria pollutants.

Role of Cost/Benefit Analyses

One commenter suggests that the standards are arbitrary and capricious because EPA gave insufficient weight to the results of the benefit-cost analysis.

EPA did assess the costs and benefits of the final standards. Furthermore, as explained in section II.G of the preamble, EPA did consider the costs and benefits of the standards. When section 202(a) requires EPA to consider the cost of compliance, it is referring to costs to vehicle manufacturers, not total social costs. However, EPA considered both costs to manufacturers and total social costs before adopting the standards. The Administrator identified the standards that he finds appropriate taking into account emissions reductions, costs to manufacturers, feasibility and other required and discretionary factors. The fact that benefits of those standards exceeded their costs (i.e., the net benefits are positive) reinforces EPA's conclusion that the standards were reasonable and appropriate. However, as noted in the preamble, EPA did not rely on benefit-cost analysis to *identify* the appropriate standards. That is, EPA did not seek to select standards that would maximize net benefits as calculated by the benefit-cost analysis. EPA finds that our approach, of placing weight on judging the appropriate level of emissions reduction in light of the costs of compliance and lead time, while still evaluating and considering total social costs and benefits, is consistent with both the Supreme Court's decision in *Michigan v. EPA*, 576 US 743 (2015) and with section 202 of the CAA.

<u>Comment Summary: Other Congressional References</u>

(Valero) takes issue with EPA's references in the proposal to statutory text, legislative history, and caselaw construing CAA Title II, where Congress or the court referred to technologies other than internal combustion engines as a means of fulfilling the emission reduction goals of that Title. Valero contends that "each source of legislative history relied on by EPA is irrelevant to the question of whether Congress authorized EPA to mandate electrification of the Nation's HDV fleet." (The commenter also maintains that the proposal invokes the Major Question Doctrine, and that EPA does not cite to a clear delegation of authority for the proposal. Responses to Major Question Doctrine comments are in RTC chapters 2.1 and 9.) Specifically, Valero raises the following points: Valero asserts that EPA's citation to 1967 Congressional hearings, where Chairman Magnuson stated "ICE vehicles might be inadequate to achieve the country's air quality goals" are unrelated to the enactment of the Clean Air Act and its amendments and do not speak to EPA's emission standards, much less indicate a grant of authority to EPA to mandate such vehicles nationwide through such standards. Valero states that EPA's citation to a statement made by President Nixon in 1970 regarding a program to develop "an unconventionally powered, virtually pollution free automobile" is an executive statement, not a legislative one, and announces a research program, not a delegation of authority.

Valero asserts that CAA section 104 (a)(2)(B) – under which EPA is to partially fund research programs "to develop low emission alternatives to the present internal combustion engine" is likewise not a grant of regulatory authority, but merely a grant program. Valero states that the same is true of EPA's authority to certify low emission vehicles (CAA section 202(e)) and encourage federal purchases of such vehicles, and to institute a clean fuel vehicles program (CAA section 241 et seq.): "researching and incentivizing electric vehicles is simply not equivalent to mandating them."

Valero points to EPA's citation of S. Rep. 91-1196 and claims that it is inapposite. Valero asserts that while it states that EPA is authorized to control vehicular emissions of criteria pollutants, the report does not state or suggest that EPA would have authority to require manufacturers to shift to those technologies.

Valero points to language EPA cited in the proposal from the D.C. Circuit's opinion in *International Harvester v. EPA*. 478 f. 2d 615 (D.C. Cir. 1973) where the court noted legislative history to the 1970 amendments stating that "Congress expected the Clean Air Amendments to force the industry to broaden the scope of its research—to study new types of engines and control systems." 478 F. 2d at 634-35. The commenter characterizes this as 50-year old dicta which is not pertinent since it is discussing legislative history.

Valero asserts that EPA's reference to various provisions of the 2022 Inflation Reduction Act are also inapposite, because the IRA is appropriation legislation which "have the limited and specific purpose of providing funds," Tennessee Valley Auth. v. Hill, 437 U.S. 153, 190 (1978), cannot be construed to provide any agency authority and, in any case, incentivized rather than mandated the use of electric vehicles.

Valero indicates that all of these statements cut against EPA because whenever Congress wanted consideration of electric vehicles, it either did so by incentivizing them, or authorizing a discrete regional program, neither of which can serve as authorization for a program of nationwide scope in section 202(a).

Response to Other Congressional References

Commenters articulated different views about the significance of legislative and statutory history. For example, commenters disagree on the significance of Congressional action in the IRA and BIL for EPA's legal authority, with some commenters stating that these statutes do not add to EPA's regulatory authority, and other commenters stating that these statutes reinforce EPA's authority and confirm Congress' commitment to reducing motor vehicle emissions through electrification. Similarly, some commenters point to the fact that legislation passed under Congressional budget reconciliation rules must be related to spending, revenue, or the federal debt limit, as evidence that the legislation did not increase EPA's authority, while other commenters point to the fact that Congress only incentivized ZEVs in the legislation and did not mandate them as evidence that EPA's lacks authority to consider EVs in standard-setting under section 202(a).

As EPA explains in preamble I, the basis for EPA's authority to establish the final standards is section 202(a)(1)-(2). The text and context of the Act unambiguously mandate that the Administrator consider available vehicle technologies to limit emissions of GHGs, which on this record, includes ZEV technologies that are available at a reasonable cost during the timeframe of the rule. EPA's additional historical citations only corroborate the clear congressional authorization found in the statute itself. We also address specific points relating to the history in preamble I and the major questions doctrine response in RTC 2.1. Below we specifically address comments regarding the significance of the recently enacted IRA and BIL.

EPA agrees with those commenters who state that the IRA and BIL reinforce EPA's authority. Although the BIL and IRA are not necessary to find that the statute plainly authorizes the final rule, they confirm and extend Congress' longstanding interest (which, as discussed in section I of the preamble and elsewhere in this RTC dates back to the 1960s) in encouraging the development and deployment of ZEVs. EPA acknowledges that the IRA and BIL are not what gives EPA authority to include consideration of electrification technologies in standard-setting, but finds that this legislation, which is consistent with the long history of Congressional support for cleaner alternative-fueled vehicles, provides further support for the conclusion that the Congresses that enacted and amended section 202(a)(1) gave EPA the authority to take into consideration the emissions performance of ZEVs when setting standards for motor vehicles.

Likewise, EPA does not find that it would be appropriate to infer from the massive incentives of this legislation that Congress wanted EPA[247] to change course and stop taking into

[247] The IRA made amendments to the CAA affirming that Congress regards programs incorporating ZEV technology as an important aspect of EPA's mission to reduce air pollution under the law. Those amendments include adding a definition of "zero-emission vehicle" into the newly added CAA Section 132, which consists of a

consideration the emissions performance of ZEVs in setting standards. This rulemaking does not constitute an EV mandate, so the fact that Congress likewise did not adopt an EV mandate provides no basis for suggesting that this rulemaking is beyond the scope of EPA's authority. In fact, since EPA's 2021 LD GHG rule was adopted shortly after the BIL but shortly before the IRA, Congress can be presumed to have acted in the IRA with knowledge of EPA's approach to regulating motor vehicles for GHG emissions, and the fact that Congress increased incentives for EVs and provided funding for states to adopt GHG standards, rather than objecting to EPA's approach, confirms that the purpose of this legislation was not to displace EPA's authority (or to correct EPA's views of its authority) but to support EPA's authority to set standards based on ZEV emissions performance—to "combine[] new economic incentives to reduce climate pollution with bolstered regulatory drivers that will allow EPA to drive further reduction under its CAA authorities."[248]

While EPA's authority to promulgate the final rule arises from section 202(a) and does not depend on the IRA, the IRA also reflects Congressional ratification of EPA's interpretation that section 202(a)(1) encompasses standards for control of greenhouse gas emissions predicated on performance of ZEVs. Section 60105(g) of the Inflation Reduction Act authorizes $5 million for states "to adopt and implement greenhouse gas and zero emission standards for mobile sources pursuant to section 177 of the Clean Air Act." Section 177 applies only to "standards relating to the control of emission from new motor vehicles" for which Congress has granted a waiver from federal preemption pursuant to CAA section 209(a). Consequently, the IRA indicates Congress's intent that a "greenhouse gas and zero emission standar[d]" is a "standard for the control of emissions from new motor vehicles."

Further, ratification is supported by the fact that Congress was aware of EPA's interpretation that emission standards for new motor vehicles could be predicated on performance of zero emission vehicles, and was equally aware that California was seeking a waiver for its GHG and zero emissions vehicular standards. As the then-Chair of the Energy and Commerce Committee, Representative Pallone stated, "Congress recognizes the reductions in GHG emissions from motor vehicles and engines owing to increased engine efficiency, improved vehicle design, and the transition to low- and zero-emission vehicles, including fuel-cell and battery-powered electric vehicles. EPA's recent light-duty vehicle regulations establishing standards for motor vehicles and engines for 2023 and later model years identify and incentivize these technological developments…. Congress recognizes EPA's longstanding authority under CAA Section 202 to adopt standards that rely on zero emission technologies, and Congress expects that future EPA regulations will increasingly rely on and incentivize zero emission vehicles as appropriate."[249]

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program of EPA grants and rebates towards the purchase of zero-emission heavy-duty vehicles, CAA 132(d)(5), and creating a new CAA section 133 to provide grants for zero-emission port equipment or technology," which can include zero emission drayage vehicles. Inflation Reduction Act of 2022, P.L. 117-1698, 136 Stat. 2064-65 (2022).

[248] 168 Cong. Rec. E868-02 (daily ed. Aug. 12, 2022) (statement of Rep. Pallone discussing the IRA); see also 168 Cong. Rec. at 880-02 (daily ed. Aug. 12, 2022) (statement of Rep. Pallone).

[249] See 168 Cong. Rec. E879-02 at 880 (Aug. 26, 2022) (statement of Chairman of the House Energy and Commerce Committee Rep. Pallone). Congress expressed equal awareness of the pending California waiver for its zero emission GHG standards: "Section 60105(g) provides EPA $5 million to provide grants to states to adopt and implement GHG and zero-emission standards for mobile sources pursuant to Section 177 of the CAA. Congress supports states taking actions to address their air pollution and climate needs. *An important tool that many states have available is the ability to adopt California's GHG, zero-emissions vehicle, and criteria pollutant emissions*

The commenter overstates that ratification via appropriation is impossible. In fact, Congress can confirm or ratify executive authority through an appropriation if "the appropriation … plainly show[s] a purpose to bestow the precise authority which is claimed."[250] The ratification must fund the specific action in question such that a ruling that the agency lacks authority to do so would conflict with the specific language of the appropriation.[251] That is the case here. If standards predicated on ZEV performance were beyond EPA's authority, then this appropriation for states to adopt the California GHG zero emission standards is negated, since such standards could not be deemed "emission standards for new motor vehicles" requiring a waiver of preemption.

Courts further require that the agency have an arguable basis for the action ostensibly being ratified.[252] EPA's assertions of authority here are at the very least arguable; indeed, as we explain in preamble I, the statute provides clear Congressional authorization for the final standards. Ratification by appropriation also "will not be accepted where prior knowledge of the disputed action cannot be demonstrated clearly."[253] As just documented, Congress was well aware of both EPA's interpretation in its prior GHG rules, as well as the pending waiver request from the State of California.

Summary of Specific Comments Related to Constitutional Provisions

The proposed rule may violate the Takings Clause of the Constitution and, to the extent that the rule relies on any state's ZEV mandate, a number of other Constitutional provisions: the Dormant Commerce Clause, the Import-Export Clause, the Privilege and Immunities Clause, and the Full Faith and Credit Clause. (Valero)

Response Specific Comments Related to Constitutional Provisions

EPA disagrees with the commenter that the Takings Clause applies here. The Takings Clause of the U.S. Constitution states that "private property [shall not] be taken for public use, without just compensation." U.S. Const. amend. V. The purpose of the Takings Clause is to prevent "Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole." Penn Central Trans. Co. v. City of New York, 438 U.S. 104, 123 (1978). The protections of the Takings Clause apply to real property, see Lucas v. South Carolina Coastal Council, 505 U.S. 1003, 1019 (1992), personal property, see

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standards for mobile sources under Section 177, which they may submit to EPA afterwards as part of their state measures. Funding available in Section 60105(g) is intended to support states wishing to use this tool. A necessary predicate for states adopting California's standards under Section 177 is that EPA issue a waiver of preemption pursuant to CAA Section 209. *By making these funds available specifically for states to adopt and implement California's GHG and zero emission mobile source standards, Congress indicates its approval of EPA's decision to grant a waiver to California for such standards where the statutory criteria have been met*." Id. (emphasis supplied).

[250] *Ex parte Endo*, 323 U.S. 283, 3032 n. 24 (1944).

[251] U.S. GOVERNMENT ACCOUNTABILITY OFFICE, PRICIPLES OF FEDERAL APPROPRIATIONS LAW 2-57 to 2-60, 2-72 to 2-76 (2016). See also *Brooks v. Dewar*, 313 U.S. 354, (1941) (Congress had ratified the Secretary of Interior's construction of the Taylor Grazing Act by appropriating funds collected pursuant to the Secretary's interpretation); *Fleming v. Mohawk Wrecking & Lumber Co*., 331 U.S. 111, (1947) (finding Congress had ratified a presidentially created temporary controls administrator by recognizing the office in an appropriation bill).

[252] *D.C. Civic Action Ass'ns v. Airis*, 391 F. 2d 478, 481 (D.C. Cir. 1968).

[253] Id. at 482.

Andrus v. Allard, 444 U.S. 51, 65 (1979), and intangible property, see Ruckelshaus v. Monsanto Co., 467 U.S. 986, 1003-04 (1984)

Regulatory takings are treated more deferentially. Although a compensable taking can occur by government regulations that unduly burden private property interests, see Pennsylvania Coal Co. v. Mahon, 260 U.S. 393, 415 (1922), "[t]he mere regulation of the use of property, even if it results in the diminution of its value and profitability does not constitute a taking within the meaning of the fifth amendment." Nance v. EPA, 645 F.2d 701, 715 (9th Cir. 1981), cert. denied, 454 U.S. 1081 (1981). In considering whether a regulation constitutes a taking of private property, "'the aggregate must be viewed in its entirety'" such that "for example, a regulation that prohibited commercial transactions in eagle feathers, but did not bar other uses or impose any physical invasion or restraint upon them, was not a taking." Tahoe-Sierra Preservation Council, Inc. v. Tahoe Reg. Planning Agency, 535 U.S. 302, 328 (2002) (quoting Andrus, 444 U.S. at 66); see also Keystone Bituminous Coal Ass'n v. DeBenedictis, 480 U.S. 470, 498 (1987) (holding that a requirement that coal pillars be left in place to prevent mine subsidence was not a regulatory taking).

We do not believe the rule takes the property of any entity, let alone does it take the entirety of any industry. The rule sets feasible emission standards, allowing industry to comply by the means of its choosing. EPA's modeling of various pathways of compliance does not direct any certain path, and even shows that no particular industry need be ceased to comply. To the extent that a court could find a taking here, it cannot be viewed as barring all economic uses of such property. This is true for all industries affected by this rule, from vehicle manufactures to fuels and beyond.

Further, the injury that the commenter, who represents fuels interests, complains of is no more than derivative economic injury not recognized by the courts as a Takings violation. A takings claimant must, at minimum, assert that its property interest was actually taken by the government action. See United States v. Gen. Motors Corps., 323 U.S. 373, 379 (1945); see also Yuba Nat. Res., Inc. v. United States, 904 F.2d 1577, 1581 (Fed. Cir. 1990) (holding that "the measure of just compensation is the fair value of what was taken, and not the consequential damages the owner suffers as a result of the taking"); Klein v. United States, 375 F.2d 825, 829 (Ct. Cl. 1967) (holding that "compensation under the Fifth Amendment may be recovered only for property taken and not for incidental or consequential losses, the rationale being that the sovereign need only pay for what it actually takes rather than for all that the owner has lost"). But where, as here, the regulation's indirect impact to the claimant flows only through its impact to another, the claimant lacks a cognizable property interest. Air Pegasus of D.C., Inc. v. United States, 424 F.3d 1206, 1215 (Fed. Cir. 2014). The rule addresses emissions from motor vehicles, without directing the means of reduction. Although the affected vehicles may decrease fossil fuel demand, that impact is incidental to the emissions controls required in the vehicles themselves. As such, the commenter's warning of a takings violation through the rule's perceived economic impact to fossil fuel demand is misplaced.

As for the remaining constitutional principles cited by commenter relating to state ZEV mandates, EPA disagrees that any such principles apply. This action is a final rule issued by the federal EPA, not an action issued by any State government. While EPA has carefully considered and addressed comments on how the agency should account for state ZEV mandates in assessing factors like technology availability and costs, comments on the constitutionality of those state ZEV mandates are beyond the scope of this rulemaking.

2.2 Applicability (specific applications)

2.2.1 Motorcoach

Comments by Organizations

Organization: American Bus Association (ABA)

Fleet Composition and Infrastructure

The Notice lays out several future fleet adoption rates for zero emissions vehicles (Table ES-3 and IF-3). While modestly aggressive estimates, the estimates significantly discount the current and future state of the infrastructure. Based on the grant programs outlined and recently unveiled under the Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA), the technology suite being prioritized for adherence with these future goals appears to be electric vehicles. However, the research has not yet been finalized in terms of what plug technology is best suited for heavy-duty vehicle charging. In addition, according to the US Department of Energy's Alternative Fuels Data Center (https://afdc.energy.gov/fuels/electricity_infrastructure.html), Direct Current (DC) Fast Charging Stations would be needed to support heavy-duty vehicle charging given their current operational models. There are currently less than 4800 of those type of DC charging stations in the United States and very few in the midwestern and southern parts of the US. Based on projections in the Notice that are looking to have roughly 2-3 vehicles supported at every charging station, the current infrastructure is far below being able to support the current fleet offerings, even with reasonable adoption rates of the new technologies. To go further, our current energy grid would not be able to support a significant increase in electrical output to charging facilities. There are already rolling blackouts in many parts of the country today (https://www.americanexperiment.org/most-of-the-u-s-faces-elevated-risks-of-blackouts-during-heatwaves-this-summer/). [EPA-HQ-OAR-2022-0985-1634-A1, p. 2]

We additionally have operational concerns about electric battery adoption for interstate motorcoach operations, due to decreased baggage storage capacity in the luggage bay, plus increased operating weight for the battery packs. If people are no longer able to travel as far, as quickly or as comfortably as they are used to, will they continue to travel at all? Will motorcoach vehicles even be able to operate without enduring costly overweight tickets, as mandated by our current highway bridge formula which dictates vehicle size and weight? In just looking at the specification sheets for new electric motorcoaches versus current diesel models currently commercially available for sale, the below floor baggage storage capacity will be limited by at least 75% (https://www.mcicoach.com/coach/electric-series/specs/ vs. https://www.mcicoach.com/coach/j-series/specs/). While operational testing under fully loaded passenger vehicles is somewhat incomplete, new research released by AAA points to range decreases for electric vehicles approaching maximum load capacity (https://www.ttnews.com/articles/AAA-evs-range-weight). Such unexpected and unplanned range decreases could cripple long-range heavy-duty vehicle operations given the current status of the charging infrastructure. As noted in the specifications sheet for current and electric motorcoaches, currently diesel motorcoaches can travel roughly 1200 miles on a full tank of fuel and takes about 10-15 minutes to fill with diesel fuel. A fully loaded electric motorcoach currently has a max range of 180-220 miles before needing a charge, which also takes a minimum of 4 hours. This is a significant issue for motorcoach companies and passengers needing to operate over long distances. Our passengers cannot afford to travel roughly 3 hours, wait 4 hours for a full charge (assuming we can plug in upon arrival and no wait at a charging station) and may unintentionally be left short of a charging station given the current infrastructure, resulting in a safety hazard and increased operating costs. [EPA-HQ-OAR-2022-0985-1634-A1, pp. 2 - 3]

We also share concerns with other commenters that even if the electric infrastructure expands to meet the demand for expanded capacity and range, will charging speeds also advance to meet operational requirements, to stay in phase with hours of service compliance requirements and other safety concerns. [EPA-HQ-OAR-2022-0985-1634-A1, p. 3]

Technology Adoption

Many researchers believe hydrogen fuel cell technology may be a better fit for heavy-duty vehicle operations and their increased need for longer range operations, and is something that is briefly explored in this proposal. However, the concerns about the infrastructure for refueling for hydrogen fuel technology are even more dire than they are currently for electric charging stations compatible with heavy duty vehicles. There are currently less than 60 hydrogen fueling stations in the United States and they are only in California. While there are a few grant incentives currently available to motorcoach companies pursuing zero-emission technology, such as the California HVIP program or the EPA DERA program, they focus on and prominently feature battery electric vehicles on their approved vehicle lists (https://californiahvip.org/vehicle-category/transit-bus/) or prioritize them on the verified technology list (https://www.epa.gov/verified-diesel-tech/verified-technologies-list-clean-diesel). So even though this proposal does explore alternate fuel technology alternatives, real world factors assume and predict the assumed adoption of battery electric technology solutions. This makes consideration of hydrogen fuel cell technology, unlikely and inconsequential. We also note from the current unified agenda published by the Administration (https://www.reginfo.gov/public/do/eAgendaMain), that standards are not yet fully formed for safe hydrogen battery technology and are still under development (RIN 2127-AM40). Similarly, safety standards are still being developed and adopted for heavy-duty electric batteries as well (RIN 2127-AM43). Between a lack of safe or reliable technology development or operational standards, a lack of existing infrastructure, unreliable projections for future infrastructure, it seems prudent to delay a selection of any particular low or zero-emission technology strategy and any fleet requirements or projections should be set aside. [EPA-HQ-OAR-2022-0985-1634-A1, p. 3]

ABA and the motorcoach industry supports the exploration and investment in environmental initiatives and the limiting of the expansion of greenhouse gas pollution, while we continue to serve as a hallmark of sustainable and responsible environmental solutions. We hope that these important contributions as well as the suggestion provided in comments from a multitude of motorcoach operators, equipment manufacturers and on behalf of the traveling public will be considered. [EPA-HQ-OAR-2022-0985-1634-A1, p. 5]

Motorcoaches should be exempted from consideration under a phase 3 greenhouse gas standard. [EPA-HQ-OAR-2022-0985-1634-A1, p. 5]

Organization: Bailey Coach - John Bailey

The Motorcoach industry is unique to the diesel engine industry and represents a very small amount of the diesel engines on the road today [EPA-HQ-OAR-2022-0985-1438-A1, p. 1]

We are not opposed to clean air technology; we have embraced it and provide a low-cost way of travel. Costs of new motorcoaches are about $550,000.00 and with proposed electric over the road coach models cost 1 million or more. With this type of cost, it will eliminate smaller carriers and allow the survivors to charge higher rates to the public. The current electric coaches have a short milage range, take too long to recharge and have no luggage capacity or place for sports equipment. The infrastructure required to support the widespread adoption of charging of EV Coaches is nonexistent. The motorcoach industry is already short on drivers and equipment due the covid pandemic along with a 12 month wait time for ordering new equipment and now we fear the engine manufacturers will not be able to meet the 2027 mandate due the size of our industry. The lack of motorcoach parking in cities causes drivers driving through cities circling blocks looking for a safe spot to park their 45-foot 50,000-pound vehicle. A coach operating 7–10-day sightseeing tour would have to recharge every 300 or so miles and this would limit the distance we could cover in a normal day; a normal travel day is about 450 miles on multi day tours [EPA-HQ-OAR-2022-0985-1438-A1, pp. 1-2]

I ask that you classify our industry differently from the trucking industry as we represent about 1% of the diesel powered over the road vehicles. [EPA-HQ-OAR-2022-0985-1438-A1, p. 2]

Organization: Black Tie Transportation Bus Charters

Currently, the Over-The-Road Motorcoach industry, specifically within the State of North Carolina, and Black Tie Transportation Bus Charters is in a dilemma. [EPA-HQ-OAR-2022-0985-1602-A1, p. 1]

Black Tie Transportation Bus Charters and 99% of the over-the-road Motorcoach Companies are primarily composed of small family run operations, which have always strived for excellence and perfection. We are a service related industry that utilizes equipment from a handful of motorcoach manufacturers. While the nationwide motorcoach manufacturers are less than 10, there are only 3 major manufacturers of propulsion systems for this equipment (Cummins, Mercedes Benz, and Volvo – * Detroit Diesel notified the industry in 2020, they will no longer support the small motorcoach industry). [EPA-HQ-OAR-2022-0985-1602-A1, p. 1]

All these current propulsion systems manufacturers are diligently working to create innovative and alternative sources of power while we, (the operators) are thrust into a quandary. We must wait for technology to emerge, and we have no control over this or how quickly and efficiently it will occur. [EPA-HQ-OAR-2022-0985-1602-A1, p. 1]

Along with the entire motorcoach industry, we eagerly anticipate the day we can be considered a “zero-emissions” industry. Though today, we must standby and await the technology to come to completion. [EPA-HQ-OAR-2022-0985-1602-A1, p. 1]

A study by The University of Vermont Extension, conducted by David Kestenbaum, which began in 2009 titled “Green Coach Certification program”, helps to identify steps our industry has taken to offset carbon emissions. Active participation in this program demonstrates our commitment to improvement. [EPA-HQ-OAR-2022-0985-1602-A1, p. 1]

Further analysis by “the Union of Concerned Scientists”; “Motor Coaches Leave Carbon in the Dust*

It’s plain and simple: buses are the low-carbon travel champ. On a per-passenger basis, buses emit less than one-sixth the carbon pollution of a typical car with one passenger. Put another way, every person who chooses motor coach travel instead of driving alone reduces his or her carbon dioxide emissions by an average of 85 percent. This couldn’t be better news for climate change. Even at today’s average occupancy rates, your carbon footprint will be a mere 0.17 pound for every mile you travel on a motor coach—the smallest footprint of any mode for people traveling alone or with a companion. *Getting There Greener, Union of Concerned Scientists [EPA-HQ-OAR-2022-0985-1602-A1, p. 1]

Total North American sales of motorcoaches is estimated at 2,500 per year. Medium and heavy truck sales were almost 500,000 in 2022. The motorcoach industry is simply too small to be a focus for powertrain manufacturers (as is evident by Detroit Diesel pulling away from the Motorcoach industry) and we have to rely on advances on the truck side to be developed and then applied to our industry, which significantly delays implementation. [EPA-HQ-OAR-2022-0985-1602-A1, pp. 1 - 2]

We ask that our industry be provided with a waiver / exemption until the technology is invented and proven to assist our industry towards compliance while maintaining our ability to service our clients, including emergency and military operations. [EPA-HQ-OAR-2022-0985-1602-A1, p. 2]

The current “ICE” engine allows most of the vehicles (complying with FMCSA – Hours of Service requirements, with a single driver) to travel up to 600 miles in one day, which assists in accomplishing the tasks of the “emergency vehicle”, as stated above. [EPA-HQ-OAR-2022-0985-1602-A1, p.2]

From a client perspective, this affords seamless travel for a wide range of uses. From an emergency perspective, it makes our assistance possible. [EPA-HQ-OAR-2022-0985-1602-A1, p.2]

While the engine manufacturers advise they will meet the U.S. Environmental Protection Agency 2027 Model Year requirements for heavy-duty engines, they will not meet the MYs 2024, 2025, 2026. This places heavy-duty vehicle operators at a distinct disadvantage as manufacturers will not be able to sell to “CARB” states (including North Carolina). Unable to acquire newer updated engines with existing technology that reduces emissions, North Carolina is unwittingly increasing emissions by compelling operators of heavy-duty vehicles to retain older equipment instead of the next step in modernization. [EPA-HQ-OAR-2022-0985-1602-A1, p.2]

Motorcoaches are designed and manufactured to carry 55+ passengers and their luggage on long distance travel. The infrastructure for readily charging batteries in heavy duty vehicles traveling long distances does not exist yet, although progress is being made. There are some indications hydrogen fuel cells may be the logical next step for zero emissions heavy duty vehicles such as motorcoaches. While this technology is promising, the technology remains under development as does the refueling infrastructure. [EPA-HQ-OAR-2022-0985-1602-A1, pp. 2 - 3]

Challenges we identify:

We are “Green” – carrying 56 or more (up to 80) passengers at one time, significantly reducing individual vehicles on the highway, while greenhouse gases and emissions being emitted are significantly decreased. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

Until technology can meet or exceed the current levels of operations, emergency operations will be severely impacted if ICE engines are removed without an adequate alternative. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

While there are a few alternative fuel vehicles being evaluated, there are no “over-the-road” motorcoaches available to our industry, at present or being tested in actual use for the services described above. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

The vehicles which have been “tested” have identified various challenges, including but not limited to: charging facilities which could accommodate a motorcoach, the weight of the vehicle and handling characteristics while on the highway, significant loss of storage space within the vehicle, maintenance challenges (mechanic knowledge and abilities), distance the vehicle could travel, time the vehicle could remain active on the highway, time required to replenish the batteries, plus others. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

Currently there is not an alternative fuel – Sustainable – that has been brought forth and regularly available for our industry. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

At this time, consequences for non-compliance should be set aside, as “we” (the operators) have no control over the innovative technological advancements required. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

We are frequently called for emergency situations, which require the vehicles to be active and ready to move 24 hours a day. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

Our recommendation would be: The State should adopt the U.S. Environmental Protection Agency regulation for MY 2027 heavy-duty diesel engines so that North Carolina operators of large heavy-duty vehicles can continue to upgrade their fleets for Mys 2024-2026. [EPA-HQ-OAR-2022-0985-1602-A1, p. 3]

Organization: Brown, David

The motorcoach industry is small in total with only about 2500 new over the road buses added per year in North America, and it is comprised of some corporate, but mostly small family owned and operated enterprises. Even with our small stature, and small organizations, we succeed in carrying school groups on their field trips, senior groups on outings, military groups needing relocation, emergency support for utility workers in times of disaster, and evacuation of citizens in the aftermath of events like Katrina in New Orleans. We are a small, but essential, part of the US transportation solution. [EPA-HQ-OAR-2022-0985-1970, p.1]

Our small size has many benefits, but it also comes with limitations. While there are half a million new trucks put on the road each year, there are only about 2500 over the road buses. For this reason, new technology development is slow and really needs to be proven elsewhere for the most part. For something as drastic as trying to move over the road buses to a non-diesel solution will require massive R&D and will be fraught with trial and error. These iterations will go much more quickly with trucking. If over the road buses are subjected to the same process, there will be failures in troop movements, inabilities to respond in times of national disasters, and disappointing field trips. [EPA-HQ-OAR-2022-0985-1970, p.1]

My request is that the bus industry be exempted from compliance until which time that the technology can be proven to be reliable an effective. In our disaster relief efforts for Katrina, it was necessary to have buses in operation for up to 36 hours straight. No current or planned technology could be implemented to achieve the requirements of the motorcoach industry and allowing us to meet the needs in front of us. [EPA-HQ-OAR-2022-0985-1970, p.1]

We are not against progress and the industry had participated in many green initiatives, most notably by the University of Vermont. We are by our very nature ‘green’ in that we move large numbers of people in a single vehicle. It is simply that we offer essential services that require robust equipment. Let trucking work out the kinks, then give our three manufacturers, none of which are US based, sufficient time to implement the technologies that work. [EPA-HQ-OAR-2022-0985-1970, p.1]

Organization: Compass Coach Inc.

Cost: The price for a new motorcoach currently is between 575,000-650k, this is a huge expense for a small business, but we pay that to get new, clean coaches. We are already financially strapped to keep our fleets modern due to the price tag. However, an all-electric motorcoach is double that of a typical motorcoach with a price tag coming in around 1.1 million. This will lead to smaller companies being priced out of the market, which could reduce competition and lead to higher prices for consumers. It will also discourage fleet owners from purchasing new model year vehicles and will lead operators running older models for longer periods. This is counterproductive, instead of operators migrating towards cleaner options with advance technology, they will opt to keep their fleet with vehicles that produce higher Nox and GHG. [EPA-HQ-OAR-2022-0985-1498-A1, p.2]

Range: Just to quick background of our industry and how we operate, or vehicles travel across country for multiple days at a time. Many times, our trips will exceed 1000 miles in a day. Taking a group of students from Michigan to our Nation’s Capital in DC currently takes us about 15 hours in a coach. The range of electric vehicles is extremely limited compared to a traditional combustion engine. Currently, our vehicles can travel roughly 1200 miles on a full tank, and takes about 10 minutes to fill with diesel. The technology for EV coaches as of now has a max range of 180 miles before needing a charge, which also takes minimum of 4 hour. This is a significant issue for motorcoach companies to operate over long distances. Our customer cannot afford to travel roughly 3 hours, wait 4 hours for a full charge (assuming we can plug in upon arrival and no wait at charging station). Our groups are on a time crunch and expect to be at their destination in a timely manner. A 2 day trip would turn into a 6-7 day trip, which will make motorcoach travel undesirable. Our customer will seek other means of transportation. Even if time of travel was not a factor, it would make the cost of travel to expensive for customer. Having to pay for additional nights in hotel, meals, wages, etc… would all add up to make travel unaffordable. More than likely, our industry would slowly diminish and wither away as groups will seek alternative options, such as airline travel. [EPA-HQ-OAR-2022-0985-1498-A1, pp.2-3]

No luggage space: very simple, the EV's that are currently on the market have ZERO luggage space because they have been converted to battery storage. Our industry depends on a large area of luggage space to accommodate passenger bags, athletic equipment, band instruments, and other items used while on a voyage. Eliminating luggage space for batteries, again, will lead to customer seeking other means of transportation. [EPA-HQ-OAR-2022-0985-1498-A1, p.3]

Safety: This is our main priority, getting 56 athletes/families/children/senior citizens to their destination safely. While electric vehicles are generally considered safe, there are some concerns about the safety of the lithium-ion batteries that power these vehicles. These batteries can catch fire or explode in certain situations, such as during a crash. We do everything we possibly can to prevent any accident, but if or when something does happen, its important that our passenger have every chance at survival. An Explosion from a battery would significantly reduce the chance of survival. [EPA-HQ-OAR-2022-0985-1498-A1, p.3]

Maintenance. All of our technicians are trained and educated in diesel technology. For them to start from scratch and learn an entirely new type of system is unrealistic. Technicians are hard to come by as is, and this will only further hinder our ability to maintain are safe/reliable fleet. Smaller operators and operators in remote areas would struggle finding talented techs, and will lead to more road side break downs with lack of proper maintenance. What we are hearing from industry professionals is that we would be in need of a technical expert with a degree in electrical engineering to maintain these vehicles. So many companies may find it unfeasible to operate and close their doors permanently. [EPA-HQ-OAR-2022-0985-1498-A1, p.3]

Infrastructure: The infrastructure required to support widespread adoption of electric vehicles is nowhere near what would be needed to supply the demand for charging if EV's are mandated. Especially in remote areas where are groups travel regularly. This includes not only charging stations, but also the electrical grid that will need to support increased demand for electricity. Without adequate infrastructure in place, mandating electric vehicles could create more problems than it solves. I have been told by electricity representatives, that if just 30% of the car owning population goes to electric cars, that the grid will not support this use. And if it does get to 30% and for some gift of god, the grid system can handle this….that there would need to be a new energy plant (Coal/nuclear/water/wind etc), built every 100 miles apart from each other. Everybody wants clean electricity, but NOBODY wants a electricity plant in their backyard! That is the simple truth. [EPA-HQ-OAR-2022-0985-1498-A1, p.3]

Cost of charging: To add charging stations at each motorcoach facility for every vehicle is unrealistic. We have a fleet of 70 vehicles, which would require 70 charging stations at our terminal home base. The cost to add these are very expensive and our local power supplier said it would be impossible to do this on a widespread level. Even though the price is astronomical to add in these charging stations, on top of that, we are still paying for energy through the electric bill. Electricity does not magically appear; it is produced through other means and many times that is through non renewable resources. An overwhelming majority of electricity is produced by Coal powered plants and natural gas. Seeing train carts full of black dirty coal being transported to the power plants is only going to get more and more prominent if we go in the direction EPA has proposed. There has to be a source of energy, 60% is supplied by fossil fuels. So again, it is counterproductive assuming electric vehicles will replace all carbon power. [EPA-HQ-OAR-2022-0985-1498-A1, pp.3-4]

Organization: Field trips 101, Inc.

I have several buses that run continuously 24 hours a day 7 days a week. We don't have any logistics built in nor is it possible to accommodate a bus that ONLY does 200 miles before a recharge is required. I have another route that is 240 miles one way. I would need two buses for a single route. What about all those senior trips were the kids go to DC and we got a drive them 500 miles to get there. What about when we're moving the soldiers for the department of defense and they need to get out for deployment and we can only go 200 miles? You need to leave the Motorcoach industry, unscathed and unaffected and you could apply this to more shipping because goods don't necessarily need to get to where they need to go and one fell swoop, but people certainly do especially in the middle of the winter or going through death Valley. [EPA-HQ-OAR-2022-0985-1971, p.1]

Why is our Government pushing for a alternative energy source that is NOT practical. There is so much talk of Hydrogen Energy and how this would provide better energy in my opinion then electricity. Hydrogen fuel would be a lot more practicable in a motorcoach. Lets lean on this technology and see if this can work for motorcoach/trucks and locomotives. [EPA-HQ-OAR-2022-0985-1498-A1, p.4]

Organization: Holiday Companies, Inc. - Jonathan Moody

I am writing to you today to implore you to consider the ramifications of this policy on the most forgotten of industries – the Motorcoach Charter Industry. I know you have the capability to do this, because on December 20, 2022, the EPA adopted a final rule called 'Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards.' That final rule set aside a special set of rules for Motorcoach Operators because they recognized the rapid derate schedule that would work for trucks harshly and dangerously affected the passengers we transport every day. [EPA-HQ-OAR-2022-0985-1497-A1, p. 1]

That's right – these could be your kids, grandkids, parents, siblings… People of every age, gender, and ethnicity rely on our transportation to make their travel easy and safe on a daily basis. In every circumstance, if this rule comes down and does not exclude motorcoaches, these situations will do one of two things: they will either cease to exist or they will dramatically increase in costs. Why? A couple main reasons:

- Cost – Right now EV buses are around 2X the cost of a normal bus. For reference, a new 45' motorcoach costs $550,000-675,000.
- Range – Right now, our clean diesel motorcoaches have a 222 gallon diesel tank, capable of going around 1,200 miles. To achieve that range legally today, would take more than 2 drivers full daily On- Duty Drive Time. An electric bus by comparison, will struggle to make 250 miles. And then instead of a 10-15 minute fill-up, it's a 3-4 hour wait for your batteries to charge. Long travel days that take 2 drivers and 16 hours today with no overnight costs, will now take 3-4 days with multiple hotel stops.

- Cargo space – Remember that group of Seniors we discussed on a 13-day Yellowstone tour? That group will fill over 300 cubic feet of baggage space. On an Electric bus, there is very little baggage space. This trip wo
- Infrastructure – The availability and ability of buses to charge over the road does not exist today. It would take an insane amount of infrastructure, all to continue to face the other problems discussed.
- Emissions – Motorcoaches are the lowest Carbon Dioxide Emission per passenger mile form of transportation that exists today. Period, full stop, end of statement. A motorcoach gets 240 passenger miles per gallon compared to commuter rail at 90, Transit buses at 70, Hybrid cars at 50, and a gas passenger car at 28. We are a green industry. [EPA-HQ-OAR-2022-0985-1497-A1, p. 1]

I hope you see, taking motorcoaches off the road will, in the end, increase the number of vehicles on the road, and increase the amount of carbon dioxide that is being spread in the environment. I implore you today to recognize the significance of the motorcoach industry, and to do so by separating us from the trucking companies this rule is aimed at. We know changes are coming, and that they are needed, but I beg you to remember our industry and think about the effects these rules will have on our groups. [EPA-HQ-OAR-2022-0985-1497-A1, p. 1]

Organization: United Motorcoach Association (UMA)

The proposed GHG standards for heavy-duty highway vehicles starting in model year (MY) 2028 through MY 2032 create uncertainty. Engine manufacturers have advised operating companies that they will not be capable of meeting CARB MY 2024, 2025, and 2026 standards. While we presume engine manufacturers will meet EPA requirements for MY 2027, new standards for 2028-2032 create more uncertainty and fear that engine manufacturers may eventually abandon research, development, and production of new heavy-duty diesel engines to meet regulatory demands. [EPA-HQ-OAR-2022-0985-1627-A1, p. 2]

If unable to obtain new engines or zero emissions vehicles with some level of certainty, motorcoach companies may simply hold on to older motorcoaches with less desirable emissions. [EPA-HQ-OAR-2022-0985-1627-A1, p. 2]

Concerns are compounded by the uncertainties surrounding heavy-duty vehicles transition to zero emission vehicles. The proposal suggests motorcoaches will likely transition to fuel cell electric vehicles, however, there is virtually no discussion within the industry of adopting this technology. [EPA-HQ-OAR-2022-0985-1627-A1, p. 2]

While battery electric and hydrogen fuel cell technology look promising for heavy-duty vehicle application, both remain in development stages for motorcoaches and are not currently viable for the motorcoach service consumer. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Typical consumers of motorcoach services have baggage and often equipment (sports teams, military, high school/college bands/orchestra, etc.). Early development of zero emission vehicles reduces baggage capacity to the degree the motorcoach will not meet the needs of the consumer and will require alternative or supplemental transportation. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Along with 50+ passengers and baggage, motorcoaches must heat, cool, furnish passenger compartment lighting, internet and USB/110 outlets. Until there are technical advances, battery electric powered motorcoaches will have limited range before charging is required. While drivers are recharging, they will likely be considered on duty/not driving for purposes of logging hours-of-service. Depending on the length of the trip, additional drivers (already in short supply) may be required, further adding to the cost that may not have been contemplated in EPA's calculations. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Compounding the limited range is the current lack of infrastructure for recharging batteries that must include safe and comfortable locations to deboard the motorcoach passengers. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Motorcoach providers are routinely called upon to provide emergency service during hurricanes and wildfire. Emergency planners often stage fuel tanker/trucks to assure ample diesel to complete the trip as traditional outlets are frequently closed due to a loss of electricity. Before the motorcoach industry transitions to battery electric or fuel cell electricity, this must be addressed. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

The current cost of a motorcoach exceeds $500,000 and often exceeds $600,000. Early estimates of battery electric equipped motorcoaches are over $1 million. We are unaware of any fuel cell electric motors under development for motorcoaches, so we are unable to predict the cost. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Motorcoach companies' capital costs are not subsidized by federal, state and/or local grants and must amortize the cost of the capital investment in the cost of group charter fees and individual fares. Many consumers of motorcoach services will find these monetary increases challenging if not impossible to pay the cost of increased group charter prices and individual fares. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Along with training drivers the nuances of a motorcoach powered by batteries or hydrogen fuel cells, mechanics will require specialized training for maintenance, repair, and safety. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

While the motorcoach industry appears to be accepting EPA standards for MY 2027, the aggressive adoption of new regulations for MY 2028-2032 will require significant engine manufacturer research and development, capital investments by motorcoach companies, the burden of maintaining and repairing motorcoaches with a variety of technologies. The proposed transition will also be burdened with additional driver cost. All increased costs will preclude some charter groups and individuals from travelling. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

We respectfully request EPA consider the condition and size of the motorcoach industry post COVID and permit a slower adoption of heavy-duty diesel technology while zero emission technology and the associated infrastructure matures. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

UMA encourages comprehensive studies with definitive conclusions before pursuing further rulemaking. [EPA-HQ-OAR-2022-0985-1627-A1, p. 3]

Organization: Vandalia Bus Lines, Inc.

Cost: The price for a new motorcoach currently is between 500-600k, this is a huge expense for us as is. We are already financially strapped to keep our fleets modern due to the price tag. However, an all-electric motorcoach is double that of a typical motorcoach with a price tag coming in around 1.1 million. This will lead to smaller companies being priced out of the market, which could reduce competition and lead to higher prices for consumers. It will also discourage fleet owners from purchasing new model year vehicles and will lead operators running older models for longer periods. This is counterproductive, instead of operators migrating towards cleaner options with advance technology, they will opt to keep their fleet with vehicles that produce higher Nox and GHG. [EPA-HQ-OAR-2022-0985-1491-A1, p.2]

Range: Just to quick background of our industry and how we operate, or vehicles travel across country for multiple days at a time. Many times, our trips will exceed 1000 miles in a day. Taking a group of students from St. Louis to our Nation's Capital in DC currently takes us about 15 hours in a coach. The range of electric vehicles is extremely limited compared to a traditional combustion engine. Currently, our vehicles can travel roughly 1200 miles on a full tank, and takes about 10 minutes to fill with diesel. The technology for EV coaches as of now has a max range of 180 miles before needing a charge, which also takes minimum of 4 hour. This is a significant issue for motorcoach companies to operate over long distances. Our customer cannot afford to travel roughly 3 hours, wait 4 hours for a full charge (assuming we can plug in upon arrival and no wait at charging station). Our groups are on a time crunch and expect to be at their destination in a timely manner. A 2 day trip would turn into a 6-7 day trip, which will make motorcoach travel undesirable. Our customer will seek other means of transportation. Even if time of travel was not a factor, it would make the cost of travel to expensive for customer. Having to pay for additional nights in hotel, meals, wages, etc… would all add up to make travel unaffordable. More than likely, our industry would slowly diminish and wither away as groups will seek alternative options, such as airline travel. [EPA-HQ-OAR-2022-0985-1491-A1,pp.2-3]

No luggage space: very simple, the EV's that are currently on the market have ZERO luggage space because they have been converted to battery storage. Our industry depends on a large area of luggage space to accommodate passenger bags, athletic equipment, band instruments, and other items used while on a voyage. Eliminating luggage space for batteries, again, will lead to customer seeking other means of transportation. [EPA-HQ-OAR-2022-0985-1491-A1,p.3]

Safety: This is our main priority, getting 56 athletes/families/children/senior citizens to their destination safely. While electric vehicles are generally considered safe, there are some concerns about the safety of the lithium-ion batteries that power these vehicles. These batteries can catch fire or explode in certain situations, such as during a crash. We do everything we possibly can to prevent any accident, but if or when something does happen, its important that our passenger have every chance at survival. An Explosion from a battery would significantly reduce the chance of survival. [EPA-HQ-OAR-2022-0985-1491-A1, p.3]

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Maintenance. All of our technicians are trained and educated in diesel technology. For them to start from scratch and learn an entirely new type of system is unrealistic. Technicians are hard to come by as is, and this will only further hinder our ability to maintain are safe/reliable fleet. Smaller operators and operators in remote areas would struggle finding talented techs, and will lead to more road side break downs with lack of proper maintenance. What we are hearing from industry professionals is that we would be in need of a technical expert with a degree in electrical engineering to maintain these vehicles. So many companies may find it unfeasible to operate and close their doors permanently. [EPA-HQ-OAR-2022-0985-1491-A1, p.3]

EPA Summary and Response:

Summary:

ABA, Bailey Coach, Black Tie Transportation Bus Charters, Compass Coach, D. Brown, Holiday Companies, Field Trips 101, United Motorcoach Association, and Vandalia Bus Lines raised concerns related to the ability of motorcoaches to perform their mission (transporting people and their cargo) using battery electric technology. Furthermore, commenters raised concerns regarding the infrastructure needs for electrified motorcoaches because these vehicles would need to rely on public enroute charging.

Response:

As described in Chapter 2.2.1.2, there are some existing BEV coach buses; however, these buses include less underfloor storage volume than comparable coach buses in the market today. Therefore, as discussed in preamble Section II.F.1 and RIA Chapter 2.9.1.2, EPA re-analyzed the packaging space available for batteries on motorcoaches and updated our analysis and approach in the final rule for coach buses as further explained in those sections. Under the final rule, EPA's optional custom chassis standards for Coach Buses will remain unchanged from the existing Phase 2 MY 2027+ CO_2 emission standards.

Please see Sections 3 and 4 of this RTC document for our responses relating to our analysis of costs, range, infrastructure, maintenance and repairs, and safety with respect to the other heavy-duty vehicle sectors for which the final rule will apply.

2.2.2 Concrete Mixer/Concrete Pumper

Comments by Organizations

Organization: American Concrete Pumping Association (ACPA)

The majority of our member companies are small businesses, family-owned and operated. Concrete pump companies operate in every state, in urban, suburban, and rural areas. Concrete pumps use a single engine to propel themselves over the roads to and from job sites daily and to operate their pumps in power take-off (PTO) mode. Concrete pumps need robust electric battery technology to support their energy needs, as well as a geographically comprehensive charging network to ensure operation reliability. Until such technology and infrastructure exist, ACPA opposes the implementation of the proposed standards. [EPA-HQ-OAR-2022-0985-1593-A1, p. 1]

As a relatively small, but highly impactful construction industry, the concrete pumpers have some serious concerns about the implementation of this proposed Phase 3 rule. Concrete pump companies purchase the truck chassis from major truck manufacturers and the pumps from pump manufacturers. We are subject to what those markets provide. While we work closely with our manufacturing partners, we do not develop new technology. [EPA-HQ-OAR-2022-0985-1593-A1, p. 2]

First, we are concerned about access to the technology needed by the truck manufacturers to meet the standards in the time allowed in the proposed rule. We understand from our truck manufacturers that the electric vehicle (EV) technology required to build an electric concrete pump does not exist now. While they are working on developing the EV technology, they do not expect to complete all the work necessary to deliver compliant vehicles on the schedule described in the proposed rule. [EPA-HQ-OAR-2022-0985-1593-A1, p. 2]

Second, replacing the diesel engines that now power concrete pumps to drive to and from jobs sites, as well as to operate the pumps in power take off mode or PTO on the job sites, with electric batteries will add significant weight to operating concrete pumps. Our operators are concerned that a heavier electric-powered concrete pump would not be able to access all job sites because it could exceed road and bridge weight limits. As stated above, concrete pumps are mobile machinery; concrete pumps do not carry a load and cannot reduce their weight. [EPA-HQ-OAR-2022-0985-1593-A1, p. 2]

Third, as mobile machinery, concrete pumps travel to jobs sites daily. Our members are concerned about access to charging stations where they will need them and the potential delay caused by the need to recharge the batteries on the road and at job sites. This is a particular concern for our operators that serve rural areas. [EPA-HQ-OAR-2022-0985-1593-A1, p. 2]

Fourth, liquid concrete is a perishable product. Ready-mixed concrete trucks deliver liquid concrete to the hopper of the concrete pump set up at the job site. The concrete is pumped through the boom (65 to 200 feet) and placed where it will cure into the final product. There is a limited amount of time before the concrete begins to harden. Should an EV concrete pump run out of battery supply while it is pumping, the damage to the pump would be catastrophic. One may argue that a concrete pump operator should be able to plan to avoid such a situation. However, concrete pump operators work around delays on construction job sites on a regular basis. Currently, the concrete pumps' fuel supply is sufficient to allow for significant delay without risk of running out of fuel before the pumping is complete. Without EV charging stations on job sites, the risk of a shutdown exists, and the damage caused by a shutdown while pumping would be catastrophic – to the equipment and to construction workers and all near the construction site. [EPA-HQ-OAR-2022-0985-1593-A1, p. 2]

Finally, threat to the power supply of the concrete pump presents serious risks on and around job sites to construction workers and those around the construction site. If a concrete pump loses all power supply, the hydraulics would fail, and the boom will fall. In addition, the outriggers that support the truck chassis of the concrete pump while in PTO could fail as well, causing the whole concrete pump to tip and fall. Such actions can cause fatalities. Alternatively, if a concrete pump operator determines that it is possible to "clean" a boom filled with hardened concrete, cleaning a concrete pump boom with compressed air is a very dangerous activity that could cause fatal accidents. [EPA-HQ-OAR-2022-0985-1593-A1, pp. 2-3]

The bottom line is that the concrete pumpers see this proposed rule as a direct threat to their ability to operate their businesses. Should EPA move forward with this proposal, ACPA requests that EPA allow for exceptions or extensions to allow concrete pumps to operate while the truck chassis manufacturers develop and implement the technology needed to produce EV concrete pumps and the charging station infrastructure is adequate to support powering such EV concrete pumps. [EPA-HQ-OAR-2022-0985-1593-A1, p. 3]

Organization: American Trucking Associations (ATA)

For example, under the vocational category, 35 percent of concrete mixers would need to be electrified by 2032 7. Requiring an electrified powertrain to mix and place concrete risks catastrophic internal component failure when interruptions to the power unit occur. [EPA-HQ-OAR-2022-0985-1535-A1, p. 7] [See Docket Number EPA-HQ-OAR-2022-0985-1535-A1, page 7 for Figure 1].

7 U.S. Environmental and Protection Agency, Greenhouse Gas Emissions Standards for Medium-Heavy Duty Vehicles-Phase 3, Draft Impact Regulatory Analysis, pg. 242, April 27, 2023.

Organization: California Air Resources Board (CARB)

CARB staff note emergence of diverse highly specialized ZEV examples in the U.S. and internationally many of which could fall into the custom chassis definition, highlighting how the fast-growing nature of this sector directionally supports greater inclusion into the stronger vocational standards instead of the weaker custom chassis standards. Multiple manufacturers and upfitters already have ZEV examples that include concrete mixers,46 truck cranes,47 knuckle boom cranes,48 bucket trucks,49 sewer cleaning trucks,50 armored trucks,51 stinger-steered auto carrier transports,52 street sweepers,53 aviation fuel delivery,54 container roll off, hook loader and skip loaders,55 school buses,56 double decker and motorcoaches,57 and refuse.58 This specialized ZEV development activity is even reaching into emergency response vehicles including BEV and ZE-capable plug-in fire trucks59 and BEV and FCEV ambulances.60 [EPA-HQ-OAR-2022-0985-1591-A1, pp.21-26]

46 Concrete mixer examples. https://www.electrive.com/2022/02/14/unicon-volvo-trucks-collaborate-on-electric-concrete-mixers/

https://www.ft.com/content/750327ec-ab2f-4b62-8fc3-548a1a71a193

https://www.electrive.com/2021/01/19/futuricum-delivers-three-electric-concrete-mixer-trucks-toholcim/

https://www.electrive.com/2021/01/19/futuricum-delivers-three-electric-concrete-mixer-trucks-to-holcim/#:~:text=Designwerk%20has%20delivered%20three%20electric,drums%20are%20fully%20electrically%20operated.

http://concreteproducts.com/index.php/2018/05/15/national-cement-parent-drives-carbon-emissionsfree-mixer-project/

https://www.liebherr.com/en/deu/latest-news/news-press-releases/detail/first-fully-electric-10-and-12-m3-truck-mixers-from-liebherr-and-designwerk.html

https://www.liebherr.com/en/deu/latest-news/news-press-releases/detail/first-fully-electric-10-and-12-m3-truck-mixers-from-liebherr-and-designwerk.html

https://www.prnewswire.com/news-releases/sany-battery-electric-truck-mixers-when-traditionalconcrete-mixing-goes-green-301138618.html

https://www.prnewswire.com/in/news-releases/sany-embraces-the-era-of-cleaner-fuel-with-hydrogenfuel-cell-construction-vehicles-873229355.html

https://www.driven.co.nz/news/new-zealand-set-to-get-first-electric-milk-tanker-after-governmentfunding-boost/

https://mp.weixin.qq.com/s/3_oDaY5fTTdMf-XSMUbvdA

https://www.electrive.com/2022/06/30/tarmac-orders-electric-mixer-truck-from-renault-trucks/
https://www.muldereurope.com/elektrisch-aangedreven-betonmixers/
https://lectura.press/en/article/putzmeister-launches-the-first-zero-emissions-truck-mounted-concretepump/59003

http://www.spanos-group.com/energya-k42e-new-battery-electric-driven-concrete-truck-pump-cifa/

https://www.pveurope.eu/e-mobility/electric-utility-vehicles-paul-group-develops-battery-electricconcrete-mixer

Organization: Daimler Trucks North America, LLC

DTNA recommends that EPA review energy consumption assumptions and battery sizing characteristics for vocational truck categories. DTNA believes many HHD vocational categories operate with energy-intensive duty cycles that are not well-predicted from daily VMT. Vocational applications greatly differ from the tractor applications presented here (e.g. cement mixers, dump trucks, etc.) and it is likely that vocational applications will require several more years of research and development, necessarily delaying their implementation. [EPA-HQ-OAR-2022-0985-1555-A1, p. 22]

Organization: MEMA

Section 3: Continuous, stationary use and occasional high-performance demands

Similarly, ready-mix concrete applications need to continuously turn the drum to avoid concrete hardening leading to higher fuel burn in the range of 35-49% from PTO usage. This is higher fuel burn from PTO usage than referenced NREL data from utility bucket trucks showing <15% fuel burn from intermittent PTO usage. Likewise, concrete pumpers have extremely high-performance needs for PTO that would require higher performance PTO than utility bucket trucks. [EPA-HQ-OAR-2022-0985-1570-A1, p. 20.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, page. 20, for referenced figures.]

Organization: National Association of Clean Air Agencies (NACAA)

EPA should, in its final rule, improve upon its proposal by adopting federal Phase 3 GHG emission standards that, at a minimum, are based on values that reflect ACT ZEV sales percentages through MY 2032 but with more rigorous standards for several types of heavy-duty vehicles: 1) transit buses and school buses, for which federal funds for electrification are specifically targeted and various states have laws and policies setting electric vehicle and ZEV purchasing goals and requirements and 2) refuse and concrete trucks, for which EPA already projects substantial ZEV market uptake. Also of note is that because of their vocation, emissions from these vehicle types significantly impact overburdened communities. These vehicle categories, with many existing ZEV technologies, should be removed from the weaker Custom Chassis GHG standards and placed back in Vocational GHG standards with the flexibility option to remain in the Custom Chassis GHG standards if they produce a minimum fraction of ZEVs to offset the difference in standards. [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

Organization: Truck and Engine Manufacturers Association (EMA)

Vehicles such as Class 8 concrete mixers typically are “spec’d” to carry 10 to 11 yards of concrete, which is equivalent to 40,000 to 44,000 pounds of concrete, fully three-times the weight that GEM assessed in Phase 3 to determine the energy needed for a concrete mixer to perform its work. That significant underestimation causes the battery size to be substantially undersized and the associated cost to be well below what would actually be needed for this application. That also significantly skews the payback and adoption rate analysis in HD TRUCS. Thus, the concrete mixer application is one that needs a dramatically lower adoption rate, rather than being lumped in with the other vocational trucks. [EPA-HQ-OAR-2022-0985-2668-A1, p. 51]

Organization: Volvo Group

Phase 3 Proposed Stringencies

EPA Stringency Setting Process

Assumptions and inputs covered in the EMA comments, specifically concerning to the Volvo Group include:

- EPA’s estimates of vehicle availability and application suitability in the 101 vehicle categories do not agree with our internal timelines and knowledge. One example is concrete mixers at an 18% penetration of BEVs in 2027. Concrete mixers are highly weight and space constrained, so much so that some customers specify medium-heavy duty engines in heavy-heavy duty vehicles in order to maximize payload. Concrete mixers are not seen as a candidate for electrification given the current and expected technologies in the Phase 3 timeframe. One telling fact, at the 2023 World of Concrete show held in Las Vegas on January 17th through 19th of this year, there was zero emphasis on zero-emission vehicle technologies. [EPA-HQ-OAR-2022-0985-1606-A1, p. 17]

- Although a cement mixer is listed as a good opportunity for electrification in the EPA's HD TRUCS analysis results, we have identified risks associated to Gross Axle Weight Rating (GAWR) due to the power density required to ensure the vehicle can run its cycle and power the mixing drum

EPA Summary and Response:

Summary:

Volvo, EMA, MEMA, ATA, and the American Concrete Pumping Association raise concerns regarding the ability of concrete mixers and pumpers to electrify. They point to issues related to higher PTO usage, traveling at loads higher than those used in EPA's HD TRUCS analysis, and weight sensitivity. EMA maintains that energy used by concrete mixers is significantly higher than what is represented in GEM, and suggests the underestimated load requirements (and therefore energy requirements) result in smaller battery sizes and lower costs in HD TRUCS than what EMA expects. As a result, EMA states that concrete mixers should have unique standards from other vocational vehicles based on lower adoption rates. On the other hand, CARB provided links to several electrified concrete mixer and pumpers where prototypes have been supplied to customers in Europe. Additionally, NACAA stated that EPA should set more stringent standards for concrete mixers based on their emissions impact on overburdened communities.

Likewise, DTNA suggests that EPA review energy consumption for vocational trucks, maintaining that these vehicles consume significant energy using their duty cycle that cannot be predicted from using VMT. Cement mixers and dump trucks, for example, will require R&D before they can be electrified. Volvo shares similar sentiment as EMA and DTNA in that the suitability of cement mixers as BEV is limited because of the weight impact and space constraints from batteries.

Response:

For the final rule, EPA obtained data based on information provided by one commenter which shows significantly larger power demands. Therefore, for the final rule, EPA increased the PTO loads required for concrete mixers and pumpers in our HD TRUCS analysis based on consideration of information provided. These vehicles now have larger power demands and battery sizes in the final rule HD TRUCS analysis than the vehicles had in the NPRM analysis. As a result, EPA determined that EPA's optional custom chassis standards for Concrete Mixers/Pumpers and Mixed-Use Vehicles will remain unchanged from the existing Phase 2 MY 2027+ CO_2 emission standards.

However, some electrified concrete mixers and pumpers presently exist, at least as prototypes in Europe. This suggests that these vehicles represented in HD TRUCS could be considered for utilization of ZEV technologies in the HD TRUCS analysis for the HHD vocational vehicle subcategory. EPA then investigated if there are payload constraints that would make such inclusion inappropriate. For the final rule, as discussed in RIA Chapter 2.9.1.1, the concrete mixer has a BEV powertrain that weighs approximately 2,100 pounds more than the comparable ICE powertrain. This leads to an impact of 3.5% of the full payload (40,000 lbs). This payload impact would not be a limiting factor for some applications and therefore we are continuing to include this vehicle in the HD TRUCS analysis, and correspondingly the technology packages used in the modeled potential compliance pathway for HHD vocational vehicles.

2.2.3 Recreational Vehicles

Comments by Organizations

Organization: RV Industry Association (RVIA)

RVIA has reviewed the April 27th NPRM and supports the EPA's decision to retain the inclusion of motorhomes in the "custom vocational chassis" category and to establish the allowable CO2 standard for these vehicles at 226 grams/ton-mile. The EPA indicates in the NPRM that it is not proposing new standards for motorhomes certified to the optional custom chassis regulatory subcategory because of the projected impact of the weight of batteries in battery electric vehicles in model years 2027-2032. In addition to the increased weight of the batteries, RVIA would also note that requiring motorhomes to transition to battery power would require extensive modifications to the vehicles, which will significantly and adversely impact the features of these vehicles that make them attractive to consumers. These adverse impacts would include loss of storage space, inability to carry luggage and furniture, and reduced appliance capacity. If battery size and weight is such that typical features of a motorhome will need to be deleted or appreciably altered, the powertrain transition to batteries and motors will be unpopular with consumers. Such a transition would add further costs onto vehicles, to which purchasing consumers are already extremely cost-sensitive. [EPA-HQ-OAR-2022-0985-1486-A1, pp. 1 - 2]

RVIA would also remind the EPA that, when the current Phase 2 regulation was promulgated, the EPA properly recognized that motorhomes have unique characteristics which differentiate them from all other vocational vehicles:

- Motorhomes are predominantly non-commercial vehicles - they are discretionary purchases for the purpose of recreation and provide no source of revenue to the typical owner;
- Motorhomes have extremely low annual vehicle miles traveled (about 4,000 miles per year on average);
- Motorhome production volumes are extremely low; and
- Motorhome buyers are particularly sensitive to cost increases (as these vehicles are discretionary purchases that generate no revenue for the operators). [EPA-HQ-OAR-2022-0985-1486-A1, p. 2]

In the Phase 2 rule, EPA established the optional custom chassis program for a number of reasons. These included:

- a recognition that there are manufacturers who produce specialized heavy-duty vocational vehicles where some of the technologies EPA used for the primary program standards would be unsuited for use;
- concern that the primary program drive cycles are either unrepresentative or unsuitable for certain specialized heavy-duty vocational vehicles;
- concern that some manufacturers of these specialized vocational vehicles have limited product offerings such that the primary program's emissions averaging is not of practical value as a compliance flexibility;

- some motorhome chassis manufacturers are not full-line heavy-duty vehicle manufacturers and thus do not have the same flexibilities as other firms in the use of the averaging, banking and trading program;
- concern regarding the appropriateness of the primary program's vocational vehicle standards as applied to certain specialized/custom vocational vehicles. [EPA-HQ-OAR-2022-0985-1486-A1, p. 2]

The concerns listed above remain valid today and are likely to remain valid in the future with respect to the setting of CO2 standards for the post-2027 time period. [EPA-HQ-OAR-2022-0985-1486-A1, p. 3]

RVIA further notes that electrification will be disruptive and challenging to motorhome operators while they are traveling, as the charging infrastructure needed to recharge these vehicles is not yet available. This is especially true in the more rural areas where motorhome owners prefer to travel and often camp in non-traditional campsites where utility functions such as electric, water and sewage are not present. Additionally, recharging depleted motorhome batteries will take significantly longer than the 20 minutes on average that it takes to recharge a light-duty vehicle battery with DC fast charging. The resulting increases in motorhome travel times will make the travel experience far less pleasurable. [EPA-HQ-OAR-2022-0985-1486-A1, p. 3]

For all the above reasons, the RV Industry Association supports the decision of the EPA in this NPRM to keep motorhomes in the custom vocational chassis category and to set the allowable emissions standard at 226 grams/ton-mile. We applaud EPA for not proposing new standards for motorhomes certified to the optional custom chassis regulatory subcategory for Model Years 2027-2032 and believe that this is the proper decision for these vehicles moving forward. [EPA-HQ-OAR-2022-0985-1486-A1, p. 3]

Organization: Winnebago Industries, Inc.

Winnebago Industries supports the Proposed Rule's provisions allowing continued certification of motor homes under the vocational vehicle optional custom chassis regulatory subcategory in model years ('MY') 2027 through 2032 In EPA's 2016 HD GHG Phase 2 rule, EPA offered optional custom chassis standards for several vocational vehicle regulatory subcategories including motor homes. EPA established the optional custom chassis standards for a number of reasons, including because it recognized that the primary vocational vehicle standard would not be appropriate as applied to certain specialized/custom vocational vehicles. 81 Fed. Reg. 73531 (Oct. 25, 2016). [EPA-HQ-OAR-2022-0985-1612-A1, p. 2]

In the Proposed Rule, EPA proposes to maintain the eight existing Heavy-Duty GHG Phase 2 vocational vehicle regulatory subcategories, which include the motor homes subcategory. Given the significant variability in types of vocational vehicle chassis, and the correspondingly unique technical characteristics of the different applications, Winnebago Industries supports EPA's proposal. Furthermore, the Proposed Rule proposes to maintain the CO2 emissions standard for motor homes certified to the optional custom chassis vocational vehicle standards at 226 g/tonmile as contained in the 2016 Phase 2 GHG rule. Winnebago Industries supports this emission standard as technically feasible and reasonable, especially given the impact that heavy batteries would have on emissions standards, as provided further detail in the Proposed Rule and EPA's Draft Regulatory Impact Analysis. [EPA-HQ-OAR-2022-0985-1612-A1, pp. 2-3]

Winnebago Industries does not support further reductions to the proposed GHG standards for motor homes under the custom chassis vocational vehicles provision. In the Proposed Rule, EPA seeks comments regarding the potential for more stringent GHG standards for certain custom chassis subcategories including motor homes for MY 2027 to 2032. Winnebago Industries urges EPA not to lower or consider lowering the GHG standards for motor homes at this time based on the technical challenges that Winnebago Industries and its chassis manufacturers would face in meeting lower standards, and the deleterious affect any lower standards would have on Winnebago Industries and the RV/motor home industry overall. We are also aware of and are fully supportive of the comments filed by the RVIA specific to the Proposed Rule. [EPA-HQ-OAR-2022-0985-1612-A1, p. 3]

EPA Summary and Response:

Summary:

RVIA and Winnebago supported EPA's proposal to maintain the existing HD GHG Phase 2 MY 2027+ Optional Custom Chassis Recreational Vehicle CO_2 emission standards for Phase 3.

Response:

EPA is finalizing its proposal to maintain the Phase 2 MY 2027+ Optional Custom Chassis Recreational Vehicle CO_2 emission standards. Our evaluation of RVs demonstrates that it is unlikely that ZEV technology will pay back for RVs that typically travel low annual miles (as they are modeled in HD TRUCS) and are expected to travel long distances in a day over a small number of annual operational days, as shown in RIA Chapter 2.9.2.

2.2.4 Other

Comments by Organizations

Organization: ABF Freight System, Inc.

ABF Freight is an LTL transportation company comprised of over 4500 class 8 and class 6 vehicles with operations in all 50 states. In addition, ABF purchased 6 EVs in 2022 comprised of both Class 8 and 6 models. [EPA-HQ-OAR-2022-0985-1442-A1, p.1]

Our industry and company have worked with EPA and other stakeholders during the drafting of the federal Phase 1 and 2 Greenhouse Gas emissions regulations to achieve substantial emissions improvements—regulations that we supported due its ability to achieve real-world fuel savings with proven technologies. [EPA-HQ-OAR-2022-0985-1442-A1, p.1]

EPA's currently proposed Greenhouse Gas Phase 3 regulation is not that. It picks winners and losers for emissions technology and sets a de facto mandate on the adoption of electric vehicle technology that is at an early stage of development in the trucking industry. Currently there is very limited quantities for battery electric trucks on the road today and hydrogen fuel cell trucks are an even smaller number. As you look to mandate technology for our industry, you must consider the various unique applications of commercial vehicles and the specific use cases for electrification. What works for the passenger car industry will not work for the heavy-duty trucking industry. What works for last-mile package and delivery vans will vary greatly with on-highway tractor trailers. Your rule must account for this diversity as you set standards that impact the reliability, cost parity and performance of our fleet. The industry continues to study other technology options that can reduce GHG emissions, like biofuels, renewable diesel and hydrogen combustion. All these technologies could potentially deliver cost-effective emissions reductions. [EPA-HQ-OAR-2022-0985-1442-A1, p.1]

As stated above, our company incorporated a total of 6 electric trucks into our fleet last year. Our experience with these EVs is that our range and usable application is greatly diminished in comparison with clean diesel technology. In addition, all locations have experienced both financial and physical constraints regarding supporting infrastructure. In one location we are two years into the waiting of added utility infrastructure that is needed to support our current vehicles as well as anticipated growth in EV purchases. [EPA-HQ-OAR-2022-0985-1442-A1, p.1]

As you begin your work on the new GHG standards, charging and alternative fueling infrastructure must be at the center of successful adoption. Long lead times and significant investment are barriers that currently exist that have been unaddressed for commercial trucks. We encourage you to account for what stage this technology is at given your aggressive market penetration assumptions, guarantee a robust infrastructure charging or alternative fueling system is built out to support deployment of zero-emission trucks and ensure cost parity with clean diesel technology is maintained. Thank you. [EPA-HQ-OAR-2022-0985-1442-A1, p.1]

Organization: American Soybean Association (ASA)

As EPA considers new GHG standards for heavy-duty vehicles, it is critically important that they also consider the emissions that will increase from additional wear and tear on roads. Further, the likely man hours to complete additional trips or investment of additional fleet vehicles could create a cost-prohibitive environment for farmers who already operate on thin margins. As is, farmers have seen a significant cost increase of up to 20% in freight rail trucking in recent years. The only way for the agricultural sector not to see significant economic impacts to shipping from either of the EPA’s GHG proposals would be to increase federal truck weights to accommodate for heavier batteries. [EPA-HQ-OAR-2022-0985-1549-A1, p. 2]

Organization: American Trucking Associations (ATA)

EPA’s adoption rate table includes levels of stringency that require fleets to adopt increasing ZEV percentages in the vocational, short, and long-haul segments. [EPA-HQ-OAR-2022-0985-1535-A1, p. 6]

While ATA appreciates EPA’s addition of three broad market segmentations and 101 different vehicle types in the EPA HD TRUCS model, we note that the operational diversity and complexity of the trucking industry are still too broad to be entirely inclusive of all three vehicle categories. The vehicle weight distributions relative to the battery cell and axle weight impact real-world payload, charge time, and maintainability in each vehicle configuration and category. Each category and configuration require separate treatment as these factors—important variables in the fleet purchase decision—affect the TCO calculation. [EPA-HQ-OAR-2022-0985-1535-A1, p. 6]

Organization: California Air Resources Board (CARB)

B. Emissions Standards for HDVs

1. Vehicle Categories in Custom Chassis Provision

Affected pages: NPRM 25990-25991, 25993, 25996, and 26123 (1037.105 (h)); Draft Regulatory Impact Analysis (DRIA) 245, 247, and 254-256

In the existing federal Phase 2 GHG regulation, manufacturers of motor homes, coach buses, other buses (including transit/urban bus), school buses, refuse haulers, concrete mixers, mixed-use vehicles, and emergency vehicles have an option to certify those vehicles with a less stringent process called custom chassis. Custom chassis standards are significantly less stringent than the primary vocational vehicle standards. U.S. EPA established these optional less-stringent standards to provide flexibilities to the manufacturers who produce specialized vocational vehicles. U.S. EPA believed that the manufacturers of these types of vehicles may have difficulty meeting the primary standards due to the limited number of technologies that may be used on these specialized vehicles to meet the standards and the limited number of product offerings, which leads to an inability to take advantage of averaging. When developing the California Phase 2 GHG regulation, CARB staff understood U.S. EPA's reasoning behind the creation of the custom chassis certification option, and California Phase 2 GHG regulation includes the custom chassis standards. However, CARB staff provided evidence during the rulemaking that custom chassis standards were not necessary for transit buses because they already had on the market many examples of the ultimate CO2 reduction achievable via zero-emission bus (ZEB) powertrains. [EPA-HQ-OAR-2022-0985-1591-A1, p.20]

Both battery and fuel-cell electric buses are commercially available for transit applications, and CARB also adopted an Innovative Clean Transit (ICT) regulation in 2018 requiring all public transit agencies to gradually transition to a 100 percent ZEB fleet by 2040.44 Hence, CARB did not align with the custom chassis standards for transit buses. Instead, CARB staff required transit bus manufacturers to meet the primary vocational standards (i.e., removed the transit bus vehicle category from the custom chassis provision). Manufacturers elected to certify in California Phase 2 also produced ZEBs which at that time further encouraged the commercialization of ZEBs. [EPA-HQ-OAR-2022-0985-1591-A1, pp.20-21]

44 The ICT regulation requires all public transit agencies to gradually transition to a 100 percent ZEB fleet. https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit

CARB staff urges U.S. EPA to require transit bus manufacturers to comply with the primary vocational vehicle standards in this Phase 3 rule. CARB staff also recommends U.S. EPA incorporate the same provisions as in California's Phase 2 GHG transit bus requirements for the following custom chassis vehicle categories: school bus, other bus, coach bus, refuse hauler, and concrete mixer. As specified in the NPRM Table 11-24 - Projected ZEV Adoption Rates for MYs 2027 to 2032 Technology Packages, these vehicle categories have high projected ZEV adoption rates (45 percent ZE school bus in MY 2032, 34 percent ZE other bus in MY 2032, 25 percent ZE coach bus in MY 2032, 36 percent ZE refuse hauler in MY 2032, and 35 percent ZE concrete mixer in MY 2032), reflecting the availability and cost-effectiveness of ZE vehicles in this category. Additionally, a recent white paper released by ICCT predicts full electrification of some vehicle categories within the next 15 years; ICCT's "National ACT" scenario shows the feasibility of 100 percent ZEV sales for transit buses by 2032, followed by shuttle and school buses by 2035, and then, coach buses by 2037.45 These high projected ZEV adoption rates, both in ICCT's work and in U.S. EPA's own NPRM, show manufacturers of these vehicle categories do not need the weaker custom chassis standards and instead will be able to meet the primary standards. [EPA-HQ-OAR-2022-0985-1591-A1, p.21]

45 ICCT's Potential Benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles, White Paper, April 2023. https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

CARB staff note emergence of diverse highly specialized ZEV examples in the U.S. and internationally many of which could fall into the custom chassis definition, highlighting how the fast-growing nature of this sector directionally supports greater inclusion into the stronger vocational standards instead of the weaker custom chassis standards. Multiple manufacturers and upfitters already have ZEV examples that include concrete mixers,46 truck cranes,47 knuckle boom cranes,48 bucket trucks,49 sewer cleaning trucks,50 armored trucks,51 stinger-steered auto carrier transports,52 street sweepers,53 aviation fuel delivery,54 container roll off, hook loader and skip loaders,55 school buses,56 double decker and motorcoaches,57 and refuse.58 This specialized ZEV development activity is even reaching into emergency response vehicles including BEV and ZE-capable plug-in fire trucks59 and BEV and FCEV ambulances.60 [EPA-HQ-OAR-2022-0985-1591-A1, pp.21-26]

46 Concrete mixer examples.
https://www.electrive.com/2022/02/14/unicon-volvo-trucks-collaborate-on-electric-concrete-mixers/
https://www.ft.com/content/750327ec-ab2f-4b62-8fc3-548a1a71a193
https://www.electrive.com/2021/01/19/futuricum-delivers-three-electric-concrete-mixer-trucks-toholcim/
http://concreteproducts.com/index.php/2018/05/15/national-cement-parent-drives-carbon-emissionsfree-mixer-project/
https://www.liebherr.com/en/deu/latest-news/news-press-releases/detail/first-fully-electric-10-and-12-m3-truck-mixers-from-liebherr-and-designwerk.html
https://www.liebherr.com/en/deu/latest-news/news-press-releases/detail/first-fully-electric-10-and-12-m3-truck-mixers-from-liebherr-and-designwerk.html
https://www.prnewswire.com/news-releases/sany-battery-electric-truck-mixers-when-traditionalconcrete-mixing-goes-green-301138618.html
https://www.prnewswire.com/in/news-releases/sany-embraces-the-era-of-cleaner-fuel-with-hydrogenfuel-cell-construction-vehicles-873229355.html
https://www.driven.co.nz/news/new-zealand-set-to-get-first-electric-milk-tanker-after-governmentfunding-boost/
https://mp.weixin.qq.com/s/3_oDaY5fTTdMf-XSMUbvdA
https://www.electrive.com/2022/06/30/tarmac-orders-electric-mixer-truck-from-renault-trucks/
https://www.muldereurope.com/elektrisch-aangedreven-betonmixers/
https://lectura.press/en/article/putzmeister-launches-the-first-zero-emissions-truck-mounted-concretepump/59003
http://www.spanos-group.com/energya-k42e-new-battery-electric-driven-concrete-truck-pump-cifa/
https://www.pveurope.eu/e-mobility/electric-utility-vehicles-paul-group-develops-battery-electricconcrete-mixer

47 Truck cranes examples.
https://www.internationalcranes.media/news/New-fully-electric-Bocker-truck-crane-and-workplatform/8023128.article
https://www.prnewswire.com/in/news-releases/zoomlion-produces-the-world-s-first-pure-electric-truckcrane-takes-the-lead-in-environmental-protection-construction-in-machinery-industry-838304210.html
https://www.plantandequipment.news/news/product-updates/the-worlds-first-licensable-electric-

truckcrane-from-sany/
https://www.heavyliftnews.com/the-xct25_ev-plug-in-double-drive-hybrid-crane-from-xcmg/
https://www.scania.com/group/en/home/newsroom/news/2023/first_fully_electric_crane_truck_for_waste_collection_in_denmark.html

48 Knuckle boom cranes examples.
https://www.internationalcranes.media/news/electric-volvo-truck-with-hiab-crane/8012590.article
https://www.volvotrucks.com/en-en/trucks/trucks/volvo-fmx/volvo-fmx-electric.html

49 Bucket trucks examples.
https://www.terex.com/utilities/en/about/news/terex-utilities-debuts-industry-s-first-all-electric-buckettruck
https://www.worktruckonline.com/10139523/electric-utility-bucket-truck-makes-clean-energybreakthrough
https://triblive.com/local/electric-bucket-truck-coming-to-pittsburgh-thanks-to-electric-vehicles-grantmoney/
https://vertikal.net/en/news/story/40623/cte-to-unveil-all-electric-truck-mount
https://twitter.com/ZeusChassis/status/1645819257094287362?cxt=HHwWhMDR-Z75j9ctAAAA
https://www.ccjdigital.com/alternative-power/battery-electric/article/15383970/production-to-start-onfreightliners-em2-in-fall-2023

50 Sewer cleaning trucks examples.
https://www.designwerk.com/en/post/press/sales-launch-of-the-first-fully-electric-sewer-cleaningvehicle/
https://www.electrive.com/2022/05/06/volvo-trucks-and-bucher-municipal-build-electric-trucks-forsewer-cleaning/
https://bouwmachineweb.com/nieuws/718/elektrische-man-kolkenzuiger-scoort-bij-klanten

51 Armored trucks examples.
https://www.loomis.us/resources/press-releases-news/Loomis-orders-150-electric-armored-vehicles

52 Stinger-steered auto carrier transports examples.
https://www.scania.com/group/en/home/newsroom/news/2023/worlds_first_all_electric_scania_standard_car_transporter_goes_into_service.html
https://www.electrive.com/2022/11/30/designwerk-electric-car-carrier-sports-1000-kwh-battery/

53 Street sweepers examples.
https://www.government-fleet.com/10194978/electric-sweeper-has-enough-power-for-a-full-workload
https://schwarze.com/en/electric/
https://www.glutton.com/en/categorie/your-electric-street-sweeper-zen-quiet-compact-ergonomicconnected-economical-efficient-cleanliness.html
https://www.dulevo.com/us/products/power-supply-battery-powered-electric/
https://www.prnewswire.com/news-releases/ideanomics-and-global-environmental-products-expandpartnership-to-produce-zero-emission-street-sweepers-301621573.html
https://www.aebi-schmidt.com/en/products/schmidt/sweepers/eswingo-200/
https://ravo.fayat.com/en/references/fully-electric-ravo
https://madvac.com/models/mini-outdoor-street-sweeper-ls175/
https://madvac.com/electric/electric-sweeper-ls125/
https://www.buchermunicipal.com/us/en/products/sweepers/compact-sweepers/citycat-v20e
https://www.nyc.gov/assets/dsny/site/resources/press-releases/clean-streets-clean-air-new-york-citydepartment-of-sanitation-unveils-first-of-its-kind-all-electric-street-sweeper
https://investors.ideanomics.com/2023-03-09-Made-in-California-Ideanomics-subsidiary-US-Hybrid-and-Global-Environmental-Products-begin-manufacturing-18-zero-emission-street-sweepers-for-Caltrans
https://investors.ideanomics.com/2023-03-09-Made-in-California-Ideanomics-subsidiary-US-Hybrid-and-Global-Environmental-Products-begin-manufacturing-18-zero-emission-street-sweepers-for-Caltrans
https://investors.ideanomics.com/2023-03-09-Made-in-California-Ideanomics-subsidiary-US-Hybrid-and-Global-Environmental-Products-begin-manufacturing-18-zero-emission-street-sweepers-for-Caltrans
https://investors.ideanomics.com/2023-03-09-Made-in-California-Ideanomics-subsidiary-US-Hybrid-and-Global-Environmental-Products-begin-manufacturing-18-zero-emission-street-sweepers-for-Caltrans
https://townsquarenoco.com/check-out-fort-collins-nifty-new-electric-street-sweeper/
https://townsquarenoco.com/check-out-fort-collins-nifty-new-electric-street-sweeper/

https://www.denverpost.com/2018/11/21/denver-bike-lane-street-sweeping/
https://www.eugene-or.gov/CivicAlerts.aspx?AID=5348&ARC=12741
https://www.aebi-schmidt.com/en/about-us/blog/2019/07/08/aebi-schmidt-delivers-the-first-fullyelectric-sweeper-to-the-city-of-thun-in-a-rather-unusual-way/
https://patch.com/massachusetts/medford/medford-gets-grant-replace-diesel-street-sweeper
https://twitter.com/BostonPWD/status/1553434229517721601
https://www.boston.gov/bid-listings/ev00011115
https://www.mlive.com/news/saginaw-bay-city/2022/10/egle-gives-saginaw-grant-for-electric-vehiclestreet-sweepers.html
https://documents.takomaparkmd.gov/government/city-council/ordinances/2021/ordinance-2021-38.pdf
https://globalsweeper.com/electric-street-sweepers
https://today.csuchico.edu/chico-state-all-electric-sweeper/
https://govlaunch.com/projects/the-city-of-edinburgh-council-gb-adds-uks-first-electric-street-sweeperto-its-fleet
https://dep.nj.gov/vw/spending-information/
https://www.cityofcapitola.org/sites/default/files/fileattachments/city_administration/page/18994/january_waves_2022_issue_1.pdf
https://cityofholland.civicweb.net/document/151791/
https://www.biztrib.com/news/newberg-will-get-a-big-truck-and-join-the-evrevolution/article_42c9e9c9-32cc-5d12-8aa9-260adfe59212.html
https://www.montereyherald.com/2022/08/01/carmel-to-consider-climate-adaptation-action-plans/
https://glendaleca.primegov.com/Public/CompiledDocument/48077
https://www.road-street-sweeper-blog.com/a-street-sweeper-for-over-1-million-euros-in-germany/
https://fleetvisionintl.com/2022/02/clean-green-machine-first-electric-street-sweeper-for-harrowcouncil/
https://www.nbcsandiego.com/videos/not-so-trashy-city-names-electric-street-sweeper/3110635/
https://www.boschung.com/s2-0-nottingham/et-sweeper-named-sweep-e

54 Aviation fuel delivery examples.
https://aviationweek.com/business-aviation/airports-fbos-suppliers/fbo-atlantic-aviation-takes-deliveryelectric-refuelers
https://www.aviationpros.com/gse/fueling-equipment-accessories/product/10024950/bossermanaviation-equipment-inc-electric-rampcharger-isuzu-750-gallon-avgas-refueler
https://www.aviationpros.com/gse/gse-technology/green-alternative-energy-gse/pressrelease/21218528/titan-aviation-titan-aviation-builds-worlds-first-100-electric-refueler
https://www.bp.com/en/global/air-bp/news-and-views/press-releases/Air-bp-introduces-new-customdesigned-all-electric-refuelling-vehicle-at-brisbane-airport.html
https://insideevs.com/news/425595/world-first-electric-aircraft-refueller-transporter/
https://www.electrive.com/2023/03/17/stuttgart-airport-acquires-30-heavy-duty-evs-for-manoeuvringarea/
https://ngtnews.com/world-fuel-provides-all-electric-refueling-truck-to-pump-sustainable-aviation-fuel

55 Container roll off, hook loader and skip loaders examples.
http://bouwmachineweb.com/nieuws/923/vrijbloed-transport-voorloper-in-duurzaam-transport-met-nutien-elektrische-volvo-trucks
https://www.scania.com/group/en/home/newsroom/press-releases/press-release-detailpage.html/4278090-
https://www.ft.com/content/750327ec-ab2f-4b62-8fc3-548a1a71a193
https://motortransport.co.uk/blog/2019/10/29/volvo-to-showcase-fe-electric-6x2-hook-lift-rigid-atfreight-in-the-city-expo-on-6-november/
https://www.meiller.com/en/information-centre/news/detail/2020/11/23/first-all-electric-truck-withmeiller-hooklift/
https://www.palfinger.com/en-gb/news/smart-electric-prospects-for-hooklift_n_885597
https://media.daimlertruck.com/marsMediaSite/en/instance/ko/Robust-efficient-and-battery-electric-Daimler-Truck-subsidiary-FUSO-presents-the-Next-Generation-eCanter-with-roll-off-tipper-for-theconstruction-industry-at-bauma-2022.xhtml?oid=52079443
https://ajot.com/news/zf-and-mercedes-benz-trucks-showcase-silent-emission-free-eworx-power-takeoff-for-electric-truckszf
https://ajot.com/news/zf-and-mercedes-benz-trucks-showcase-silent-emission-free-eworx-power-takeoff-

for-electric-truckszf
https://www.recyclinglives.com/news/general/first-uk-electric-skip-truck
https://www.biztrib.com/news/newberg-will-get-a-big-truck-and-join-the-evrevolution/article_42c9e9c9-32cc-5d12-8aa9-260adfe59212.html
https://mp.weixin.qq.com/s/3_oDaY5fTTdMf-XSMUbvdA

56 School bus examples.
https://californiahvip.org/vehicle-category/school-bus/

57 Double decker and motorcoaches examples.
https://californiahvip.org/vehicles/?search=bus

58 Refuse examples.
https://californiahvip.org/vehicles/?vcat=10
https://www.prnewswire.com/news-releases/republic-services-is-rolling-out-industrys-first-fullyintegrated-electric-recycling-and-waste-trucks-301751057.html
https://www.scania.com/group/en/home/newsroom/news/2023/first_fully_electric_crane_truck_for_waste_collection_in_denmark.html

59 BEV and ZE-capable plug-in fire trucks examples.
https://www.prnewswire.com/news-releases/zeus-electric-chassis-redefines-the-fire-truck-with-new-allelectric-design-301348659.html
https://www.oshkoshairport.com/innovations/striker-volterra
https://www.piercemfg.com/electric-fire-trucks/pierce-volterra
https://revgroup.com/blog-single/rev-fire-group-to-introduce-first-fully-electric-north-americanstyle-fireapparatus
https://www.rosenbauer.com/en/int/rosenbauer-world/vehicles/municipal-vehicles/rt
https://www.electrive.com/2021/11/01/basel-orders-4-electric-fire-trucks-from-rosenbauer/
https://www.thebigredguide.com/news/rosenbauer-showcases-panther-6x6-electric-driveline-co-614-ga.1655699414.html
https://e1group.co.uk/e1-evo
https://www.newpowerprogress.com/news/scania-hybrid-engine-powers-airport-firetruck/8027600.article
https://www.fireapparatusmagazine.com/fire-apparatus/london-to-test-electric-fire-truck/

60 BEV and FCEV ambulances examples.
https://www.prnewswire.com/news-releases/zeus-electric-chassis-redefines-the-fire-truck-with-new-allelectric-design-301348659.html
https://www.oshkoshairport.com/innovations/striker-volterra
https://www.piercemfg.com/electric-fire-trucks/pierce-volterra
https://revgroup.com/blog-single/rev-fire-group-to-introduce-first-fully-electric-north-americanstyle-fireapparatus
https://www.rosenbauer.com/en/int/rosenbauer-world/vehicles/municipal-vehicles/rt
https://www.electrive.com/2021/11/01/basel-orders-4-electric-fire-trucks-from-rosenbauer/
https://www.thebigredguide.com/news/rosenbauer-showcases-panther-6x6-electric-driveline-co-614-ga.1655699414.html
https://e1group.co.uk/e1-evo
https://www.newpowerprogress.com/news/scania-hybrid-engine-powers-airport-firetruck/8027600.article
https://www.fireapparatusmagazine.com/fire-apparatus/london-to-test-electric-fire-truck/
https://electrek.co/2021/11/02/uks-nhs-unveils-new-hydrogen-electric-ambulances-at-cop26/
https://wmas.nhs.uk/2020/10/01/wmas-launches-the-first-100-electric-ambulance-in-the-uk/
https://www.electrive.com/2021/02/13/zerro-londons-first-hydrogen-ambulance-with-fuel-cell-rex/
https://global.toyota/en/newsroom/corporate/35008661.html
https://businessbreathes.co.uk/case-studies-inner/yorkshire-ambulance-service-fleet-transition
https://www.dailymail.co.uk/news/article-9874973/Transit-vans-turned-electric-ambulances-slash-NHScarbon-footprint-fuel-bills.html
https://www.greencarreports.com/news/1128219_nissan-electric-ambulance-curbs-the-tailpipeemissions
https://www.sustainability-times.com/sustainable-business/a-new-ambulance-made-in-denmark-hasgone-

all-electric/
https://electrek.co/2021/04/15/lightning-emotors-and-rev-to-produce-electric-ambulances/
https://www.prnewswire.com/news-releases/demers-ambulances-and-lion-electric-launch-all-electricpurpose-built-ambulance-301402381.html
https://www.automotiveworld.com/news-releases/mercedes-benz-vans-is-electrifying-ambulancevehicles/
https://www.vcs-limited.com/vcs-launches-uks-first-all-electric-front-line-ambulance/
https://www.firehouse.com/apparatus/press-release/21248621/rev-fire-group-amr-awards-electricambulance-order-to-rev-group-company
https://www.fool.com/earnings/call-transcripts/2021/12/15/rev-group-inc-revg-q4-2021-earnings-calltranscrip/nonprofit-1qJgQO4WPlR09i9Q/
https://www.ems1.com/ems-products/ambulances/articles/rev-announces-alternative-fuel-ambulancedeals-with-amr-us-government-qatar-nonprofit-1qJgQO4WPlR09i9Q/

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #3: We also request comment, including supporting data and analysis, if there are certain market segments, such as heavy-haul vocational trucks or long-haul tractors which may require significant energy content for their intended use, for which it may be appropriate to set standards less stringent than the alternative for the specific corresponding regulatory subcategories in order to provide additional lead time to develop and introduce ZEV or other low emissions technology for those specific vehicle applications.

- DTNA Response: EPA should revisit all assumptions underlying the proposed standard stringency on a regular cadence to ensure Phase 3 standard feasibility for all HD applications. Certain vehicle categories are not readily converted to BEV or FCEV technologies. Specifically, EPA should not adopt any new, more stringent CO2 standards for long haul tractors and heavy duty vocational vehicles based upon projected zero-emission vehicle (ZEV) penetration until at least 2033, and even then, EPA should not impose new standards for long-haul applications until a nationwide network of refueling infrastructure exists to support them.[EPA-HQ-OAR-2022-0985-1555-A1, pp. 158-159]

EPA Request for Comment, Request #47: EPA requests comment on a standards structure for Phase 3 which would establish unique, mandatory, application-specific standards for some subset of heavy-duty vehicle applications. EPA requests comment on what data, what program structure, what applications, and what criteria EPA should consider for designing application-specific standards. EPA also requests comment on how the application-specific CO2 standards would interact with the broader Phase 3 program structure EPA has included in this proposal, including the CO2 emissions averaging, banking, and trading program. For example, if EPA were to separate these applications and apply more stringent standards, EPA requests comment on whether emission credits should be allowed to be averaged across the primary Phase 3 program and the application specific standards, and if yes, what limits if any should apply to those standards.

- DTNA Response: As discussed in Section II.B.3 of these comments, the Proposed Rule can only be successfully implemented if ZEV products are in demand and adopted by fleets. DTNA is concerned that the emission standard stringency of Proposed Rule may be unsupported if fleets do not adopt ZEV technologies at the rates predicted by EPA. DTNA believes a beachhead type proposal could generate ZEV demand in specific categories, if only ZEVs were permitted to be sold and do not compete with ICE payback periods. [EPA-HQ-OAR-2022-0985-1555-A1, p. 166]

EPA Request for Comment, Request #56: We request comment on specific considerations and impacts the proposed standards would have on vehicles certified to these optional custom chassis standards. We also request comment and data regarding the potential for more stringent GHG standards for the motor homes, emergency vehicles, or mixed-use vehicles optional custom chassis regulatory subcategories in this time frame.

- DTNA Response: DTNA supports EPA's proposal not project ZEV adoption for certain custom chassis subcategories, as it is unlikely that customers will adopt ZEVs in those categories at any significant rate. [EPA-HQ-OAR-2022-0985-1555-A1, p. 168]

Organization: Electrification Coalition (EC)

We are already seeing a significant uptake of EVs into the HD fleet, as the technology is ready today and offers financial benefits for end users. [EPA-HQ-OAR-2022-0985-1558-A1, p. 4]

As the EPA notes in the proposed rule with many examples, uptake of EVs in the HD sector is occurring rapidly, with many fleet commitments announced for the transition to EVs. As the EPA requests specific comment on the assessment of the HD ZEV market and any additional data sources to consider, the EC overall agrees with the EPA on the market assessment and offers the following additional examples and information.6 [EPA-HQ-OAR-2022-0985-1558-A1, p. 4]

6 See page 25943 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

The near-term interest from commercial vehicle operators in electrifying their fleets, such as delivery and logistics companies, has grown in recent months, particularly since the passage of the Inflation Reduction Act (IRA) and the 45W commercial clean vehicle tax credit. This includes on-line retailer Amazon; shippers FedEx, UPS and DHL; and food and beverage companies Nestlé and PepsiCo, Inc, who collectively rely on hundreds of thousands of vehicles to help transport products. To provide even further detail, FedEx has already committed to achieve carbon-neutral operations by 2040 and will convert its entire parcel pickup and delivery fleet to EVs.7 [EPA-HQ-OAR-2022-0985-1558-A1, p. 4]

7 https://newsroom.fedex.com/newsroom/global/fedex-continues-advancing-fleet-electrification-goals-with-latest-150-electric-vehicle-delivery-from-brightdrop

Commercial fleets make purchasing decisions based on the total cost of ownership (TCO), which increasingly favors EVs. Transitioning to EVs also provides companies with fuel price certainty—as electricity is extremely stable in price relative to diesel—while lowering their operating costs. These characteristics make commercial fleets more likely to value the broader operational savings from electrification.8 [EPA-HQ-OAR-2022-0985-1558-A1, p. 4]

8 See diesel prices here: https://afdc.energy.gov/fuels/prices.html, and NACFE's TCO calculator here: https://www.atlasevhub.com/resource/medium-duty-battery-electric-vehicle-tco-calculator/

As noted above, the EC is specifically working to advance the HD EV sector to make it easier for businesses to transition their fleets to be electric. The EC is piloting programs with companies like Nestle and Meijer, for example, to support their freight electrification efforts, which include data analysis through our total cost of ownership calculator, working as an intermediary with utility companies to help establish relationships, as well as identifying challenges and best practices when electrifying freight to scale for large corporations. The EC is continually conversing with shippers, carriers, OEMs, and businesses up and down the supply chain in order to share knowledge and quickly advance the transition to electrified transport. [EPA-HQ-OAR-2022-0985-1558-A1, p. 4]

These examples and efforts show that the transition to HD EVs is happening now, and the technology is ready today. Given that the standards will apply to vehicles in MY 27 and beyond, many fleets will have already incorporated EVs into their fleet, with some completing a full transition. By the time the standards will lead to even greater penetration levels of EV adoption, fleets will understand the best practices for implementing EVs into the fleet. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 4-5]

Due to the economics of certain HD EV classes, supportive federal and state level policies and programs and current EV fleet adoption rates, we support a proposal from the EPA that would accelerate the adoption of EVs with electric school buses (ESBs), last mile delivery vehicles, drayage and terminal tractors. [EPA-HQ-OAR-2022-0985-1558-A1, p. 5]

The EPA is specifically requesting comment and data that would support more stringent greenhouse gas standards than are proposed for MYs 2027 through 2032, including comment and data on different technologies' penetration rates.9 The EC notes that different classes of vehicles can achieve EV adoption rates quicker, as clarified below.[EPA-HQ-OAR-2022-0985-1558-A1, p. 5]

9 See page 25929, 25933 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

In terms of ESBs, as a fixed route, highly utilized transportation system, school buses have been a good use case for medium- and heavy-duty vehicle electrification. As of December 2022, the World Resources Institute (WRI) found there are 1,398 electric school buses (ESBs) either ordered, delivered, or operating in the United States.10 The number of ESBs committed doubled between September and December 2022 to 5,612 ESBs, in large part due to the U.S. Environmental Protection Agency's Clean School Bus program – which awarded over $900 million for more than 2,400 buses to 389 school districts. With the popularity in ESBs growing, manufacturers like Thomas Built Buses want to capitalize on the demand. In March 2022, Highland Electric and Thomas Built Buses announced a signed letter of intent that enables Highland to provide ESB subscriptions at prices that are at cost parity with diesel through 2025.11 Therefore, some manufacturers are already offering ESBs at cost parity to their diesel counterparts. Outside of individual agreements with manufacturers, decreasing battery costs and scaling of the components market, projected total-cost-of-ownership parity between ESBs and diesel buses is expected by 2029 according to WRI.12 [EPA-HQ-OAR-2022-0985-1558-A1, p. 5]

10 https://www.wri.org/insights/where-electric-school-buses-us

11 https://thomasbuiltbuses.com/resources/news/highland-electric-fleets-and-thomas-built-2022-03-17/

12 https://www.wri.org/technical-perspectives/which-electric-school-bus-business-model-right-your-district

Vans and steps vans for last-mile delivery are a great opportunity for early adoption of EVs for the HD vehicle market as well. The North American Council for Freight Efficiency's (NACFE) Electric Trucks Have Arrived: The Use Case for Vans and Step Vans report found that electric vans and step vans are reaching total-cost-of-ownership parity with the diesel and gasoline vehicles. Attributing to this is the fuel savings by transitioning to electric-approximately $8,000 per vehicle annually in fuel savings, smaller battery packs that do not impact cargo capacity or payload, and lower power requirements when charging.13 [EPA-HQ-OAR-2022-0985-1558-A1, pp. 5-6]

13 https://nacfe.org/wp-content/uploads/edd/2022/04/Vans-and-Step-Vans-Report-FINAL.pdf

Drayage vehicles are also seeing accelerated adoption of electric technology. According to the CALSTART Drayage Driver Study in 2013 at the Ports of Los Angeles and Long Beach, drayage drivers average 3 roundtrips a day with 81 percent of trips being less than 60 miles. Given the shorter routes and the fact that the study found that 80 to 90 percent of the trucks return to an operator yard near the ports, drayage presents a great use case for the electrification of Class 7 and 8 vehicles.14 Moreover, the Advanced Clean Fleet regulation recently adopted by the California Air Resources Board will require drayage trucks to transition to zero-emission technology starting in 2024. By 2035, all drayage trucks must be a zero-emission.15 In addition, a study conducted by NREL on the Port of New York and New Jersey on drayage electrification found that partial fleet electrification of would be possible 'with minimal changes to operations.' Additionally, while electricity costs would increase by operating electric trucks, the savings from the reduction of diesel consumption would offset these costs.16 [EPA-HQ-OAR-2022-0985-1558-A1, p. 6]

14 https://calstart.org/wp-content/uploads/2018/10/I-710-Project_Key-Performance-Parameters-for-Drayage-Trucks.pdf

15 https://ww2.arb.ca.gov/resources/fact-sheets/carb-fact-sheet-2023-advanced-clean-fleets-regulation-drayage-truck

16 https://www.nrel.gov/docs/fy23osti/83400.pdf

Finally, terminal tractors are one of the best use cases for electrification, particularly for early adopters of HD EVs, according to the North American Council for Freight Efficiency's (NACFE) Electric Trucks Have Arrived: The Use Case for Terminal Tractors report. This is primarily because terminal tractors average very few miles per day – 14 to 29 miles per day in NACFE's 2021 Run on Less- Electric initiative – and are 'limited to a small area around the facility,' allowing for opportunity charging. The report also found that electric terminal tractors can be a 'direct replacement for virtually all diesel-powered terminal tractor use cases with very few operational adjustments.'17 Additionally, the study found that in most cases, the duty cycle for terminal tractors can use charging stations at lower power levels compared to other heavy-duty vehicle duty cycles, thereby reducing capital costs. [EPA-HQ-OAR-2022-0985-1558-A1, p. 6]

17 https://nacfe.org/wp-content/uploads/edd/2022/03/Terminal-Tractor-Report-FINAL.pdf

Organization: Hill Bros. Inc.

Subject: Battery powered trucks will not work for expedited team freight

3. I called Tesla and others and not one OEM has the power to run a 80,000 lbs. truck for a daily production of 8 hours let alone the maximum 11 hrs by law. It cannot be done. [EPA-HQ-OAR-2022-0985-1461-A1, p. 1]

4. I would support battery power for local urban transit such as garbage trucks, buses, etc. but you need liquified fuel (diesel) for long haul and heavy duty work for and 8-11 hr day. [EPA-HQ-OAR-2022-0985-1461-A1, p. 1]

5. We need realistic leaders that understand the complex world of interstate trucking and time constraints that will not work with electric powered trucks. [EPA-HQ-OAR-2022-0985-1461-A1, p. 1]

Organization: MEMA

Section 3: Continuous, stationary use and occasional high-performance demands

Vehicles such as Fire Trucks, Utility trucks and Snowplows periodically have higher performance demands than typical daily operation. Fire trucks need to pump water continuously all night to quench a fire. Utility trucks must restore critical services like power or sanitation to protect public health and the environment. [EPA-HQ-OAR-2022-0985-1570-A1, p. 19]

Some vehicles that need to operate continuously are mostly stationary, so challenges of electrifying are not well captured in EPA's Vehicle Miles Traveled (VMT) analysis. Other vehicles in the EPA models have mileage needs that vary widely on a day-today basis, so average VMT analysis does not reflect the true need for asset flexibility and end-use patterns. [EPA-HQ-OAR-2022-0985-1570-A1, p. 20]

Another example is that snowplows must operate continuously in adverse winter weather to clear roads for public safety. Snowplows are often converted and used as dump trucks for highway maintenance other times in the year. It will be very challenging for OEMs and end-users to size batteries for this different seasonal usage, so H2ICE, Renewable Fuel or FCEV with liquid fueling would provide better asset flexibility for this kind of seasonal dual-use vehicle. [EPA-HQ-OAR-2022-0985-1570-A1, p. 20.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, page. 21, for referenced figures.]

EPA recognizes a special use case in the NPRM where an optional custom chassis certification structure for Fire Trucks is proposed so that the regulation does not force BEV technology to this category prematurely, even though the HD TRUCS model predicts 13% BEV adoption in MY27 and 25% BEV adoption in MY2032 for Fire Trucks based on energy requirements. [EPA-HQ-OAR-2022-0985-1570-A1, p. 21]

Recommendation: EPA provide an optional custom chassis certification for other vehicles used in emergency response (ex. snow emergency, utilities restoration) to provide needed regulatory relief until there is more certainty in 1:1 replacement capability and productivity for each conventional application to decarbonized vehicle conversion based on technology and infrastructure readiness. This approach would mirror EPA's proposal for "Optional Customer Chassis: Emergency Vehicle" with 0% ZEV adoption modeled through MY32. [EPA-HQ-OAR-2022-0985-1570-A1, p. 21]

For vehicles not engaged in emergency response, but with wide variation of daily operating needs, we recommend that EPA give thought to a productivity factor for each vehicle's mission, apart from mileage analysis, to improve the HD TRUCS model's ability to forecast 1:1 replacement. Given sufficient time to gather data, industry can support EPA with daily fuel consumption, when in heavy use, for these targeted applications to determine correct battery sizing. A MEMA member has compiled available duty cycle data to provide real-world examples of these kinds of vehicle's daily variation in miles traveled, shown in figure x-y below. [EPA-HQ-OAR-2022-0985-1570-A1, p. 21] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, page. 22, for referenced figure.]

OEMs prioritize resources towards deploying new GHG-saving technology on higher volume vehicle configurations with end-users that value fuel savings first, and these features are released for specialized vocational trucks later. [EPA-HQ-OAR-2022-0985-1570-A1, p. 17]

Vehicles that have higher volumes, less specialization, and operate in less harsh environments, like step-vans, can be a better starting point for vocational segments, rather than targeting ZEV adoption across all vocational segments before MY32. [EPA-HQ-OAR-2022-0985-1570-A1, p. 17]

Organization: Morales, Jorge

Below is a thorough letter my advocacy center advises us to send, but first I wanted to personalize the letter in the off chance one of your staff members, or you, actually reads this letter. These are my thoughts as a tax paying citizen concerned about the cost as well as unintended consequences of the EPA and individual states passing requirements to ban new gas/diesel vehicle sales and only allow new EVs. [EPA-HQ-OAR-2022-0985-1691.html, p. 1]

Towing and Cold Weather and hot weather

Where will recharge stations be located? Will those be public or privately owned? The State of Iowa is already charging tax on Privately Owned charging stations located at supermarkets. Therefore eventually those private corporations will pass the tax down to consumers and charge us to charge our EVs. [EPA-HQ-OAR-2022-0985-1691.html, p. 1]

Where will funds for road infrastructure come from with a significant decrease in gasoline/diesel sales - which is what State's tax to afford road repairs? Will the Federal Level implement a tax on charging stations similar to the State of Iowa? Well, that will certainly be passed on to consumers. [EPA-HQ-OAR-2022-0985-1691.html, p. 1]

How are people supposed to be able to afford their increased utility bill from charging said expensive EV in their home? Currently heating utility bills are astronomically high. Won't this only increase even more? [EPA-HQ-OAR-2022-0985-1691.html, p. 1]

Organization: Moving Forward Network (MFN) et al.

- Prioritize zero emissions for freight trucks, i.e., Class 7 and 8 (short-haul) drayage trucks. These trucks have never been prioritized in heavy-duty truck regulations and are some of the oldest and most-polluting vehicles in frontline and fence-line communities. The rule must include a mandatory scrapping program to prevent a scenario in which: port-adjacent communities are further burdened by the existing diesel truck fleet and new

> ZEVs. Establishing a scrapping program is critical to preventing the re-sale, migration, and increased density of dirty diesel heavy-duty vehicles in already overburdened, largely BIPOC and low-income communities where goods movement is concentrated. [EPA-HQ-OAR-2022-0985-1608-A1, p. 6]

One of the key MFN demands is that the rule should prioritize zero-emissions for freight trucks, i.e., Class 7 and 8 (short-haul) drayage trucks. These trucks have never been prioritized in heavy-duty truck regulations, and are some of the oldest and most-polluting vehicles in frontline and fence-line communities . Electrifying our nation's fleet of tractor trucks is vital to addressing pollution from medium- and heavy-duty vehicles. Although they are less than one-third of the total fleet, they consume over 70 percent of fuel powering Class 4 through 8 trucks and buses on our roads and highways. While Tesla's 500-mile range Semi gets much of the attention, several legacy manufacturers, including Daimler and Volvo are producing and delivering zero-emission Class 8 tractors. These vehicles are well-primed for use in day cab duty cycles such as drayage runs and regional hauls. Focusing more strongly on Class 7 and 8 tractors will bring much-needed relief to communities adjacent to and downwind from ports, railyards, warehouses, and industrial corridors; tractor trucks emit at levels much greater than other MHDVs, and even more so when traveling at lower speeds through neighborhoods. [EPA-HQ-OAR-2022-0985-1608-A1, p. 72]

Organization: National Association of Clean Air Agencies (NACAA)

EPA should, in its final rule, improve upon its proposal by adopting federal Phase 3 GHG emission standards that, at a minimum, are based on values that reflect ACT ZEV sales percentages through MY 2032 but with more rigorous standards for several types of heavy-duty vehicles: 1) transit buses and school buses, for which federal funds for electrification are specifically targeted and various states have laws and policies setting electric vehicle and ZEV purchasing goals and requirements and 2) refuse and concrete trucks, for which EPA already projects substantial ZEV market uptake. Also of note is that because of their vocation, emissions from these vehicle types significantly impact overburdened communities. These vehicle categories, with many existing ZEV technologies, should be removed from the weaker Custom Chassis GHG standards and placed back in Vocational GHG standards with the flexibility option to remain in the Custom Chassis GHG standards if they produce a minimum fraction of ZEVs to offset the difference in standards. [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

Organization: National Tank Truck Carriers (NTTC)

NTTC recognizes that collaboration and cooperation between federal regulatory agencies and America's tank truck industry will yield the mutual goal of enhancing the safety and efficiency of bulk commodity transportation. An inherent yet beneficial byproduct of an efficient surface transportation system is the reduction of air pollution that may endanger public health or welfare. [EPA-HQ-OAR-2022-0985-1551-A1, p. 1]

NTTC supports the EPA intended objective of reducing air pollution from heavy-duty highway vehicles utilized by the American tank truck industry. NTTC members seek to be good custodians of the planet we all share, cherish, and preserve for future generations. [EPA-HQ-OAR-2022-0985-1551-A1, p. 1]

NTTC is concerned regarding the EPA proposal for more stringent MY207 HD vehicle CO2 emission standards beyond what was finalized in HD GHG Phase 2. The association, representing over 230 trucking companies and subsidiaries with operational nuances that must be considered by regulatory agencies, seeks to be a part of the dialogue between EPA and companies that manufacture, sell, or import into the United States new heavy-duty vehicles and engines as end-users. [EPA-HQ-OAR-2022-0985-1551-A1, p. 1]

1) Federal regulations limit gross vehicle weights to 80,000 pounds except where lower gross vehicle weight is dictated by the bridge formula, according to 23 CFR 658.17(b). NTTC members, like all commercial vehicle operators, must abide by this weight limit. To ensure a state of good repair of America's roads and bridges, NTTC does not support an increase to this 80,000 pound gross vehicle weight limitation. [EPA-HQ-OAR-2022-0985-1551-A1, p. 2]

Tank truck owners and operators, hauling very heavy bulk commodities daily, are therefore mindful of this gross vehicle weight limitation. Generally, ZEVs add considerable tractor weight due to their battery composition and size. An internal combustion engine tractor can weigh approximately 15,600 pounds. An electric day cab may weigh approximately 22,000 pounds. If a tank truck has a maximum gross vehicle weight of 80,000 pounds, approximately 6,400 pounds of payload (an 8% reduction) may be lost based on a single shipment if an electric cab was used versus a typical diesel cab of today. [EPA-HQ-OAR-2022-0985-1551-A1, p. 2]

This 6,400 pounds of lost payload due to the usage of ZEV tractors must therefore be made up by equipment that has shorter range. A battery electric Class 8 Tractor may have a 230 mile range, whereas a Diesel tractor of today may have a 1,000+ mile range. Therefore, the problems of ZEV usage for the tank truck industry are compounded with increased truckloads needed. [EPA-HQ-OAR-2022-0985-1551-A1, p. 2]

Further, America has a tank truck driver shortage that cannot make up the difference for these extra truckloads resulting from ZEV usage to meet updated EPA mandates. An NTTC study has shown that from May 2019 to May 2021, there has been a 41.6% reduction in qualified tank truck driver applicants resulting in an 11% reduction in loads hauled (capacity). The tank truck driver workforce is also an aging workforce, with 80% of drivers over the age of 45 as of 2021. NTTC is not confident that today's workforce can respond adequately to the increased number of truckloads (due to increased tractor weight) needed to haul the same amount of commodity. [EPA-HQ-OAR-2022-0985-1551-A1, p. 2]

2) Due to the weight issue identified in the previous section of this letter, NTTC is pleased with EPA's position in Section II of the proposal that the proposed greenhouse gas standards do not mandate ZEV technology, and that fleets would likely use a diverse range of technologies. NTTC is also pleased that EPA is open to comments suggesting technology or implementation alternatives that would provide a more gradual phase-in of proposed emissions standards. [EPA-HQ-OAR-2022-0985-1551-A1, p. 2]

The use of hydrogen as a viable energy source for commercial heavy-duty trucking does appear to have many advantages over ZEVs, particularly in a tanker truck application, but NTTC members are concerned with refueling capabilities and costs. By EPA's own admission, "Hydrogen storage cost projections also vary widely in the literature. Sharpe and Basma reported costs ranging from as high as $1,289 per kg to $375 per kg of usable hydrogen in 2025." The mid and long-term cost projections for hydrogen usage to power trucking fleets raise a high degree of uncertainty for America's trucking industry. EPA also acknowledged that, "…this market is still emerging and that hydrogen fuel providers will likely pursue a diverse range of business models. For example, some businesses may sell hydrogen to fleets through a negotiated contract rather than at a flat market rate on a given day. Others may offer to absorb the infrastructure development risk for the consumer, in exchange for the ability to sell excess hydrogen to other customers and more quickly amortize the cost of building a fueling station. [EPA-HQ-OAR-2022-0985-1551-A1, p. 2]

FCEV manufacturers may offer a 'turnkey' solution to fleets, where they provide a vehicle with fuel as a package deal. These uncertainties are not reflected in our hydrogen price estimates presented in the DRIA." Notably, EPA advised verbatim (with emphasis added) in its proposal, "We also note that the hydrogen infrastructure is expected to need additional time to further develop, as discussed in greater detail in DRIA Chapter 1.8, but we expect the refueling needs can be met by MY 2030." This uncertainty will likely discourage trucking fleet owners and independent owner-operators from investing in hydrogen as an energy solution for trucking. [EPA-HQ-OAR-2022-0985-1551-A1, p. 3]

According to the U.S. Energy Information Administration1, there are about 48 hydrogen vehicle fueling stations in the United States with nearly all of them within California. The lack of widespread hydrogen fueling infrastructure raises concerns about hydrogen viability to meet EPA's aggressive goals cited in its Notice of Proposed Rulemaking on Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3. Further, hydrogen's cost per mile can exceed double the highest rate per mile than other fuels. [EPA-HQ-OAR-2022-0985-1551-A1, p. 3]

1 https://www.eia.gov/energyexplained/hydrogen/use-of-hydrogen.php

Many trucking companies have considered using natural gas as a potential solution to decrease vehicle emissions. In fact, compressed natural gas (CNG) tractors saw an 80% increase of new registrations in 2021, although it only made up 3% of total new tractor registrations. The primary concern about widespread investment in natural gas (compressed or liquefied) tractors is price. A January 2023 U.S. Department of Energy report2 cites that the National Average Retail Fuel Prices for CNG increased from $2.88 per gasoline gallon equivalent (GGE) in October 2022 to $3.25 (GGE) in January 2023, an increase of $.37. Alarmingly, LNG prices skyrocketed in the same period from $3.63 to $4.76 – a difference of $1.13. For context, CNG prices achieved parity with Diesel in January 2023, but CNG and LNG prices have initiated a price climb in mid-2021 with no signs of decelerating. [EPA-HQ-OAR-2022-0985-1551-A1, p. 3]

2 https://afdc.energy.gov/files/u/publication/alternative_fuel_price_report_january_2023.pdf

The U.S. Energy Information Administration website3 reports that in 2022 there were 98 LNG and 1,399 CNG refueling stations in the United States. Sparse availability of these fueling stations nationwide is a concern for America's tank truck industry. [EPA-HQ-OAR-2022-0985-1551-A1, p. 3]

3 https://afdc.energy.gov/data/10332

4) America's tank truck industry is eager to protect and preserve the environment, but high costs of Class 8 Tractor equipment pose an existential threat to businesses that would need to

comply with the Proposed Rulemaking on Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3. [EPA-HQ-OAR-2022-0985-1551-A1, p. 4]

The cost of a typical Diesel tractor of today, used by the tank truck industry, is approximately $125,000. It is notable to compare this cost with similar tractors that use different fuel types such as natural gas ($170,000), battery electric ($450,000), and hydrogen fuel cell ($800,000). Considering these higher prices, equipment manufacturers are financially incentivized to push these technologies on carriers and owner-operators. [EPA-HQ-OAR-2022-0985-1551-A1, p. 4]

Average net profit margins of trucking companies are low, sometimes between 2 and 6%. Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3, as currently proposed by EPA, will yield in carriers and owner-operators needing to make a choice: (a) purchase new equipment at higher cost, with lower range, lower refueling availability, lower payload (if ZEV), and lower confidence in their return on investment; or (b) purchase older equipment to circumvent these issues, thus countering EPA intent, which poses maintenance and safety concerns over time. NTTC does not accept either of these mutually exclusive choices for future end-users. [EPA-HQ-OAR-2022-0985-1551-A1, p. 4]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

The Phase 2 GHG program includes optional custom chassis standards for eight specific vehicle types. Those vehicle types may either meet the primary vocational vehicle program standards or, at the vehicle manufacturer’s option, they may comply with these optional standards. The existing custom chassis standards are numerically less stringent than the primary GHG Phase 2 vocational vehicle standards. Manufacturers should not have the option to certify urban buses, school buses, refuse hauling trucks, and concrete mixers to optional custom chassis standards that are weaker than the vocational category. [EPA-HQ-OAR-2022-0985-1562-A1, p. 12]

Organization: NTEA - The Association for the Work Truck Industry

Intermediate Steps

As it stands today, EV heavy duty trucks will not be available or capable of adequately fulfilling the wide variety of applications for which vocational trucks are designed in the time frames under consideration. Fleets need options that can significantly reduce emissions but don’t have some of the inherent limitations of EVs in specific applications. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Vocational trucks, as opposed to over-the-road trucks, often drive low miles and then spend longer times on the jobsite. The driving component of fuel consumption is likely lower than lighter duty pick-up and delivery trucks. Promoting technologies such as ePTOs and PHEVs with parallel hybrid configurations may offer a good bridge to the future. [EPA-HQ-OAR-2022-0985-1510-A1, pp. 4-5]

Fleets need alternatives to EVs if they are not a fit for their applications. Diesel trucks with ePTOs may be a very effective, clean and economical alternative for work truck applications. [EPA-HQ-OAR-2022-0985-1510-A1, p. 5]

NTEA also suggests that the EPA consider allowing for delegated assembly by intermediate and final-stage manufacturers to provide credits that help incomplete vehicle manufacturers (chassis OEMs) to meet whatever more stringent regulations that are promulgated. [EPA-HQ-OAR-2022-0985-1510-A1, p. 5]

Organization: TeraWatt Infrastructure, Inc.

National standards for MHD vehicles will be a critical component to address emissions from the transportation sector. States are beginning to take action to address GHG emissions from MHD vehicles, such as the recent adoption by the California Air Resources Board (CARB) of the 'Advanced Clean Fleet Regulation'1, which requires MHD vehicles to transition fully to ZEVs by 2036. In addition to this, 15 states and the District of Columbia have signed a multi-state MOU2 to enact regulations to reduce MHD truck emissions through 100% ZEV truck sales by 2050. While these regulations take an enormous step towards tackling emissions from MHD vehicles, these actions focus largely on vehicle sales and are only being considered in a third of US states. The full transition to ZEV for MHD vehicles requires national standards. [EPA-HQ-OAR-2022-0985-1587-A1, pp. 1-2]

1 Advanced Clean Fleets Regulation, Final Regulation Order, California Air Resources Board. April 17, 2023. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acffroa4.pdf

2 https://www.nescaum.org/documents/multistate-truck-zev-mou-media-release-20200714.pdf

National standards to accelerate the transition to MHD ZEVs will also be supported by significant public and private sector investment in ZEV fueling infrastructure. The Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) represent billions in public funding for ZEV charging infrastructure through grants, incentives and tax credits. This is complemented by investments from electric utilities that have already committed to more than $3.4 billion in funding to support charging infrastructure3. TeraWatt announced in September 2022 that it had raised $1 billion for the purpose of building dedicated fleet charging infrastructure. This investment was secured before the passage of CARB's ACF regulation, and any proposed federal rules for MHD vehicles to transition to ZEV. Collectively, the public and private sector investments in MHD ZEV charging infrastructure is already in the tens of billions, and EPA's proposed rule can impact an exponential growth in both investment and deployment of charging infrastructure over the next decade to meet the market needs of this transition. [EPA-HQ-OAR-2022-0985-1587-A1, p. 2]

3 Electric Vehicle Sales and the Charging Infrastructure Required Through 2030, EEI, June 2022. https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Electric-Transportation/EVForecast--Infrastructure-Report.pdf

Organization: Transportation Departments of Idaho, Montana, North Dakota, South Dakota and Wyoming

As state DOTs we are also struck by the singular focus in the NPRM on EVs and inadequate attention to low carbon liquid fuels and biofuels as means of addressing emissions concerns. [EPA-HQ-OAR-2022-0985-1487-A1, p. 2]

Yet EVs are not well suited for all climates of our nation, especially in states that are rural, are at high altitude, or both. In such areas long distance travel in often extreme temperature ranges significantly impact EV range and the ability of Americans to access healthcare, food, and other necessities. The challenges faced by many states is exemplified through their winter operations and snow removal. For example, in South Dakota this past winter, the DOT alone totaled 3.2 million miles, used about one million gallons of fuel, and clocked approximately 178,000 man-hours to keep the state's roads safe. We are concerned the proposed emissions standards and push to heavy-duty EV use could significantly limit states' ability to keep roads clear and safe during winter conditions, which is necessary for travelers and freight to safely reach their destination. [EPA-HQ-OAR-2022-0985-1487-A1, p. 2]

Organization: Truck and Engine Manufacturers Association (EMA)

Energy-Intense Vehicle Applications – There are vehicle types, as identified by EPA in the preamble, such as heavy-haul vocational tractors trucks and long-haul tractors, that may require significant energy content for their intended use. Those applications, especially the heavy vocational trucks, are required to haul higher loads than are described and calculated within GEM. EPA used GEM to determine the battery energy needed per-mile to move a vehicle. Vocational trucks are loaded with 7.5 tons (15,000 pounds) in GEM for this assessment. [EPA-HQ-OAR-2022-0985-2668-A1, p. 51]

Dump trucks also haul significantly greater loads than are used by GEM and HD TRUCS to assess feasibility as a ZEV and potential adoption rates. The Class 8 configurations typically have additional axles added to allow the vehicle to carry more payload. The added axles also use up the space that could otherwise be used for batteries. That yields a double negative – more batteries are needed to move the higher vehicle weights, but less space is available due to the added axles to carry the additional weight. Accordingly, dump trucks, especially Class 8 versions, clearly warrant much lower ZEV-truck adoption rates. [EPA-HQ-OAR-2022-0985-2668-A1, p. 51]

Long-haul tractors are deemed to be FCEVs under the NPRM. The performance of FCEVs is still in the development phase so it is uncertain if the systems will have the horsepower capability to move representative freight loads on the timelines that are needed. There is no question about the torque to get the vehicle moving, but there can be concerns about the sustained horsepower necessary to allow the long-haul vehicle to maintain the needed speed across the various terrains, especially for vehicles that exceed the 82,000 pound national weight limit. [EPA-HQ-OAR-2022-0985-2668-A1, p. 51]

FCEVs that will go into production in 2025 are limited by the total combination weight that can be hauled, the mileage range, and the performance power. Although FCEVs are specified by EPA in the NPRM for heavy-haul tractors, it is unclear if the FCEVs can be rated with a power capacity to handle combination weights that exceed 120,000 pounds. It is also uncertain whether the technology can or will progress sufficiently, and if the needed hydrogen refueling infrastructure will be developed nationally over the following five years to have it ready to support long-haul tractor applications. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 51 - 52]

Organization: Truck Renting and Leasing Association (TRALA)

Rental Operations are Unlike Those of Traditional Trucking Companies

Rental trucks are fundamentally temporary transportation assets that are utilized by multiple customers throughout the year. Trucks owned by rental and leasing companies are typically rented to a business for less than one year. Short-term rental trucks operate under the renter's DOT number and the IRP and IFTA accounts of the rental and leasing company. [EPA-HQ-OAR-2022-0985-1577-A1, p. 3]

Rented and leased trucks frequently cross state borders and are vessels of interstate commerce. TRALA members do not control truck movements, operations, route planning, or fueling opportunities. This responsibility falls squarely on the renter or lessee. The potential also exists for the movement or drop-off of ZEV assets at locations that may not have fueling infrastructure or properly trained technicians available. These are the realities in the renting and leasing space that TRALA members will have to cope with moving forward. [EPA-HQ-OAR-2022-0985-1577-A1, p. 3]

Flexible fleet access to rental vehicles also serves a critical economic role for small businesses that do not specialize in transportation, enabling businesses to add extra capacity during peak seasons, manage growth in an uncertain market, and replace trucks at a moment's notice. These rental vehicles may be utilized by a single entity, but the vehicles have no single operator, no designated single routes, and no single home facility. These variables are the reason why rental vehicles are not the best candidates for near-term electrification or use of hydrogen. [EPA-HQ-OAR-2022-0985-1577-A1, p. 3]

Organization: Westport Fuel Systems

The EPA has asked for comments on adoption rates listed for ZEV long haul sleeper cabs

As mentioned in our response, the timelines for 2030 and 2032 are very ambitious given the current rate of deployment. The adoption rate is also dependent on the rate of charging and refuelling infrastructure development. There are numerous challenges to establishing infrastructure. It can take years to create the infrastructure ecosystem which includes developing the market and having commercially available vehicles for sale at scale. FCEVs which have the greatest flexibility to perform in the highest weight vehicles are still in development or demonstration phase in this segment and are not at full volume production, nor are price competitive. [EPA-HQ-OAR-2022-0985-1567-A1, p. 10]

EPA Summary and Response:

Summary:

ABF claims the proposed rule is a "de facto mandate on the adoption of electric vehicle technology that is at an early stage of development in the trucking industry." Their current experience with BEVs has shown limited range and challenges associated with charging infrastructure installation.

American Soybean Association is concerned about wear/tear on roads, extra time for more trips for farmers, cost of additional vehicles for farmers, suggest a need to increase truck weight limits on roads to avoid what would otherwise be payload losses due to increased battery weight (and presumable, size). They also posit increased emissions from road wear due to heavier ZEV vehicles.

ATA highlights the operational diversity of the trucking industry that needs to consider the weight impact, charging time, and maintainability in their TCO applications.

CARB staff urges U.S. EPA to require transit bus manufacturers to comply with the primary vocational vehicle standards in this Phase 3 rule. CARB staff also recommends U.S. EPA incorporate the same provisions as in California’s Phase 2 GHG transit bus requirements for the following custom chassis vehicle categories: school bus, other bus, coach bus, refuse hauler, and concrete mixer. CARB’s comment included examples of specialized ZEVs, many of which could fall into the custom chassis definition and supports greater inclusion into the stronger vocational standards instead of the weaker custom chassis standards. Similarly, NESCAUM/OTC commented that, in general, there should not be an option for refuse trucks and cement mixers to certify to the less stringent custom chassis standard.

ZEV examples cited in the comment include concrete mixers, truck cranes, knuckle boom cranes, bucket trucks, sewer cleaning trucks, armored trucks, stinger-steered auto carrier transports, street sweepers, aviation fuel delivery, container roll off, hook loader and skip loaders, school buses, double decker and motorcoaches, refuse, . plug-in fire trucks, and BEV and FCEV ambulances. EPA developed Table 2-1 to summarize the website links provided in CARB’s comments.

Table 2-1: **Electric Vehicles Included in CARB's Comments**

Vehicle					**Platform**	
Make	**Model**	**OEM Country**	**Type**	**Available Date**	**Make**	**Model**
Bocker	AK 48e	Germany	Crane	2022	Mercedes	eActros
Fass	F245	Denmark	Crane	2023	Scania	25L
Hiab	X-HiPro 122		Crane	2021	Volvo	FE Electric
CTE	MP 20 Ev	Italy	Crane	2022		
Zeus	19	USA	Bucket	2023		
Altec		USA	Bucket	2023	International	eM2
			Sewer Cleaner	2022	MAN	eTGM
Loomis			Armored Vehicle	2022	Xos	
Kassbohrer		Germany	Auto Carrier	2023	Scania	P 25
Kassbohrer		Germany	Auto Carrier	2022	Volvo	FM
Elgin Sweeper		USA	Street Sweeper	2023	Battle Motors	
Schwarze	M6 Avalanche EV	USA	Street Sweeper	2024		
Glutton	Zen	EU	Street Sweeper	2023		
Dulevo	D.Zero2		Street Sweeper	2023		
Dulevo	D.Zero2 Hydro		Street Sweeper	2023		
aebi schmidt	eSwingo 200+		Street Sweeper	2023		
RAVO	5 eSeries		Street Sweeper	2023		
Madvac	LS175		Street Sweeper	2023		
Madvac	LS125		Street Sweeper	2023		
Bucher	CityCat V20e		Street Sweeper	2023		
GEP			Street Sweeper	2023	US Hybrid	USA
Global	W4E		Street Sweeper	2021		
Global	M3EV		Street Sweeper	2023		
Battle Motors	LET 2		Street Sweeper	2023		
Bosserman Aviation Equipment			AVGAS Refueler	2007	Isuzu	
Titan	eRR20	France	AVGAS Refueler		PVI	France
Titan	eHD150	France	Hydrant Dispenser			
Titan	eSPR35	France	AVGAS Refueler	2022		
Palfinger	PHT 20 TEC 5	France	Hooklift	2022	Volvo	FE Electric
FUSO	eCanter		Roll-Off Tipper	2022		
Renault	E-Tech DZE	France	Roll-Off Tipper			
Battle Motors	LET 2		Roll-Off Tipper	2022		
Striker	Volterra		Fire Truck	2023	Oshkosh	
Pierce	Volterra		Fire Truck	2023	Oshkosh	
E-One	Vector		Fire Truck	2022		
Rosenbauer	RT		Fire Truck	2023		
Rosenbauer	Panther Electric		ARFF	2023		
E-One	Evo		Fire Truck	2023		
Titan	T-39	Germany	ARFF	2023	Scania	
Titan	ZEPA1	UK	Fire Truck	2022	Mercedes	
Hydrogen Vehicle Systems		UK	Ambulance	2021		
WMAS		UK	Ambulance	2020		
Ulemco	Zerro	UK	Ambulance	2021		
Ford	Transit	UK	Ambulance	2021		
Nissan	NV400	Japan	Ambulance	2020		
Lightning eMotors	Leader	USA	Ambulance	2021	Ford	Transit
VCS	E-DCA	UK	Ambulance	2023		

DTNA stated that EPA should not adopt any new CO_2 standards for long-haul tractors and heavy-duty vocational vehicles until at least 2033 and a nationwide network of refueling infrastructure exists to support them. DTNA believes a beachhead type of proposal could generate ZEV demand in specific categories. DTNA supports EPA's proposal not projecting ZEV adoption for certain custom chassis subcategories.

Electrification Coalition generally agrees with EPA's ZEV market assessment and supports more stringent standards for school buses, drayage and terminal trucks, and step vans, providing examples why each category should have quicker adoption than EPA proposed. MFN commented that drayage trucks should be subject to a more stringent standard, given their suitability for ZEV technologies (limited range, overnight charging in depots) plus the environmental benefits of reducing emissions given their use in heavily polluted areas like ports and railway yards.

MEMA stated that certain vehicles occasionally require higher demand than a typical day, such as fire trucks, utility trucks and snowplows. They suggested that EPA add an additional optional custom chassis category for vehicles used in emergency response, beyond fire trucks and ambulances. MEMA provided duty cycle data for some applications.

Hill Bros. stated that BEVs will not work for expedited team freight due to their limited range (assuming a depot charging model).

Jorge Morales raised concerns about the cost and the infrastructure growth related to EPA requirements to ban ICE vehicle sales.

NACAA suggests that EPA adopt standards that reflect the ZEV percentages required by ACT and even more stringent standards for transit buses, school buses, refuse haulers and concrete mixers.

NTTC raised concerns related to the extra weight and cost of BEVs for tank truck applications and H2 refueling availability and costs.

NTEA states that currently heavy-duty EVs are not available or capable of fulfilling the variety of vocational vehicle applications. They suggest that ePTOs may be an effective alternative and suggest that EPA allow delegated assemblers provide credits to incomplete vehicle manufacturers.

TeraWatt stated that support from IIJA and IRA in addition to utility investments will support the HD charging infrastructure. TeraWatt also highlighted that it raised $1 billion in 2022 for building fleet charging infrastructure.

EMA maintains that energy used by certain HDV applications are significantly higher than what is represented in GEM and HD TRUCS. Specifically, they suggest that dump trucks are an example where load requirements (and therefore energy requirements) are significantly underrepresented in HD TRUCS and that the added weight of batteries and potential impacts on payload capability indicate that standards for dump trucks should be predicated on lower ZEV adoption rates. EMA also raised concerns about the ability of FCEVs to meet the horsepower requirements for freight delivery and heavy-haul applications. They also raise a concern related to the availability of H2 refueling infrastructure needed in time to support long-haul applications. TRALA stated that rental operations were not the best candidates for ZEVs due to the charging infrastructure needs of the renter and the need for properly trained technicians.

Westport raised concerns related to the rate of the charging and hydrogen infrastructure development needed to support the 2030 and 2032 timelines.

Response:

EPA's proposed and final heavy-duty vehicle CO_2 emission standards are performance-based standards and are not a "de facto mandate on the adoption of electric vehicle technology." As discussed in Section II.F.4 of the preamble, we have analyzed several additional example potential compliance pathway's technology packages that support the final emission standards, that do not include BEVs or FCEVs relative to the reference case.

We received mixed comments on the readiness of the infrastructure, including support from TerraWatt for our assessment in the proposal. In response to several commenters raising concerns related to the readiness of the infrastructure to support ZEVs, we have carefully assessed infrastructure needed for the modeled potential compliance pathway as described in Section II.D.2.iii of the preamble and RIA Chapter 1.6.2 that supports the feasibility of the final standards, and as described in preamble Section II.G we conclude that the Phase 3 standards are feasible and appropriate. EPA also commits in this final rule to actively engage with stakeholders and monitor both manufacturer compliance and the major elements of heavy-duty ZEV infrastructure, as discussed in preamble Section II.B.2.iii. Additional comments and responses to comments related to charging and hydrogen refueling infrastructure readiness can be found in RTC Sections 6.1, 6.2, and 8.

For the analysis to support the final rulemaking, EPA evaluated the weight impact of BEV powertrains relative to a comparable ICE powertrain. As discussed in RIA Chapter 2.9.1.1, we assess the weight difference for specific applications in HD TRUCS on an individual basis and determine the suitability of each application for BEVs based on the payload difference between comparable ICE vehicles and BEVs. Many applications show no weight increase for BEVs. See also our response to comments in RTC Section 3. With respect to the comment suggesting an increase in the allowable weight limits on roads, this is outside of the scope of this rulemaking and EPA's authority.

As discussed in the preamble to this final rule, we are continuing to allow the option for manufacturers to meet custom chassis standards for certain vehicle categories. We are retaining the current eight vehicle categories finalized in the HD GHG Phase 2 program. After considering comments, including CARB, NACAA, and NESCAUM/OTC and others, we are revising standards for some, but not all, of the optional custom chassis subcategories. See section II.C.1 of the preamble for background on our custom chassis standards and section II.F.1 for a description of the optional custom chassis standards we are finalizing in this rule.

Some commenters raised concerns about electrifying specific applications, such as long-haul tractors, trucks that use team drivers, rental trucks, snowplows, and utility trucks. As discussed in preamble Section II.F.1, under the modeled potential compliance pathway the majority of sales of new HD vehicles in MYs 2027 through 2032 are projected to be ICE vehicles with GHG-reducing technologies. Furthermore, as discussed in preamble Section II.F.4, there are many other possible compliance pathways for meeting the final standards that do not involve the widespread adoption of BEV and FCEV technologies. In that section we describe and assess additional example potential compliance pathways.

Electrification Coalition and MFN specifically commented about drayage tractors. As noted in the proposal (88 FR 25991), a drayage tractor is not a unique application nor do these tractors contain unique design features to differentiate them from other tractors – nearly any tractor can be used for drayage operation. At this time, we do not have data and the commenters did not provide sufficient information to inform new standards for drayage applications. We are not including new standards specifically for drayage tractors in this final rule and these tractors will continue to be required to meet the applicable day cab or sleeper cab tractor emission standards.

For the final rule analysis, we made adjustments to our sizing of fuel cell stack, battery, and motor components for FCEVs, as described in RIA Chapter 2.5.1. To avoid undersizing the fuel cell system, we oversized the fuel cell stack by an additional 25 percent to allow for occasional scenarios where the vehicle requires more power (e.g., to accelerate when the battery state of charge is low, to meet unusually long grade requirements, or to meet other infrequent extended high loads like a strong headwind) and so the fuel cell can operate within an efficient region.

With respect to the comment suggesting that ePTOs are an effective technology for reducing GHG emissions, we note that ePTOs can be taken into account today under the existing regulations 40 CFR 1037.520(k) and 40 CFR 1037.540 and those regulations remain for the Phase 3 program (and were not reopened in this final rulemaking).

2.3 Structure of the Program

2.3.1 Modifying Phase 2

<u>Comments by Organizations</u>

Organization: American Trucking Associations (ATA)

ATA and other industry stakeholders worked with EPA in good faith to arrive at a final regulation that was stringent but achievable and defended the final rule from external political pressures. Changing GHG Phase 2 mid-stream will upend the lead-time, planning and resources necessary for manufacturers to design and validate emissions reduction technologies and that remains our concern with reopening the rule today. [EPA-HQ-OAR-2022-0985-1535-A1, p. 4]

Besides the policy implications, the Clean Air Act (CAA) Section 202(a)(3)(C) requires four-year lead time and three-year stability periods for new or revised heavy-duty truck emissions. [EPA-HQ-OAR-2022-0985-1535-A1, p. 4]

EPA's proposed reopening of MY 2027 GHG Phase 2 standard fails to follow the CAA four-year lead time requirement. [EPA-HQ-OAR-2022-0985-1535-A1, p. 5]

Organization: National Association of Chemical Distributors (NACD)

Revising Phase 2 Greenhouse Gas Standards

This proposal includes revising the EPA's previously finalized phase 2 GHG emission standard, setting new targets for Model Year 2027. NACD strongly disagrees with this approach as it would disincentivize manufacturers and others in the industry to plan farther into the future when other rulemakings are finalized, as there would be no certainty that set EPA standards will not be changed before they are eventually implemented. [EPA-HQ-OAR-2022-0985-1564-A1, pp. 4 - 5]

NACD strongly recommends that the EPA maintain the current phase 2 GHG standards to maintain consistency for the trucking industry. Manufacturers and buyers have factored these standards in their various business decisions over the years, and retroactively adjusting them standards would severely harm the industry and the economy as a whole. [EPA-HQ-OAR-2022-0985-1564-A1, p. 5]

Organization: National Automobile Dealers Association (NADA)

III. Any reopening of the Phase 2 GHG mandates would undermine market stability.

ATD categorically opposes any increases to the stringency of the Phase 2 GHG standards applicable through MY 2027 as they would undermine the regulatory certainty that is critical to compliance and marketplace stability. The Phase 2 standards resulted from a carefully coordinated joint rulemaking with the National Highway Traffic Safety Administration (NHTSA), the agency primarily responsible for administering the Energy Policy and Conservation Act (EPCA), as amended by the Energy Independence and Security Act (EISA).9 Clean Air Act (CAA) section 202(a)(3)(C) states that four-year lead time and three-year stability periods are required for HDV emission standards and a reopening of Phase 2 for MY 2027 would not comport with this statutory mandate. Thus, it would be contrary to the CAA and the intent of Congress for EPA to revise the Phase 2 GHG standards. Moreover, EPA's suggestion that the Phase 2 GHG mandates should be tightened based on aspirational HDV manufacturer goals for the potential rollout of ZEV HDVs is necessarily arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1592-A1, p. 4]

9 Section 102 of EISA specifically mandated that NHTSA coordinate with EPA to establish fuel economy/GHG standards for medium- and heavy-duty trucks. 49 U.S.C. §32902(b)(1)(C).

Organization: National Waste & Recycling Association (NWRA)

As the industry that facilitates and conducts recycling throughout the country, NWRA members support EPA's goals to make the environment a better place and increase the cleanliness and efficiency of the vehicles their companies produce and operate. NWRA does not want to have a regulation that limits the strides our manufacturers and operating companies are already taking to incorporate zero emission vehicles (ZEV) into our fleets. NWRA-member truck manufacturers are already seeing an uptick in the request and ordering of ZEVs. NWRA requests that EPA institute a technologically feasible rule and not change the current regulatory environment as it relates to Phase 2. [EPA-HQ-OAR-2022-0985-1616-A1, p. 1]

Organization: NTEA - The Association for the Work Truck Industry

This NPRM effectively re-opens the Phase 2 rules. Re-opening the finalized GHG Phase 2 rules would undermine the regulatory stability manufacturers need in order to develop their products. It would effectively penalize engine manufacturers for their ongoing efforts to assure compliance with the existing 2024 and 2027 GHG standards. Additionally, changing the GHG rules would put manufacturers in the position of trying to develop technologies to meet increased GHG standards for existing and necessary ICE trucks while also trying to design and introduce ZEVs to the market. [EPA-HQ-OAR-2022-0985-1510-A1, p. 2]

Organization: PACCAR, Inc.

I. EPA SHOULD NOT RE-OPEN MY2027 STANDARDS

In the HD GHG Phase 2 rule, EPA promulgated MY2027 standards on which manufacturers have relied in designing their product portfolios and compliance strategies. EPA now proposes to make the MY2027 standards more stringent, relying on increased ZEV adoption rates as the rationale for re-opening these standards. Increased ZEV adoption is precisely the policy goal EPA sought to promote in setting the HD GHG Phase 2 standards, allowing vehicle manufactures flexibility in choosing the best combination of technologies to meet the standards. OEMs have chosen to invest in ZEVs – rather than other available compliance pathways – to meet Phase 2 standards. OEMs advanced ZEV technologies, making this aspect of the HD GHG Phase 2 successful. [EPA-HQ-OAR-2022-0985-1607-A1, p. 3]

Although ZEV adoption rates have exceeded EPA's HD GHG Phase 2 rule projections, several other key technologies have lagged behind those projections. For example, EPA's GHG Phase 2 stringency calculations assumed for MY2027: 30% of tractors would have automatic tire inflation systems; 30% of tractors and 15% of vocational vehicles would have electric accessories (power steering pump, water pump, etc.); more than 70% of vocational vehicles would have tamper proof one minute idle shutdown timers; and 20% of vocational vehicles would have stop-start, and up to 30% of vocational vehicles would have advanced shift strategies confirmed by powertrain testing. PACCAR anticipates these technologies' MY2027 adoption rates will be below these assumptions for a variety of reasons including technology availability (e.g., engine stop-start), technology costs (e.g., auto tire inflation, electric accessories), customer adoption willingness (e.g., one minute idle shutdown timers), and high compliance costs (e.g., powertrain testing). PACCAR respectfully requests that if EPA seeks to increase MY2027 stringencies in response to one specific technology – ZEVs – that is over performing predicted adoption rates, the Agency should similarly account for technologies that are underperforming predicted adoption rates. [EPA-HQ-OAR-2022-0985-1607-A1, pp. 3 - 4]

Organization: State of California et al.

A. Statutory and Regulatory Framework

Section 202(a) of the CAA requires EPA to set emission standards for air pollutants from new motor vehicles or new motor vehicle engines that the Administrator has found "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."127 Standards under section 202(a) shall take effect "after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period."128 Therefore, in establishing or revising emission standards promulgated under section 202(a), EPA must consider issues of technological feasibility, compliance cost, and lead time.129 [EPA-HQ-OAR-2022-0985-1588-A1, pp.17-18]

127 42 U.S.C. § 7521(a).

128 Id. § 7521(a).

129 88 Fed. Reg. 25,926, 25,949 (Apr. 27, 2023) (citing 76 Fed. Reg. 57,129 (Sept. 15, 2011); 81 Fed. Reg. 73,478, 73,512 (Oct. 25, 2016)).

EPA can and does consider the development and application of a range of technologies, including zero-emission technologies.130 Section 216(2) defines "motor vehicle" as "any self-propelled vehicle designed for transporting persons or property on a street or highway,"131 an expansive definition that reflects Congress's intent not to limit standards to vehicles running on any particular fuel, power source, or system of propulsion.132 Moreover, section 202(a) authorizes EPA to set emission standards by reference to both "future advances" and "presently available" technologies that could be applied more broadly,133 and directs EPA to apply its standards to vehicles that "are designed as complete systems," as well as those that "incorporate" additional "devices" to "prevent or control pollution."134 Thus, the agency's section 202(a) standards can be technology forcing. Indeed, the D.C. Circuit has long recognized that, "Congress expected the Clean Air Amendments to force the industry to broaden the scope of its research—to study new types of engines and new control systems."135 [EPA-HQ-OAR-2022-0985-1588-A1, p.18]

130 88 Fed. Reg. at 25,948-51.

131 42 U.S.C. § 7550(2).

132 88 Fed. Reg. at 25,948.

133 NRDC v. EPA, 655 F.2d 318, 328, 330 (D.C. Cir. 1981) (cleaned up); 42 U.S.C. § 7521(a)(2).

134 42 U.S.C. § 7521(a)(1).

135 Int'l Harvester Co. v. Ruckelshaus, 478 F.2d 615, 635 (D.C. Cir. 1973).

B. Existing Federal Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles and Engines

EPA has regulated GHG emissions from the heavy-duty sector under CAA section 202(a) since 2011, when EPA and the National Highway Traffic Safety Administration finalized their respective parts of the Phase 1 Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles. Among other things, the Phase 1 GHG Standards regulated CO2 emissions for highway heavy-duty vehicles and heavy-duty vehicle engines for model years 2014 through 2018.136 The program "offered flexibility allowing manufacturers to attain the standards through a mix of technologies and the option to participate in an emissions credit averaging, banking, and trading program."137 [EPA-HQ-OAR-2022-0985-1588-A1, p.18]

136 76 Fed. Reg. 57,106 (Sept. 15, 2011).

137 87 Fed. Reg. 17,414, 17,432 (Mar. 28, 2022) (describing prior regulatory programs addressing heavy-duty vehicles).

In 2016, EPA and the National Highway Traffic Safety Administration finalized their respective parts of the Phase 2 GHG and fuel efficiency program for heavy-duty vehicles, which again included performance-based standards for highway heavy-duty vehicles and heavy-duty engines.138 EPA's standards for most vehicles and engines commenced in model year 2021, will increase in stringency in model year 2024, and will culminate in model year 2027.139 EPA based its Phase 2 GHG standards on technologies currently available in 2016, as well as technologies that were still under development or not yet widely available; however, EPA specifically did not consider heavy-duty ZEV technologies as an available emission-reduction strategy for the sector.140 This failure to consider heavy-duty ZEV technologies was a departure from its practice of considering these technologies in other rulemakings under section 202(a). In its "Tier 2" criteria pollutant standards for light-duty vehicles, for example, EPA incentivized manufacturers to adopt ZEV technologies by including such vehicles in the fleet average.141 And EPA continued this approach in its "Tier 3" standards for light-duty vehicles,142 among others. [EPA-HQ-OAR-2022-0985-1588-A1, p.19]

138 81 Fed. Reg. 73,478 (Oct. 25, 2016).

139 Id.

140 87 Fed. Reg. at 17,432-433.

141 65 Fed. Reg. 6698, 6746 (Feb. 10, 2000).

142 79 Fed Reg. 23,414, 23,454, 23,471 (Apr. 28, 2014).

In March 2022, EPA proposed a rule titled "Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards" (Heavy-Duty NOx Proposal).143 While the proposed rule primarily sought to strengthen criteria pollutant emission standards for heavy-duty engines, the agency also sought comment on whether the Phase 2 GHG standards should be strengthened for certain model year 2027 vehicles in the heavy-duty sector based on the better-than-anticipated deployment of zero-emitting vehicles in certain heavy-duty vehicle classes such as buses and delivery vans. Many of these States and Cities commented on the proposal—supporting EPA's general methodology for updating the Phase 2 GHG standards, but encouraging EPA to base its update on a more robust projection of ZEVs in the heavy-duty sector that reflects multiple States' ZEV mandates and market conditions that increasingly favor heavy-duty ZEVs.144 The States and Cities further encouraged EPA to prioritize new GHG standards for the heavy-duty sector as a whole, based on proven, cost-effective ZEV technology.145 [EPA-HQ-OAR-2022-0985-1588-A1, p.19]

143 87 Fed. Reg. 17,414 (Mar. 28, 2022).

144 Comments of California et al., Docket No. EPA-HQ-OAR-2019-0055 (May 16, 2022).

145 Id.

I. EPA SHOULD STRENGTHEN THE PHASE 2 GHG STANDARDS FOR MODEL YEAR 2027 VEHICLES

As discussed above, the States and Cities agree that heavy-duty ZEVs are rapidly becoming an important presence within the heavy-duty vehicles sector, at rates far surpassing those projected in 2016 when EPA adopted the Phase 2 standards. EPA's proposal to recognize this and the availability of other technologies and tighten the MY2027 Phase 2 GHG standards accordingly is sound. The proposed approach preserves the environmental integrity of EPA's existing Phase 2 standards, in light of the expanding deployment of ZEV technologies, because those standards were premised on other emission-reduction technologies.226 [EPA-HQ-OAR-2022-0985-1588-A1, pp.31-32]

226 footnote was not included in comment document

It is rational and consistent with the CAA to update the Phase 2 GHG standards to reflect recent developments and to ensure the standards continue to demand technologically feasible and cost-effective emission reductions. Indeed, it would be "patently unreasonable" for EPA to ignore the “dramatic[]” changes in the regulated industry. NRDC v. Herrington, 768 F.2d 1355, 1408 (D.C. Cir. 1985). The CAA, in particular, is designed so that EPA may respond to “changing circumstances and scientific developments” and “forestall . . . obsolescence.” Massachusetts v. EPA, 549 U.S. 497, 532 (2007). The projections that heavy-duty ZEVs will reach cost parity with, and then achieve cost advantage over, conventional heavy-duty engines within the next one to eight years is surely one such change,227 as are the myriad developments described in the Proposal and above. It is therefore appropriate for EPA to forestall obsolescence here by adjusting the Phase 2 GHG standards to respond to technological developments, most notably increasing ZEV deployment in the heavy-duty sector. To that end, as discussed in more detail below, the States urge EPA to improve the accuracy of its update to the MY2027 Phase 2 GHG standards by ensuring the estimated heavy-duty ZEV penetration rate reflects other States’ adoption of California’s ACT regulations and other favorable market conditions for HD ZEVs, and increase the stringency of the final standards to provide protection levels, and thus technological deployment levels, equivalent to that of ACT. [EPA-HQ-OAR-2022-0985-1588-A1, p.32]

227 88 Fed. Reg. at 25,942; see also ICCT, Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards (March 2023), https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf.

Organization: Truck Renting and Leasing Association (TRALA)

Phase 2 Rule Should not be Reopened

TRALA does not support reopening the final EPA 2016 Phase 2 Greenhouse Gas (GHG) rule. Reopening any final rule that was the culmination of years’ worth of stakeholder discussions, input, data sharing, and negotiation is simply not good public policy. Changing the final rule mid-stream sets a bad precedent and upends the lead-time, planning, and resources necessary for manufacturers to design technologies for the future. [EPA-HQ-OAR-2022-0985-1577-A1, p. 21]

Testimony presented by environmental advocacy groups during the April 12-14, 2022, EPA public hearing on HD2027 encouraged the agency to not only tighten truck GHG standards in 2027, but also in years 2028 and 2029 as well. Many stakeholders also called for Phase 2 revisions to mandate zero-emission trucks as opposed to a phased-in approach. What became abundantly clear during the hearing was that virtually none of the parties testifying in support of accelerated decarbonization efforts purchased or operated trucks nor did they run trucking companies. With the retail price of new Class 8 electric trucks costing over $400,000 per vehicle and fuel cell vehicles estimated to cost even more, many trucking fleets will not be able to afford the up-front costs to buy new trucks that are 3-4 times more expensive than their clean diesel counterparts – even with the availability of federal incentives, [EPA-HQ-OAR-2022-0985-1577-A1, p. 21]

From a purely equitable standpoint, the agency should also change the implementation of any mobile source final rule that adversely impacts fleet operations due to changes in circumstances as well – such as pandemics, labor and technician shortages, excessive inflationary rates, economic downturns, parts shortages, or technological inability to comply. Put another way, good public policy necessitates the door swings both ways. [EPA-HQ-OAR-2022-0985-1577-A1, p. 21]

Organization: U.S. Chamber of Commerce

While we support a national standard that drives cutting edge technology deployment and lowers emissions, we have serious concerns that, as proposed, EPA's preferred option fails to adhere to these core principles, and as a result could lead to unintended negative consequences for both the economy and the environment. [EPA-HQ-OAR-2022-0985-1583-A1, p. 2]

While our concerns focus primarily on potential impacts to long haul freight trailers and the traditional trucking sector, similar concerns exist with respect to potential impacts on all vehicle classes covered by the rule, including transit buses, commercial delivery vehicles, and vehicles designed for waste removal, construction, agriculture, and more. [EPA-HQ-OAR-2022-0985-1583-A1, p. 2]

Maintaining the Existing GHG Program will Promote Regulatory Durability

The proposed provisions that would modify the current Phase 2 GHG requirements that have been in place since 2016 increases investment uncertainty and erodes confidence in private-public partnerships that have helped successfully implement this program. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

While each business may view these proposed changes to the phase 2 GHG emissions standards through different lenses, changing provisions that were agreed to years ago creates a moving regulatory target and sends mixed signals to the market. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

Although polarizing changes to regulatory programs have occurred across a range of EPA and other federal agency programs during the last few administrations, the heavy-duty GHG requirements have remained constant following the issuance of the 2016 final rulemaking.3 This is in no large part due to the commitment by companies to invest and meet the 2016 standards. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

3 Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles— Phase 2, 81 Fed. Reg. 73478, October 25, 2016.

Companies are continuing to innovate and bring GHG reducing technologies, fuels, and other solutions to the heavy-duty marketplace. EPA may be able to achieve additional GHG emissions reductions through incentives for advanced biofuels, such as biodiesel or renewable diesel, under the Renewable Fuels Standards program. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

Conclusion

The Chamber supports EPA's efforts to further reduce emissions from the mobile source sector. We strongly recommend, however, that the agency avoid potential counterproductive economic and environmental consequences by considering the multitude of outside the vehicle factors that could impede industry compliance with proposed standards. [EPA-HQ-OAR-2022-0985-1583-A1, pp. 4-5]

Organization: Volvo Group

Conventional Vehicle Stringency

Volvo Group supports EPA's inclusion of only BEV and FCEV penetrations in the stringency calculations. As traditional heavy-duty vehicle manufacturers transition to zero-emission technologies, we must be able to focus our limited investments on developing and commercializing zero-emission vehicles (ZEVs), while continuing to support our internal combustion engine (ICE) technologies in order to meet the needs of the transportation industry and, ultimately, all consumers during this technology transition. Additionally, the largest greenhouse gas emission reductions will come from zero and near-zero-emission technologies and greater utilization of sustainable liquid fuels, not from minor engine and vehicle improvements. [EPA-HQ-OAR-2022-0985-1606-A1, p. 15]

For these reasons we do not believe that conventional vehicle stringencies should be increased beyond the current model year 2027 levels set in the Phase 2 rulemaking. Furthermore, if EPA determines to re-evaluate either, or both of the 2027 engine and conventional vehicle levels, the agency must take all of the factors noted above into consideration, especially the impact of NOx and increased engine emissions useful life on engine fuel maps used in EPA's Greenhouse Gas Emissions Model (GEM) to calculate a vehicle's Family Emission Limit (FEL). [EPA-HQ-OAR-2022-0985-1606-A1, p. 15]

EPA Summary and Response:

Summary:

EPA proposed to commence the Phase 3 program in MY 2027 by amending the Phase 2 vehicle standards (for many but not all subcategories), but not amending the Phase 2 engine standards. The State of California supported this proposal on the grounds advanced by EPA at proposal: facts have changed from 2016 when the agency promulgated its Phase 2 rule and EPA's GHG emission standards should account for those developments. Specifically, California argued that ZEVs are being actively deployed, there are plans to increase their adoption rate, and massive federal and State efforts underway to subsidize and otherwise encourage heavy duty ZEV implementation. Given Congress's primary purpose of section 202 (a)(1) to further reduction of emissions of pollutants contributing to endangerment through the application of advanced technologies, California believes that EPA can and should amend the Phase 2 standards starting in MY 2027, as proposed.

A number of commenters opposed amendment of the Phase 2 MY 2027 standards. American Trucking Ass'n argued that CAA section 202 (a)(3)(C) mandates four years of lead time and three years of stability, and so bars both a MY 2027 start date and year-over-year stringency increases thereafter.

Other commenters posed equitable arguments opposing amending the Phase 2 standards. They note that the Phase 2 standards exhibited a rare consensus, reflecting a common understanding that the standard would remain unaltered through its final model year of phase in MY 2027. Manufacturers have relied on those standards in devising compliance strategies. (U.S. Chamber of Commerce, TRALA). Moreover, early adoption of ZEVs is part of companies' Phase 2 compliance strategies, not a valid harbinger for a Phase 3 rule. That is, rather than adopt a number of technologies on which the Phase 2 rule was predicated (such as high adoption rates for advanced aerodynamics, stop start, electric steering accessories and others), some companies instead have introduced ZEVs. If the MY 2027 standards are amended, these companies are effectively punished for their adoption of an innovative technology, because they will need to seek unanticipated reductions from other vehicles. (Paccar) If EPA is considering changed circumstances as a basis for amending 2027 standards, there are changed circumstances that cut in the other direction: under-utilization of ICE improvement technologies, pandemic altered supply chains, inflationary prices, fewer qualified technicians, and parts shortages. (Paccar, TRALA. DTNA, EMA)

Volvo stated that in any case, EPA should not amend the Phase 2 engine standards, and should carefully consider the impact of the recent HD NOx standards: "if EPA determines to re-evaluate either, or both of the 2027 engine and conventional vehicle levels, the agency must take all of the factors noted above into consideration, especially the impact of NOx and increased engine emissions useful life on engine fuel maps used in EPA's Greenhouse Gas Emissions Model (GEM) to calculate a vehicle's Family Emission Limit (FEL)."

Response:

EPA is adopting standards for most of the HDV subcategories commencing in MY 2027, as proposed. We are promulgating these standards pursuant to CAA section 202(a)(1) which does not specify a minimum number of years of lead time, nor bar year-over-year stringency. Section 202 (a)(3)(C) does not apply for the reasons discussed in Section 2.3.3 of this RTC.

CAA section 202(a)(1) directs EPA to utilize technology-based standards to reduce emissions of pollutants contributing to ongoing endangerment. See e.g. Coal. for Responsible Regulation, 684 F. 3d at 122. The projections that increasingly efficient emission reduction technologies are available and already commercialized is thus a new development and a changed circumstance that EPA can and should take into account for the purpose of setting more stringent GHG emission standards (see further discussion regarding why EPA is setting Phase 3 standards, including certain revised MY 2027 standards, in preamble Sections Executive Summary and II). Indeed, were the circumstances reversed and it was apparent that the Phase 2 standards were proving to be legitimately infeasible within the regulatory time frame, EPA would similarly react to evaluating those changed circumstances and commence a rulemaking to consider amending the standards.

Based on the record now before us, EPA finds that there are technically feasible means of obtaining further significant emission reductions, at reasonable cost, and with sufficient lead time; and that these reductions would make a meaningful contribution to mitigating the ongoing climate crisis. Volvo's comment even recognizes this, noting that "the largest greenhouse gas emission reductions will come from zero and near-zero-emission technologies and greater utilization of sustainable liquid fuels, not from minor engine and vehicle improvements." See Section II.F where we discuss the modeled and additional example potential compliance pathways that meet and support the feasibility of the final standards. See NRDC v. EPA, 655 F. 2d at 328 (when setting standards under section 202(a) of the CAA, EPA must "press for the development and application of improved technology rather than be limited by that which exists today"). In reaching this conclusion, EPA has considered, and analyzed other changed circumstances, including inflation rate (costs are calculated in 2022 dollars), availability and cost of critical minerals (see RTC Section 17.2), and considered potential effects on labor (see Section 19 of this RTC). Regarding ICE vehicle technologies, see our assessment in RIA Chapters 1 and 2 and preamble Section II.

Regarding Volvo's comment that conventional vehicle stringencies should not be increased beyond the current model year 2027 levels set in the Phase 2 rulemaking, EPA notes that the vehicles with ICE in the modeled potential compliance pathway include a mix of technologies that meet the Phase 2 MY 2027 standards. These technologies are feasible and available in the timeframe of the Phase 3 program and at reasonable cost. However, manufacturers may use whatever technology or mix of technologies they choose that meets the standards. In addition, as part of the feasibility assessment of the HD2027 Rule, EPA demonstrated that the HD2027 NOx standards could be met without increasing CO_2 emissions.[254]

EPA addresses PACCAR's additional comment concerning relationship of the Phase 2 and Phase 3 standards in RTC Section 2.3.3 below. However, we note that manufacturers may meet the Phase 3 standards using whatever technology or mix of technologies they choose that meet the final standards, including vehicle with ICE technologies; EPA's additional example potential compliance pathways support the feasibility of meeting the standards through the use of non-ZEV technologies.

2.3.2 Phase 3 Implementation Years

<u>Comments by Organizations</u>

Organization: American Council for an Energy-Efficient Economy (ACEEE)

EPA must set heavy duty standards that maximize GHG emissions reductions from transportation

Transportation is the largest source of greenhouse gas (GHG) emissions in the United States, accounting for 27% of total economy-wide emissions.1 Medium- (MDV) and heavy-duty (HDV) vehicles, despite being just 5% of the on-road fleet, are responsible for 26% of sector-wide emissions.2 To stave off the worst impacts of climate change, the United States will need to make rapid progress toward eliminating pollution from heavier vehicles. [EPA-HQ-OAR-2022-0985-1560-A1, p. 1]

1 https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

2 https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

EPA must issue Phase 3 standards that will put heavy-duty vehicles on a sustainable path and help to meet nationwide climate goals. Upon taking office in 2021, President Biden set an ambitious new target to reduce US GHG pollution by 50-52% by 2030 from 2005 levels.3 The Phase 3 HDV standards must ensure that our transportation sector will contribute adequately to meeting these goals and that future progress on vehicles will help to limit the warming of the planet to no more than 1.5 degrees Celsius.4 Recent analysis finds, however, that for the heavy-duty sector to support attainment of U.S. commitments under the Paris Agreement for 2030 and 2050, emissions reductions will need to occur substantially faster than they would under the proposed Phase 3 standards, in combination with other policies now in place.5 [EPA-HQ-OAR-2022-0985-1560-A1, pp. 1 - 2]

[254] See 88 FR 4342

3 https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

4 https://theicct.org/wp-content/uploads/2022/05/globalhvsZEV-hdzev-pace-transition-may22.pdf

5 https://theicct.org/publication/hdv-phase3-ghg-standards-benefits-apr23/

Heavy-duty vehicles also represent a substantial share of the transportation sector's criteria air pollution such as nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM).6 These emissions lead to localized air pollution and the associated health impacts, such as increased rates of asthma, increased risk of heart attacks or strokes, and lung cancer, conditions that are particularly bad in low-income communities and communities of color, which have borne and continue to bear a disproportionate burden of transportation pollution. [EPA-HQ-OAR-2022-0985-1560-A1, p. 2]

If designed and implemented correctly, the next phase of EPA's GHG standards for heavy-duty vehicles can help the United States meet its climate goals and improve the health outcomes of historically disadvantaged communities, while also reducing fueling costs for truck and fleet owners in the short run and total ownership costs in the long run; costs that reduce competitiveness and are passed on to consumers. Rigorous updated standards that drive efficiency and emissions improvements in both internal combustion engine vehicles (ICEVs) and zero emission vehicles (ZEVs) are crucial to achieving the above goals, and EPA cannot miss the opportunity to deliver such standards for model years 2027 to 2032. [EPA-HQ-OAR-2022-0985-1560-A1, p. 2]

Organization: American Petroleum Institute (API)

4. Compounding concern – resource focus will be on LD, on the same timeframe

EPA released the proposals for HD and for LD/MD simultaneously – and the programs will be implemented on the same 2027-2032 timeframe as well. API has serious concerns about the implications of this timing. Both proposed programs are significantly flawed in that they rely on resources and infrastructure that are not yet ready. However, this would provide even greater difficulty for the HD program, as HD ZEVs are not at the same level of readiness as LD vehicles and the deployment of charging infrastructure is at an even greater disadvantage. Even with EPA's projections regarding the use of BIL and IRA funding, the transportation industry will be competing for the same resources to successfully stand up both programs. Furthermore, the availability of and process for obtaining such funding is not certain. [EPA-HQ-OAR-2022-0985-1617-A1, p. 11]

Organization: California Air Resources Board (CARB)

Part I. Proposed Greenhouse Gas (GHG) Emissions Standards for Heavy-Duty Vehicles (HDVs)

A. United States Environmental Protection Agency (U.S. EPA) Must Take Strong Regulatory Action to Further Reduce GHG Emissions

Affected pages:1 25928-25930, 25933, 25947, and 26006

1 Affected page numbers are page numbers relating to the comment from the published NPRM and/or DRIA.

CARB staff urges U.S. EPA to finalize CO2 emission standards for HDVs with continued increasing stringency in MYs 2027 through 2040, not only through MY 2032; stringency should reflect the feasibility of greater HD ZEV penetrations than in CARB's ACT regulation. As stated by CARB Executive Officer Dr. Steven Cliff at the federal public hearing for the Phase 3 GHG standards on May 2, 2023, the Phase 3 GHG rulemaking provides a historic chance for U.S. EPA to recognize the critical public health and welfare protections provided by HD ZEVs. As the Biden administration has recognized in its longer-term commitments such as the 27th Conference of the Parties of the United Nations Framework Convention on Climate Change and the Blueprint for Transportation Decarbonization, built from the IRA, significant reductions in GHGs are needed. And they are feasible from HD vehicles. U.S. EPA should finalize a Phase 3 GHG rulemaking with increasingly stringent standards, reflecting, among other things, the increasing availability and cost-effectiveness of HD ZEVs, extending to 2040. U.S. EPA should finalize Phase 3 standards that extend past 2032 to continue this progress until 100 percent decarbonization is achieved, as well as to send a signal to fleets, landowners, power generators, and utilities regarding the need to work together to enable greater deployment of HD ZEVs because they not only reduce GHGs but other harmful emissions as well. [EPA-HQ-OAR-2022-0985-1591-A1, p.12]

As indicated in the Phase 3 NPRM, certain original equipment manufacturers (OEM) project 50 to 60 percent of HD trucks sold being electric by 2030, carbon-neutral trucks in the United States (U.S.) by 2039, or 100 percent ZE by 2040.11 Staff has found similar OEM public statements as specified in the NPRM, for example, Navistar's executives expect 50 percent new HD ZEV sales by 2030 and 100 percent by 2040;12 Daimler Truck has stated ZEVs will make up 60 percent of its sales by 2030 and 100 percent of sales by 2039;13 Volvo Trucks led by Europe and North America set a higher target of 70 percent in 203014 and 100 percent by 2040;15 and PACCAR predicts electric vehicles production in the U.S. will ramp up exponentially in the coming years to 100 percent by 2040.[16] CARB staff requests that the final Phase 3 regulation reflect the vehicle manufacturer plans many major HD truck manufacturers have themselves been publicly stating. CARB staff were unable to evaluate the proprietary ACT Research model upon which U.S. EPA based its HD ZEV adoption rates. [EPA-HQ-OAR-2022-0985-1591-A1, pp.12-13]

11 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, Proposed Rules, 88 Fed. Reg., April 27, 2023, page 25941. https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

12 Navistar, last accessed May 7, 2023. https://www.navistar.com/sustainability/environmental-footprint

13 Reuters: Daimler Truck 'all in' on green energy as it targets costs, May 20, 2021. https://www.reuters.com/business/autos-transportation/daimler-truck-all-in-green-energy-shift-targetscosts-2021-05-20/

14 Volvo New report - High pressure on the transport industry to shift to electric, September 21, 2022. https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/sep/New-report-high-pressureon-the-transport-industry-to-shift-to-electric.html

15 The Hill: 2023 is a fork in the road for bold action to accelerate clean transportation, January 30, 2023. https://thehill.com/opinion/energy-environment/3836537-2023-is-a-fork-in-the-road-for-bold-action-toaccelerate-clean-transportation/

16 FleetOwner: Kenworth's electric future, August 18, 2022. https://www.fleetowner.com/emissions-efficiency/article/21248859/kenworths-electric-future

Additionally, the International Council on Clean Transportation (ICCT) projects the IRA, which followed the BIL, will result in an estimated HD ZEV sales share of 39 to 48 percent in 2030 and 44 to 52 percent in 2032, the final year of the IRA tax credits. These estimated HD ZEV sales shares will increase to 47 to 56 percent in 2035.17 The referenced evidence points to the feasibility of more deployment of HD ZEV technologies than anticipated in U.S. EPA's proposed Phase 3 standards. Further discussion of HD ZEV technologies and how U.S. EPA's findings regarding such technology may underestimate the status of the ZEV market is in Part I. Section C.1. below. If U.S. EPA decides not to finalize greater stringencies as recommended, staff urges U.S. EPA to at least anticipate ZEV deployment in alignment with CARB's ACT regulation18, i.e., at least 50 percent in 2030, 55 percent in 2031, 60 percent in 2032, 65 percent in 2033, 70 percent in 2034, and 75 percent in MYs 2035 and subsequent for class 4 to 8 trucks. [EPA-HQ-OAR-2022-0985-1591-A1, pp.13-14]

17 ICCT's Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States, White Paper, January 31, 2023. https://theicct.org/publication/ira-impact-evs-us-jan23/

18 Final Regulation Order, Advanced Clean Trucks Regulation Table A-1, page 5. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fro2.pdf

Organization: Colorado Department of Transportation et al.

- EPA also requested comment on adopting a rule that continues to increase in stringency for model years 2033-2035; we encourage EPA to adopt a rule which will continue to increase in stringency in these model years, like the ACT rule, to encourage continued progress towards transportation decarbonization. [EPA-HQ-OAR-2022-0985-1530-A1, pp. 2-3]

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #2: We also request comment on promulgating additional new standards with increasing stringency in MYs 2033 through 2035.

- DTNA Response: Given the uncertainty of the inputs to HD TRUCS and their significant impacts on Phase 3 standard feasibility, DTNA does not recommend that EPA set CO2 standards beyond MY 2032 without the inclusion of a periodic-and-adjustment review process, as described in Section II.C of these comments.[EPA-HQ-OAR-2022-0985-1555-A1, p. 158]

Organization: Ford Motor Company

Program Timing

Ford supports the proposed 2032 model year (MY) end date for this rule rather than the extended 2035MY end date. Heavy-duty vehicles and fleets will see significant change in the coming years, and a re-assessment of vehicle technologies, capabilities, and environmental impacts will be appropriate after six years, during which time EPA has projected the vocational vehicle fleet to go from 20 percent ZEV sales volume to 50 percent ZEV sales volume. A

2032MY end date also better aligns with the Inflation Reduction Act of 2022 (which provides incentives for ZEVs through 2032) and other heavy-duty vehicle regulations (California's Heavy-Duty Omnibus and EPA's Clean Trucks Plan HD2027) which regulate criteria emissions for heavy-duty vehicles and will be fully phased in by 2031MY. [EPA-HQ-OAR-2022-0985-1565-A1, p. 4]

Extending Phase 3 to 2035MY would create an approximately ten-year period from expected finalization in 2024 to the next regulatory action that would take effect in 2036MY, and this would increase the risk that EPA's assumptions would turn out to be inaccurate. Customer acceptance, modes of operation of heavy-duty ZEVs, and the ability of heavy-duty ZEVs to meet customer needs may diverge from EPA's assumptions in developing this proposed rule. Critical materials or new charging infrastructure may be more expensive or less available than expected. Effects of policy actions and other regulatory programs become much harder to predict. Due to uncertainty around these and other key elements of the heavy-duty electrification transformation, Ford supports a 2032MY end to the Phase 3 regulation. [EPA-HQ-OAR-2022-0985-1565-A1, p. 4]

Organization: Navistar, Inc.

Navistar supports EPA's gradual phase-in alternative, but would not modify the proposed stringency of the standards in MY 2032.

In the proposed rule, EPA requested comment on whether to consider a slower phase-in alternative with a more gradual phase-in of CO2 emission standards for MY 2027 through MY 2031 and a less stringent final standard in MY 2032. Navistar supports the slower phase-in alternative for MY 2027 through MY 2031. However, consistent with Navistar's ZEV goals, we do not at this time believe that changes to the stringency of the MY 2032 standards are warranted, as long as the necessary charging infrastructure is widely available. As discussed below, we recommend that the feasibility of the rule, including the MY 2032 standards, be reassessed by EPA during a mid-term evaluation. Such evaluation should include whether the requisite ZEV infrastructure is likely to be in place prior to the compliance deadlines. [EPA-HQ-OAR-2022-0985-1527-A1, p. 5]

Organization: Southern Environmental Law Center (SELC)

We support the adoption of stronger standards for model year 2027 and the elimination of credit multipliers for battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) in that model year. For model years 2028 and later, EPA should adopt standards that are more stringent than the current proposal. The Phase 3 standards should result in ZEV adoption rates that are at least as high as those required under California's Advanced Clean Trucks program. We also support EPA's adoption of progressively more stringent standards for model years 2033 through 2035, or until as many heavy-duty vehicles as feasible are ZEVs. [EPA-HQ-OAR-2022-0985-1554-A1, p. 1]

Organization: State of California et al.

II. EPA SHOULD ADOPT GHG STANDARDS FOR MODEL YEAR 2028 THROUGH 2032 THAT PROVIDE PROTECTIONS COMMENSURATE WITH CALIFORNIA'S ACT STANDARDS

While EPA's proposed standards would mark an important step in ensuring the heavy-duty vehicle sector continues to reduce its GHG emissions, the States and Cities urge EPA to consider more stringent standards, with values that would encourage at least the level of ZEV adoption as in California's ACT standards.228 In light of the vast strides made and expected in the deployment of heavy-duty battery-electric vehicles, the development and adoption of fuel-cell electric vehicle technology, and increased adoption of existing and cost-effective emission control technologies in conventional heavy-duty vehicles, more stringent final standards are feasible and appropriate in the lead time provided. And, while further ZEV deployment is not the only way manufacturers can and will comply with more stringent GHG standards, the increasing use of ZEVs has numerous advantages, including the reduction of toxic and criteria pollution that already overburdens environmental justice communities located near highways, railyards, distribution centers, and other sites that experience large volumes of heavy-duty vehicle traffic. [EPA-HQ-OAR-2022-0985-1588-A1, pp.32-33]

228 88 Fed. Reg. at 25,929.

It is, thus, important that EPA correct its underestimation of the baseline heavy-duty ZEV penetration rates.229 EPA's baseline should account for ZEV adoption rates resulting from compliance with the California ACT Rule, everywhere that Rule applies (including the eight other States who have adopted the ACT Rule: Massachusetts, New Jersey, New York, Oregon, Washington, Maryland, Vermont, and Colorado). EPA should also include the additional nine States and Districts that have signed a memorandum of understanding (MOU) to promote the adoption of heavy-duty ZEVs (the District of Columbia, Connecticut, Hawaii, Maine, Nevada, North Carolina, Pennsylvania, Rhode Island, and Virginia). At a minimum, EPA should adjust its reference case to reflect these actions and commitments, and other data projecting strong ZEV sales in the relevant time frame, including private sector actions and the BIL and IRA incentives that are incentivizing adoption of heavy-duty ZEVs. [EPA-HQ-OAR-2022-0985-1588-A1, p.33]

229 DRIA at 417 ("It is possible that EPA's reference case is underestimated, and adoption of ZEVs, and other technologies, will occur more rapidly than EPA predicts in this proposal.").

The States and Cities urge EPA to then increase the stringency of the final standards to reflect the additional progress that is clearly feasible and cost-effective. When setting standards under section 202(a) of the CAA, EPA must "press for the development and application of improved technology rather than be limited by that which exists today." Natural Resources Defense Council v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981). Given the plans original equipment manufacturers have announced for ZEV sales in this sector, the indications from customers (including several very large ones) that they plan to buy those ZEVs in timeframes relevant here, and the public incentives already available, adoption of ZEVs in the heavy-duty sector are achievable at levels necessary to meet nationwide standards as protective as ACT. Indeed, the fact that original equipment manufacturers in the sector have asserted plans for ZEV sales far surpassing even ACT-required levels is instructive, as it demonstrates that the regulated industry has concluded there is sufficient time to develop and apply the technologies needed to comply with robust GHG standards within the applicable timelines, and that doing so is cost effective for their businesses. Moreover, EPA is now setting standards out to (at least) MY2032. That is more than ample lead time for any other manufacturers to prepare to deploy substantially more ZEV technologies, particularly since EPA forecasts 60 percent vocational and 40 percent tractor sales would be ZEVs in MY2032 under the standards we urge EPA to adopt.230 In other words, manufacturers would retain ample room for a gradual transition to ZEV and other emission-reducing technologies, meaning, for example, that truck applications that are particularly hard to transition would not be rushed to do so. [EPA-HQ-OAR-2022-0985-1588-A1, p.33]

230 88 Fed. Reg. at 25,933.

It is vital that EPA recognize the availability, feasibility, and cost-effectiveness of these technologies and finalize more stringent standards, accordingly, in order to adequately respond to the climate harms faced by our States and Cities, as discussed in detail above. “Elevated concentrations of GHGs have been warming the planet, leading to changes in the Earth’s climate including changes in the frequency and intensity of heat waves, precipitation, and extreme weather events, rising seas, and retreating snow and ice. The changes taking place in the atmosphere as a result of the well-documented buildup of GHGs due to human activities are changing the climate at a pace and in a way that threatens human health, society, and the natural environment.”231 As EPA recognizes, the transportation sector is now the largest U.S. source of GHG emissions, with heavy-duty vehicles contributing 25 percent of the United States’ transportation emissions.232 Robust standards that maximize reductions in GHGs are a necessary component of the United States’ strategy to prevent the most catastrophic of these climate harms. [EPA-HQ-OAR-2022-0985-1588-A1, pp.33-34]

231 Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed. Reg. 74,434, 74,489 (Dec. 30, 2021); see also Summary for Policymakers, supra n.2 at 11 (surveying medium-to-high confidence attributions of extreme weather, wildfires, heat-related deaths, and ecosystem loss to greenhouse gas emissions from human activities).

232 88 Fed. Reg. at 25,952.

The States and Cities are already experiencing grievous effects from climate change, which, as described above, are expected to significantly escalate without sharp reductions in GHG emissions.233 Our residents have lost property, been displaced from homes, endured respiratory illness and other health impacts, and even been killed as a result of severe weather events exacerbated by climate change.234 Rising average temperatures, shrinking mountain snowpacks, warmer and more severe storms, wildfires, and higher sea levels also harm our economies, infrastructure, and public services.235 These impacts require long-term, resource-intensive adaptation planning and costly disaster response by all levels of government and the private sector. The U.S. Global Change Research Program’s 2017-2018 Fourth National Climate Assessment projects more extreme-weather impacts due to climate change for every region of the United States, including major damage to agriculture, coastal industries, utility grids, transportation networks, air quality, and human health, from coastal flooding, heat waves, drought, and wildfires, as well as from the spread of tree-killing and disease-carrying pests.236 [EPA-HQ-OAR-2022-0985-1588-A1, p.34]

233 Fourth National Climate Assessment, supra n.9 at 11-19 (summarizing ongoing and projected impacts to United States from climate change); see also Summary for Policymakers, supra n.2 at 11-22 (describing ongoing global climate change impacts and projecting near-, mid-, and long-term impacts, particularly from unpredictable cascading and compounded disruptions); id. at SPM-7, SPM-14 to 19 (finding reductions of

GHGs is occurring too slowly to limit global warming to even 2°C and such a goal requires unprecedented accelerations in reductions).

234 Fourth National Climate Assessment, supra n.9 at 82-83, 98-103, 115-62 (surveying national losses of coastal property and air quality deterioration and summarizing impacts to health, property, and ecosystems by U.S. region).

235 Fourth National Climate Assessment, supra n.9 at 67-68, 70-72, 82-83, 85-91, 93-96.

236 Fourth National Climate Assessment, supra n.9 at 11-19; see also id. at 102 (by shifting from a high-emissions scenario to a low-emissions scenario, "thousands of American lives could be saved and hundreds of billions of dollars in health-related economic benefits gained each year").

Significant GHG emission reductions are also essential to begin to reduce the inequitable burden disproportionately borne by communities with high poverty rates, communities of color, and indigenous peoples.237 Under Executive Order 12,898, each federal agency has been directed, "to the greatest extent practicable and permitted by law" to "make achieving environmental justice part of its mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories . . . ."238 Additionally, EPA recently committed to "make achieving environmental justice part of [its] mission[] by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."239 Action to reduce GHGs from all major-emitting sectors, including the heavy-duty vehicles sector, is imperative to tackling climate-change and minimizing the effect of climate change on at-risk communities. [EPA-HQ-OAR-2022-0985-1588-A1, pp.34-35]

237 See discussion supra at 11-17.

238 64 Fed. Reg. 7629 (Feb. 16, 1994).

239 Exec. Order 14,008, § 219.

III. EPA SHOULD ADOPT INCREASINGLY STRINGENT GHG STANDARDS FOR MODEL YEARS 2033 THROUGH 2035

In addition to adopting more stringent standards for model years 2027 through 2032, our States and Cities urge EPA to adopt standards in the final rule that continue out through model year 2035, following the demonstration of feasible protection and technology-levels in California's ACT Rule. That action is supported by the long-term commitments made by several of the major manufacturers, which have projected production of 100 percent ZEV by 2040. Moreover, the lead time for these years is substantial—more than adequate to further deploy key emission-reduction technologies, including ZEVs. Section 202(a) of the CAA authorizes EPA to rely on "future advances," in addition to "presently available" technologies.240 And, particularly given the force of the climate crisis and the need to substantially reduce emissions as soon as possible, EPA should exercise that authority here to set increasingly stringent standards that drive technology development and deployment in feasible, but forceful, terms. [EPA-HQ-OAR-2022-0985-1588-A1, p.35]

240 NRDC, 655 F.2d at 328, 330 (cleaned up); 42 U.S.C. § 7521(a)(2).

Organization: Tesla, Inc. (Tesla)

Finally, Tesla notes it is reasonable for the agency to implement MY 2033-35 standards at a later date and to set a long-term regulatory pathway that encourages industry confidence in making transformative investments. Consistent with such an approach, EPA should not provide any off ramps from compliance with the Phase 3 standard.177 There is a sufficient record today to support this standard setting. To accomplish the objective of Section 202(a)(3), manufacturers need regulatory certainty and off ramps only serve to make markets tentative in embracing technology and serve to delay and interrupt production plans. [EPA-HQ-OAR-2022-0985-1505-A1, p. 24]

177 88 Fed. Reg. at 25934.

Organization: Truck Renting and Leasing Association (TRALA)

Pursuing Phase 3 Actions Beyond MY 2032 is Premature

Action by the EPA to set additional carbon standards and project adoption rates beyond MY 2032 is premature and speculative. TRALA requests EPA carefully assess data gathered during the implementation of Phase 3 before considering expanding the current rule beyond 2032. Assessments should include continued review of all concerns outlined in TRALAs comments and include the progression of technology development and deployment, supply chain impacts, associated emission impacts under the rule from both ZEVs and non-ZEV vehicles, the capacity and performance of our energy grid, safety and infrastructure impacts, and updated cost and payback estimates. [EPA-HQ-OAR-2022-0985-1577-A1, p. 22]

Organization: Volvo Group

With respect to the agency's request for comment on whether to extend the Phase 3 regulatory period to include model years 2033 through 2035, we do not support setting stringencies that far in advance in light of the uncertainty of the ZEV market. We have already faced marketplace and supply chain complications that force us to significantly reduce projected sales as little as six months before commencement of production for the following model year. As such, it is extremely difficult to anticipate how the zero-emission transportation ecosystem will develop, let alone predict the penetration of new technology products across a diversity of applications and industries which have zero experience with these technologies today. Holding OEMs subject to penalty for lack of compliance when there are so many factors outside our control is unprecedented and unreasonable. [EPA-HQ-OAR-2022-0985-1606-A1, p. 5]

Organization: Zero Emission Transportation Association (ZETA)

ZETA also encourages EPA to consider Phase 4 GHG emissions standards for MYs 2033-2035 that are consistent with California's ACT regulation. In doing so, we urge the agency to undertake a separate final rulemaking under a different OMB Regulatory Information Number to ensure such standards are severable from these proposed GHG standards for MYs 2027-2032.69 [EPA-HQ-OAR-2022-0985-2429-A1, p. 16]

69 RIN 2060–AV50

<u>EPA Summary and Response:</u>

<u>Summary</u>:

EPA proposed that the Phase 3 standards apply commencing in MY 2027 with no further increases in stringency after MYs 2032. EPA also solicited comment on including standards for model years 2033-2035.

Most commenters opposed any extension of standard stringency after the 2032 model year. See e.g. Comments of Ford, Navistar (both of whom voiced "suppor(t)" for the 2032 MY date), DTNA, TRALA, Volvo. These commenters noted the inherent uncertainties in projecting that many years out, compounded by further uncertainties regarding vehicle utility, customer acceptance, electric infrastructure availability, critical material availability, plus the lapse of IRA subsidies in 2032.

CARB and a group of states headed by California urged extension of the program, with further increases in standard stringency, after the 2032 MY (CARB until 2040MY, and State of California et al. Until at least MY 2035). These commenters pointed to manufacturers' public statements as showing further emission reductions past MY 2032 were feasible. They also cited the need for greater reductions in light of the on-going ravages of climate change, as well as reductions in criteria pollutant emissions assuming standards are met using increasing percentages of BEVs.

SELC requested EPA set standards for 2033-2035 "or until as many heavy-duty vehicles as feasible are ZEVs." Tesla indicated that MY 2033-2035 standards could await a later date, but urged that Phase 3 standards contain no off-ramp as suggested by some commenters.

ZETA suggested EPA adopt the California ACT program as a Phase 4 standard for heavy-duty engines and vehicles for MYs 2033-35.

<u>Response:</u>

EPA is adopting MY 2032 as the last year of phase in for the Phase 3 program's standards, meaning that the federal standards would remain at the level of the Phase 3 standards after MY 2032 unless and until amended by EPA. As EPA explains in section II of the preamble, our feasibility assessment considers a wide array of data and analysis, including EPA's independent assessment of technology availability, costs, lead-time, and infrastructure; as well as our examination of the literature and expert analyst reports, and our coordination with the Department of Energy and other expert organizations. Based on our holistic and comprehensive review of these and other relevant materials, and recognizing the uncertainties of projecting farther into the future, the agency does not believe it would be appropriate to now finalize more stringent (than MY 2032) standards for MY 2033 and later years. Commenters' reliance on aspirational goals of several of the OEMs does not provide sufficient assurance of feasibility to warrant inclusion of increasing stringency beyond MY 2032 standards' stringency. Indeed, these same entities (DTNA and Volvo) caution strongly against any further standard increases after 2032. EPA agrees that the Phase 3 program should not include increased stringency levels beyond the levels of stringency we are finalizing for MY 2032 in order for the agency to properly assess implementation of the Phase 3 program before considering setting different standards than MY 2032's standards for MYs after 2032. If developments are as positive as certain commenters project, there is time to issue amended standards covering model years after 2032.

We did not propose or request comment on whether EPA should adopt Phase 4 GHG standards that match the California ACT program for MYs 2033-35 and whether they should be adopted in a separate rule to ensure they are severable from the proposed Phase 3 standards. The adoption of Phase 4 GHG standards is speculative at this time, and would be the subject of a separate rulemaking with associated analytic support.

SELC's comments on credit multipliers are addressed in preamble Section III.A and RTC Section 10.

Comments concerning potential inclusion of an offramp for the Phase 3 standards are addressed at RTC 2.9.

2.3.3 Lead time and stability (including year-over-year approach)

Comments by Organizations

Organization: American Highway Users Alliance

Overview -- The Highway Users is a Broad-Based Coalition with Major Concerns with the Proposed Rule

The Highway Users is deeply concerned that the proposed requirements for significant reduction in GHG emissions from new heavy-duty vehicles are very possibly not achievable by manufacturers in the limited time frame provided to achieve such significant reductions in emissions. We are also concerned that the rule would have significant adverse impact on the purchasers of these vehicles, notably truck and bus operators, as well as additional adverse impacts. [EPA-HQ-OAR-2022-0985-1550-A1, p. 1]

More specifically, EPA's proposal appears to be premised on huge and rapid growth in the portion of heavy-duty vehicles that are electric powered (EVs) as well as on rapid transformation of the marketplace in a number of related areas that are not the subject of the proposed regulation. EPA seems to have made favorable assumptions on many issues bearing on the feasibility of the proposal, including as to the issues set forth below. The Highway Users, on the other hand, drawing on the expertise of its members, questions that, within the MY 2027 – 2032 timeframe of the proposed rule, all or most of the following will occur, that --

- high-speed electric charging stations will be available to heavy-duty EVs in quantity and locations sufficient to encourage customers to buy heavy-duty EVs,
- electric utilities can timely provide connections from the electric grid to those charging stations – and provide the connections at reasonable cost,
- the electric grid will have the capacity to meet the demand for electricity that will follow increased electrification of trucks, buses, and passenger cars, even if the connections can be timely made to charging stations that do not yet exist,
- charging times can be reduced sufficiently to encourage customers to buy heavy-duty EVs,

- the range of heavy-duty EVs can be increased sufficiently to encourage customers to buy heavy-duty EVs,
- potential customers will not be discouraged from making a purchase by the extent to which the heavier than diesel power systems of commercial heavy-duty EVs, especially battery-powered EVs, will limit the ability of the customer to use the new vehicles to carry within weight limits cargoes that are carried by today's vehicles,
- major industries, including truck manufacturers and operators, can implement major changes in vehicles as rapidly as the NPRM assumes (given the very limited current market penetration of heavy-duty EVs, estimated by EPA as rounded to zero, the assumption that 25% of new heavy-duty vehicles sold in model year 2032 will be EVs1 represents an astounding rate of change),2
- there will be an adequate supply of rare earth and other critical minerals, and the ability to process them, including obtaining from and processing in the United States, with those minerals being so essential to the manufacture of EVs and batteries, and
- potential customers of heavy-duty trucks will proceed to purchase the new heavy-duty EVs in sufficient quantity, notwithstanding significantly higher up-front costs, uncertain availability of charging facilities, and other concerns. [EPA-HQ-OAR-2022-0985-1550-A1, pp. 1-2]

1 See NPRM at 25933, Table ES-4.

2 An April 14, 2023 Eno Transportation Weekly article referred to the estimate that EVs would constitute 25% of new heavy-duty vehicle sales in 2032, as set forth in Table ES-4, as a 'remarkable assumption.'

For reasons including those outlined above, the proposed rule should be revised to provide more time for vehicles to achieve emission reductions (including deletion of the proposal to revise in effect rules for MY 2027). We consider that it could well prove appropriate for a revised proposal to provide not only more time to achieve emission reductions estimated by EPA for MY 2032 but, while still calling for reductions, to call for fewer reductions. The need for revision is so significant that EPA should not proceed directly to a final rule after considering comments in this docket. [EPA-HQ-OAR-2022-0985-1550-A1, p. 3]

Instead, EPA should issue a revised NPRM so the public can have the opportunity to comment on a more realistic approach to the effort to reduce GHG tailpipe emissions from heavy-duty vehicles. Such a solution would reduce tailpipe emissions but more gradually, over a longer period of time than the model years that are the subject of the proposed rule, and not reduce them as much, at least not within the time frames of the currently proposed rule. [EPA-HQ-OAR-2022-0985-1550-A1, p. 4]

Organization: American Trucking Associations (ATA)

2. EPA's Phase 3 Rule Should Continue to Follow Three-year Stability

EPA's Phase 3 regulation sets new ZEV market adoption rates for model years 2027, 2028, 2029, 2030, 2031 and 2032, setting new heavy-duty emissions standards. By requiring new emissions standards each year, EPA does not follow Section 202(a)(3)(C) under the CAA that requires three-year stability for each new and revised heavy-duty truck emission standard. EPA's previous GHG Phase 1 and 2 regulations adhered to the CAA following four-year lead time and three-year stability for model years 2014, 2017, 2021, 2024 and 2027. Beyond these requirements, new ZEV technologies that are being mandated for compliance will not be given time for evaluation and adjustment prior to increasing adoption levels. [EPA-HQ-OAR-2022-0985-1535-A1, p. 5]

President Biden's August 2021 Executive Order requires the agency to complete its Phase 3 rule by the summer of 2024.5 This schedule allows EPA to continue working with stakeholders to thoroughly assess the range of associated issues, including charging infrastructure, that will play an important role in further tightening heavy-duty GHG standards in 2030 and beyond. The trucking industry continues to support the pursuit of one nationwide emissions reduction plan that is the most reasonable, technology neutral, logical, affordable, and least disruptive to the nation's supply chains. [EPA-HQ-OAR-2022-0985-1535-A1, p. 5]

5 Biden, Joseph, Strengthening American Leadership in Clean Cars and Trucks, Executive Order 14037, August 10, 2021.

3. ZEV Technology for Many Fleets is Unproven

Under the proposed Phase 3 regulation, EPA relies on technology that is at early-stage and lacks the real-world demonstrated maturity compared to proven internal combustion engine vehicle (ICEV) technologies. EPA's analysis assumes reductions in battery and vehicle costs, performance, energy generation and transmission, and charging and refueling infrastructure. Each of EPA's technical assumptions will need to align and come to fruition to hit the cost parity targets that EPA believes will follow their projected adoption curves. Market dynamics affect the availability of ZEV products, costs and performance capabilities. In some cases, the unproven nature of ZEV technologies in the heavy-duty segment will slow their adoption rate as fleets look to validate against their current total cost of ownership (TCO) schedule. Many fleets have lower profit margins, especially small, undercapitalized, or independently owned and operated ones. They are generally disinclined from experimental investments in new technologies that have yet to demonstrate TCO or ROI for their fleet size, operation, or duty cycle. EPA has acknowledged these challenges in the past, and in Phase 2 accommodated for them by giving the industry enough lead time to test and validate equipment, explaining in the preamble:

"Another important consideration was the possibility of disrupting the market, which would be a risk if compliance required application of new technologies too suddenly. Several of the heavy-duty vehicle manufacturers, fleets, and commercial truck dealerships informed the agencies that for fleet purchases that are planned more than a year in advance, expectations of reduced reliability, increased operating costs, reduced residual value, or of large increases in purchase prices can lead the fleets to pull-ahead by several months planned future vehicle purchases by pre-buying vehicles without the newer technology. In the context of the Class 8 tractor market, where a relatively small number of large fleets typically purchase very large volumes of tractors, such actions by a small number of firms can result in large swings in sales volumes. Such market impacts would be followed by some period of reduced purchases that can lead to temporary layoffs at the factories producing the engines and vehicles, as well as at supplier factories, and disruptions at dealerships. Such market impacts also can reduce the overall environmental and fuel consumption benefits of the standards by delaying the rate at which the fleet turns over. See International Harvester v. EPA, 478 F. 2d 615, 634 (D.C. Cir. 1973)."6 [EPA-HQ-OAR-2022-0985-1535-A1, p. 5-6]

6 Ibid, pg. 73,494.

Organization: California Air Resources Board (CARB)

In NRDC, the court upheld U.S. EPA's particulate matter (PM) standards for MY 2005 diesel light-duty vehicles (LDV) that U.S. EPA had promulgated in 2000. The court stated:

"Given this time frame, we feel there is substantial room for deference to the U.S. EPA's expertise in projecting the likely course of development. The essential question in this case is the pace of that development, and absent a revolution in the study of industry, defense of such a projection can never possess the inescapable logic of a mathematical deduction." NRDC at 331. [EPA-HQ-OAR-2022-0985-1591-A1, p.15]

In light of the extensive information discussed in this NPRM regarding the numerous control technologies that manufacturers are anticipated to utilize to comply with the Proposed Standards, their capability of reducing GHG emissions, current states of development, and identification of the major steps needed to refine those technologies for implementation in vehicles for MYs 2027 and subsequent year, it is clear that the Proposed Standards provide ample lead time under section 202(a)(2) of the CAA. [EPA-HQ-OAR-2022-0985-1591-A1, p.15]

It is also clear that alternative, more stringent standards—under which U.S. EPA projects rates of ZEV adoption that are consistent with the ZEV adoption rates in CARB's ACT regulation—would also provide ample lead time and are, in fact, more consistent with the criteria in CAA section 202(a)(2). In requesting a waiver for the ACT regulation, CARB staff noted the nearly one hundred different HD ZEV models that are commercially available in California.22 [EPA-HQ-OAR-2022-0985-1591-A1, p.15]

22 CARB, Waiver Support Document for ACT, Zero Emission Airport Shuttle, and Zero- Emission Powertrain Regulations (2021). EPA HQ-OAR-2022-00331-0003, pages 31-32.

Organization: China WTO/TBT National Notification & Enquiry Center

5. It is suggested to delay the implementation of regulations. [EPA-HQ-OAR-2022-0985-1658-A2, p.4]

The Federal Register (FR) 25926 regulation stipulates that the emission limits of traditional internal combustion engine vehicles have been reduced to a certain value year by year, but does not provide specific calculation processes and various factors to be considered. In the future, enterprises will invest a lot of effort and cost to improve their design to meet the emission limits specified in this regulation. [EPA-HQ-OAR-2022-0985-1658-A2, p.4]

Organization: Daimler Truck North America LLC (DTNA)

As noted in the Proposed Rule, it takes many years for manufacturers to develop new vehicles to meet customer demand and to ensure compliance with increasingly stringent emission regulations.6 This is particularly so where product development requires a shift to new technologies and supporting infrastructure, as is the case here. Manufacturers make product development and resource allocation decisions many years in advance, based upon an assessment of future market demand and regulatory requirements. It is thus essential that the Phase 3 emission standards be established with appropriate lead time for manufacturers to plan compliant product offerings, and that the standards have a built-in period of stability rather than be subject to year-by-year changes. These criteria are important both for manufacturer compliance strategies and for ensuring minimal disruption to the commercial vehicle market. [EPA-HQ-OAR-2022-0985-1555-A1, p. 9]

> 6 See Proposed Rule, 88 Fed. Reg. at 25,999 (noting that as new vehicles are being designed and developed, manufacturers need time to 'build new or modify existing manufacturing production lines to assemble the new products that include ZEV powertrains,' 'source new components such as heavy-duty battery packs, motors, fuel cell stacks, and other ZEV components, including the sourcing of critical materials').

It is for these reasons that DTNA proposes that EPA maintain the current Phase 2 CO2 standards for MY 2027+ (set forth in 40 C.F.R. 1037.105(b)(1), Table 1) as a three-year emission standard tier that would apply to MY 2027-2029 vehicles, before it imposes a new increase in standard stringency for MY 2030 and later vehicles, as discussed in more detail in Section II.C.1 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 9]

To Ensure That Its CO2 Standards Are Achievable, EPA Should Maintain the Current Phase 2 MY 2027+ Standards for Three Years and Start Phase 3 in MY 2030 With More Reasonable Stringency Levels That Are Periodically Reviewed and Adjusted to Reflect Actual ZEV Adoption Rates. [EPA-HQ-OAR-2022-0985-1555-A1, p. 60]

The current MY 2027+ CO2 standards should be maintained for three years.

As noted above in Section I.B.2, it is critically important that EPA's emission standards—in particular new standards that depend upon rapid development and consumer uptake of new technologies—observe the foundational principle of regulatory stability. This principle is integral to a manufacturer's ability to plan compliant product offerings, which is the reason that EPA emission standards have typically been set in three-year emission standard 'tiers.' [EPA-HQ-OAR-2022-0985-1555-A1, p. 60]

The final tier of the current Phase 2 CO2 standards, applicable to MY 2027+ HD vocational vehicles, already represents an ambitious step-up in stringency from the MY 2024-2026 standards. Manufacturers are currently managing production plans to ensure that they can meet these next two tiers of standards. This planning process is complex and requires many years of strategic product development based upon an assessment of future market developments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 61]

For these reasons, DTNA recommends that EPA maintain the current standards for MY 2027+ vocational vehicles for at least three years (MY 2027-2029) before phasing a new tier of Phase 3 standards in 2030. Doing so would provide a period of stability leading up to MY 2030 to evaluate market conditions and to ensure that a significant step-up in CO2 standard stringency from the current MY 2027 standards is feasible. This period of stability would facilitate Phase 3 implementation by ensuring that manufacturers have sufficient time to prepare for the new standards and that there is minimal market disruption. [EPA-HQ-OAR-2022-0985-1555-A1, p. 61]

EPA Request for Comment, Request #4: We seek comment on these proposed Phase 3 standards starting in MYs 2027 through 2032.

- DTNA Response: In Section II of its comments on the Proposed Rule, DTNA provides significant comment on EPA's proposed CO2 standard stringency levels, as well as its alternative view of how EPA could set Phase 3 standard stringency levels to ensure feasibility. [EPA-HQ-OAR-2022-0985-1555-A1, p. 159]

EPA Request for Comment, Request #57: As we propose standards for MYs 2027 through 2032, which are between four and nine years from now, we considered the lead time required for manufacturers to design, develop, and produce the ZEV and ICE vehicle technologies in the technology packages, in addition to lead time considerations for the charging and hydrogen refueling infrastructure. We welcome comment on our assessment of lead time in these areas.

- DTNA Response: Based on the current state of technology, DTNA believes additional lead time is required to bring FCEVs to market in significant volumes. Additionally, heavy heavy-duty (HHD) vocational applications will require additional lead time for body builders to produce electrify solutions in addition to the lead time required by OEMs. As detailed in these comments, it does not appear that infrastructure considerations are adequately factored in to EPA's proposed CO2 standard stringency levels. DTNA has had fleet customers that have been quoted 8-12 years for initial deployments that require major distribution system upgrades. See Section II.B.3 of DTNA's comments on the Proposed Rule for more detailed information on these issues. Today, there is no data to predict the pace of hydrogen infrastructure expansion, as discussed in Section II.B.3 of these comments. We thus recommend that EPA factor in the pace of infrastructure buildout by using an infrastructure scalar in its standards calculations, as discussed in Section II.C. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 168-169]

EPA Request for Comment, Request #58: We welcome comment on the manufacturer lead time requirements for HD ZEVs.

- DTNA Response: DTNA discusses manufacturer lead time requirements for HD ZEVs throughout these comments, starting in Section I.A.2.

EPA Request for Comment, Request #62: We request comment on whether our assessment that there is adequate lead time provided in the proposed standards is correct or if a more gradual phase in like the one described in this alternative would be more appropriate

- DTNA Response: DTNA provides comments regarding adequate lead time, including the requirements of the Clean Air Act, throughout its comments on the Proposed Rule, starting in Section I.A.2. DTNA also provides alternative adoption rate projections and standard-setting methodology in Section II. C of its comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 170]

Organization: Ford Motor Company

Second, the Phase 3 Proposal includes GHG standards with a massive year-over-year decrease in standards between 2026 and 2027, and relatively smaller decreases in subsequent years. With the largest changes coming with the least lead time, manufacturers are at risk of becoming noncompliant at the very beginning of the program. Ford proposes that steady, even, year-over-year reductions across the term of the Proposal are critical to ensuring the success of the program. [EPA-HQ-OAR-2022-0985-1565-A1, p. 3]

While Ford supports the 2032MY standards of the EPA's main proposal, the year-over-year stringency increase is too large at the outset and inconsistent over the course of the whole program. The initial assumption of 20 percent heavy-duty ZEVs in 2027MY and resulting decrease in standards creates a very large year-over-year stringency change at the beginning of the program, where manufacturers have the least amount of time to respond to regulatory changes and are in fact already planning and developing engines and vehicles to existing 2027MY GHG standards. In the main proposal, year-over-year stringency changes are generally much smaller after that first year, with the exception of 2032MY for light heavy-duty vocational vehicles when ZEV adoption is projected to go from 45 percent in 2031MY to 57 percent in 2032MY (ref. Table II-24 in the HD GHG Phase 3 NPRM). [EPA-HQ-OAR-2022-0985-1565-A1, p. 5]

Using the light heavy-duty compression-ignition multipurpose standards as an example, the 2026MY standard is 344 g/ton-mi, while the proposed 2027MY standard is 257 g/ton-mi, a 25 percent decrease in the standard in one year. Subsequent year-over-year changes are smaller, until 2032. This extremely large change in stringency in the first year of the program risks placing manufacturers into a GHG credit deficit from which they are not able to recover for the rest of the program. Table 1 illustrates this with the light and medium heavy-duty compression-ignition standards (spark-ignition standards show a similar pattern). [EPA-HQ-OAR-2022-0985-1565-A1, p. 5] [Refer to Table 1 on page 5 of docket number EPA-HQ-OAR-2022-0985-1565-A1]

Ford requests that EPA consider an alternative rate of change to achieve the same final 2032MY standards that would both be more consistent year-over-year and avoid the extremely large change in standards in the first year of the program. For example, Table 2 represents a possible alternative schedule of emission standards, again illustrating with light- and medium-heavy-duty compression-ignition standards. [EPA-HQ-OAR-2022-0985-1565-A1, p. 5] [Refer to Table 2 on page 6 of docket number EPA-HQ-OAR-2022-0985-1565-A1]

Organization: Lubrizol Corporation (Lubrizol)

Lubrizol commends EPA on a historic Proposal that will deliver critically-needed greenhouse gas emissions reductions nationwide. We strongly encourage EPA to finalize its rule by the end of this calendar year, which will ensure that industry has the certainty and lead time that it needs to meet the requirement of the final Phase 3 rule ("Final Rule") as soon as MY 2027. [EPA-HQ-OAR-2022-0985-1651-A2, pp. 1 - 2]

Organization: MEMA

Timing of Regulations: EPA Cannot Begin HD GHG Phi Regulations with MY2027

The Clean Air Act, which is the primary source of authority for EPA to conduct this rulemaking, provides for a four-year lead time for new standards. This is codified in 42 USC 7521(a)(3)(C) which states:4

(C) Lead time and stability.—

Any standard - promulgated or revised under this paragraph and applicable to classes or categories of heavy-duty vehicles or engines - shall apply for a period of no less than 3 model years beginning no earlier than the model year commencing 4 years after such revised standard is promulgated. [Emphasis added]5 [EPA-HQ-OAR-2022-0985-1570-A1, p. 6]

4 https://www.govinfo.gov/content/pkg/USCODE-2021-title42/pdf/USCODE-2021-title42-chap85-subchapII-partAsec7521.pdf

5 42 USC § 7521(b)(3)(A) defines the term “model year” https://www.govinfo.gov/content/pkg/USCODE-2010-title42/html/USCODE-2010-title42-chap85-subchapII-partA-sec7521.htm

Changing MY 2027 standards will result in millions of dollars of additional unnecessary burden on manufacturers, due to the associated replanning of production timelines, production contracts, and revision of capital expenditure plans already in place for MY2027 under the current regulations. [EPA-HQ-OAR-2022-0985-1570-A1, p. 6]

Similarly, EPA intends to finish this rulemaking near the end of 2023. By that time, MY2024 designs will be the “new” designs. Adding four years’ lead time per 42 USCG 7521(a)(3)(C) results, again, in 2028 implementation. [EPA-HQ-OAR-2022-0985-1570-A1, p. 6]

Because of these two significant issues, Phase 3’s proposed three-year lead time should be extended to four years and new regulations should begin with MY 2028 trucks (if the regulation is finished as intended, post-2028 if not). Respect for 4-year implementation timing will help avoid unnecessary negative impacts on the industry and owners associated with revisions to existing plans and allow for a more stable transition and improved regulatory certainty for the medium- and heavy-duty vehicle (MHDV) industry. [EPA-HQ-OAR-2022-0985-1570-A1, p. 6]

The probability of achieving sustainable GHG reductions improves if EPA allows a 4-year lead time for ZEV technology forcing regulations, even for vehicle applications that currently have ZEV models available. A 4-year lead time more effectively fosters industry innovation and continuous improvement for OEMs and supporting suppliers to release improved Gen 2+ ZEV technology based on field experience and learning from Gen 1 ZEV releases launched for CARB’s ZEV mandates. [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

Recommendation: EPA continues to honor minimum 4-year lead time for GHG Phase 3 technology forcing regulations, even for the heavy-duty vehicle applications we suggest as more ready to adopt ZEV technology. These vehicle applications that we project can adopt ZEV earlier than others should not have technology-forcing regulations for ZEV applied earlier than MY28, assuming the rule is finalized by the end of 2023. [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

Note: If EPA chooses to stay with MY2028, the agency should add supplier, manufacturer and owner facility, financial and schedule change burdens into the cost-benefit analyses. [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

Organization: National Tank Truck Carriers (NTTC)

3) NTTC believes EPA is incorrect in its assessment that there is adequate lead time provided in the proposed standards, and that a more gradual phase in is essential to usher success. Therefore, NTTC is grateful that EPA developed and considered an alternative that reflects a more gradual phase-in of ZEV adoption rates to account for uncertainties as specified in Table II–34. [EPA-HQ-OAR-2022-0985-1551-A1, p. 3]

NTTC applauds EPA's efforts to engage traditional and non-traditional stakeholders regarding the Notice of Proposed Rulemaking (NPRM) on Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3. Many of these stakeholders were identified in Section I.F. of the NPRM citing, "…labor unions, states, industry, environmental justice organizations and public health experts. In addition, we (EPA) have engaged with environmental NGOs, vehicle manufacturers, technology suppliers, dealers, utilities, charging providers, Tribal governments, and other organizations." [EPA-HQ-OAR-2022-0985-1551-A1, p. 3]

It is both conspicuous and disappointing that equipment end-users, such as carriers and independent owner-operators, have not been mentioned as groups targeted by EPA for engagement on these proposals that will have drastic consequences not only for their businesses, but the greater flow of last-mile bulk commodity transportation across the United States. Neither NTTC nor its members have been contacted by EPA to provide input before publishing Docket EPA–HQ–OAR–2022–0985. NTTC, uniquely positioned as a representative of simultaneous energy transporters and consumers, welcomes dialogue with EPA on practical solutions to reduce greenhouse gas emissions utilizing realistic timelines and bridge technologies. NTTC fears that the absence of communication between EPA and equipment end-users has resulted in a falsely optimistic implementation timeline informed by equipment manufacturers eager to sell to a market that is not mutually eager to buy. [EPA-HQ-OAR-2022-0985-1551-A1, p. 4]

Organization: NTEA - The Association for the Work Truck Industry

The 'Energy Independence and Security Act of 2007' provides that, with regard to CAFE standards, "The commercial medium- and heavy-duty on-highway vehicle and work truck fuel economy standard adopted pursuant to this subsection shall provide not less than ''(A) 4 full model years of regulatory lead-time; and ''(B) 3 full model years of regulatory stability.''. [EPA-HQ-OAR-2022-0985-1510-A1, p. 2]

The regulatory stability requirements of the EISA as it applies to mileage standards provides manufacturers with a minimum statutorily mandated period of time where the standards would remain unchanged. While the mandatory 4-year lead time and 3-year stability period still creates challenges it does provide some framework for resource planning purposes. [EPA-HQ-OAR-2022-0985-1510-A1, p. 2]

While the regulatory stability requirements of EISA may not apply to this proposal the intention is still valid. Vehicle manufacturers are being expected to comply, on very accelerated schedules, with highly technical – and potentially not currently possible - standards. The manufacturing community's time and resources are limited, as is the available technology needed to attempt to meet these standards and distribution goals. [EPA-HQ-OAR-2022-0985-1510-A1, p. 2]

Organization: Owner-Operator Independent Drivers Association (OOIDA)

About a year ago, we told EPA that the proposed implementation periods for the heavy-duty nitrogen oxides (NOx) emissions rulemaking would force drivers to stick with their older trucks rather than buy new ones. We encouraged the agency to give manufacturers more time to comprehensively test engines and better ensure performance and reliability. However, EPA ignored the concerns of truckers along with other commenters and maintained the Model Year

2027 timeline. It's a familiar refrain with the latest Phase 3 GHG proposal. We are once again seeing higher than projected costs for these new vehicles along with insufficient lead-up time to properly roll out the manufacturing standards. For example, EPA estimated that the GHG Phase 1 rule would increase the average cost of a combination tractor by $6,039 between 2014 and 2018. However, according to our Owner-Operator Member Profile (OOMP) Surveys, real costs increased $28,541. [EPA-HQ-OAR-2022-0985-1632-A1, pp. 1 - 2]

Organization: Truck and Engine Manufacturers Association (EMA)

3. The Relevant Statutory Authority

i. Leadtime and stability issues

As an initial matter, it needs to be noted that EPA is relying on the wrong provision of the federal Clean Air Act (CAA) in making the proposal at issue, presumably in an effort to avoid providing HDOH truck manufacturers with the four-year lead-time and three-year stability periods mandated under CAA section 202(a)(3)(C). In its NPRM, EPA cites its general rulemaking authority to establish emission standards for mobile sources, including passenger cars, as set forth in CAA section 202(a)(1) and (a)(2). On that basis, EPA claims that it only needs to provide reasonably necessary lead-time (and no stability periods) for its revised Phase 2 and Phase 3 GHG standards. [EPA-HQ-OAR-2022-0985-2668-A1, p. 14]

But, that is not the directly applicable provision of the CAA in this instance. CAA section 202(a)(3)(B) applies directly to "revised standards for heavy duty trucks," which is what the NPRM at issue all about – revised GHG standards for HDOH trucks. That is most significant because CAA section 202(a)(3)(C) goes on to state: Any standard promulgated or revised under this paragraph [(3)] and applicable to classes or categories of heavy-duty vehicles or engines shall apply for a period of no less than 3 years [the stability period] commencing 4 years after such revised standard is promulgated [the lead-time period]. 42 U.S.C. § 7521(a)(3)(C) (emphasis added). [EPA-HQ-OAR-2022-0985-2668-A1, p. 14]

Thus, since the Agency is providing only three full years of lead-time for the revised 2027 MY standards (assuming the proposed rule is finalized later this year), that proposed revised standard is violative of the CAA. Moreover, since EPA is providing no stability period whatsoever between any of the proposed annually-decreasing GHG standards at issue, those standards are inconsistent with the operative terms of the CAA as well. [EPA-HQ-OAR-2022-0985-2668-A1, p. 14]

For a full appreciation of this critical issue, it is important to set forth the relevant statutory provisions regarding EPA's mobile source standard-setting authority, and pertaining to the regulatory lead-time and stability requirements under the CAA. Those provisions are spelled out in CAA section 202(a), as follows:

§7521. Emission standards for new motor vehicles or new motor vehicle engines

(a) Authority of Administrator to prescribe by regulation
Except as otherwise provided in subsection (b) of this section—

(1) The Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air

pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.

(2) Any regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.

(3)(A) In general.—(i) Unless the standard is changed as provided in subparagraph (B), regulations under paragraph (1) of this subsection applicable to emissions of hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate matter from classes or categories of heavy-duty vehicles or engines manufactured during or after model year 1983 shall contain standards which reflect the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology.

(B) Revised standards for heavy duty trucks.—(i) On the basis of information available to the Administrator concerning the effects of air pollutants emitted from heavy-duty vehicles or engines and from other sources of mobile source related pollutants on the public health and welfare, and taking costs into account, the Administrator may promulgate regulations under paragraph (1) of this subsection revising any standard promulgated under, or before the date of, the enactment of the Clean Air Act Amendments of 1990 (or previously revised under this subparagraph) and applicable to classes or categories of heavy-duty vehicles or engines.

(C) Lead time and stability.—Any standard promulgated or revised under this paragraph and applicable to classes or categories of heavy-duty vehicles or engines shall apply for a period of no less than 3 model years beginning no earlier than the model year commencing 4 years after such revised standard is promulgated. (Emphasis added.) [EPA-HQ-OAR-2022-0985-2668-A1, pp. 14 - 15]

As reflected above, the relevant portions of CAA section 202(a) are divided into three paragraphs. Paragraph (1) describes EPA's general authority to set mobile source emission standards, including for passenger cars. Paragraph (2) establishes the general requirement for "necessary" regulatory leadtime. And paragraph (3) includes a number of more specific provisions relating to emission standards for classes or categories of heavy-duty vehicles or engines. [EPA-HQ-OAR-2022-0985-2668-A1, p. 15]

With respect to EPA's general authority under paragraph (a)(1), the U.S. Supreme Court ruled in 2007 that GHGs are "air pollutants" under the CAA, and that, as a result, EPA has the delegated authority to establish standards applicable to the emission of GHGs from new mobile sources. (See Massachusetts v. EPA, 549 U.S. 497 (2007).) In addition, EPA has made the threshold determination that GHG emissions contribute to air pollution which may reasonably be anticipated to endanger public health or welfare (the "endangerment determination"). (See 74 Fed. Reg. 66496, Dec. 15, 2009.) Thus, it has been established that the provisions of CAA section 202(a) apply to EPA's adoption and revision of GHG standards for new HDOH vehicles and engines. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 15 - 16]

In what seems to be an effort to avoid having to provide the lead-time and stability periods mandated under CAA section 202(a)(3)(C), EPA is taking the position in the NPRM that it is adopting the Phase 3 GHG regulations under the more general standard-setting provisions of paragraphs (1) and (2) of section 202(a), not under the more specific HDOH-related provisions of paragraph (3). The crux of that claim apparently is that subparagraph (3)(A) only references HDOH standards "applicable to emission of hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate matter." As a result, since the four-year lead-time and three-year stability mandates in subparagraph (3)(C) apply to "any standard promulgated or revised under this paragraph" (i.e., paragraph (a)(3)), EPA is positing that those more specific lead-time and stability mandates similarly only apply to the criteria pollutant standards referenced in subparagraph (3)(A), not to any GHG standards that may be adopted under paragraphs (1) and (2) of section 202(a). [EPA-HQ-OAR-2022-0985-2668-A1, p. 16]

EPA's apparent position is too simplistic and fundamentally flawed. First, EPA's Phase 3 rulemaking is, in fact, more appropriately viewed as a rulemaking under subparagraph (3)(B), which is captioned "Revised Standards for Heavy Duty Trucks," and which authorizes EPA to promulgate regulations revising "any standard" (not just criteria pollutant standards) on the basis of information "concerning the effects of air pollutants emitted from heavy-duty vehicles or engines" on the public health and welfare. Given EPA's prior endangerment determination for GHGs, subparagraph (3)(B) clearly provides EPA with the authority to revise the existing Phase 2 HDOH GHG standards through the adoption of more rigorous Phase 3 standards. Thus, unlike subparagraph (3)(A), EPA's authority to revise HDOH emission standards under subparagraph (3)(B) – the more directly applicable portion of section 202(a) in this case – is not constrained to only emission standards for criteria pollutants. [EPA-HQ-OAR-2022-0985-2668-A1, p. 16]

Second, EPA's position seemingly overlooks the carve-out set forth in the first clause of subparagraph (3)(A). That clause – which states that "unless the standard is changed as provided in subparagraph (B)" – makes it clear that when revised standards for heavy-duty trucks are at issue, the potential limitations of subparagraph (3)(A) – limitations that could constrain the application of paragraph (a)(3) just to standards for criteria pollutants – do not apply. [EPA-HQ-OAR-2022-0985-2668-A1, p. 16]

That distinction is significant, since the 4-year lead-time and 3-year stability mandates spelled out in subparagraph (3)(C) apply to "any standard promulgated or revised under this paragraph [i.e., under paragraph (a)(3)] and applicable to classes or categories of heavy-duty vehicles or engines." Accordingly, since the revised Phase 3 GHG standards should be deemed as promulgated under the directly applicable provisions of subparagraph (3)(B), not under subparagraph (3)(A) (or under the more general provisions of paragraphs (1) or (2)), the four-year lead-time and three-year stability mandates do apply to the anticipated Phase 3 GHG standards. In that regard, it is noteworthy that the language of subparagraph (3)(C) references any standards revised under all of paragraph (3), not just subparagraph (3)(A), as EPA, in effect, seems to assert. [EPA-HQ-OAR-2022-0985-2668-A1, p. 16]

The foregoing conclusion makes sense. Indeed, there is no sound policy justification to elevate HDOH OEM's need for lead-time to design for and comply with criteria pollutant standards above their need for lead-time to design for and comply with GHG standards. To the contrary, designing engines and vehicles to comply with more stringent GHG standards – including through the design, integration and manufacture of completely new ZEV powertrains –

arguably requires more lead-time, not less. Thus, there is no rational basis for presuming that the minimum lead-time and stability provisions that CAA section 202(a)(3)(C) expressly provides for revised HDOH standards should not apply to revised HDOH GHG standards as well. Indeed, EPA's prior HDOH GHG standards have provided for at least four years of lead-time and three years of stability. (See final "Phase 2" rulemaking, where the Agency noted, "The standards being adopted provide approximately ten years of lead time for manufacturers to meet the 2027 standards." 81 Fed. Reg. at 73493 (Oct. 25, 2016).) (See also 81 Fed. Reg. at 73570, "Section 202(a)(2), applicable to emissions of greenhouse gases, does not mandate a specific period of lead time, but EPA sees no reason for a different compliance date here for GHGs and criteria pollutants.") ("The agencies' final standards will phase in over a period of seven years, beginning in the 2021 model year, consistent with the requirement in EISA [the Energy Independence and Security Act] that NHTSA's standards provide four full model years of regulatory lead time and three full model years of regulatory stability." Id. at 73682.) [EPA-HQ-OAR-2022-0985-2668-A1, pp. 16 - 17]

In this regard, EPA's prior reference to EISA is highly relevant. That statute, which was enacted after the CAA, specifically requires 4-years of lead-time and 3-years of stability for any CO2-equivalent standards. (49 U.S.C. §32902(k)(3).) There is no reason to assume that EPA somehow has the unilateral authority to undermine that additional Congressional directive. [EPA-HQ-OAR-2022-0985-2668-A1, p. 17]

Accordingly, based on the foregoing, EPA's NPRM is fundamentally flawed since it fails to provide no less than four years of lead-time and three years of stability for the revised Phase 3 GHG standards applicable to new HDOH vehicles and engines. The Agency will need to remedy that defect before finalizing any Phase 3 rule, including by providing a three-year stability period between each progressively lower CO2 standard. EMA is raising this core legal issue not to thwart the Phase 3 rulemaking. Rather, EMA only seeks to ensure that OEMs will have the statutory lead-time and stability periods to which they are entitled (and that they urgently need), which in turn will help to ensure the ultimate adoption of a fully implementable final Phase 3 rule. [EPA-HQ-OAR-2022-0985-2668-A1, p. 17]

To comply with the applicable leadtime and stability periods specified in the CAA for revised HDOH emission standards, and to provide greater flexibilities for OEMs to attain the final targeted ZEV-truck adoption rates, the Phase 3 standards should phase-in over three-year increments, not on an annual basis, so that progressively more stringent (yet feasible) HDOH GHG standards would take effect in model years 2030 and 2033. (If EPA improperly elects to reopen and revise the Phase 2 standards unilaterally, it is possible that the phase-in could start with an initial step in 2028, but that would push the Phase 3 standards out by an additional model year.) A properly stabilized phase-in schedule will allow OEMs the larger increments of time that are necessary for them to better manage their ZEV-truck design and production schedules, to optimize sales into their most suitable ZEV-truck markets, and to strategically target their overall ZEV-truck deployment strategies toward a reduced and more realistic number of regulatory targets. [EPA-HQ-OAR-2022-0985-2668-A1, p. 58]

Organization: Volvo Group

Timing

Given the uncertainty and volatility of the Heavy-Duty (HD) ZEV market, the Volvo Group strongly believes the agency should maintain the previously finalized Phase 2 stringencies and promulgate a Phase 3 rule that commences with the 2030 model year. This position is based not only on the bad precedent it sets for trust between the agency and its regulated industry, but also on the adoption of the EPA's Clean Trucks Plan (Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards) which has impacted product plans to meet tougher Phase 2 stringencies and indirectly undercut our anticipated four year lead time because of the inherent inverse relationship between NOx and CO2 emissions from a diesel engine.[EPA-HQ-OAR-2022-0985-1606-A1, p. 5]

Structure

Year-Over-Year versus 3-Year Stringency Steps

Currently we remain undecided on our preferred stringency cycle in light of perceived risks and benefits to each approach. [EPA-HQ-OAR-2022-0985-1606-A1, p. 5]

In the transition to HD EVs, we can expect the annual EV sales share to rise on a year-over-year basis. If the energy distribution systems and charging/fueling infrastructure develop in line with the demand, and supply chain constraints improve (though we have significant doubts either will occur), we could expect these year-over-year increases to generate annual greenhouse gas reductions that would likely be significantly higher than the Phase 2 three-year stringency increases at each step. [EPA-HQ-OAR-2022-0985-1606-A1, p. 5]

Consider a case where EPA expects the year-over-year stringencies in an averaging set to be 10%, 20%, and 30% over baseline for model years (MYs) 2027, 2028, and 2029 respectively. The resultant 3-year stringency step would be the average of the three stringency increases, requiring a 20% improvement each of the three years (this does assume total vehicle sales are the same each of the three model years). [EPA-HQ-OAR-2022-0985-1606-A1, p. 5]

If an OEM started the 2027 model year with a zero credit balance, and met the year-over-year stringency increases of 10%, 20%, and 30%, they would be negative overall for the first two years if the 3-year stringency were used. In this scenario, the OEM would be at a 50% deficit for model year 2027. The OEM would meet the average for model year 2028 but would need to take 50% of those credits to cover the previous year's deficit, leaving an overall deficit of 50% in 2028. The 2029 model year would produce a 50% positive credit balance that could offset the 2028 deficit, and result in this OEM meeting the 20% stringency over the 3-year stringency period, but with several concerns. [EPA-HQ-OAR-2022-0985-1606-A1, p. 5-6]

First, the OEM would have a negative credit position for at least two years, which could give the impression to customers that its vehicles are not as fuel- or energy-efficient as its' competitors that may have had positive balances. Second, the OEM would need to expend more resources and be at significantly higher risk of noncompliance if unforeseen market impacts were to decrease EV sales, such as a severe economic downturn for multiple years. [EPA-HQ-OAR-2022-0985-1606-A1, p. 6]

Conversely, product development timelines have increased significantly in the past years. The complexity of solutions required to meet the stringent standards increases development effort and time to simulate, test and verify components and systems. In addition to long development cycles, certification tests have increased in length, requiring all hardware and software development to be frozen 18 months in advance of targeted receipt of certification. If incremental yearly improvements are required, manufacturers would be running four development projects synchronously. Resources such as manpower, engine dynamometer test facilities, chassis dynamometer test chambers and other critical areas do not exist to manage such a demand. Yearly incremental improvements to product are not feasible in the context of traditional vehicle technologies. In order to allow manufacturers to deliver robust products with high quality, three-year cycle minimums would be needed. [EPA-HQ-OAR-2022-0985-1606-A1, p. 6] Volvo Group would like to continue to engage with the agency throughout the rule making period as we further investigate potential unintended consequences of each approach. [EPA-HQ-OAR-2022-0985-1606-A1, p. 6]

With Phase 2, EPA finalized model year 2027 stringency steps for both the engine and vehicles powered by internal combustion engines (i.e., conventionally powered vehicles, or conventional vehicles). For Phase 1 and Phase 2, the agency provided three-year stringency steps, with a four-year lead time between the two. Since EPA seemed to publicly support the belief that the Clean Air Act lead time and stability requirements were applicable to motor vehicle greenhouse gas regulations when it published its final Phase 2 rule late in calendar year 2016, the stringency steps for model year 2027 engines and vehicles were expected to cover at least the three-year period of model years 2027 through 2029. The Volvo Group has been investing at record levels to meet the demands of the Phase 2 program. Spending to meet the MY 2027 Phase 2 stringency step will be close to ten times the level spent to meet the 2017 standards. As a result, further engine or conventional vehicle stringency increases are infeasible. [EPA-HQ-OAR-2022-0985-1606-A1, p. 11]

Additionally, if EPA were to open a stringency assessment for engines or conventional vehicles to increase model year 2027 stringencies, we believe it would require a review of the entire Phase 2 stringency development, since the Phase 2 2027 stringencies are intended to serve as the baseline for the Phase 3 rule making. This review would need to consider the technology packages used to set model year 2021, 2024, and 2027 stringencies, including assumptions on technology availability, timing, benefit, penetration, and cost. Reopening the stringency determination for engines and vehicles from model year 2027 could actually result in decreased stringency for engines and conventional vehicles. [EPA-HQ-OAR-2022-0985-1606-A1, p. 12]

Firstly, we believe this to be true because items included in EPA’s technology packages have not reached the levels projected (e.g., 6x2 axle configurations in tractors and vocational vehicles); are not expected to be commercialized in EPA’s projected timeline (e.g., engine stop-start and mild hybridization for HHD vocational vehicles); are no longer being developed for commercialization (e.g., Rankine Cycle waste heat recovery); and face higher costs from recent supply chain disruptions. [EPA-HQ-OAR-2022-0985-1606-A1, p. 12]

Secondly, EPA’s stringency would need to account for the impact of higher engine and conventional vehicle costs due to decreasing volumes of conventional vehicles as a result of the expected increasing shares of EVs. Not only would this create higher prices from reducing economies of scale, but also because engine and conventional vehicle development, industrialization, and commercialization costs will need to be spread over lower volumes. The latter concern will already become an issue due to more stringent NOx standards and longer useful life periods promulgated by both CARB and EPA. [EPA-HQ-OAR-2022-0985-1606-A1, p. 12]

Finally, EPA's engine and conventional vehicle stringencies would need to be re-evaluated for the increased costs due to the development of the new NOx controls required by EPA's Clean Trucks Plan NOx rule, spreading those unaccounted-for costs over lower volumes of conventional vehicles, and, for the increased consumption of fuel and diesel exhaust fluid driven by these new NOx standards. [EPA-HQ-OAR-2022-0985-1606-A1, p. 12]

EPA Summary and Response:

Summary:

A number of commenters challenged EPA's proposed commencement date for the Phase 3 standards on legal, factual and policy grounds. They argue that the standards must be adopted pursuant to CAA section 202 (a)(3)(B) since they are revised standards for heavy-duty trucks, and therefore, pursuant to 202(a)(3)(C), require 4-year lead time and 3-year stability. (Lubrizol, ATA, EMA.) They argue that the parallel authority in the Energy Independence Security Act provides for four years of lead time, and three of stability. (NTEA , EMA). Commenters also noted that EPA had provided this measure of lead time and stability in both the Phase 1 and Phase 2 standards, which they assert were less demanding than the proposed Phase 3 standards. (ATA, Volvo.)

A number of commenters maintain that, as a factual matter, insufficiency of needed electric distribution infrastructure necessitates additional lead time. (EMA) (This issue is addressed primarily in responses in RTC Section 6 and 7.1.) Daimler went into further detail, maintaining that there is no reliable way to assess availability of hydrogen infrastructure at present. Their strong recommendation is to commence Phase 3 standards (at significantly reduced stringency) in the 2030 model year. OOIDA asserted that EPA had likely underestimated vehicle purchase price increases attributable to the proposed rule, which they claim EPA had done in prior HD GHG rules, and maintain that further lead time is necessary.

Commenter EMA maintains that section 202(a)(3) must be read to allow 4 years lead time and 3 years of stability for the Phase 3 heavy-duty vehicle GHG standards. Their argument is that although section 202 (a)(3)(A)(i) applies to standards for 'hydrocarbons, carbon monoxide, oxides of nitrogen and particulate matter" – i.e., not the GHGs encompassed under the Phase 3 rule – the standard must be issued pursuant to section 202 (a)(3) (B) which applies to "revised standards for heavy duty trucks." The commenter notes that subparagraph (A) itself directs us to subparagraph (B) (the revision subparagraph) because it begins "[u]nless the standard is changed as provided in subparagraph (B). Commenter then argues that because the Phase 3 rule is a revision of a prior rule for heavy duty vehicles, it falls within 202(a)(3), including the lead time and stability provisions of section 202(a)(3)(C). The commenter further maintains that this reading represents sound policy because the lead time is needed. in addition, the parallel provision regarding fuel efficiency in EISA, section 32902(k)(3) has a 4 year lead time and 3 year stability requirement, and the two statutes should be harmonized.

Ford maintained that the proposed increase in stringency between MYs 2026 and 2027 was especially problematic. Their point is that at the time of maximum compliance difficulty (due to uncertainties of product acceptance, availability, infrastructure support), EPA is proposing the most significant increase in stringency – on the order of 25%. Ford also questioned the year-over-year stringency proposed for the model years immediately succeeding 2027.

Volvo was equivocal about commencing the Phase 3 standards in MY 2027, at least from the standpoint of whether or not manufacturers could generate sufficient credits to have a surplus coming into that year. However, Volvo further maintained (similarly to PACCAR, in Section 2.3.1 above), that a MY 2027 start date for the Phase 3 program has implications for Phase 2. Specifically, EPA should either not consider the 2027 Phase 2 standards in its baseline, or reassess the 2027 Phase 2 standards altogether. Specifically, Volvo contends that EPA should either not consider the 2027 Phase 2 standards in its baseline, or reassess the 2027 Phase 2 standards altogether. They assert that users have not adopted many of the ICE engine and vehicle technologies on which that standard was predicated, sometimes by choice (advance aerodynamic improvements, stop start of HHDV), or outright lack of commercialization (Rankine engines). They assert that, as a result, OEMs have introduced ZEVs into their production mix as a compliance strategy, but produced fewer ICE vehicles. They state that the result is that Phase 2 costs are being spread over fewer vehicles and are consequently higher than EPA estimated in Phase 2. They state that, either way, EPA's cost estimates for Phase 2 require reassessment if Phase 3 were to commence in MY 2027.

CARB asserted that the proposed lead time was adequate, and, as noted in Section 2.3.2, urged extension of standards past model year 2032.

<u>Response:</u>

EPA disagrees with EMA that this rule is promulgated under section 202(a)(3) or that section 202(a)(3)(C)'s lead-time and stability requirements apply. Specifically, section 202(a)(3)(B)(i) applies only in specific statutorily defined cases, none of which exist here; it does not, as the commenter claims, govern the revision of these HD GHG standard. The below response supplements the discussion in section I.C of the preamble.

We begin by noting that EPA has always established HD GHG standards under section 202(a)(1)-(2). We responded to comments on this issue in the Phase 1 Rule.[255] By the time of the Phase 2 Rule, this issue was settled, and we did not receive renewed adverse comments. In the Phase 3 proposal, we simply maintained our longstanding position that HD GHG standards are promulgated under section 202(a)(1). We did not reexamine this issue or otherwise reopen it for renewed comment.

In any case, the comment lacks merit. As the commenter recognizes, the lead-time and stabilty requirements in section 202(a)(3)(C) only apply to standards "promulgated or revised under this paragraph," i.e., paragraph 3. We agree with the commenter that section 202(a)(3)(A) is inapposite because it only applies to air pollutants other than the one at issue in the Phase 3 rule.[256]

We do not agree, however, that section 202(a)(3)(B)(i) applies here. That section provides in full:

> (B) Revised standards for heavy duty trucks. — (i) On the basis of information available to the Administrator concerning the effects of air pollutants emitted from heavy-duty

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[255] Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles EPA Response to Comments Document for Joint Rulemaking, at 5-19 ("Phase 1 RTC").

[256] The commenter does not claim section 202(a)(3)(B)(ii), (D) or (E) apply here; we think those sections clearly do not govern this rule.

> vehicles or engines and from other sources of mobile source related pollutants on the public health and welfare, and taking costs into account, the Administrator may promulgate regulations under paragraph (1) of this subsection revising any standard promulgated under, or before the date of, the enactment of the Clean Air Act Amendments of 1990 (or previously revised under this subparagraph) and applicable to classes or categories of heavy-duty vehicles or engines.

The crux of the commenter's argument is that this paragraph applies to the revision of all HD motor vehicle standards. We think that reading is unambiguously precluded by the statute for several reasons.

Most importantly, the text does not say it applies to all HD motor vehicle standards; rather, it identifies a very specific set of applicable standards: "revis[ions to] any standard promulgated under, or before the date of, the enactment of the Clean Air Act Amendments of 1990 (or previously revised under this subparagraph) and applicable to classes or categories of heavy-duty vehicles or engines." We think it is important to give effect to this specific language. The provision applies to revisions of standards "promulgated under" the 1990 Amendments. That clearly includes section 202(a)(3)(A)(i)'s mandate to promulgate standards for listed pollutants that "reflect the greatest degree of emission reduction achievable," given that section says it is operative "[u]nless the standard is changed as provided in subparagraph (B)." It also is fairly read to include certain statutory numeric standards Congress established in the 1990 Amendments, like those in section 202(a)(3)(B)(ii).[257] In addition, the provision applies to standards "promulgated … before the date of, the enactment of the Clean Air Act Amendments of 1990," i.e., standards promulgated before November 15, 1990. Finally, the provision applies to the revision of standards "previously revised under this subparagraph."

The Phase 3 Rule is plainly not subject to this statutory framework. The Phase 3 rule is "revising" the Phase 2 standards for MY 2027, in addition to establishing new standards for MY 2028 and future years. The Phase 2 Rule does not fit any of the three categories identified in section 202(a)(3)(B)(i): it is not a "standard promulgated under, or before the date of, the enactment of the Clean Air Act Amendments of 1990 (or previously revised under this subparagraph)." It was not promulgated under authority of the 1990 Amendments, but under section 202(a)(1), which was enacted in 1965 and amended in 1970. Phase 2 was also not promulgated before the date of the 1990 Amendments, but in 2016. Nor was Phase 2 previously revised under subparagraph (B). Thus, the text is clear that section 202(a)(3)(B)(i) does not apply to the final rule. Rather, EPA is promulgating the final rule under section 202(a)(1)-(2). Accordingly the lead-time and stability requirements in section 202(a)(3)(C)—which only apply to standards promulgated or revised under section 202(a)(3)—also do not apply.

The commenter does not address section 202(a)(3)(B)(i)'s detailed statutory applicability language at all. The comment emphasizes that the statute says "any standards"; but obviously that phrase is qualified by the subsequent phrase "promulgated under, or before the date of, the enactment of the Clean Air Act Amendments of 1990 (or previously revised under this subparagraph)." The commenter also invokes the title of section 202(a)(3)(B) ("Revised

[257] The 1990 Amendments also set forth other provisions for HD standards, such as section 202(h) (establishing certain standards for light-duty trucks of more than 6,000 lbs. GVWR; note that under the section 202(b)(3), HD vehicles are those that exceeds 6,000 pounds gross vehicle weight) and 202(j)(2)(4) (cold temperature CO HD standards).

standards for heavy duty trucks”). But that title is also compatible with EPA’s understanding of the plain meaning of the statute, and in any event, the title cannot trump the unambiguous statutory text.[258]

The commenter also fails to explain how its reading is consistent with the canon against surplusage. Had Congress wanted section 202(a)(3)(B)(i) to apply to revisions of all HD standards, it could have said that by omitting the phrase “promulgated under, or before the date of, the enactment of the Clean Air Act Amendments of 1990 (or previously revised under this subparagraph)” and defining applicability to “revising any standard [] applicable to classes or categories of heavy-duty vehicles or engines.” But that is not what Congress did, and it is important to give effect to the detailed language that Congress wrote.[259]

The commenter alleges that there is “no sound policy justification” for applying a statutory lead-time and stability requirement to criteria pollutant standards subject to section 202(a)(3)(A)(i), but not to GHG standards. But a commenter’s policy preferences cannot defeat the unambiguous text of the statute. In any event, we think the statute effects a rational distinction. Congress required EPA to promulgate stringent standards for HD vehicles, including under section 202(a)(3)(A)(i)’s mandate to promulgate standards that “reflect the greatest degree of emission reduction achievable,” as well as other statutory numeric standards. Section 202(a)(3)(B)(i) functions as a safety valve, allowing the agency to modify those standards if it determined appropriate based on specific statutory factors. Complementing the very specific direction on standard-setting, Congress also provided specific direction on lead-time and stabilty provisions in section 202(a)(3)(C). By contrast, standards promulgated under EPA’s general section 202(a)(1)-(2) authority are not subject to the same level of legislative specificity with respect to either stringency or lead-time and stability; in these cases, Congress continued to entrust such judgments to the Administrator.

The commenter’s reliance on 42 USC 32902(k)(3) is misplaced. That provision is irrelevant. It is contained in a different statute (EISA), applies to a different agency, and is directed at a different policy issue. *See Massachusetts v. EPA*, 549 U.S. 497, 532 (2007) (“[T]hat DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public’s ‘health’ and ‘welfare,’ a statutory obligation wholly independent of DOT’s mandate to promote energy efficiency.”).

The commenter also claims the Phase 2 GHG rule provided more lead-time and stability. While that may be true, it is irrelevant to the statutory interpretation issue. EPA found the lead-time and stability provided in Phase 2 appropriate based on the record then before us and under our section 202(a)(1)-(2) authority, not because we thought ourselves bound by section 202(a)(3)(C). We are taking the same basic approach in this rule, as we find on this record that the lead-time and stability we have provided is sufficient and appropriate under section

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[258] See, e.g. *Whitman v. Am. Trucking Associations,* 531 U.S. 457, 483, 2001) (“This eliminates the interpretive role of the title, which may only ‘she[d] light on some ambiguous word or phrase in the statute itself’”) (internal citations omitted) (alteration in original).

[259] The same problem with surplusage exists for the commenter’s reading of section 202(a)(3)(C). Had Congress wanted that provision to apply to all HD standards, it could have said so. Instead, section 202(a)(3)(C) specifically refers to “[a]ny standard promulgated or revised under this paragraph and applicable to classes or categories of heavy-duty vehicles or engines,” indicating that it applies only to the subset of HD standards “promulgated or revised under this paragraph.”

202(a)(1)-(2). We note, moreover, that the Phase 1 Rule also provided less lead-time than the Phase 2 Rule, as that rule was published in late 2011 and applied to vehicles beginning in MY 2014.

EPA notes again the purpose of section 202 (a)(1) standards is to utilize deployment of technologies to prevent or control emissions that cause or contribute to dangerous pollution, provided that costs of doing so are reasonable, and that there is sufficient lead time to do so. The record for this rulemaking demonstrates that there is sufficient lead time to commence the program in MY 2027, and that this can be done at reasonable cost.

We do agree with certain of the comments, including that the proposed increase in stringency between MYs 2026 and 2027 was too great, and that more lead time was needed for certain HDV subcategories. As further described in Section II of the preamble, the final Phase 3 GHG standards include revised GHG standards for many MY 2027 HD vehicles and new GHG standards for other subcategories of HD vehicles commencing in MYs 2028, 2029 and 2030, with revisions through 2032. Compared to the proposed Phase 3 standards, in general, after further consideration of the lead times necessary for the standards (including both the vehicle development and the projected infrastructure needed to support the modeled potential compliance pathway that demonstrates the feasibility of the standards), we are finalizing CO_2 emission standards for heavy-duty vehicles that include a lower increase in stringency of standards for many HD vehicle categories in MY 2027, a slower phase-in of standards through MYs 2028 and 2029, and a phase-in of standards from MYs 2030 through 2032 that, for many of the subcategories, achieves similar levels of stringency in MY 2032 as proposed . For the final standards, the new standards for HHD vocational vehicles begin in MY 2029 and new standards for day cab tractors begin in MY 2028 (i.e., we are not finalizing the proposed revisions to the Phase 2 MY 2027 HHD vocational vehicles or day cab tractor standards) and include less stringent standards than those proposed across the phase-in of Phase 3 standards for HHD vocational vehicles.

With regard to stability, EPA does not believe that the longer (e.g., three-year) stability periods requested by some commenters is necessary or appropriate for these Phase 3 standards. EPA understands that manufacturers typically redesign vehicles on multi-year cycles. This is consistent with the final standards' year-over-year increases in stringency, given that manufacturers have access to averaging. As a result, manufacturers may choose to have some vehicles fall short of the standards, while other vehicles exceed the standards, so long as the fleet as a whole is in compliance. Thus, the final standards are entirely compatible with, for instance, a manufacturer's decision to improve pollution control technology on any given model once every three (or more) years. Averaging thus provides manufacturers with the benefits of three-year (or other multi-year) standard stability; the difference is that averaging allows each manufacturer to have even greater flexibility to determine the compliance pathway that best suits its business model, as opposed to being locked into predetermined stability cycles with a fixed number of years. Further, while EPA did not rely on banking and trading to determine the level of the standards, manufacturers also have access to banking and trading flexibilities, which further enhance their ability to comply in the way best suited to their business. At the same time, EPA notes that were it set the same final standards for MY 2029 and 2032, for example, but exclude the ramp-up in the other years, significant, achievable emissions reductions would be lost, along with the consequent benefits for public health and welfare. Given that the final standards already reflect a balanced and measured approach premised on many conservative technical assumptions, and the need to address GHG emissions that contribute to dangerous climate change, EPA finds that giving up feasible emissions benefits would be inappropriate. EPA notes that it could achieve the same emissions benefits by providing for three-year stability but also increasing the stringency of the standards; however, commenters requesting stability generally also sought less stringent standards.

EPA evaluated the MY 2021 and MY 2022 heavy-duty GHG certification results. In this analysis, we found that there are vehicles being built that already meet the Phase 2 MY 2027 emission standards. While we agree with Volvo that manufacturers are not using the exact technology package to meet the Phase 2 standards we projected in the Phase 2 rulemaking, we did not expect that they would exactly follow the Phase 2 MY 2027 technology package since the standards are performance-based and thereby provide manufacturers the flexibility to determine the best technology or mix of technologies to deploy for their fleets to meet the standards. Similarly, as described in preamble Section II.F, we developed several technology pathways that manufacturers could use to meet the final Phase 3 standards, none of which we expect manufacturers to exactly follow. Regarding our assessment of ICE vehicle technologies, see preamble Section II and RIA Chapters 1 and 2.

Regarding OOIDA's assertion that EPA likely underestimated vehicle purchase price increases attributable to the proposed rule because they claim EPA has done in prior HD GHG rules, namely the Phase 1 rule, the commenter provides no basis for its statement that the costs of combination tractors it cites are attributable to the Phase 1 rule (i.e., the commenter failed to disaggregate costs of compliance with the Phase 1 standards from other factors that impact purchaser prices). Furthermore, EPA finds this claim unlikely. The Phase 1 standards were predicated on modest vehicle improvements relating to better tire rolling resistance, improved vehicle body aerodynamics, extended idle reduction, downweighting, and use of a vehicle speed limiter. 76 FR at 57148-155 (Sept. 15, 2011). EPA suspects that the survey cited in the comment reflects various causes for price increases, not limited to those reflecting the cost of Phase 1 regulatory compliance. See preamble Sections II and IV and RIA Chapters II and III, for our thorough evaluation of manufacturer costs and purchaser costs for the Phase 3 standards.

2.4 Stringency and Feasibility

Comments by Organizations

Organization: Advanced Engine Systems Institute (AESI)

The clean mobility supplier industry, employing more than 300,000 workers, places enormous value on long-term regulatory certainty to drive investment and job creation. AESI member companies support uniform national GHG standards and remain committed to developing and deploying highly advanced technologies to meet the goals of this rule. [EPA-HQ-OAR-2022-0985-1600-A1, p. 2]

Organization: Allergy & Asthma Network et al.

EPA Should Finalize Standards at Least as Strong as the Emissions Reductions in ACT

The EPA proposed standards are an important step forward and would provide greater emissions reductions than the less stringent alternative. However, in light of the urgency of the climate crisis and the rapid deployment of heavy duty zero emission vehicles, EPA should finalize standards at least as stringent as those reflecting the Advanced Clean Trucks policy, and potentially as stringent as reflecting the announcements manufacturers have made about plans to transition their fleets to zero-emission vehicles, as suggested in the proposal. EPA's analysis of the standards as proposed shows that the benefits would outweigh the implementation costs five-to-one, a strong start. However, while EPA did not provide a similar analysis of the more stringent alternatives the agency asks for comment on, we note that our reports mentioned above help show the enormous benefits for public health and health equity that could be achieved under a more protective standard. [EPA-HQ-OAR-2022-0985-1532-A1, p. 3]

The Advanced Clean Trucks program is an increasing success story, with six states having adopted the rule and 16 states plus Washington, DC having signed the Multi-State Memorandum of Understanding to achieve 20 percent zero-emission truck sales by 2030 and 100 percent by 2050. Work is underway in additional states to adopt ACT. [EPA-HQ-OAR-2022-0985-1532-A1, p. 4]

While the structure of the standards is different, and EPA is not proposing to directly require increasing shares of zero-emission trucks sales as ACT does, we urge the agency to finalize heavy-duty greenhouse gas standards that reflect at least the same emissions stringency as ACT. These emissions standards would ensure health benefits in states beyond those that have already adopted ACT and drive a significant transition toward zero-emission trucks. [EPA-HQ-OAR-2022-0985-1532-A1, p. 4]

Organization: American Council for an Energy-Efficient Economy (ACEEE)

EPA must set stringency based on ambitious EV market penetration rates

EPA's proposed Phase 3 standards would constitute a major step toward the electrification of heavy-duty vehicles. Yet the market for heavy-duty electric vehicles is changing radically and rapidly, and ACEEE believes that higher adoption rates are achievable and should be included in the final standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 2]

Manufacturers now offer market-ready electric options in a wide variety of vehicle categories including semis and delivery vans.7 Large corporations such as Amazon, Fedex, and Walmart have all set targets for fleet electrification and have placed substantial orders with EV manufacturers for the coming years.8 [EPA-HQ-OAR-2022-0985-1560-A1, p. 2]

7 https://www.aceee.org/blog-post/2023/02/ev-sales-soar-electrifying-big-rigs-remains-challenge

8 https://www.aceee.org/blog-post/2023/02/ev-sales-soar-electrifying-big-rigs-remains-challenge

Additionally, recent landmark legislation has energized the market for heavy-duty EVs through major investments in EV deployment and charging infrastructure. The Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA) combined have set aside up to $100 billion of funding for which EVs are eligible.9 A recent report by the International Council for Clean Transportation found that the tax credits in IRA alone could encourage rapid EV uptake in the heavy-duty sector, reaching 44%-52% sales share by 2032.10 [EPA-HQ-OAR-2022-0985-1560-A1, pp. 2 - 3]

9 https://www.atlasevhub.com/data_story/3-billion-in-federal-funding-for-evs-to-date/

10 https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23.pdf

Nevertheless, additional research has found that the recent landscape of electrification policies -the Phase 2 GHG standards, state adoption of California’s Advanced Clean Truck rule, and IRA incentives - and manufacturer commitments will not go far enough to align with our nation-wide climate goals.11 It is crucial that EPA take the opportunity of the Phase 3 standards to push for the highest feasible level of EV adoption and contribute adequately to the achievement of national climate goals. [EPA-HQ-OAR-2022-0985-1560-A1, p. 3]

11 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

The collaboration of other stakeholders will be essential to large-scale EV deployment. In particular, utilities must step up to the plate and commit to EV charging and grid improvement investments for EV adoption in both the light- and heavy-duty sectors. Vehicle electrification presents a major business opportunity for these companies, and as a result, utilities have a big role to play in driving transportation decarbonization. EPA cannot wait for other stakeholders to lead the way, however, and must set a pace for EV adoption that meets the needs and capabilities of the nation. [EPA-HQ-OAR-2022-0985-1560-A1, p. 3]

Phase 3 targets should account for actions taken to date by manufacturers and federal and state governments to drive vehicle electrification. In light of the rapid push to zero emissions vehicles globally, standards based on aggressive electrification are essential for the economic wellbeing of the country and the success of HDV manufacturers (OEMs) in the U.S. All major global vehicle markets have adopted or are working on requirements to electrify heavy-duty vehicles. Setting a pace that keeps U.S. manufacturers at the forefront of this transition will boost their position, help them maintain or grow share as buying patterns shift, and prevent laggards from gaining near-term advantages by postponing investment in ZEV technology. [EPA-HQ-OAR-2022-0985-1560-A1, p. 3]

To be effective, the standards should be ambitious enough to drive the industry beyond what the market alone will deliver. The proposed standards reflect EPA’s projected ZEV adoption rates based on ZEVs’ ability to meet buyers’ payback requirements and perform the same work as an ICEV in each vehicle application. A well-functioning market should deliver these levels of ZEV adoption, but market barriers such as fleets’ lack of familiarity with the technology may prevent this. In that case, the role of standards is precisely to address those barriers and close the gap between market-driven and economically feasible levels of adoption. Indeed, this view underlies the approach that NHTSA and EPA have taken to vehicle standards for years and is appropriate for these heavy-duty standards as well. However, EPA’s analysis of ZEV adoption rates does not adequately account for other factors driving ZEV adoption, including state actions, discussed next. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 3 - 4]

EPA should adjust its ZEV adoption projections to fully reflect state actions

EPA’s analysis of MY 2032 EV sales shares for the Phase 3 standards should fully reflect states’ adoption of the ACT to date, as well as further actions through the Advanced Clean Fleet (ACF) program. Both regulations will have significant impact on the market for heavy-duty vehicles nationally. [EPA-HQ-OAR-2022-0985-1560-A1, p. 4]

In March of 2023, EPA granted California's request for a waiver to set vehicle emissions standards related to heavy-duty vehicles.12 The waiver gives California the authority to move forward with its Advanced Clean Truck (ACT) rule, which requires that manufacturers sell increasing numbers of MDV and HDV zero-emission vehicles. [EPA-HQ-OAR-2022-0985-1560-A1, p. 4]

12 https://www.epa.gov/newsreleases/epa-grants-waivers-californias-highway-heavy-duty-vehicle-and-engine-emission

The approval of the waiver means that California and other states that have committed to adopting ACT can implement their regulations. As of April 2023, seven states, representing 23% of total relevant vehicles sales (including California,)13 had adopted ACT: Massachusetts, Vermont, New York, New Jersey, Washington, Oregon, and Colorado. On top of that, Maryland and Connecticut have passed ACT legislation and will soon embark on the rulemaking process. Six other states and the District of Columbia were signatories to a memorandum of understanding signed in 2020, committing to ACT adoption.14 These 17 states represented 34% of the total medium- and heavy-duty vehicle market in 2021.15 [EPA-HQ-OAR-2022-0985-1560-A1, p. 4]

13 https://www.fhwa.dot.gov/policyinformation/statistics/2021/mv1.cfm

14 https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf

15 https://www.fhwa.dot.gov/policyinformation/statistics/2021/mv1.cfm

While EPA's proposal reflects heavy-duty ZEV sales shares in a subset of these states in the reference case, it does not reflect the full extent of state ACT adoption. Moreover, the ZEV adoption rates EPA projects in the control case do not account for ACT-driven sales shares at all. This does not comport with EPA's stated goal of maximizing emissions reductions to the greatest feasible extent (FR 26005). EPA appropriately includes ACT state ZEV sales in the reference case, and these vehicles will still be sold under the control scenarios. The adoption rates EPA found to be feasible in its HD TRUCS analysis are below the rates required under ACT, so the ACT levels would prevail in ACT states, while the adoption rates found in the HD TRUCS analysis would remain feasible in the rest of the nation. The final rule should reflect this. [EPA-HQ-OAR-2022-0985-1560-A1, p. 4]

ACT requires that ZEV penetration rates for vocational vehicles will reach 60% and that 40% of tractors be ZEVs by MY 2032. EPA's proposed scenario assumes that ZEV penetration of vocational vehicles reaches 50% in 2032 (FR25933, Table ES-4) while short-haul tractors and long-haul tractors reach EV penetration levels of 35% and 25% respectively in 2032 and beyond. Given that the states that have already adopted ACT rules or legislation make up 23% of the heavy-duty vehicle market, EPA should, at a minimum, increase its assumed MY 2032 ZEV adoption levels by 23% of the difference between the proposed rule and ACT levels for each of those vehicle types. Table 1 highlights what this would mean for the targets for vocational vehicles and tractors in MY 2032. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 4 - 5.] [See Table 1, Comparison of MY 2032 ZEV Shares under EPA Proposal and with ACT Regulation Shares, on page 5 of docket number EPA-HQ-OAR-2022-0985-1560-A1.]

For the final MY 2027-2032 final rule, EPA should apply ACT-projected ZEV market shares to any state that adopts ACT between now and the completion of the final rule. [EPA-HQ-OAR-2022-0985-1560-A1, p. 5]

EPA should consider matching or exceeding ACF's level of ambition for ZEV adoption in the final rule

To further push ZEV adoption to the highest feasible levels, EPA should consider including the market effects of California's new Advanced Clean Fleets (ACF) targets in the final MY 2027-2032 standards. Having determined that ACT will not move the EV market fast enough to meet Governor Newsom's goal that 100% of MDV and HDV vehicles be zero-emissions by 2045 where feasible, California recently adopted the ACF rule.17 ACF goes beyond ACT to set out an ambitious trajectory for ZEV penetration, requiring that all medium- and heavy-duty vehicles that are sold by manufacturers in California be electric starting in 2036. To the extent that other states adopt the more ambitious targets laid out in the ACF rule, EPA's final standards should take into account these higher ZEV market shares for those states. [EPA-HQ-OAR-2022-0985-1560-A1, p. 6]

17 https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

To demonstrate that ACF is realistically achievable, California uses findings from their one-time fleet reporting requirement for ACT to highlight that most fleets of MDVs and HDVs can be serviced by ZEV models on the market today.18 The Initial Statement of Reasons (ISOR) issued by the Air Resources Board for the ACF regulation finds that the majority of trucks operating in California drive, on average, less than 100 miles a day and most of the ZEVs available today have batteries and energy storage systems big enough to satisfy those driving requirements.19 Additionally, California's TCO assessment of six different vehicle types shows that, even before accounting for cost reductions that will likely come from the ZEV sales requirements in the states that have adopted ACT, BEVs and FCEVs will be cost-competitive with ICEVs as soon as 2025 thanks to the declining cost of batteries and fuel cell components.20 ACEEE supports EPA's consideration of ACF levels of ZEV penetration nation-wide to set appropriate targets in the final rule. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 6 - 7]

18 https://ww2.arb.ca.gov/sites/default/files/2022-02/Large_Entity_Reporting_Aggregated_Data_ADA.pdf

19 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf

20 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appg.pdf

Phase 3 stringency should reflect remaining potential for efficiency improvements to ICEVs

EPA bases the proposed increases in stringency of HDV standards for MY 2027-2032 entirely on projected ZEV sales shares. The remaining sales are assumed to be ICEVs achieving the current MY 2027 standards (FR 25996). The resulting standards would fail to take advantage of the considerable remaining potential for improvement in ICEV efficiency and, furthermore, would not be consistent with EPA's stated goal of maximizing emissions reductions to the greatest feasible extent (FR 26005). This is a major failing, especially given that under the compliance pathway presented in the proposal ICEVs would be the great majority of vehicles sold in MY 2027-2032. These ICEVs should continue to improve from one model year to the next over the time frame of the Phase 3 standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 7]

It is essential that EPA include ICEV improvements in setting the level of the final targets to maximize the emissions reduction benefits of the standards and chart a course for minimizing cumulative heavy-duty GHG emissions out to 2050. According to a recent ICCT paper, the heavy-duty sector will fall short of meeting its share of the transportation GHG reductions needed to reach the U.S. nationally determined contribution under the Paris Agreement in 2030 and beyond unless ICE vehicle fuel efficiency continues to improve under Phase 3 and ambitious ZEV adoption targets are achieved.21 [EPA-HQ-OAR-2022-0985-1560-A1, p. 7]

21 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf.

Continued improvement in ICEV efficiency cannot be treated simply as an option that provides compliance flexibility to manufacturers

In the past, EPA has frequently and appropriately demonstrated the achievability of proposed vehicle standards by presenting a single compliance pathway, knowing that manufacturers will use different technology pathways based on considerations specific to them. In that spirit, EPA might argue that there is no need to include remaining conventional efficiency technologies in the compliance pathway presented for the Phase 3 standards, and that justifying the proposed stringency increase through increasing ZEV adoption alone is a simple and satisfactory approach. In this view, any available ICEV efficiency improvements constitute flexibility for manufacturers to meet the standards with a different technology mix. However, we object strongly to this notion, which underpins a proposal that leaves substantial, cost-effective GHG reduction opportunities on the table. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 7 - 8]

In the proposal, EPA has demonstrated the feasibility of the projected ZEV adoption rates based on vehicle cost and availability, infrastructure development and federal tax incentives. Those adoption rates are far below 100%, however. To the extent that there are cost-effective technologies available to improve the efficiency of the ICEVs that comprise the remainder of sales, EPA's approach is best described not as flexibility for manufacturers but rather as a missed opportunity to reach higher levels of cost-effective emissions reduction. This is inconsistent with EPA's stated goal "to maximize emissions reductions given our assessment of technological feasibility and accounting for cost of compliance, lead time, and impacts on purchasers and willingness to purchase" (FR 26005). Manufacturer flexibility would be retained under a standard based on broadly feasible improvements in both ICEVs and ZEV adoption; manufacturers that were in a position to achieve still higher levels of ZEV adoption would be able to comply with lower levels of ICEV efficiency improvement. [EPA-HQ-OAR-2022-0985-1560-A1, p. 8]

Sleeper cab tractors constitute a particularly important demonstration of the importance of continuing ICEV emissions rate reductions. These trucks, which make up 12.8% of MDV and HDV sales (per HD TRUCS) and a larger share of MDV and HDV emissions, are projected to reach only 25% ZEV adoption (all FCEV) by 2032. Using the HD TRUCS assumption of constant sales of sleeper cabs across model years and the adoption rates in proposal Table II-24 (FR 25992), 92% of sleeper sales (as well as 78% of sales of other tractors) will be ICEVs in MY 2027-2032. It would be unacceptable for these trucks to emit at the level of the current MY 2027 standard. The industry can and must do better to ensure HDVs contribute adequately to transportation GHG emissions reductions. [EPA-HQ-OAR-2022-0985-1560-A1, p. 8]

Failing to assume such conventional technology improvements in setting the standards also opens up the possibility of a manufacturer using these technologies to slacken its pace on ZEV production. For ICE sleeper cab tractors, for example, a recent ICCT report identifies readily available, cost-effective technology to achieve 23%-24% emissions reduction below the levels of the current MY 2027 standard.22 Adopting these technologies would allow manufacturers to comply with sleeper cab standards throughout Phase 3 without any of the ZEV sales the proposed standard assumes (25% FCEVs in MY 2032). While this alternative pathway may demonstrate the flexibility and non-prescriptive nature of the standards, it would represent a total and unnecessary failure to drive ZEV adoption at a rate that is both feasible and necessary to achieve national commitments. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 8 - 9]

22 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

There are multiple ICE vehicle technologies that could support more stringent standards than those proposed, and the final standards should be strengthened accordingly

The rapid electrification of heavy-duty vehicles will present many challenges to truck manufacturers and dealers. Public policies such as those in IIJA and IRA have a key role in ensuring that the industry has the resources to make this transition successfully. Given the millions of heavy-duty ICEVs that will be produced and sold in the coming years, however, allowing these vehicles to stagnate technologically should not be an option. There are cost-effective technologies already available that have yet to achieve high penetration, but face no market obstacles to doing so, as discussed further below. These technologies do not require substantial additional investment on the part of manufacturers. [EPA-HQ-OAR-2022-0985-1560-A1, p. 9]

Furthermore, for market segments in which ICEVs will remain a substantial share of sales through the next few product cycles, continued investment in emerging efficiency technologies is warranted. This is especially the case of for tractors, which EPA projects will reach only 25%-35% ZEV sales shares by MY 2032. But EPA also assumes that no segment will achieve over 80% ZEVs (FR 25992), seeming to hedge its bets on a full phase-out of ICEVs. This perspective on the part of the agency makes it all the more important that the rule ensures continued progress on ICEV efficiency.23 [EPA-HQ-OAR-2022-0985-1560-A1, p. 9]

23 EPA's exclusion of 20% of vehicles is based on the argument that the highest-VMT vehicles would have battery requirements exceeding those of the great majority of vehicles and hence should be excluded from the calculation of EV specs in HD TRUCS, and that other vehicles might face special charging challenges making electrification especially difficult (FR 25992). While not unreasonable so far as is goes, this approach should not be taken to preclude electrification of high-VMT vehicles or vehicles with special charging needs in perpetuity.

Moreover, vehicle efficiency improvements such as aerodynamic drag reduction, reductions in tire rolling resistance, and mass reduction can contribute to the efficiency, and hence cost-effectiveness and/or range, of BEVs and FCEVs. As EPA notes: "By reducing the energy required to move a truck down the road, aerodynamic improvements can extend the range of BEV/FCEV/hybrid for a given battery size"(DRIA p.27). Hence continued investment in these areas will also be worthwhile. The need to promote the advancement of such technologies only increases in view of EPA's proposal to continue excluding upstream vehicle emissions from certification values (FR 25994). This policy, which we urge EPA below to discontinue, eliminates an important manufacturer incentive to make their ZEVs as efficient as possible. Failure to incentivize development of these broadly applicable "no-regrets" technologies by allowing ICEV efficiency to stagnate as well would compound the error. [EPA-HQ-OAR-2022-0985-1560-A1, p. 9]

EPA provides only a cursory discussion of specific ICEV technologies that could reduce conventional vehicle emissions in Phase 3 but requests comments on such technologies (FR

25993). Sources of relevant information include DOE's SuperTruck Program, ICCT reports, and NACFE's Annual Fleet Fuel Study. These sources identify multiple technologies available in the market today that remain underutilized, as well as emerging technologies that can provide substantial additional benefits. [EPA-HQ-OAR-2022-0985-1560-A1, p. 10]

The above-mentioned 2023 ICCT white paper on the emissions benefits of the Phase 3 standards identifies technology packages for each heavy-duty class and regulatory type that would substantially and cost-effectively (with 2-year payback) improve efficiency beyond current MY 2027 requirements.24 They found additional savings potential ranging from 22% to 31%, depending upon vehicle type. [EPA-HQ-OAR-2022-0985-1560-A1, p. 10]

24 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf.

Many technologies in the ICCT packages were also part of EPA's Phase 2 compliance packages but have not been fully adopted in the market, including improvements to tires, aerodynamics and accessories, as well as waste heat recovery. Other technologies, including engines achieving 55% brake thermal efficiency, mild hybridization, and additional aerodynamic improvements were tested extensively in DOE's SuperTruck 2 program for long-haul tractors, a segment expected to remain less than fully electrified well into the future. EPA should consider all of these ICE technology improvements in setting the stringency of the Phase 3 standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 10]

The cumulative GHG benefit of maintaining the emissions reduction trajectory of ICEVs is substantial

The potential to reduce ICEV carbon dioxide (CO2) emissions below the level of current MY 2027 standards, together with the expectation that ICEV sales will continue to MY 2039 (based on the US National Blueprint for Transportation Decarbonization,25) imply that EPA could substantially increase emissions reductions out to 2050 by steadily increasing ICEV efficiency through the Phase 3 standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 10]

25 https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf

For long-haul tractors, for example, the potential for 23% cost-effective efficiency improvements, as estimated by ICCT, could translate to an annual reduction in long-haul ICEV emissions of more than 5% per year in MY 2028-2032. Using Argonne National Laboratory's VISION model, we estimated that this would reduce cumulative emissions out to 2050 from MY 2027 and beyond sleeper cab tractors by 154 million metric tons (MMT) of CO2. This would add 11% to the emissions reductions achieved through an electrification-only strategy in which BEV share reached 100% in 2040 per the National Blueprint. If sleeper cab BEV market share were instead to max out at 80% in 2040 or alternatively to reach 100% only in 2050, the ICEV efficiency improvements would add 18% or 24%, respectively, to cumulative emissions reductions from electrification alone. (See Figure 1.) Otherwise viewed, these results show that raising ICEV efficiency by 5% per year in MY 2028-2032 would nearly (97%) make up for the shortfall in cumulative emissions reduction resulting from a maximum BEV sales share for sleepers of 80%, instead of 100%, in 2040. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 10 - 11.] [See Figure 1, Cumulative emission reductions from electrification of long-haul tractors, 2027-2050, on page 11 of docket number EPA-HQ-OAR-2022-0985-1560-A1.]

Phase 3 standards should promote BEV and FCEV efficiency

The energy efficiency of ZEVs is an important determinant of their economics and environmental impacts. While BEVs, and to a lesser extent FCEVs, already have a sizable energy efficiency advantage over ICEVs, continuing efficiency gains will be key to overcoming the remaining barriers to these vehicles' achieving dominance in the market and minimizing their environmental and societal impacts, including mineral resource requirements and demands on the electric grid. Given the cost savings and range increases that greater efficiency can provide, the heavy-duty vehicle market will drive efficiency gains over time, but the standards should be used to accelerate these gains at this critical juncture. However, the standards cannot promote BEV and FCEV efficiency if they consider these vehicles to have zero GHG emissions and, therefore, cannot distinguish among them. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 15 - 16]

Gains in ZEV efficiency could increase feasible adoption rates, which should be reflected in EPA's analysis. Increasing efficiency would be captured in HD TRUCS' adoption rate projections through at least two mechanisms. First, HD TRUCS rules out BEVs if battery size/weight exceeds 30% of vehicle payload. Increased efficiency could allow some vehicles to avoid that constraint by reducing the size and weight of the battery. Second, even for vehicles unaffected by the constraint, greater efficiency would reduce battery and fuel cell system costs and thus payback period, increasing ZEV adoption rates. [EPA-HQ-OAR-2022-0985-1560-A1, p. 16]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

II. The Proposed Rule Is Arbitrary And Capricious

Beyond exceeding EPA's statutory authority, the proposed Heavy-Duty rule also violates the Clean Air Act's mandate (echoing the Administrative Procedure Act, 5 U.S.C. §§ 551 et seq., 701 et seq.) that agency action be the product of reasoned decision-making. 42 U.S.C. § 7607(d)(9)(A) (reviewing "court may reverse" EPA action "found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law"); cf. 5 U.S.C. § 706(2)(A). The proposed rule's feasibility, net emissions, compliance, and cost-benefit analyses all ignore the facts on the ground and are plagued with unrealistic assumptions and arbitrary modeling decisions. And the rule does not address potential alternatives to achieve EPA's stated goals. Even if EPA's interpretation of the Clean Air Act were otherwise permissible, its proposed rule is still arbitrary, capricious, and unlawful. [EPA-HQ-OAR-2022-0985-1660-A1, p. 18]

A. Compliance With The Proposed Emissions Standards Is Not Feasible

Section 202(a) requires EPA to consider whether compliance with the proposed emissions standards is feasible, giving appropriate consideration to the cost of compliance. 42 U.S.C. § 7521(a)(2) ("Any regulation prescribed . . . shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period."). While the agency may take future advances into account, it may not promulgate rules on the basis of "crystal ball" prognostications. NRDC v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981) (internal quotation marks omitted). Instead, the agency must explain why its projections are "reason[able]" and defend "its methodology for arriving at numerical estimates." Id. Here, that includes answering theoretical objections to widespread electrification, identifying the major steps necessary to achieve that objective, and offering plausible reasons for believing that each of those steps can be completed in the time available. Id. at 331–32. [EPA-HQ-OAR-2022-0985-1660-A1, p. 18]

EPA's proposed rule is not feasible for multiple independent reasons. Overall, EPA's conclusion that compliance with its proposed standards is possible assumes a drastic increase in the adoption of heavy-duty electric vehicles that is implausible and unrealistic within the proposed rule's constrained timetable. In addition, EPA has failed to confront several specific impediments to the expanded availability and adoption of heavy-duty electric vehicles, including serious threats to the supply of minerals critical to manufacturing batteries; the Nation's inadequate charging infrastructure and limitations of its electricity grid; safety concerns with electric vehicles that will deter uptake by users and may prompt intervention by other regulators; and the significant costs that manufacturers will face in attempting to electrify their fleets. EPA cannot rationally conclude that compliance with its proposed emission standards is feasible without demonstrating how these obstacles will be overcome. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 18 - 19]

1. EPA's Projections Of Electric-Vehicle Adoption Are Unrealistic And Flawed On Their Own Terms

The agency's conclusion that compliance with the proposed rule is feasible critically depends on the electric-vehicle adoption rates it projects for model years 2027 through 2032. EPA expects that by 2032, 50 percent of vocational vehicles, 35 percent of day-cab tractors, and 25 percent of sleeper-cab tractors will be battery-electric or fuel-cell vehicles. 88 Fed. Reg. at 25,933; Draft RIA at 245. Those numbers are staggering. Current adoption rates are essentially nonexistent, and the method EPA uses to conclude that they will increase exponentially is flawed in many respects. [EPA-HQ-OAR-2022-0985-1660-A1, p. 19]

b. Future Adoption Of Electric Vehicles

To reach EPA's projected rates of adoption, the manufacture and sale of electric heavy-duty vehicles would have to experience rampant growth. The agency expects that in model year 2032—less than a decade from now—there will be more than 418,000 battery-electric and nearly 40,000 fuel-cell vehicles sold. See Draft RIA at 243–44. Even a snapshot of these market projections demonstrate their implausibility. Battery-electric bus sales would have to jump 12 times above their current levels. See IEA, Electric Bus Registrations and Sales Share by Region, 2015-2022 (Apr. 26, 2023), https://tinyurl.com/yckwdj3e; Draft RIA at 243–44. Fuel-cell bus sales would have to increase by a factor of 26. See IEA, Trends in Electric Light-Duty Vehicles (2023), https://tinyurl.com/mpwrhuev; Draft RIA at 244. And even though there are currently no available fuel-cell models for model year 2023, sales for box trucks, step vans, and utility trucks would have to reach more than 3,000 units; sales for port-drayage tractors, day-cab tractors, and yard tractors will have to reach more than 15,000 units; and sales for sleeper-cab tractors would have to reach almost 14,000 units. See Draft RIA at 243–44. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 20 - 21]

EPA has identified no evidence to demonstrate that these staggering increases are even possible, let alone likely or a good idea. Even the agency acknowledges that "[t]here is limited existing data to support estimations of adoption rates" for either of these heavy-duty technologies. Draft RIA at 231; see also id. at 420 ("Purchaser acceptance of BEVs and FCEVs is difficult to estimate. The data and research needed to definitively discuss what affects whether HD buyers will adopt BEVs or FCEVs is limited."); 88 Fed. Reg. at 25,941 ("The projected rate of growth in electrification of the HD vehicle sector currently varies widely."). And with respect to fuel-cell vehicles, studies report that "there is currently no consensus on this technology's eventual market share." Gideon Katsh et al., Electric Highways: Accelerating and Optimizing Fast- Charging Deployment for Carbon-Free Transportation, Nat'l Grid, at 8 (2022) ("Electric Highways"). [EPA-HQ-OAR-2022-0985-1660-A1, p. 21]

In the face of this uncertainty, EPA should proceed with great caution. The proposed rule does the opposite. It relies on speculation and faulty modeling to project unrealistic increases in the rates at which electric vehicles can be produced and are likely to be purchased and used. Those projections are unsound for multiple reasons. [EPA-HQ-OAR-2022-0985-1660-A1, p. 21]

i. Electric-Vehicle Production

EPA concludes that manufacturers are already on track to transform fundamentally the composition of their heavy-duty fleets toward electric vehicles. That conclusion is unsupported. [EPA-HQ-OAR-2022-0985-1660-A1, p. 21]

EPA relies principally on a handful of announcements in which manufacturers have outlined plans to increase the number of "zero-emission" sales in the coming decades. See, e.g., 88 Fed. Reg. at 25,930. These announcements, which are forward-looking and conditional, do not prove how many models will actually be available by the time of the compliance period. Shifting from internal-combustion-engine designs to electric ones presents many new challenges that manufacturers will have to navigate. For example, "[t]he manufacture of electric trucks and buses represents a huge change in industrial practices . . . because a different kind of automation is required." Beia Spiller et al., Medium- and Heavy-Duty Vehicle Electrification: Challenges, Policy Solutions, and Open Research Questions, Res. for the Future, at 13 (May 2023) ("Medium- and Heavy- Duty Vehicle Electrification"). Manufacturers cannot "just drop a big battery into the shell of a diesel vehicle." Id. Instead, manufacturers will need to make "significant investment in manufacturing equipment, tools, and processes." Id. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 21 - 22]

For these reasons and others, manufacturers may significantly revise their plans or fail to meet their targets—as has happened many times before. Tesla, for example, introduced a prototype for an electric semitruck in 2017 and set a production date for December 2019. But following the exit of an executive and "a series of supply chain issues," the company pushed the production date back nearly three years (to 2022). Nora Naughton, Another Tesla Semi Was Spotted Apparently Broken Down on the Side of the Road, Bus. Insider (Jan. 20, 2023), https://tinyurl.com/38x8xkvc. Similarly, General Motors "dialed back" an electric-vehicle sales target by more than two years, "citing startup issues with a new battery plant in Ohio." Bart Ziegler, Electric Vehicles Require Lots of Scarce Parts. Is the Supply Chain Up to It?, Wall St. J. (Nov. 12, 2022), https://tinyurl.com/ynkuw9bd. Stellantis "previously had a stated 2025 target but scrapped it in favor of a new 2030 target." BloombergNEF, Zero-Emission Vehicles Factbook: A BloombergNEF Special Report Prepared for COP27, at 48 (Nov. 2022), https://tinyurl.com/2dyrxn66 ("Zero-Emission Vehicles Factbook"). Lordstown Motors suspended production and deliveries of its electric pickup truck in February 2023 to address performance and quality issues with certain components. See Michael Wayland, Lordstown Halts Production, Shipments of Endurance Electric Trucks to Address Quality Issues, CNBC

(Feb. 23, 2023), https://tinyurl.com/ykjwtz39. And Ford has fallen far behind on filling purchase orders for the F-150 Lightning pickup truck. See Luc Olinga, Ford Suffers Another Setback, TheStreet (Mar. 11, 2023), https://tinyurl.com/ymuuy5nv. These real-world examples demonstrate that far-in-advance announcements (often in the face of significant political pressure) do not reliably indicate whether electric vehicles will get to the market on time, in the amounts promised, or even at all. Model year 2032 could come and go with far fewer electric models than EPA assumes. [EPA-HQ-OAR-2022-0985-1660-A1, p. 22]

EPA also overreads the manufacturer statements it cites. Volvo Group North America, for example, participated in the public hearing for the proposed rule to clarify that, although "[t]he NPRM cited Volvo Trucks' goal of having 50 percent of trucks sold being electric by 2030," that is "a global goal for only one Volvo Group brand." Volvo Grp. N. Am. Oral Statement, Dkt. No. EPAHQ- OAR-2022-0985 (May 2, 2023). Even then, Volvo does not expect to achieve more than "35% global zero emission product sales by 2030." Id. And although the company has "been actively working with stakeholders to accelerate market penetration of battery-electric trucks since 2019" and considers itself "the North American heavy-duty zero-emission truck market leader," it has only "251 trucks delivered to date"—a far cry from the number EPA expects the manufacturer to provide over the coming years. Id. [EPA-HQ-OAR-2022-0985-1660-A1, p. 23]

Moreover, manufacturers in the heavy-duty industry often specialize "in only one use case"—e.g., school buses, tractors, etc. Medium- and Heavy-Duty Vehicle Electrification at 14. As a result, pointing to a small group of manufacturer announcements is insufficient to show that production will increase for each of the many different vehicle categories the agency models in purporting to project future adoption rates. See Draft RIA at 111–14, 243–44. [EPA-HQ-OAR-2022-0985-1660-A1, p. 23]

EPA additionally assumes that manufacturers will begin transitioning to electric models because "there have been multiple actions by states to accelerate the adoption of HD ZEVs." 88 Fed. Reg. at 25,930; see also id. at 25,939. Specifically, the agency observes that California and other States have adopted the Advanced Clean Trucks ("ACT") program, which "would require that manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines to sell zero-emission trucks as an increasing percentage of their annual [state] sales from 2024 to 2035." Id. at 25,930–31 (brackets in original; internal quotation marks omitted). Those "other states," however, are only a handful: Massachusetts, New York, Oregon, New Jersey, Washington, and Vermont. See id. at 25,930, 25,939, 26,040 n.657. Their policies are not representative of the whole country, and there is no reason to suppose that manufacturers will respond to those States' measures by fundamentally changing the nature of their entire fleets. If EPA did have a valid basis to expect such a wholesale nationwide shift in response to those particular States' policies, it would have no justification for adopting the Heavy-Duty rule it has proposed to achieve the same objective. [EPA-HQ-OAR-2022-0985-1660-A1, p. 23]

Similarly, EPA points out that 17 States—including those that have adopted California's ACT program—have signed a "Memorandum of Understanding" that sets targets "to make all sales of new medium- and heavy-duty vehicles [within their jurisdictions] zero emission vehicles by no later than 2050," with an "interim goal of 30 percent of all sales of new medium- and heavy-duty vehicles being zero emission vehicles no later than 2030." 88 Fed. Reg. at 25,947 (internal quotation marks omitted). But EPA does not specify what any of these States have actually done to implement this “understanding”—which the signatories have made clear is a “voluntary initiative” that they are “free to withdraw” from at any time. Ne. States for Coordinated Air Use Mgmt., Multi- State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding, at 4. Moreover, a State’s policy preferences tomorrow may not match its preferences today, especially in an area subject to vigorous debate and disagreement like climate policy. EPA has no “special expertise” in predicting political winds, and it is arbitrary and capricious to rest a rule of this significance on unqualified assumptions. Ass’n of Private Sectors Colls. & Univs. v. Duncan, 70 F. Supp. 3d 446, 452–53 (D.D.C. 2014) (citation omitted); cf. New York v. DHS, 969 F.3d 42, 83 (2d Cir. 2020) (agencies may not rely on “unsupported speculation” that “run[s] counter to the realities” of the situation); N.M. Farm & Livestock Bureau v. U.S. Dep’t of Interior, 952 F.3d 1216, 1227 (10th Cir. 2020) (reliance on “speculative” finding was arbitrary and capricious). [EPA-HQ-OAR-2022-0985-1660-A1, p. 24]

ii. Electric-Vehicle Sales

Beyond barriers to increased production, EPA’s projected increase in electric- vehicle adoption rests on unrealistic estimates of future sales. EPA’s projections are not based on an analysis of historical sales data. Instead, EPA concludes that future sales can be estimated based on the “payback period” associated with each heavy-duty vehicle type—that is, the number of years EPA estimates that it will take for operational savings from using an electric vehicle to offset the higher upfront costs of acquiring one. 88 Fed. Reg. at 25,973–74; Draft RIA at 110. That methodology is ill suited for this context, and in any event, the agency makes critical errors in applying it. [EPA-HQ-OAR-2022-0985-1660-A1, p. 24]

Methodology. The agency assumes—without any supporting data—that commercial fleet owners make purchasing decisions based primarily on which vehicles have the shortest payback period. See Draft RIA at 232 (“Based on our experience, payback is the most relevant metric to the HD vehicle industry.”). That unfounded assumption is refuted by real-world experience. If payback period were the principal driver of purchasing decisions, electric vehicles would already have high adoption rates in the heavy-duty industry. As explained above, they do not. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 24 - 25]

Instead, as various commercial-fleet owners who participated in the public hearings or submitted comments on the proposed rule have made clear, the pace of cost recoupment is merely one factor, but far from the only factor, that they take into account when deciding what type of vehicle to purchase. To take just a few examples:

- “In addition to price, the greater obstacles to adoption are range and weight. Trucking is a for-profit business, and commercial viability is crucial for acceptance. At Kenworth of Louisiana, we have a Class 8 electric truck in stock. The dealer cost was nearly half a million dollars as compared to 180,000 for diesel power. The range is about 150 miles. This is compared to the current range of most Class 8 trucks at up to 1,000-1,500 miles between refueling stops. While customers are curious about the technology, the price, and range are usually met with everything from disbelief to laughter. . . . We have had no customer interest despite our zealous attempts to push this very costly truck.” Am. Truck Dealers Div., Dkt. No. EPA-HQ-OAR-2022-0985 (May 3, 2023).
- “Our experience with these EVs is that our range and usable application is greatly diminished in comparison with clean diesel technology. In addition, all locations have experienced both financial and physical constraints regarding supporting infrastructure.

In one location we are two years into the waiting of added utility infrastructure that is needed to support current vehicles as well as anticipated growth in EV purchases." ABF Freight Sys., Dkt. No. EPA-HQ-OAR-2022-0985 (May 2023).

- "Surface transportation truck lanes that require team operations due to time constraints cannot wait for battery charging. . . . I called Tesla and others and not one OEM has the power to run a 80,000 lbs. truck for a daily production of 8 hours let alone the maximum 11 hrs by law. It cannot be done." Hill Bros. Inc., Dkt. No. EPA-HQ-OAR-2022-0985 (Apr. 26, 2023).
- "The current electric coaches have a short mil[e]age range, take too long to recharge and have no luggage capacity or place for sports equipment. The infrastructure required to support the widespread adoption of charging of EV Coaches is nonexistent. . . . A coach operating a 7–10- day sightseeing tour would have to recharge every 300 or so miles and this would limit the distance we could cover in a normal day." John Bailey, President of Bailey Coach, Dkt. No. EPA-HQ-OAR-2022-0985 (May 2, 2023). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 25 - 26]

The American Trucking Associations reiterated some of these concerns at a recent hearing the Senate Environment and Public Works Subcommittee held on the future of clean vehicles. See A Heavy Dose of Reality for Electric-Truck Mandates, Am. Trucking Ass'ns (Apr. 19, 2023), https://tinyurl.com/e562mjjx ("A Heavy Dose of Reality"). And even EPA acknowledges that such issues are "barriers that fleet managers prioritize[] for fleet electrification." 88 Fed. Reg. at 25,943 n.146. EPA itself identifies at least ten non-payback-period-related considerations that "could lead to lower ZEV adoption rates than [it is] estimating in this proposal":

(1) "unavailability of vehicles";

(2) "concerns related to functional unsuitability of electric options";

(3) "perceptions of the comparisons of quality and durability of the different HD powertrains";

(4) "uncertainty about the technology, both with respect to ZEVs, as well as with new technology applied to ICE vehicles";

(5) "concern that infrastructure might not be ready to support electric or hydrogen adoption";

(6) "uncertainty about future fuel and electricity prices";

(7) "uncompetitive upfront costs of hydrogen";

(8) concern "that there is an uncertain return on investment";

(9) principal-agent problems causing split incentives between purchasers and operators; and

(10) "unpromising support from state government."

Draft RIA at 418–20; see also 88 Fed. Reg. at 26,071–72. [EPA-HQ-OAR-2022-0985-1660-A1, p. 26]

Instead of attempting to estimate the particular effect that each of those considerations will have on projected adoption rates, however, EPA declined to analyze them. The agency asserts that it would be too "difficult" to assess any of "these problems" empirically, Draft RIA at 421, and it relegates them to afterthoughts following its payback-period analysis, see 88 Fed. Reg. at 26,072. For example, the agency assumes that many of the uncertainties plaguing the electric-vehicle industry will resolve on their own once purchasers are “educate[d]” about the “benefits of HD ZEVs” and electric vehicles “become more affordable and ubiquitous on the roadways.” Draft RIA at 418–19. It purports to account for “some” others by adjusting the battery sizes used in its modeling. Id. at 420. And it proposes to account for the rest by capping the adoption rate for each vehicle type to be “no more than 80 percent”—a number which it does not explain and which the agency appears to apply only to those vehicle types that have an immediate payback. Id. at 232–33, 420. None of these backdoor fixes is sufficient. To estimate future sales accurately, EPA must use a methodology that properly accounts for these well-documented concerns. See Int’l Harvester Co. v. Ruckelshaus, 478 F.2d 615, 644 (D.C. Cir. 1973). It has not done so. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 26 - 27]

Even if payback period were an appropriate benchmark for estimating future sales, however, EPA has made several errors in evaluating both the operational savings and upfront costs that form the basis for that calculation. [EPA-HQ-OAR-2022-0985-1660-A1, p. 27] Operational Savings. When estimating the overall operational savings associated with electric vehicles, EPA relies on unwarranted assumptions and omits critical costs. [EPA-HQ-OAR-2022-0985-1660-A1, p. 27]

First, EPA concludes that electric vehicles come with substantial savings in maintenance and repair. See Draft RIA at 185. That conclusion is based on a 2022 study finding that the maintenance and repair costs for battery-electric vehicles will be 29 percent lower than those for internal-combustion-engine vehicles. Id. (citing Guihua Wang et al., Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks, Univ. of Cal., Davis, at 10 (Feb. 2022)). But the authors of that study emphasize the uncertainty underlying that finding: To sum up, currently there are very limited data on [maintenance and repair] costs for battery electric and fuel cell trucks. Even for the transit bus segment which has the most experience in advanced HD technology applications, there is no consensus on the maintenance cost comparison among diesel, battery, and fuel cell buses. [EPA-HQ-OAR-2022-0985-1660-A1, p. 27]

Wang et al., Estimating Maintenance and Repair Costs at 10 (emphases added). Although the study notes a consensus in existing research that maintenance and repair costs for electric vehicles, in the future, will be smaller than for conventional vehicles generally, see id., the degree of difference is critical to EPA’s estimate of future sales: If the maintenance and repair costs for electric and conventional vehicles are not as far apart as EPA assumes, the payback period could be longer—and, in turn, the adoption rates of electric vehicles could be much lower. According to EPA’s own analysis, the adoption rate could drop by 10 percent if the payback period is off by even one month. See Draft RIA at 232–33. The existing data, however, are inadequate to make reliable calculations of the degree of difference. [EPA-HQ-OAR-2022-0985-1660-A1, p. 28]

Second, EPA estimates operational savings without considering “midlife overhaul costs,” which include “the cost resulting from an engine rebuild for a conventional diesel vehicle, a battery replacement for a battery electric vehicle, or a fuel cell stack refurbishment for a hydrogen fuel cell vehicle.” Wang et al., Estimating Maintenance and Repair Costs at 10–11. EPA disregarded these costs on the ground that its “payback analysis typically covers a shorter period of time than the expected life of these components." Draft RIA at 185. That reasoning is illogical. Assuming (as EPA does) that net costs drive purchasing decisions, commercial-fleet owners are unlikely to buy an electric model if they anticipate that such vehicles will require costly midlife repairs that would erase any initial savings. Some evidence suggests that this will occur. For example, one report (performed by the California Air Resources Board) cited in the Wang study noted above posits that electric trucks will require battery replacement every 300,000 to 500,000 miles—much sooner than a comparable conventional vehicle is likely to require an engine rebuild. See Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document, Cal. Air Res. Bd., at 26 (Sept. 9, 2021) (indicating that a Class 8 heavy-duty diesel truck is likely to require an engine rebuild after 800,000 miles). The cost of major midlife repairs for electric vehicles also may be substantially greater. Compare, e.g., Certified Diesel Sols., When to Overhaul a Diesel Engine, https://tinyurl.com/2dch6xv3 (estimating cost of a diesel-engine rebuild between $20,000 and $40,000), with EPA, Heavy- Duty Technology Resources Use Case Scenario, at 2_BEV Tech (Apr. 10, 2023), https://www.epa.gov/system/files/other-files/2023-04/hd-tech-trucs-tool-2023-04.xlsm (Columns AJ & AK) (EPA's modeling suggesting that the cost of manufacturing batteries may be several multiples higher). The Senior Vice President of the American Transportation Research Institute cautions that heavy duty-vehicle operators are "going to be switching out the batteries on a Class 8 truck every four to seven years" and "pay between $85,000 and $120,000 for a replacement set." Cristina Commendatore, Report Pinpoints Top Challenges for Widespread Battery-Electric Vehicle Adoption, FleetOwner (Dec. 7, 2022), https://tinyurl.com/243euzxr. Thus, owners of electric heavy-duty vehicles could find themselves saddled with new and substantial midlife overhaul costs that cut into their operational savings. EPA should assess—not ignore—this issue before calculating the payback period. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 28 - 29]

Third, the agency considers the electricity needed to charge electric vehicles as part of operational costs. See Draft RIA at 182. But in doing so, it assumes that the price of electricity will be the same regardless of whether the vehicle is plugged into a private depot charging station or a public charging station. Id. at 185. That assumption is unwarranted. The agency itself notes that "[t]he price to charge at public stations may be higher than for depot charging, . . . since the public charging price may incorporate the profit margin of the third-party charging provider along with operating expenses, and costs associated with charging equipment deprecation." Id. at 68; see 88 Fed. Reg. at 25,998. And available information, primarily from studies examining light-duty charging, indicates that "[e]lectricity purchased at a public charger can cost five to ten times more than electricity at a private one." Philipp Kampshoff et al., Building the Electric-Vehicle Charging Infrastructure America Needs, McKinsey & Co. (Apr. 18, 2022), https://tinyurl.com/bdh74knn. And as the agency recognizes, many fleet owners—such as those with long-haul trucks and transit buses—will rely on public charging in lieu of, or in combination with, private depot charging. See Draft RIA at 195. The increased cost associated with public charging stations is yet another highly relevant, yet disregarded, operational cost. [EPA-HQ-OAR-2022-0985-1660-A1, p. 29]

Fourth, EPA explains that the operating costs for a battery-electric vehicle include "insurance" and "labor." Draft RIA at 182. Nevertheless, the agency does not evaluate either of these costs because it assumes that they will not "differ significantly" for owners of electric and internal-combustion-engine vehicles. Id. Available evidence suggests otherwise. According to a recent study, fleets considering electric-vehicles "are facing higher insurance costs," which "may be due to new and unfamiliar technology, overall higher purchase costs, and higher costs of repair after accidents." Medium- and Heavy-Duty Vehicle Electrification at 10. And although the labor costs associated with electric and internal- combustion-engine vehicles may eventually even out, owners will incur additional costs when they first begin incorporating electric vehicles into their fleets. Managers and maintenance staff will need to be retrained in the new technology or replaced by workers who are already up to speed. Id. at 11. These costs should likewise be factored into the agency's calculation. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 29 - 30]

Upfront Costs. EPA also relies on unwarranted assumptions and omissions when evaluating the upfront costs that purchasers will face in electrifying their fleets. [EPA-HQ-OAR-2022-0985-1660-A1, p. 30]

First, in calculating the upfront purchase price for electric vehicles, EPA incorrectly assumes that manufacturers and purchasers will benefit from two tax credits provided in the Inflation Reduction Act ("IRA"). See 88 Fed. Reg. at 25,937, 25,946–47, 25,985, 25,989, 25,997–98, 26,003, 26,035; Draft RIA at 109, 259. [EPA-HQ-OAR-2022-0985-1660-A1, p. 30]

The first credit, provided in Section 13502, is referred to as the "Advanced Manufacturing Production Credit" or "battery tax credit." Among other things, it provides manufacturers with a credit of up to $35 per kilowatt-hour for producing battery cells, 26 U.S.C. § 45X(b)(1)(K), and a credit of up to $10 per kilowatt-hour for producing battery modules, id. § 45X(b)(1)(L). These credits begin in 2023, start phasing down in 2030, and end after 2032. See 88 Fed. Reg. at 25,944. EPA assumes that manufacturers will eventually earn 100 percent of these tax credits and, in turn, pass those savings to the purchaser in the form of lower prices. See id. at 25,985 ("[W]e model this tax credit . . . such that HD BEV and FCEV manufacturers fully utilize the battery module tax credit and gradually increase their utilization of the cell tax credit for MY 2027-2029 until MY 2030 and beyond, when they earn 100 percent of the available cell and module tax credits."); Draft RIA at 173 ("To estimate the price of the battery packs to the purchaser, we projected that the full value of the tax credit earned by the manufacturer is passed through to the purchaser because market competition would drive manufacturers to minimize their prices."). [EPA-HQ-OAR-2022-0985-1660-A1, p. 30]

This assumption defies reality. According to the tax code, manufacturers will receive these credits only if the battery cells and modules are produced within the United States. 26 U.S.C. § 45X(d)(2). But, as EPA acknowledges, "there are few manufacturing plants for HD vehicle batteries in the United States, which means that few batteries would qualify for the tax credit now." 88 Fed. Reg. at 25,945; see also id. at 25,985; Draft RIA at 172. The agency attempts to sidestep this problem by noting that it "expect[s] that the industry will respond to this tax credit incentive by building more domestic battery manufacturing capacity in the coming years," highlighting the plans a few companies have announced to enter or increase their presence within that segment of the market, and noting that the Bipartisan Infrastructure Law provides funding to support those and similar operations. Draft RIA at 172. But none of those points establish that all manufacturers will produce battery cells or modules within the United States, which is necessary to support its assumption that all manufacturers will eventually receive the credit and pass the savings to purchasers in the form of lower prices. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 30 - 31]

The second credit, provided in Section 13403, is referred to as the "Qualified Commercial Clean Vehicles Credit" or "vehicle tax credit." It provides purchasers with a maximum credit of up to $7,500 when they buy a Class 2b or Class 3 vehicle and a credit of up to $40,000 if they buy a Class 4 through Class 8 vehicle. 26 U.S.C. § 45W(b)(1)-(4). This credit is available from 2023 through 2032, and EPA assumes that purchasers will receive the credit for each of those years whenever the purchase price for an electric vehicle is higher than that of its conventional counterpart. 88 Fed. Reg. at 25,945, 25,986. That assumption is likewise unfounded for several reasons. First, a recent study points out that small fleets—which "represent the large majority of trucking companies" in the United States—may not receive the benefits of the tax credit because they "lack the staffing [needed] to take advantage of incentive programs" and, in any event, are "likely" to purchase commercial vehicles "in the secondary market" rather than buying them new. Medium- and Heavy-Duty Vehicle Electrification at 2, 35. Second, there is no guarantee that manufacturers will not raise the price of electric vehicles in response to the tax credit and thereby erase any potential benefit for the purchaser. "[S]imilar to how colleges raise tuition costs when the government offers more grants and student loans, subsidies to purchase electric vehicles act as an incentive for manufacturers to raise their prices and capture the subsidies for themselves. That's basic economics." Jonathan Lesser, The EPA's Mileage Standards Are a Stealth Electric-Vehicle Mandate, Wall St. J. (Dec. 28, 2021), https://tinyurl.com/7dhwbrcx. As a result, it is far from clear that the vehicle tax credit will affect purchase prices in the way EPA expects. [EPA-HQ-OAR-2022-0985-1660-A1, p. 31]

Second, in estimating the other upfront costs associated with electric-vehicle ownership, EPA accounts for "the hardware and installation costs" of depot charging stations. Draft RIA at 109, 201. But as the agency acknowledges, "additional upfront costs associated with depot charging"—such as necessary upgrades to the electricity-distribution system—"could be incurred." Id. at 201. As discussed in detail below, those costs are likely to arise given the capacity needed to charge heavy-duty electric vehicles. Even EPA notes that "loads of just 200 kW or higher could trigger the need for an onsite distribution transformer, at an estimated cost between $12,000 and $175,000," and that "[n]ew charging loads of 5 MW or higher . . . could require more significant and costly distribution system upgrades such as those to feeder circuits or breakers." Id. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 31 - 32]

Despite recognizing the need for these system upgrades, EPA declined to consider them in its analysis for two reasons, but both are unsound. First, the agency states that there are a "variety of approaches" that fleet owners can take to reduce the need or scale of these upgrades, including factoring distribution system capacity into station-siting decisions, using mobile charging units or standalone charging canopies with integrated solar generation, or managing charging load to limit peak demand. Draft RIA at 201. But each of these alternatives costs money in its own right. EPA can include in its analysis either the cost of the upgrade or the cost of the alternative, but it cannot exclude both altogether. Second, EPA notes that "costs for some distribution system upgrades may be borne by utilities" rather than fleet owners. Id. The agency does not explain which distribution upgrades it believes utilities would cover or why they would do so. Excluding the costs of all upgrades to the electricity distribution system on this basis is unreasonable. [EPA-HQ-OAR-2022-0985-1660-A1, p. 32]

For these reasons, the agency falls fall short of showing that the estimated sales it predicts are reliable even under its preferred (but invalid) methodology. Electric vehicles are, and will likely remain, the exception in the heavy-duty market. Compliance with a final rule that assumes otherwise is infeasible. [EPA-HQ-OAR-2022-0985-1660-A1, p. 32]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

EPA's Proposal is Infeasible within the proposed Timeline and Arbitrary and Capricious

Even if EPA had Congressional authority to promulgate the Proposed Rule, EPA's proposal is infeasible and arbitrary and capricious. The EPA is forcing a rapid transition to ZEVs when it is unclear whether (1) vehicle manufacturers could produce and sell an adequate number of ZEVs beyond the West Coast,(2) there will be adequate charging infrastructure, (3) our nation's already strained electrical generation and transmission companies will be able to acquire land, permit, construct, and connect the necessary infrastructure to deliver energy throughout the country, and (4) fails to properly evaluate the lifecycle impacts of its proposal. Discussions of these concerns are factually inadequate and lack a proper cost-benefit analysis. [EPA-HQ-OAR-2022-0985-1659-A2, p. 4]

First, the United States lacks the critical minerals needed for BEV production. Despite the IRA's objective of creating U.S. manufacturing capacity and granting tax credits for largely domestically produced BEV batteries, EPA's proposal would be reliant on China for more than 50 percent of imports for approximately 19 critical minerals needed for BEV production.10 Thus, regulations making the United States less energy independent violates the EISA and IRA. Even assuming adequate battery and HD ZEV production, EPA ignores market penetration data. Cost, limited range for HD BEVs, weather, and reduced freight capacity are barriers to HD BEV deployment. [EPA-HQ-OAR-2022-0985-1659-A2, p. 4]

10 Combatting Child Labor in the Democratic Republic of the Congo's Cobalt Industry, US Dept. of Labor, note 14.

Second, EPA assumes that creating a pot of money to build the necessary charging infrastructure will translate into timely land acquisition and permitting, and adequate supplies of copper and other scarce resources needed for construction and grid connection. EPA's discussion of charging infrastructure fails to address the unique charging requirements of HD BEVs, such as significantly more expensive conduits and transformers and vastly more electricity than charging light- and medium-duty vehicles. Developing and building the necessary charging technology for heavy-duty vehicles will take many more years to develop and deploy if it is even economically feasible. [EPA-HQ-OAR-2022-0985-1659-A2, p. 4]

Third, EPA is mandating a transition to electric vehicles when relevant stakeholders express serious concern that our nation's electric grid cannot meet current demand, let alone the increasing electrical demand if EPA's proposal is adopted. PJM Interconnection released a report highlighting that "retirements [of older power units] are at risk of outpacing the construction of new resources."11 The recently announced emissions standard for electric generating units exacerbates this concern. EPA's expectation of adequate electricity and transmission infrastructure is unrealistic given chronic delays and uncertainty associated with acquiring land, federal and state permitting of new electrical generation and transmission lines, and new regulatory requirements leading to retirement of baseload units. [EPA-HQ-OAR-2022-0985-1659-A2, p. 4]

11 See Energy Transition in PJM: Resource Retirements, Replacements & Risks (Feb. 24, 2023).

Finally, EPA's environmental impact analysis is completely skewed by comparing HD BEV and ICEV tailpipe emissions. EPA disregards that an HD BEV's fuel source—a battery composed of carbon intensive minerals and the electricity generated to power the battery—produces upstream emissions, but no tailpipe emissions. Moreover, the GHG emissions and environmental impact associated with mineral resource extraction and increased power generation have largely been ignored. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 4 - 5]

IV. The Proposed Rule Relies on Incomplete Facts, Employs Mistaken Assumptions, and Is Not Based on Reasoned Decision-Making.

Even if EPA had Congressional authority to promulgate the Proposed Rule, which it does not, the proposal is substantively deficient and based on unrealistic assumptions, illogical reasoning, and incomplete analysis. Therefore, it constitutes arbitrary and capricious decision-making. [EPA-HQ-OAR-2022-0985-1659-A2, p. 15]

A. The Proposed Rule is Infeasible.

1. EPA's Proposed Rule Ignores the Reality of Current ZEV Production and Commands Impractical Adoption Rates.

In describing the need for this regulatory action, EPA suggests that the rapid electrification resulting from the Proposed Rule either is already in progress or aligned with major trucking fleets, heavy-duty vehicle and engine manufacturers and U.S. states. In support, EPA cites the existing ambitions of the automotive industry and publicly-stated original engine manufacturer ("OEM") ZEV adoption rates of 50–60% by 2030.59 But this circular reasoning cannot support EPA's Proposed Rule here—like the chicken and the egg, EPA and other federal regulators cite auto manufacturers' statements about ZEV adoption projections to justify the feasibility of enormous increases in a federal ZEV mandate, while automakers, in turn, cite EPA's and other federal agency regulations to support their statements about ZEV adoption projections. The underlying reality is that without federal regulation requiring vastly increased EV penetration, providing automakers certainty for long-term planning, automakers could not financially justify long-term investment in a technology with tepid consumer demand. And it is only cross-subsidization that is causing increasing consumer demand for ZEVs—cross-subsidization that depends entirely on federal regulations, since any rational company would not subsidize a losing product line without an ancillary benefit, such as avoiding Clean Air Act penalties. Automakers may be publicly acquiescing to government demands, but this does not demonstrate that the technology and infrastructure will be available in the stated timeframe and, most critically, that consumers are ready and willing to adopt electric vehicles. And these government demands can vanish in an instant, through changes in administrations or judicial challenge.60 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 15 - 16]

59 Proposed Rule at 25,929.

60 Notably, the Proposed Rule heavily relies on California programs serving to spur ZEV development, but the underlying Clean Air Act preemption waivers necessary for California to promulgate its own regulations are currently being challenged in Federal court.

In reality, as EPA acknowledges, the facts show that in model year 2021, only 0.2% of all heavy-duty vehicles certified by the Agency were electric.61 Thus, the ambitions of even the most aggressive engine manufacturers from a ZEV adoption rate perspective would require over 100% growth over the next seven years.62 And, of the 0.2%, nearly all were purchased by government and private entities using taxpayer dollars, primarily for things like school and city buses that were also subsidized through other federal and state taxpayer-funded programs.63,64,65 EPA makes no attempt to account for a substantial percentage, and often the majority, of heavy-duty ZEV costs being covered by taxpayers. There is no support for concluding there will be substantial private consumer adoption of heavy-duty (HD) ZEVs. [EPA-HQ-OAR-2022-0985-1659-A2, p. 16]

61 Proposed Rule at 25,940.

62 VOLVO GROUP, "Report on the first quarter 2023," available at https://www.volvogroup.com/content/dam/volvo-group/markets/master/news/2023/apr/4519530-volvo-group-q1-2023.pdf; TUBES AND LUBES DAILY, "Volvo launches electric truck with longer range in N. America" (Jan. 2021) available at https://www.fuelsandlubes.com/volvo-launches-electric-truck-with-longer-range-in-n-america/?mc_cid=b124969b23&mc_eid=4a00dc8f80 (Volvo Trucks set target that half of all trucks sold are electric by 2030); VOLVO GROUP, "Geared for Growth – Annual Report 2022," available at https://www.volvogroup.com/content/dam/volvo-group/markets/master/investors/reports-and-presentations/annual-reports/AB-Volvo-Annual-Report-2022.pdf.

63 Utility Dive. "Volvo wins $21.7M in grants to deploy electric trucks in California" October 21, 2020. https://www.utilitydive.com/news/Volvo-Trucks-VNR-Electric-EV-California-grants-emissions/587451/.

64 California Air Resources Board. "CARB and DERA School Bus Funding." https://ww2.arb.ca.gov/our-work/programs/school-buses/carb-and-dera-school-bus-funding.

65 California Air Resources Board. "Funding for Clean School Buses." https://ww2.arb.ca.gov/our-work/programs/school-buses/funding-clean-school-buses.

Moreover, the HD BEV and FCEV technologies, industries, and markets are not mature enough to support EPA's regulatory impact analysis or proposed standards. Of the estimated 850,000 new heavy-duty vehicle sales per year in the U.S.,66 EPA projects that 142,000 (16.8%) will be ZEVs in MY 2027 and 390,000 (46.0%) will be ZEVs in MY 2032.67 By contrast, in 2021, only 543 new HD ZEVs were sold in the U.S.68 EPA's projections and ambitions in the Proposed Rule would represent a staggering 63,000% growth in HD BEV adoption over 2021 to 2032 and 1,250,000% growth in HD FCEV adoption over the same period.69 These growth rates are an unrealistic assumption that highlight the infeasibility of the proposal. EPA cannot justify imposing billions of dollars in costs on adoption rates at the scale of a pilot-level program. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 16 - 17]

66 Proposed Rule Docket at EPA-HQ-OAR-2022-0985-0830, Heavy Duty Technology Resources Use Case Scenario (HD TRUCS) at Tab 1_Veh Prop, Column T.

67 Id. at Tab 4_Adoption Rates, Cells T7 and U7. (In MY 2027, EPA projects that all of the HD ZEV will be BEVs. In MY 2032, EPA projects that the 46.0% ZEV sales will break down as 40.1% BEVs and 5.9% FCEVs).

68 Claire Buysse, THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION, "Zero-emission bus and truck market in the United States and Canada: A 2021 update" (Sept. 2022), at Fig. 1, available at https://theicct.org/wp-content/uploads/2022/09/update-ze-truck-bus-market-us-can-sept22.pdf (The 75 medium truck and van sales are excluded from the sum, as EPA is proposing in separate rulemaking to categorize these as Medium-Duty Vehicles, see Docket EPA-HQ-OAR-2022-0829).

69 Id., Figures 3 and 4 (In 2021, FCEV sales accounted for 7% (Figure 4) of the 51 heavy truck sales (Figure 3)—or 4 vehicles—with the remainder being BEV).

Thus, should EPA continue with promulgating a final rule for future HD GHG standards, EPA must account for the reality of today's ZEV market and not the ambitions of the vehicle manufacturing industry and unsupported estimates of future market growth.70 [EPA-HQ-OAR-2022-0985-1659-A2, p. 17]

70 EPA also cannot mandate electric HDVs across all classes of HDVs, in attempt to spread the costs of electrification across a larger buyer pool. EPA has failed to conduct any substantive analysis of the incremental costs of electric HDVs, by weight class. This is unreasonable because as the weight of HDVs increase, the marginal costs of electrification increase even more. Analyzing costs by vehicle class could show that even assuming that electrifying lower weight class HDVs were justifiable (it is not), it would not be justifiable for heavier weight class HDVs. EPA's ignoring of this essential aspect of the problem is arbitrary and capricious.

Organization: American Highway Users Alliance

The American Highway Users Alliance (the 'Highway Users' or 'we' or 'our') respectfully submits these comments opposing the proposed rule in this docket issued by the Environmental Protection Agency (EPA). That proposal, among other actions, would set standards that are overly aggressive in attempting to reduce the permissible level of emissions of various substances, including but not limited to CO2 and other greenhouse gases (GHGs), from newly manufactured heavy-duty vehicles (principally trucks but also buses and other vehicles). [EPA-HQ-OAR-2022-0985-1550-A1, p. 1]

Feasibility of the proposal is highly questionable and benefits are likely overestimated

The proposed rule is estimated by EPA to have major downward impact on GHG emissions, a reduction of 18 percent of national overall CO2 equivalent emissions before any adjustment to add emissions from new electric generating units necessitated by massive electrification of heavy-duty trucks and equipment. See NPRM at 88 Fed. Reg. 25935, Table ES-5 and related text. Notwithstanding such a major change, and much higher up-front costs for electric trucks, EPA finds the new standards feasible. [EPA-HQ-OAR-2022-0985-1550-A1, p. 4]

We are skeptical that the estimated GHG reduction can be realized in that timeframe. Many truckers, especially those configured as small business, can be expected to keep and maintain older vehicles rather than pay for new, much more expensive electric vehicles. [EPA-HQ-OAR-2022-0985-1550-A1, p. 5]

Organization: American Petroleum Institute (API)

v. EPA's limits are not set on a realistic scientific based approach

EPA's proposed standards are based on projected ZEV penetration rates based on OEM stated ambitions and on California ZEV targets such as the Advanced Clean Trucks rule. These ambitions are stretch goals that OEMs likely will not be able to comply with. For instance, one study found that multi-year queues for service, uncertainty, and growing costs are delaying grid upgrade and increasing power production costs, which will translate into inability to meet the targets set by the California rules.12 EPA's targets are also based on using the 2027 model year as a baseline, which has not materialized yet. This approach misses the mark as it is not grounded on application fit, total cost of ownership (TCO), or necessary infrastructure considerations. EPA should revisit its methodology for setting the standards by holistically evaluating technology adoption rates based on feasibility of all technologies per specific application requirements, and consider a more realistic baseline. Further, EPA should consider a lifecycle approach that would accurately capture all the emissions associated with the life of a vehicle and capture the efficiency differences of different technologies in different applications. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 9 - 10]

12 Gladstein, Neandross & Associates (GNA), "State of Sustainable Fleets 2023 Market Brief", May 2023, Santa Monica, CA. Available at: https://www.stateofsustainablefleets.com/.

Organization: American Soybean Association (ASA)

Considering Agricultural Sector Costs

ASA appreciates that EPA has not proposed a zero-emission vehicle (ZEV) sales mandate in the proposed rule but remains concerned about the ambitious scale-up of GHG emissions regulations. American soybean growers support efforts to lower emissions and improve fuel efficiency, but this proposal must consider manufacturing and energy costs that will ultimately be passed down to end users, including soybean farmers. ASA believes in harnessing diversified engine and fuel types to achieve positive climate outcomes while also focusing on efficiencies in hauling that remove trucks from the road and remain economically and environmentally efficient. [EPA-HQ-OAR-2022-0985-1549-A1, p. 2]

Soybeans and all agricultural commodities rely on a multi-modal network that includes rail, truck, and inland waterways to move their harvest to domestic and international markets. The largest advantage for American soybean farmers over competitors abroad has always been an economically efficient transportation system. Given that over half of U.S. soybean movement is by truck, reliable and cost-effective trucking is critically important. [EPA-HQ-OAR-2022-0985-1549-A1, p. 2]

The proposed rule projects a ZEV adoption rate of 35% for short-haul tractors by 2032, with the gradual alternative proposal projecting ZEV adoption of the same vehicle at 25%. While both proposals raise concerns in terms of additional costs to growers, the alternative proposal provides a longer implementation period to improve technology, build out appropriate infrastructure, and provide customers with the ability to appropriately budget. [EPA-HQ-OAR-2022-0985-1549-A1, p. 2]

Organization: American Thoracic Society (ATS)

The ATS strongly supports EPA's efforts to seek further reductions in greenhouse gas (GHG) emissions from heavy duty vehicles and urges EPA to swiftly finalize and implement a final rule that significantly reduces GHG and criteria pollutant emissions from heavy duty vehicles. [EPA-HQ-OAR-2022-0985-1517-A1, p. 1]

ATS urges EPA to finalize a standard no less protective than emissions standards in the Advanced Clean Truck (ACT) policy. [EPA-HQ-OAR-2022-0985-1517-A1, p.3]

EPA has proposed a range of policy alternatives for setting and enforcing GHG emissions from heavy-duty vehicles, including modeling EPA standards on the Advanced Clean Truck standards established by California and adopted by 6 other states. Under the Advanced Clean Truck rules, vehicle manufacturers who certify 2b-8 chassis or complete vehicles with combustion engines would be required to sell zero-emissions trucks as an increasing percentage of their annual California and other participating states sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales would need to be 55% of class 2b-3 truck sales, 75% of Class 4-8 straight truck sales, and 40% of truck tractor sales.[EPA-HQ-OAR-2022-0985-1517-A1, pp. 3-4]

Further, large companies, including manufacturers, brokers and others are required to report information on shipments and shuttle services. Fleet owners, with 50 or more trucks, are required to report on existing fleet operations to provide data to inform future policy about heavy duty vehicle emissions and how best further implement zero-emissions vehicle policy. [EPA-HQ-OAR-2022-0985-1517-A1, p. 4]

As noted, seven states are already implementing the Advanced Clean Truck policies. While the regulatory format is somewhat different than what EPA has proposed, the agency should finalize a rule that realizes the same GHG heavy-duty truck emissions achieved by ACT. [EPA-HQ-OAR-2022-0985-1517-A1, p. 4]

In summary, the ATS appreciates the opportunity to comment on this important rule to address climate change. The ATS urges EPA to swiftly finalize and implement a strong rule to yield achievable GHG emissions from heavy-duty vehicles. The health of our patients, including those historically marginalized and excluded, and our planet depends on it. [EPA-HQ-OAR-2022-0985-1517-A1, p. 5]

Organization: American Trucking Associations (ATA)

post rule implementation actions issue

EPA requests comments on adopting a national GHG 3 standard that follows California's Advance Clean Trucks Rule adoption timeline, followed by other opt-in states.11, 12 [EPA-HQ-OAR-2022-0985-1535-A1, p. 9]

11 California Air Resources Board, Advanced Clean Truck Rule, March 15, 2021.

12 www.electrictrucksnow.com/states

ATA does not support EPA adopting California's Advanced Clean Truck percentages as national Phase 3 stringency requirements. The percentages proposed in Table 3 will lead to market disruptions and economic distortions. Fleets are experiencing product availability issues today in California. The state's Advanced Clean Trucks rule, which requires manufacturers to sell an increasing percentage of electric trucks, and its Omnibus NOx regulation have created uncertainty in the heavy-duty market. The regulatory impact of these requirements is reflected in purchase volumes and expected price increases. Fleets will find alternative solutions to purchasing a truck that can provide service, such as holding trucks longer, purchasing from the used truck market, limiting their California operations, or reconfiguring their business. ATA expects that California will need to amend their sales percentages during the life of the regulation to recognize lack of available products and infrastructure capacity. EPA has limited regulatory capability to revise emissions standards in response to California amending their ZEV sales mandates. [See Table 3 on p. 9] [EPA-HQ-OAR-2022-0985-1535-A1, p. 9-10]

7. ATA Recommendations

Trucking companies are in the early stages of testing ZEVs, primarily BEVs. For instance, Volvo was one of the first companies to introduce a Class 8 BEV day cab as part of its $91 million Volvo Lights project in December 2020, less than 3 years ago. While the 23 heavy-duty BEV trucks deployed as part of this project have provided valuable information on the operation of these vehicles, more deployment-scale demonstrations are needed. [EPA-HQ-OAR-2022-0985-1535-A1, p. 21]

Data compiled by the CPUC helps illustrate the uncertainty associated with vehicle operations.31 A study by researchers at the University of California-Davis examined 10 recent studies on the heavy-duty BEV TCO. The findings revealed that variations in TCO are directly linked to differences in assumptions, parameters, and other factors across the studies. For instance, the average distance traveled by truck varied by a factor of two to four times, as depicted in Figure 4. [EPA-HQ-OAR-2022-0985-1535-A1, p. 21] [See Docket Number: EPA-HQ-OAR-2022-0985-1535-A1, p. 22, for Figure 4]

31 California Public Utilities Commission, Freight Infrastructure Planning (5/22/2023). Available at: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/freight-infrastructure-planning.

Like the average VMT estimates, other BEV-related TCO components, such as vehicle, battery and maintenance costs, battery sizing and efficiency, etc., tended to have similar levels of variability. As the authors note, "Overall, TCO estimates across the studies, for a given truck type, can vary dramatically, though often several studies cluster together." This level of uncertainty across several research organizations raises concerns over the EPA and others' understanding of the performance and cost of ZEV technology. [EPA-HQ-OAR-2022-0985-1535-A1, p. 22]

Given the uncertainties outlined in these comments, ATA makes the following recommendations:

- More research and testing of ZEVs are needed to prove that the technology can scale to meet the trucking industry's various duty cycles and operating environments. EPA should conduct a supplemental analysis incorporating these factors.
- EPA should not reopen GHG Phase 2 2027 standards.
- GHG Phase 3 stringency targets should not begin until model year 2030 at the earliest to allow EPA time to evaluate the technology, fleets and OEMs to gather more real-world data, and accelerate charging and refueling infrastructure build out.
- EPA should work with the Department of Energy (DOE) and Department of Transportation (DOE) to determine metrics and regulatory authority to require the robust buildout of heavy-duty charging infrastructure.
- EPA and DOE jointly determine policy initiatives to streamline the patchwork regulatory system for energy transmission.
- Adopt a fuel and technology-neutral approach that incorporates established low-emission fuels alongside ZEVs. Including more mature and available fuels like renewable diesel, biofuels, compressed natural gas, and clean diesel can effectively reduce emissions today and align with the operational profile of our industry. Fuel diversity is a critical component to achieve a zero-emission future. [EPA-HQ-OAR-2022-0985-1535-A1, p. 22]
- Consistent with the operational complexity of the trucking industry, ATA views the transition to ZEVs as a sequence based on technological maturity and readiness. Some fleets will figure out how to electrify portions of their operation, given predictable routes, limited geographical range, and operationally compatible dwell times for charging. Others have discovered that ZEVs are not working in their operations because of the high

purchase price, unavailability of infrastructure, or payload and performance concerns. Some fleets running certain battery-electric vocational trucks can appropriately scale the infrastructure required for their operation and duty cycle. Most long-haul operators, however, tell us that the challenges are too significant to do so affordably and at scale. EPA should sequence its focus on the infrastructure to support ZEVs and segments of the industry that prove the technology works for the duty cycle. [EPA-HQ-OAR-2022-0985-1535-A1, p. 22-23]

Organization: Arizona State Legislature

In a Clean Air Act case involving power plant regulation, the Supreme Court held that EPA ‘must consider cost—including, most importantly, cost of compliance—before deciding whether regulation is appropriate and necessary.’ Michigan v. E.P.A., 576 U.S. 743, 759 (2015). EPA had determined that the statute conferring authority to regulate if EPA found that ‘such regulation is appropriate and necessary’ did not require EPA to consider costs. Id. at 750-51 (citing 42 U.S.C. 7412(n)(1)(A)). The Supreme Court found EPA’s interpretation unreasonable. Id. at 760. [EPA-HQ-OAR-2022-0985-1621-A1, p. 8]

The law applicable to EPA’s proposed rule here even more expressly requires consideration of costs than the law before the Court in Michigan v. EPA. Section 202(a) requires ‘appropriate consideration to the cost of compliance within such period.’ 42 U.S.C. 7521(a)(2) (emphasis added). And when revising standards for heavy-duty trucks, Congress specifically directed EPA to consider costs: ‘On the basis of information available to the Administrator concerning the effects of air pollutants emitted from heavy-duty vehicles or engines and from other sources of mobile source related pollutants on the public health and welfare, and taking costs into account, the Administrator may promulgate regulations under paragraph (1) of this subsection . . . .’ Id. at 7521(a)(3)(B)(i) (emphasis added). [EPA-HQ-OAR-2022-0985-1621-A1, p. 8]

Despite this clear direction, EPA openly admits that it did not rely on a cost-benefit analysis to set the standards in the proposed rule. According to EPA, ‘EPA’s consistent practice has been to set standards to achieve improved air quality consistent with CAA section 202, and not to rely on cost-benefit calculations, with their uncertainties and limitations, in identifying the appropriate standards.’ 88 Fed. Reg. 26,003; see also id. at 26,005 (‘[T]here are additional considerations that support, but were not used to select, the proposed standards. . . . [T]he Administrator has not relied on these estimates in identifying the appropriate standards under CAA section 202.’). EPA provides no citation of statutory authority to support its ‘consistent practice,’ and the applicable statutes instruct EPA to do the opposite. [EPA-HQ-OAR-2022-0985-1621-A1, p. 8]

The proposed rule is arbitrary and capricious because it fails to rely on a cost-benefit analysis. [EPA-HQ-OAR-2022-0985-1621-A1, p. 8]

The proposed rule also is arbitrary and capricious. An agency rule is arbitrary and capricious if ‘the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.’ Motor Vehicle Mfrs. Ass’n of U.S., Inc.

v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983). [EPA-HQ-OAR-2022-0985-1621-A1, p. 8]

By openly admitting that it did not rely on a cost-benefit analysis to set the standards in the proposed rule, EPA runs afoul of the clear statutory requirements in Section 202(a) and the reasoning in Michigan v. EPA requiring it to consider costs. EPA's failure to consider cost-benefit analysis to set the requirements in the proposed rule is thus arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 8]

EPA's Calculation of the 'Social Cost of Greenhouse Gases' Is Unlawful, Unconstitutional, Arbitrary and Capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

The Interim Estimates are substantively arbitrary and capricious.[EPA-HQ-OAR-2022-0985-1621-A1, p. 15]

The proposed rule is arbitrary and capricious because it relies on erroneous assumptions about vehicle costs. [EPA-HQ-OAR-2022-0985-1621-A1, p. 22]

EPA's failure to include accurate estimates for vehicle costs and the resulting impact on customer demand is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 23]

The proposed rule is arbitrary and capricious because it relies on speculative and erroneous estimates for repair and maintenance. [EPA-HQ-OAR-2022-0985-1621-A1, p. 23]

EPA's failure to adequately consider repair and maintenance costs is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 24]

The proposed rule is arbitrary and capricious because of erroneous estimates about charging availability. [EPA-HQ-OAR-2022-0985-1621-A1, p. 27]

EPA's erroneous estimates about resource availability are arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 28]

The proposed rule is arbitrary and capricious because of erroneous estimates about grid reliability. [EPA-HQ-OAR-2022-0985-1621-A1, p. 28]

EPA has failed to consider the significant grid reliability issues caused by its interconnected proposals that increase electricity demand while decreasing electricity supply.[EPA-HQ-OAR-2022-0985-1621-A1, p. 31]

The proposed rule is arbitrary and capricious because it fails to model its climate change impacts. [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

EPA admits that it took no steps to quantify or assess this supposed 'contribut[ion].' EPA's failure to consider the actual climate benefits of the proposed rule is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

Organization: Bradbury, Steven G.

EPA fails to consider the negative societal consequences and second-order cost effects of its proposals.

In putting forward regulatory proposals designed to force upon the American people a vast and rapid industrial transformation, EPA has an obligation to go further than just considering the direct cost effects of its proposals (which are themselves woefully underestimated, as highlighted above); it must also consider the broader indirect economic consequences and negative societal costs that would follow if these rules are finalized as proposed. So far in these rulemakings, the Agency has either ignored or deliberately downplayed these second-order effects. [EPA-HQ-OAR-2022-0985-2427-A2, p. 15]

On each of these points, EPA blithely asserts that the current problems, challenges, supply constraints, security risks, and limitations will all miraculously resolve themselves as the United States collectively marches forward into a happy future of EVs. Taken together, the EPA's long string of sunny assumptions, each one designed to minimize the costs and challenges of the new rules, adds up to a wholly arbitrary set of regulatory analyses. [EPA-HQ-OAR-2022-0985-2427-A2, p. 21]

If U.S. consumers do not embrace EVs as quickly and enthusiastically as the EPA assumes they will, or if even one of the EPA's other overly optimistic assumptions comes a cropper, the consequences of these rules will be catastrophic—for America's industrial base, our nation's workforce, and the safety and wellbeing of Americans, particularly medium- and lower-income Americans. [EPA-HQ-OAR-2022-0985-2427-A2, p. 21]

Organization: California Air Resources Board (CARB)

1. U.S. EPA's Statutory Authority Requires It to Adopt More Stringent Standards

Affected pages: 25948-25951

As explained above, CARB staff believes that U.S. EPA's Proposed Standards do not adequately reduce GHG emissions from HDVs, and therefore urges U.S. EPA to adopt more stringent standards that reflect the feasibility of ZEV adoption rates that are at least consistent with the ZEV adoption rates specified in CARB's ACT regulation. [EPA-HQ-OAR-2022-0985-1591-A1, p.14]

CAA section 202(a)(2) also requires U.S. EPA to consider the cost of compliance of regulations promulgated pursuant to the authority of CAA section 202(a). "Any regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." [EPA-HQ-OAR-2022-0985-1591-A1, p.16]

In Motor and Equip. Mfrs Assoc. v. EPA, 627 F.2d 1095 (D.C. Cir. 1979), (MEMA I), the court wrote:

Section 202's "cost of compliance" concern, juxtaposed as it is with the requirement that the Administrator provide the requisite lead time to allow technological developments, refers to the economic costs of motor vehicle emission standards and accompanying enforcement. See S. Rep. No. 1922, 89th Cong., 1st Sess. 5-8 (1965); H.R. Rep. No. 728 90th Cong., 1st Sess. 23 (1967), U.S. Code Cong. & Admin. News 1967, p. 1938. It relates to the timing of a particular emission control regulation rather than to its social implications. Congress wanted to avoid undue economic disruption in the automotive manufacturing industry and also sought to avoid doubling or tripling the cost of motor vehicles to purchasers. It therefore requires that emission control regulations be technologically feasible within economic parameters. Therein lies the intent of the "cost of compliance" requirement. (MEMA I, 627 F.2d at 1118.] [EPA-HQ-OAR-2022-0985-1591-A1, p.16]

U.S. EPA extensively discussed in the NPRM the projected costs of compliance for the Proposed Standards and determined that those costs are reasonable within the proposed time frame, even after considering elements including battery manufacturing capacity and critical materials availability.25 [EPA-HQ-OAR-2022-0985-1591-A1, p.17]

25 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, Proposed Rules, 88 Fed. Reg., April 27, 2023, page 26004. https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

CARB staff agrees that the costs of compliance for the Proposed Standards are reasonable, but also agrees with U.S. EPA that the costs of compliance associated with the more stringent alternative standards are entirely consistent with the criteria in CAA section 202(a)(2). [EPA-HQ-OAR-2022-0985-1591-A1, p.17]

2. HDVs with ICE Technologies

Affected pages: 25928, 25958-25961, 25972, 25991-25993, and 26027

The proposed Phase 3 standards were not based on any additional CO2-reducing technologies to HDVs with ICE technologies beyond those assumed when developing the existing Phase 2 GHG regulation for MY 2027. However, U.S. EPA acknowledged that projected ICE technologies to meet the existing Phase 2 GHG MY 2027 standards may continue to evolve to further improve the efficiency of the engine, transmission, drivetrain, aerodynamics, and tire rolling resistance in HDVs, thus, potentially resulting in lower CO2 emission through MY 2032. The NPRM requests comment on including additional ICE technologies to reduce GHG emissions from ICE HDVs and/or higher levels of penetration rates of existing ICE technologies when developing the standards for the final rulemaking. [EPA-HQ-OAR-2022-0985-1591-A1, p.42]

CARB staff suggests that U.S. EPA include additional CO2-reducing ICE technologies as well as higher penetrations rates beyond the existing Phase 2 GHG regulation as a basis for more stringent standards for MYs 2027 and later. It is important that remaining combustion sources continue to improve alongside the rollout of ZEVs. As indicated in the DRIA Chapter 1.4.2,139 the aerodynamics for tractors as part of the United States Department of Energy SuperTruck 2 program are further improved than those used in the existing Phase 2 GHG MY 2027 standards. On page 27 of the DRIA, "Aerodynamic improvements on Class 8 sleeper cab were noted in SuperTruck 2 updates from Daimler (10 percent (tested tractor)), Volvo (15 percent (some was due to trailer)), and PACCAR (~30 percent (63 percent split with tractor/trailer)). CO2 emission reductions are typically about half that of the aerodynamic improvement." Additionally, hybrid HDVs is another pathway to meet the CO2 standards, its CO2 emissions reductions ranges from ten to 30 percent compared to ICE HDVs as shown in Table 1-14 of DRIA. ICCT is also forecasting additional ICE technologies and higher levels of penetration rates compared to the existing Phase 2 GHG regulation for MY 2027. Cost-effective (i.e., payback within two years) and advanced ICE HDVs (e.g., predictive cruise control, reduced accessory loads, improve aerodynamics, tire low rolling resistance coefficient, etc.) is assumed to improve up to 25 percent beyond 2027 for tractors, and up to 31 percent for vocational trucks.140 Certain technologies forecast as the basis for the Phase 2 GHG standards have not in actuality been required to meet those standards and remain candidates for further GHG reductions as well. [EPA-HQ-OAR-2022-0985-1591-A1, pp.42-43]

139 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis, April 2023. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

140 ICCT's Potential Benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles, White Paper, April 2023. Tables 3 and 4. https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

Overall, CARB staff urges U.S. EPA to evaluate each potential improved ICE technology and reflect estimated penetration rate in each vehicle subcategory per MY, as was done when developing the Phase 2 GHG regulation. Given the urgent need to address climate change, more stringent CO2 emission standards are needed, and the addition of ICE technologies lowering the ICE contributions using known technology as part of the Phase 3 final rulemaking would enable further GHG reductions from the overall Phase 3 program. [EPA-HQ-OAR-2022-0985-1591-A1, p.43]

Organization: California Air Resources Board et al.

As Section 177 States, we are writing to urge the EPA to adopt the ACT-aligned option that is currently offered in the proposed heavy-duty vehicle Phase III Greenhouse Gas (GHG) standards.1 We believe that the Phase 3 Rulemaking has the clear potential to be the most impactful rule the EPA has considered in years. As states that have already adopted or are anticipating the adoption of California's Advanced Clean Trucks (ACT) regulation2, we believe a federal equivalent is not only possible, but essential. If designed to build on actions by states as well as federal funding incentives, the rule will protect countless communities, reduce our use of petroleum, save consumers money, and address climate change for decades to come. [EPA-HQ-OAR-2022-0985-1594-A1, p. 1]

1 https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

2 https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

Nationwide standards that match the ACT penetration rates will provide a critical market signal to both vehicle manufacturers and infrastructure providers on the scale and timing needed for deploying vehicles, charging infrastructure, and providing interconnection. Zero emission vehicles have now reached technology readiness in all key applications, with hundreds of models already in early production globally, including the first longer haul Class 8 trucks.3 Positive total cost of ownership (TCO) is emerging in several applications by 2025 and in most by 2030.4 We believe sending strong market signals for the longest period possible is critical to reduce investment risk and we support the rulemaking proposal's coverage between now and 2032; but further encourage EPA to consider sending a strong signal of the path beyond 2032. [EPA-HQ-OAR-2022-0985-1594-A1, p. 1]

3 https://globaldrivetozero.org/tools/zeti-data-explorer/

4 https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

We urge EPA to finalize a strong Phase 3 heavy-duty GHG rule that includes requirements to produce zero emission trucks at levels at least as ambitious as the ACT rule. Doing so will send a clear signal to the market, support our states' efforts, and recognize the unique opportunity to significantly improve air quality in our most overburdened communities and respond to the climate challenge. [EPA-HQ-OAR-2022-0985-1594-A1, p. 2]

Organization: CALSTART

The EPA Phase 3 regulation represents a critical and seminal point to mitigate the worse impacts from the climate crisis and requires a clear and strong signal of the nation's needed direction and pace. [EPA-HQ-OAR-2022-0985-1656-A1, p. 3]

It is vital that the finalized standards:

- Are adopted by the end of 2023.
- Meet the emissions reduction levels and timeline required to address critical climate change and public health protections and put us on a path toward climate stability and public health improvement, especially in vulnerable communities.
- Acknowledge the pivotal role vehicle electrification plays to meet the challenges to reach carbon neutrality by 2050. [EPA-HQ-OAR-2022-0985-1656-A1, p. 3]

We want to recognize the solid foundational assessment EPA staff has done in this NPRM to build the reality of zero-emission vehicle (ZEV) technology and adoption as a central element of the proposed rule's stringency. Our primary observation is that we believe EPA's projections do not adequately reflect the potential and realistic adoption rates of the electric vehicle market. EPA relies primarily on ZEVs being required by states who have adopted the Advanced Clean Trucks (ACT) regulation, and on expected economically driven market adoption elsewhere, to establish stringency without any technology-forcing requirements of its own. We believe EPA can and should go beyond this baseline assumption. Indeed, under the Clean Air Act's requirements regarding mobile sources and EPA's own endangerment findings for GHGs, we believe EPA is obligated not just to regulate but to be technology forcing. CALSTART will provide specific examples of feasible and faster adoption rates and therefore the greater stringency that is possible, as well as the accelerated co-benefits these rates can provide. [EPA-HQ-OAR-2022-0985-1656-A1, p. 3]

First, based on CALSTART's extensive field experience and technical analysis, we believe Phase 3 stringency can and should be more aggressive than EPA's preferred option. It should be based on a deeper penetration of ZE-MHDVs than is currently assumed in the NPRM. Indeed, we believe EPA's model evaluating zero-emission penetration artificially limits or caps the assumptions of what can be achieved. That, combined with setting no requirement for internal combustion engines (ICEs) to further reduce GHG emissions, sets stringency too low. [EPA-HQ-OAR-2022-0985-1656-A1, p. 3]

Finally, the United States can attract companies and investment from around the world, but we are competing with Europe and Asia for those dollars. Europe has enacted its "Green New Deal" investments and is in the midst of setting strong GHG regulations on MHDVs that currently exceed EPA's proposed standards in stringency and timeline. Investors and companies are looking for certainty of market, commitment, and support. Private capital is poised for massive infrastructure investments but faces risk without clear regulatory signals on the need for and the timing of the market. [EPA-HQ-OAR-2022-0985-1656-A1, p. 5]

One last takeaway from this data is that while the industry technology shift to electrification is unambiguous, the bulk of sales to date are occurring in those markets where ACT regulations are in place. Therefore, the signal of a strong regulation, coupled with supportive policies and incentives, are driving most U.S. sales. There are conditions that would support faster zero-emission penetration in non-ACT states, but they will need a strong regulatory signal, like a national ACT regulation, to meet the GHG reductions needed. [EPA-HQ-OAR-2022-0985-1656-A1, p. 11]Stringency and Penetration Rate Considerations

CALSTART believes that EPA staff has generally taken a thoughtful and serious approach to set assumptions about ZE-MHDV sales penetration rates. The HD TRUCS tool is a solid framework, and we do not believe EPA needs to make wholesale changes to its basic model. That said, we do believe there are some important modifications and adjustments to the assumptions that would better support the rule and set the penetration rate based on additional researched sources, given how important this rate is to set the ultimate stringency in the rule. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 11 - 12]

We start with our understanding of the Phase 3 framework. In our observations and discussions with multiple stakeholders, we believe EPA has set stringency based on:

- No additional improvements in ICE technology;
- Incorporating ZE-MHDV sales in ACT states as part of compliance with EPA stringency; and
- Setting assumptions based on expected market-driven ZE-MHDV sales in the remaining states as the limit of GHG stringency. [EPA-HQ-OAR-2022-0985-1656-A1, p. 12]

We do not believe this basic framework is adequate for several reasons. [EPA-HQ-OAR-2022-0985-1656-A1, p. 12]

First, the stringency level is not based on making use of readily available and implementable ICE technology that is highly likely to be used during the period of the rule. An ICCT analysis shows there is a suite of low-cost, short-payback ICE technologies, from aerodynamics and low rolling resistance tires to powertrain and engine efficiencies, that could achieve 20 percent or more in efficiency gains but have yet to be implemented.27 By not accounting for this ready technology in the stringency level, EPA in essence will dilute the ZE-MHDV penetration assumptions because a meaningful amount of GHG compliance can occur without any ZEV sales. Essentially, ZE-MHDV sales will be offset with low-cost ICE compliance. We do not object to the use of these GHG-reducing technologies, but they must be accounted for and add to the regulation's stringency. [EPA-HQ-OAR-2022-0985-1656-A1, p. 12]

27 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

Second, the stringency levels are based almost exclusively on two factors: 1) ZE-MHDV expected penetration rates in ACT states added to 2) an expected market-based ZE-MHDV adoption rate in non-ACT states—in other words, what the market is already expected to do. This is a key issue as the market alone—even with incentive assistance from BIL and IRA—is not on pace to meet climate reduction requirements.28 [EPA-HQ-OAR-2022-0985-1656-A1, p. 12]

28 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

We believe that following this approach to set its stringency levels does not fulfill EPA's critical leadership role on protecting public health nor does it meet the intent of EPA's role under the Clean Air Act (CAA). EPA's authority to regulate is documented clearly in the preamble section of the NPRM. However, given EPA's endangerment finding for GHGs and the global climate emergency the Intergovernmental Panel on Climate Change (IPCC) has documented,29 CAA provides ample authority for setting regulatory standards that are technology-forcing, not just market-following. As early as 1973, the courts rejected arguments that EPA was limited to standards requiring "technology in being as of the time of the application."30 EPA instead is "expected to press for the development and application of improved technology rather than be limited by what exists today."31 EPA's proposed stringency relies on the leadership of a few states and allows the market to set the pace elsewhere. At this critical juncture EPA is obligated to lead the market, not defer to it. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 12 - 13]

29 https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

30 U.S. Court of Appeals for the District of Columbia Circuit, 1973

31 Natural Resources Defense Council v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981)

Third, EPA's zero-emission penetration rate is based largely on a single source and simply derived technology adoption rate formula that is not based on empirical data. The 2021 report it is derived from, Charging Forward, remains mostly proprietary. The technology adoption rate it uses, now adopted by EPA (equation 2-61) was based solely on the experience of the report authors. This equation drives the technology adoption outputs of the regulation, yet the rate assumption was also applied equally to all vehicle categories, which neglects differential business case, finance, and operational considerations in different applications. Penetration rate based on TCO is not one-size-fits-all. [EPA-HQ-OAR-2022-0985-1656-A1, p. 13]

While industry experience can be a powerful and informative tool in the realm of new technologies, ideally any such single source would be synthesized and assessed with other inputs. We strongly believe the Phase 3 rulemaking would be made stronger if EPA synthesized multiple penetration rate curves rather than use a single assumption. [EPA-HQ-OAR-2022-0985-1656-A1, p. 13]

Fourth, we believe EPA's penetration rate assumption is artificially constrained. It caps maximum penetration at 80 percent for reasons not completely clear. This is even a reduction from the ACT Research cap of 86 percent, which we also believe is too limited. EPA argues that some of this constraint reflects concerns that infrastructure will not be available to some fleets. However, we believe the EPA infrastructure assumptions also need revision as they do not match industry practices already underway, which we will address in the next section of these comments. [EPA-HQ-OAR-2022-0985-1656-A1, p. 13]

There are several categories of vehicles, such as terminal tractors and transit buses, already showing the potential to achieve 100 percent penetration—though for reasons that go beyond pure TCO assessments. Penetration rate assumptions can be useful to set the floor for stringency levels. However, this rate has set the ceiling for Phase 3 stringency. We strongly encourage EPA to revise its penetration rate assumptions based on more than TCO payback curves alone. These curves are backward-looking and limited to techno-economics in a neutral context. Climate change and generational federal investments are not a neutral context. EPA should incorporate assessments that more adequately project what is economically viable, even if it is faster than traditional adoption in the absence of other important drivers. These other considerations impact a fleet's willingness to act, which CALSTART has long observed with incentive and development work for the past 30 years. Some of these considerations include:

- Accelerated regulatory timelines and requirements: If a regulation signals a change in technology, a larger percentage of purchasers adopt early for preparation than would in a neutral climate.
- Corporate sustainability; climate; and environmental, social, and governance (ESG)commitments:32 If a technology solution matches internal company or customer climate reduction metrics and will be required, it accelerates adoption.
- Availability of funding for a limited time period: If funding to ease a required technology is available during a limited timeframe, adoption rates can increase to take advantage of the opportunity. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 13 - 14]

32 https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/getting-to-carbon-free-commercial-fleets

Drive to Zero penetration rate assessment: EPA did cite the CALSTART Global Drive to Zero Global Sales Targets for ZE-MHDVs33 report and its penetration rates as one of the examples it considered but did not incorporate. The Drive to Zero assessment developed a market projection model that does incorporate issues such as fleets' willingness to act—measured by a fleet innovation profile and fleet bias—together with technology readiness (which incorporates TCO and payback considerations), supply scalability, and infrastructure availability. [EPA-HQ-OAR-2022-0985-1656-A1, p. 14.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 14, for Figure 5]

33 https://globaldrivetozero.org/publication/global-sales-targets-zemhdvs/

This multi-variable model analyzing the reality of ZE-MHDV market penetration established that a weighted average of at least 45 percent zero-emission sales by 2030 across all Class 2b-8 vehicles—and higher in key segments that align with EPA segmentation bins—is realistic and viable. [EPA-HQ-OAR-2022-0985-1656-A1, p. 14]

As previously mentioned, there are several segments that show the ability to adopt at a much higher rate than EPA's penetration assumptions. Besides transit and shuttle buses (including school buses) and urban/regional vocational vehicles, these are Class 7/8 regional tractors and a faster adoption of a percentage of Class 8 long haul that can take advantage of emerging BEV capabilities along the first corridors, which we will highlight in our infrastructure section of these comments. [EPA-HQ-OAR-2022-0985-1656-A1, p. 14.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 15, for Figure 6]

We recommend EPA use these ZEV penetration projections by segment to better inform the GHG stringency level (combined with further reductions in ICE emissions). Comparing and synthesizing researched penetration curves will provide a sounder baseline from which to establish stringency. [EPA-HQ-OAR-2022-0985-1656-A1, p. 15]

An alternative adoption curve: CALSTART recommends that EPA blends or synthesizes multiple researched curves to generate its technology adoption forecasts or considers using or incorporating an alternative adoption curve that is based on empirical data. One such curve, which could still be used with EPA's existing forecasting structure, can be developed from NREL data derived from its Transportation Energy and Mobility Pathway Options Model (TEMPO). The "TEMPO Curve" draws from historical data to generate an adoption rate (Figure 7).34 [EPA-HQ-OAR-2022-0985-1656-A1, p. 15.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 16, for Figure 7]

> 34 ICCT describes the technology adoption curve in the appendix to their comments to the proposed rule, in a table describing the estimate of ZEV adoption at each payback period. The method of fitting a technology adoption function to the data points in the table was developed by the Environmental Defense Fund and is described in their comments on the proposed rule.

This data was cited by EPA, but its use as a curve was established in collaboration with multiple stakeholders. We consider it a constructive alternative approach that provides EPA with a strong and analytically based framework for establishing one part of its stringency. [EPA-HQ-OAR-2022-0985-1656-A1, p. 16]

Given that 17 states representing roughly 36 percent of the nation's trucks have now signed the State MOU endorsing ACT regulation goals, seven states have fully adopted the ACT regulation, and the United States has signed the Global MOU for ZE-MHDVs, industry is already preparing for sales requirements. This contributes to the ability to support a faster adoption rate. The regional clustering of first interest and capability also leads to a more focused infrastructure build out that can accommodate this rate, as we illustrate in the next section. [EPA-HQ-OAR-2022-0985-1656-A1, p. 16]

Economic Co-Benefits

It can strongly be argued that any regulations involving ZEVs is not so much technology forcing as it is technology focusing and accelerating. Domestic and global vehicle manufacturers have already shown their pathway to full electrification (cited earlier in these comments). What EPA's Phase 3 regulation can do is set a pace for this transition that not only meets the urgent public health needs for GHG reductions but generates significant economic co-benefits and keeps American industry on track to lead a technology transition which matches their investments. [EPA-HQ-OAR-2022-0985-1656-A1, p. 26]

Organization: Ceres BICEP (Business for Innovative Climate and Energy Policy)

The BICEP Network urges the U.S. Environmental Protection Agency (EPA) to adopt greenhouse gas (GHG) emissions standards for heavy-duty vehicles aligned with the 2030 and 2050 U.S. climate commitments. Specifically, the BICEP Network urges EPA to adopt:

- Heavy-Duty Vehicle (HDV) Phase 3 GHG standards that are stronger than those proposed, and that support zero-emission vehicle (ZEV) adoption at least consistent with California's Advanced Clean Trucks (ACT) rule, which requires 60% zero-emission vehicle (ZEV) sales share for Class 4-8 vehicles and 40% ZEV sales share for Class 7-8 tractors by model year (MY) 2032.1 Given the adoption of the ACT rule by California and other states; manufacturer, fleet, and shipper ZEV commitments; and the significant incentives provided by the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) for vehicle and battery manufacturers, purchasers, and charging infrastructure, standards supporting greater ZEV sales shares are justified. Stronger standards can be met by incorporating additional GHG emission reductions from internal combustion engine (ICE) vehicles as well as from greater ZEV sales shares. [EPA-HQ-OAR-2022-0985-1581-A1, p. 1]

1 https://ww2.arb.ca.gov/sites/default/files/2023-06/ACT-1963.pdf (p.5)

BICEP Network companies see climate change as a significant business risk, and reducing GHGs as a major economic opportunity. In its most recent March 2023 report,2 the International Panel on Climate Change (IPCC) emphasized the necessity to 'massively fast-track climate efforts by every country and every sector and on every timeframe,' underscoring the urgency of drastically reducing GHG emissions by 2030.3 Given that the transportation sector is the largest source of U.S. GHG emissions,4 and heavy-duty vehicles represent an outsized portion of those emissions, strong truck standards are critical to meeting U.S. climate goals of limiting warming to well-below 2° Celsius.5 BloombergNEF's June 2023 EV Outlook concludes that the heavy truck sector in particular is 'far behind the net-zero trajectory and should be a priority focus for policymakers.'6 Recent analysis from the International Council of Clean Transportation (ICCT) concludes that fully aligning the U.S. medium- and heavy-duty vehicle sector with climate goals would require a 55% ZEV sales share for MHDVs in 2030, including a 40% ZEV sales share for long-haul tractors.7 Although ICCT projects that IRA incentives could stimulate up to 44% heavy-duty ZEV sales in 2030, EPA's current proposal falls short of even this level of ZEV sales share, let alone what is needed to meet climate goals.8 [EPA-HQ-OAR-2022-0985-1581-A1, pp. 1-2]

2 https://www.ipcc.ch/report/ar6/syr/

3 https://www.unmultimedia.org/avlibrary/asset/3022/3022200/#:~:text=UN%20Secretary%2DGeneral%20Ant%C3%B3nio%20Guterres%20said%20that%20the%20new%20IPCC,on%20all%20fronts%20%2D%2D%20everything%2C

4 https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

5 https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

6 https://about.bnef.com/electric-vehicle-outlook/

7 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

8 https://theicct.org/publication/ira-impact-evs-us-jan23/

BICEP members' abilities to meet their own climate commitments are also contingent on strong standards that will ensure the availability of clean trucks across the U.S. and drive the necessary shift to electrification. Vehicle manufacturers like Ford, Daimler, Volvo, and Navistar have committed to 50% or higher zero-emission truck sales by 2030.9 Unfortunately, truck manufacturers have generally set more ambitious goals and are providing greater ZEV availability in the European Union. Strong U.S. standards are necessary to spur greater availability and sales of ZEVs in the U.S. BICEP members also recognize that stronger HDV emissions standards will mitigate the economic risks of volatile fuel prices, and reduce transportation costs given that they will ensure the availability of more efficient internal combustion engine (ICE) vehicles in addition to driving greater deployment of ZEVs, which will be increasingly cost effective given advances in technology and economies of scale, in addition to offering operational cost savings.10 Electric heavy truck sales are increasing,11 and a growing number of companies, including Amazon, FedEx, and WalMart,12 have committed to electrifying their fleets in addition to setting transportation GHG reduction goals and advancing EV charging.13 While there is the growing momentum toward electric trucks represented by manufacturer and fleet commitments, it is critical that EPA provide a strong market signal to support those commitments by adopting stringent standards. Further, strong standards will ensure billions of dollars in savings from health and climate costs.14 [EPA-HQ-OAR-2022-0985-1581-A1, pp. 2-3]

9 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

10 https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf

11 https://www.iea.org/reports/global-ev-outlook-2022/trends-in-electric-heavy-duty-vehicles

12 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf (p.4)

13 https://www.dgardiner.com/corporate-transportation-decarbonization-initiatives/

14 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

Finally, heavy-duty vehicles are largely responsible for the harmful pollutant emissions that disproportionally impact historically low-income and BIPOC15 communities located near fleet depots, major transportation corridors, distribution centers, and ports. 41% of Americans live in communities with unhealthy air pollution, and a person of color is 61% more likely than a white person to live in such a community. Further, the American Lung Association predicts that the U.S. could see $735 billion in public health benefits from cleaner air by 2050 as the nation shifts to zero-emission trucks and power.16EPA must finalize strong HDV emission standards as soon as possible to protect the health of those in these vulnerable communities and realize these significant economic benefits. [EPA-HQ-OAR-2022-0985-1581-A1, p. 3]

15 Black, Indigenous, People of Color.

16 https://www.lung.org/getmedia/e1ff935b-a935-4f49-91e5-151f1e643124/zero-emission-truck-report.pdf

Thus, on behalf of the companies in the BICEP network, I urge EPA to adopt Phase 3 heavy-duty vehicle standards that will support ZEV adoption rates that are at least consistent with those required by California's ACT rule as well as ensure greater reductions from ICE vehicles. [EPA-HQ-OAR-2022-0985-1581-A1, p. 3]

Organization: CleanAirNow

As it stands, all of the options in EPA's Phase 3 proposed rule will not relieve the daily burdens caused by the freight transportation system, in particular heavy-duty trucks. CleanAirNow, along with our partner environmental justice organizations nationwide, only have one goal and that is to eliminate emissions from freight transportation, prioritize environmental justice communities and address the cumulative impacts caused by the freight sector in industrialized inland ports putting communities at risk on a daily basis because of the current lack of regulation and standards. [EPA-HQ-OAR-2022-0985-1579-A1, p. 1]

EPA must finalize standards stronger than its preferred proposal. [EPA-HQ-OAR-2022-0985-1579-A1, p. 2]

The agency should set a strong standard paired with a sales mandate, that would ensure a clear pathway to 100% new heavy-duty vehicles being zero emissions by 2035. Additionally, this mandate for zero-emission vehicles would include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities. A whole-of-government approach is needed to ensure these investments advance equity and support large-scale deployment of zero-emission trucks on the road. [EPA-HQ-OAR-2022-0985-1579-A1, p. 2]

The EPA must strengthen the proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. Protective standards must ensure that emissions are reduced in environmental justice communities. Stringent standards should use state regulations like the Advanced Clean Truck Rule as a baseline, and adopt more stringent controls. [EPA-HQ-OAR-2022-0985-1579-A1, p. 4]

Advances in electric vehicle technology are outpacing even the best estimates from just a few years ago—cost and technology assessments of battery-electric trucks from 2018 are already becoming obsolete. The barriers that once relegated ZEVs to a niche solution are shrinking, allowing zero-emission trucks to become a real solution in our battle against air and climate pollution. EPA must include policies that center environmental justice solutions and rapidly advance ZEVs to accelerate the shift and achieve zero emissions as soon as possible. [EPA-HQ-OAR-2022-0985-1579-A1, p. 4]

Once more, we want to reiterate that EPA can and should strengthen the proposed rule for a target of zero emissions to protect our health and our climate. [EPA-HQ-OAR-2022-0985-1579-A1, p. 4]

Organization: Clean Air Task Force et al.

Circumstances have changed dramatically since EPA published its final Phase 2 Heavy-Duty Vehicle Rule in 2016. Congress affirmed its commitment to achieving ambitious reductions in greenhouse gas (GHG) emissions from motor vehicles in the Bipartisan Infrastructure Law (BIL)1 and the Inflation Reduction Act (IRA),2 which provide unprecedented financial support for zero-emission vehicle (ZEV) technology and infrastructure. Separate from these laws, the public and private sectors have demonstrated record commitments to reducing GHG emissions from heavy-duty vehicles. And ZEVs, as well as numerous emission control technologies for combustion vehicles, have reached technological maturation and are market-ready for heavy-duty vehicles (HDVs). These developments come alongside a growing threat to public health and welfare posed by the intensifying climate crisis. While the market is heading in the right direction, greater GHG emissions reductions in the heavy-duty vehicle sector are both technically and economically feasible. EPA's standards should facilitate even greater deployment of zero-emission and internal combustion engine technologies to help protect the public from the destructive effects of climate change. To this end, we urge EPA to finalize the strongest possible emission standards. Standards at least as protective of public health and welfare as the Advanced Clean Truck (ACT) Rule, implemented nationwide, are feasible and would better serve EPA's statutory mandate to address the environmental and health impacts of GHG emissions from heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1640-A1, p. 6]

1 Infrastructure Investment and Jobs Act of 2021, Pub. L. No. 117–58, 135 Stat. 429 (2021), www.congress.gov/bill/117thcongress/house-bill/3684/text.

2 Inflation Reduction Act of 2022, Pub. L. No. 117–169, 136 Stat. 1818 (2022), https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf

II. EPA Must Establish Strong Emission Standards to Meet its Obligations Under the Clean Air Act.

A. Clean Air Act Section 202(a) requires EPA to set emission standards for heavy-duty vehicles that prioritize public health and welfare.

To carry out its statutory mandate, EPA must promulgate emission standards that protect public health and welfare by harnessing advancements in emissions reduction technology. EPA's primary duty under the Clean Air Act is to protect public health and welfare by minimizing harmful air pollution. In passing the Clean Air Act, Congress found that "the growth in the amount and complexity of air pollution brought about by urbanization, industrial development, and the increasing use of motor vehicles, has resulted in mounting dangers to the public health and welfare." 42 U.S.C. § 7401(a)(2). Congress thus declared that the express purpose of the Clean Air Act is to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare." 42 U.S.C. § 7401(b)(1).3 [EPA-HQ-OAR-2022-0985-1640-A1, p. 8]

3 Congress affirmed this goal in the 1977 amendments to the Clean Air Act, which "emphasize[d] the preventive or precautionary nature of the act, i.e., to assure that regulatory action can effectively prevent harm before it occurs; [and] emphasize[d] the predominant value of protection of public health." Lead Industries Ass'n v. EPA, 647 F.2d 1130, 1152 (D.C. Cir. 1980) (quoting H.R. Rep. No. 95-294, 95th Cong., 1st Sess. 49 (1977)); see also 74 Fed. Reg. 66496, 66507 (Dec. 15, 2009).

1. Section 202 requires EPA to set standards that protect public health and welfare.

Section 202(a)(1) of the Clean Air Act directs EPA to promulgate motor vehicle standards that "prevent or control" emissions of air pollutants that "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). The Supreme Court held in Massachusetts v. EPA that Congress clearly provided EPA with "the statutory authority to regulate the emission of [greenhouse] gasses from new motor vehicles" pursuant to section 202(a)(1)–(2). 549 U.S. 497, 532 (2007). In response to this decision, in 2009 EPA found that GHG emissions from motor vehicles—including from heavy-duty vehicles— "contribute to the total greenhouse gas air pollution, and thus to the climate change problem, which is reasonably anticipated to endanger public health and welfare." 74 Fed. Reg. at 66499. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 8 - 9]

Once EPA makes an endangerment finding, it must set standards that are commensurate to the magnitude of the danger to public health and welfare posed by the covered emissions. See Massachusetts, 549 U.S. at 532 (noting that section 202(a) "charge[s] [EPA] with protecting the public's 'health' and 'welfare'"); Coal. for Responsible Regulation v. EPA, 684 F.3d 102, 117, 122 (D.C. Cir. 2012) (stating that EPA must carry out "the job Congress gave it in § 202(a)—utilizing emission standards to prevent reasonably anticipated endangerment from maturing into concrete harm").4 The Clean Air Act defines "effects on welfare" broadly, including "effects on . . . weather . . . and climate." 42 U.S.C. § 7602(h). The dangers to public health and welfare originally cited in the 2009 Endangerment Finding— "risks associated with changes in air quality, increases in temperatures, changes in extreme weather events, increases in food- and water-borne pathogens, and changes in aeroallergens," 74 Fed. Reg. at 66497, to name a few—have only worsened. EPA recognized that this was likely to happen in the Endangerment Finding itself, finding that these "risk[s] and the severity of adverse impacts on public welfare are expected to increase over time." 74 Fed. Reg. at 66498–66499. [EPA-HQ-OAR-2022-0985-1640-A1, p. 9]

> 4 See also S. Rep. No. 91-1196, at 24 (1970), reprinted in A Legislative History of the Clean Air Amendments of 1970, at 424 (1974) (Section 202(a) requires EPA to "make a judgment on the contribution of moving sources to deterioration of air quality and establish emission standards which would provide the required degree of control."). Cf. 74 Fed. Reg. at 66505 ("the Administrator is required to protect public health and welfare, but she is not asked to wait until harm has occurred. EPA must be ready to take regulatory action to prevent harm before it occurs.").

It is not enough for EPA to promulgate regulations that maintain the status quo or adopt projected market conditions—especially given that the danger to public health and welfare from GHG emissions continues to intensify. Section 202(a)(2) provides that standards promulgated pursuant to section 202(a)(1) "shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology." 42 U.S.C. § 7521(a)(2). As the D.C. Circuit has recognized, this language embodies Congress's intent that EPA "press for the development and application of improved technology rather than be limited by that which exists today." NRDC v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981) (quoting S. Rep. No. 91-1196 (1970)). Here, adopting more stringent standards would not require EPA to press for the development of new technologies; zero-emission and internal combustion engine technologies have reached technological maturation and are already market-ready for HDVs. But EPA's standards should facilitate greater deployment of those technologies within the fleet. [EPA-HQ-OAR-2022-0985-1640-A1, p. 9]

EPA should not propose standards that merely track what the market will achieve independent of any regulation, which would not be consistent with its statutory duty to address public health and welfare harms wrought by GHG emissions from HDVs. A rule that could readily go further to address the dangers to public health and welfare posed by GHG emissions from heavy-duty vehicles would not align with Congress's instruction in section 202(a).5 As discussed in the following section, greenhouse gas emissions from heavy-duty vehicles contribute massively to the worsening climate crisis. EPA should therefore choose a regulatory response that will do more to address the pollution responsible for the "endanger[ment]" that heavy-duty vehicles pose to public health and welfare. See Massachusetts, 549 U.S. at 532; 74 Fed. Reg. at 66525–26. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 9 - 10]

> 5 Granted, section 202(a) provides discretion to EPA as to the exact manner of "prevent[ing] or control[ing]" emissions of dangerous air pollutants. And section 202 places certain limitations on EPA in setting standards. EPA's standards pursuant to section 202(a) must allow lead time for technical feasibility and must give "appropriate consideration to the cost of compliance." 42 U.S.C. § 7521(a)(2). Accounting for these requirements, EPA must promulgate standards that adequately address the danger to public health and welfare caused by the pollutant at issue.

B. EPA should use its authority under Clean Air Act Section 202(a) to achieve greater and faster deployment of emission control technologies within the heavy-duty vehicle fleet.

We agree with EPA's assessment of its statutory authority to set vehicle emission standards that rely on the full spectrum of technologies to prevent and control tailpipe pollution, including both zero-emission and combustion vehicle technologies. See 88 Fed. Reg. at 25948-51. We also agree that there is no reason for EPA to reopen its longstanding, and correct, view that the Clean Air Act authorizes it to incorporate ABT into its standards, and that EPA may include zero-emission vehicles in the “classes” of vehicles subject to fleetwide average standards. See id. at 25950. [EPA-HQ-OAR-2022-0985-1640-A1, p. 13]

As detailed throughout this comment letter, however, EPA must use this clear statutory authority to meet its mandate to protect public health and welfare by finalizing standards more stringent than it proposed. Far from enshrining the status quo or protecting the market share of polluting technologies, Congress intended that EPA set standards that go beyond what the market would achieve on its own.30 See Int’l Harvester Co. v. Ruckelshaus, 478 F.2d 615, 640 (D.C. Cir. 1973) (recognizing that Congress’s choices in the 1970 Clean Air Act Amendments may lead to “fewer models and a more limited choice of engine types”). The proposed standards fall short of that guiding principle. [EPA-HQ-OAR-2022-0985-1640-A1, p. 13]

30 As EPA explained in its brief in Texas v. EPA, section 202(a), “by design, seeks innovation and change.” EPA’s Final Answering Br., Texas v. EPA, Case No. 22-1031 (D.C. Cir. Apr. 27, 2023), ECF No. 1996730, at 43-44 [hereinafter “EPA Br.”]. Indeed, over the decades, EPA’s emission standards have led to significant technological innovation and advancements in the auto industry. See id. at 7; Br. of Amici Curiae Margo Oge & John Hannon in Support of Respondents, Texas v. EPA, Case No. 22-1031 (D.C. Cir. Mar. 8, 2023), ECF No. 1989149, 7-8, 21-22, 26-27 [hereinafter “Oge & Hannon Amicus Br.”].

C. Phase 3 standards at levels stronger than EPA proposed are technically and economically feasible.

As explained in detail below, more stringent Phase 3 standards are technically and economically feasible for a wide variety of reasons. In particular, EPA underestimates the feasibility of ZEVs, and its ZEV adoption rate schedule warrants revision. 88 Fed. Reg. at 25992. Specifically, EPA includes an 80 percent cap on ZEV adoption for all vehicle types in the HD TRUCS model. Id. EPA should not include this arbitrary cap on all vehicle types, as there may be categories of vehicles that move to complete ZEV adoption. And EPA’s projected 0 percent ZEV adoption rate for sleeper cab and heavy haul tractors in model years 2027-2029, id., is not reasonable, as both BEVs and FCEVs will be well-integrated into those vehicle categories by that time. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 40 - 41]

The regulatory history shows that EPA’s projections of ZEV technology advancements and overall ZEV deployment within the fleet routinely prove too conservative. EPA should not repeat those same mistakes in this rulemaking. [EPA-HQ-OAR-2022-0985-1640-A1, p. 41]

In the 2016 Phase 2 Final Rule, for example, EPA projected very small levels of HD ZEV penetration through MY 2027. In that rule, EPA projected “limited adoption of all-electric vehicles into the market,” and stated that the Agency “do[es] not project fully electric vocational vehicles to be widely commercially available in the time frame of the final rules.” 81 Fed. Reg. at 73500, 73704.161 By the time EPA proposed a new rule in 2022, however, the Agency recognized that its 2016 projections were underestimates. See, e.g., 87 Fed. Reg. at 17595 (“Several factors have changed our outlook for heavy-duty electric vehicles since 2016. First, the heavy-duty market has evolved such that in 2021, there are a number of manufacturers producing fully electric heavy-duty vehicles in several applications.”). Despite having predicted very limited HD ZEV penetration through MY 2027 in 2016, EPA noted that by 2019, there were already approximately 60 makes and models of HD BEVs available for purchase, “with additional product lines in prototype or other early development stages.” Id. EPA explained that “manufacturers and U.S. states have announced plans to shift the heavy-duty fleet toward zero-emissions technology beyond levels we accounted for in setting the existing HD GHG Phase 2 standards in 2016," and recognized the need "[t]o update the MY 2027 vehicle CO2 standards from the HD GHG Phase 2 rulemaking to reflect the recent and projected trends in the electrification of the HD market." Id. at 17598. EPA acknowledged its 2016 under-projections again in the current proposal, stating that the Agency has "considered new data and recent policy changes," and is "now projecting that ZEV technologies will be readily available and technologically feasible much sooner than we had projected." 88 Fed. Reg. at 25939. [EPA-HQ-OAR-2022-0985-1640-A1, p. 41]

161 See also 81 Fed. Reg. at 73818 ("As we look to the future, we are not projecting the adoption of electric HD pickups and vans into the heavy duty market…we believe there is no need to a cap for HD pickups and vans because of the infrequent projected use of EV technologies in the Phase 2 timeframe.").

The light-duty sector—which currently has a higher percentage of the fleet employing zero-emission technologies—also provides a useful illustration of EPA's historical pattern of underestimating future levels of vehicle electrification. For example, EPA's light-duty GHG rule finalized in 2012 set standards for MYs 2017–2025 and projected "very small" numbers of electric vehicles in the light-duty fleet through MY 2025. 77 Fed. Reg. at 62917. In the 2012 rule, EPA projected combined PHEV and BEV penetration of only 1 percent for the MY 2021 car fleet. Id. at 62872. Yet BEV sales alone accounted for at least 3.2 percent of all vehicle sales in MY 2021.162 In the 2012 rule, EPA did not even project combined BEV and PHEV sales that high by MY 2025. For the combined car and truck fleet, EPA projected BEV and PHEV penetration of only 2 percent by MY 2025, and for the car fleet alone, BEV and PHEV penetration of only 3 percent by MY 2025. Id. at 62874, 62875 Tbl. III-52. EPA re-evaluated those projections in 2016 and 2017, again projecting MY 2025 technology penetrations of around 3 percent or less for BEVs.163 And EPA's 2020 rule still projected only 3.4 percent BEVs by MY 2025. 85 Fed. Reg. at 24936 Tbl. VII-29. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 41 - 42]

162 Cox Automotive, In a Down Market, EV Sales Soar to New Record (Jan. 13, 2023), https://www.coxautoinc.com/market-insights/in-a-down-market-ev-sales-soar-to-new-record/; EPA, The 2022 Automotive Trends Report, at 74. See also Ilma Fadhil et al., ICCT, Electric Vehicles Market Monitor for Light-Duty Vehicles: China, Europe, United States, and India, 2020 and 2021, at 6 (2023), https://theicct.org/publication/ev-ldv-major-markets-monitor-jan23/ (estimating nearly 5 percent total U.S. BEV and PHEV sales in MY 2021).

163 See EPA, Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022–2025, at ES-10 (2016) https://www.nhtsa.gov/sites/nhtsa.gov/files/draft-tar-final.pdf; EPA, Final Determination on the Appropriateness of the Model Year 2022–2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, at 4-5, 21 (2017), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ91.pdf.

In the 2012 rulemaking, EPA also considered a more stringent alternative projecting a 5 percent combined BEV and PHEV penetration for MY 2025 for the car fleet, but it rejected this alternative based on "serious concerns about the ability and likelihood manufacturers can smoothly implement [that level of] increased technology penetration." 77 Fed. Reg. at 62877. Yet automakers ultimately surpassed that "serious[ly] concern[ing]" electrification penetration level in MY 2022 with BEVs alone. In MY 2022, BEV sales reached at least 5.8 percent of total light-duty vehicle sales,164 and this growth has continued, with the United States on track to vastly outpace EPA's previous projections of MY 2025 light-duty vehicle electrification. In Q1 of 2023, for example, U.S. light-duty BEV sales alone reached 7.2 percent of total vehicle sales.165 In both the light- and heavy-duty sectors, then, EPA's previous projections of ZEV deployment have proven far too conservative, and automakers have repeatedly shown they can deploy zero-emission technologies on a scale and at a pace far greater than EPA originally predicted. [EPA-HQ-OAR-2022-0985-1640-A1, p. 42]

164 Cox Automotive. See also EPA, The 2022 Automotive Trends Report, at 74 (preliminary report that electric vehicle sales, including both BEVs and PHEVs, were 7.2 percent of total sales in 2022).

165 Cox Automotive, Another Record Broken: Q1 Electric Vehicle Sales Surpass 250,000, as EV Market Share in the U.S. Jumps to 7.2% of Total Sales (Apr. 12, 2023), https://www.coxautoinc.com/market-insights/q1-2023-ev-sales/.

2. The availability of FCEVs also supports stronger standards.

The feasibility of fuel cell technologies also supports stronger Phase 3 standards. FCEV technology for heavy-duty trucks is a budding market, still at the pre-commercialization stage but expected to grow rapidly as the technology matures, vehicle and hydrogen fuel costs continue to decrease, and regulations like the ACT are adopted in more states around the country. That regulation, which requires an increasing number of zero-emission trucks to be sold, counts both BEVs and FCEVs as ZEVs, allowing hydrogen to play a key role in heavy-duty vehicle decarbonization. [EPA-HQ-OAR-2022-0985-1640-A1, p. 61]

For specific trucking operations, particularly long-haul (but potentially also regional delivery and drayage), FCEVs are an appealing zero-emission vehicle technology. Relative to diesel, these vehicles can complete long-haul routes without a substantial number of additional refueling stops, can be refueled in approximately the same amount of time, and their powertrains are only slightly heavier—such that FCEVs can carry up to 98 percent of the cargo that diesel trucks can carry when fully loaded.271 This makes FCEVs an excellent diesel replacement on long-haul routes, thus increasing the percentage of a given truck fleet that can be decarbonized, improving operational flexibility, and optimizing timelines as hours do not need to be budgeted for charging. The option of hydrogen FCEVs, alongside BEVs, acts to increase the efficiency of transportation decarbonization, allowing EPA to strengthen the proposed standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 62]

271 Thomas Walker, CATF, Zero Emission Long-Haul Heavy-Duty Trucking 15, fig. 4 (2023), https://www.catf.us/resource/zero-emission-long-haul-heavy-duty-trucking/

D. Additional evidence supports purchaser acceptance of HD ZEVs.

1. EPA has discretion in considering purchaser acceptance when promulgating emission standards but should not give undue weight to that factor.

As explained in EPA's proposal and Section II of these comments, when promulgating new emission standards under Clean Air Act section 202(a), EPA must consider the statutory criteria of technical feasibility, cost of compliance, and lead time. See 42 U.S.C. § 7521(a)(2). EPA may consider other factors, and in the past has considered various impacts of standards on HDV purchasers. But, as EPA notes, "demand and purchaser acceptance are only two of the factors [EPA] consider[s] when evaluating the feasibility of HD ZEV technologies in the MY 2027 through MY 2032 timeframe." 88 Fed. Reg. at 25998. [EPA-HQ-OAR-2022-0985-1640-A1, p. 68]

Unqualified purchaser acceptance is not an appropriate consideration under Clean Air Act section 202(a), and the Agency therefore should not let the unique preferences of each and every purchaser dictate its consideration of the appropriateness or feasibility of emission standards. In International Harvester Company v. Ruckelshaus, 478 F.2d 615, 640 (D.C. Cir. 1973), the D.C. Circuit Court of Appeals concluded: We are inclined to agree with the Administrator that as long as feasible technology permits the demand for new passenger automobiles to be generally met, the basic requirements of the Act would be satisfied, even though this might occasion fewer models and a more limited choice of engine types. The driving preferences of hot rodders are not to outweigh the goal of a clean environment. [EPA-HQ-OAR-2022-0985-1640-A1, p. 68]

While International Harvester involved emission requirements for light-duty vehicles under a provision of the 1970 Amendments, the principles the court expressed apply just as well to heavy-duty vehicle standards under section 202(a)(1)–(2). As detailed in Section II, Congress intended EPA's standards to push the industry toward greater emission reductions and did not expect them to preserve the market dominance of any particular type of powertrain or power source. EPA should not give oversized weight to arguments questioning purchaser preferences, which is not a factor Congress identified in section 202(a)(1)–(2). [EPA-HQ-OAR-2022-0985-1640-A1, pp. 68 - 69]

While EPA has discretion whether to consider and how much weight to give purchaser acceptance in setting emission standards, that discretion is limited by EPA's primary statutory duty to set standards that adequately protect public health and welfare. An understanding of purchasers' willingness to purchase and drive HD ZEVs could of course inform the feasibility and effectiveness of EPA's regulations. EPA's attention to consumer preferences, however, cannot compromise its overall Clean Air Act mandate to mitigate the vehicles' "devastating impact on the American environment," International Harvester, 478 F.2d at 622, or the Agency's primary duty to protect public health and welfare by minimizing harmful air pollution. [EPA-HQ-OAR-2022-0985-1640-A1, p. 69]

E. EPA's standards should reflect greater deployment of existing and cost-effective emission control technologies for combustion vehicles.

More stringent final standards would also be feasible and appropriate if EPA accounts for greater deployment of proven and cost-effective emission control technologies in the millions of HD combustion vehicles that will be produced in the coming decade. While the need to achieve zero emissions within the nation's truck fleets is urgent, it is also true that many combustion vehicles will be manufactured, sold, and driven before full ZEV adoption is reached. (Indeed, EPA capped ZEV adoption at a maximum of 80 percent in its modeling.) Yet in composing the technology packages for the proposed Phase 3 standards, EPA elected not to apply combustion vehicle technologies or adoption rates beyond what would be required to meet the existing Phase 2 standards, which were finalized seven years ago. 88 Fed. Reg. at 25991. As the Agency acknowledges, there is an "opportunity for further adoption of these Phase 2 combustion vehicle technologies beyond the adoption rates used in the HD GHG Phase 2 rule." Id. EPA should not underestimate the deep emission cuts that will result if manufacturers implement existing, cost-effective combustion vehicle technologies that already have a track record of success in the industry. EPA should thus strengthen its final standards to help ensure that these technologies are deployed in new HD combustion vehicles to minimize overall emissions in the coming years. [EPA-HQ-OAR-2022-0985-1640-A1, p. 75]

1. Combustion vehicle technologies can yield more immediate emission reductions for long-haul vehicles.

EPA requested comment on whether to include additional GHG-reducing technologies and/or higher levels of adoption rates of existing technologies for combustion vehicles in the technology assessment on which its final rule will be based. 88 Fed. Reg. at 25961. EPA did not assume that additional combustion vehicle technologies would be adopted beyond what OEMs would use to meet the Phase 2 standards, nor did the Agency change its assumed adoption rates from Phase 2. EPA's baseline combustion vehicle technology package for MY 2027 tractors includes "technologies such as improved aerodynamics; low rolling resistance tires; tire inflation systems; efficient engines, transmissions, and drivetrains, and accessories; and extended idle reduction for sleeper cabs." Id. at 25958. Yet there are more technologies EPA leaves on the table that yield even greater emissions reductions when considered cumulatively. As Cummins CEO Jennifer Rumsey said, "Cummins estimates that the 100,000 internal combustion engines that are each 10% more efficient are equivalent to the improvement gained by putting 10,000 zero emission vehicles on the road."344 [EPA-HQ-OAR-2022-0985-1640-A1, p. 75]

344 N. Am. Council for Freight Efficiency, 2022 Annual Fuel Fleet Summary, at Exec. Summary p. 6 (2022), https://nacfe.org/wp-content/uploads/edd/2022/12/AFFS-2022-Report-FINAL-1.pdf (quoting Jennifer Rumsey).

Several additional manufacturers agree that greater deployment of emission control technologies is feasible for HD combustion vehicle fleets. For example, Eaton recently commented to EPA that "the Omnibus 2027 NOx levels are achievable with margins in excess of 40%, while contributing to lower CO2 emissions, at reasonable cost increments that are offset by fuel savings, and with robust technologies designed for the life of the truck."345 Eaton pointed to several examples, including Cylinder Deactivation as an active thermal management technology, and alternative active heating, implemented through either electrical heaters or fuel burners.346 And other organizations submitting comments on this proposal have identified numerous options EPA should consider, such as advanced tires and aerodynamic improvements—some of which would also improve efficiency if utilized in BEVs. See, e.g., Comments of ICCT, to be filed in Docket EPA-HQ-OAR-2022-0985 on June 16, 2023. EPA's decision not to include the full suite of available combustion vehicle technologies in its technology packages, and at greater adoption rates than required to meet the Phase 2 standards, was unreasonable. Correcting this approach would support stronger final standards that better serve EPA's statutory mandate to protect public health and welfare. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 75 - 76]

345 Eaton Comments on the Notice for Proposed Rule Making for Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, Docket ID No. EPA-HQ-OAR-2019-0055, at 2 (May 16, 2022).

346 Id. The North American Council for Freight Efficiency's 2022 Annual Fleet Fuel Study confirms that multiple options exist to control emissions from HD combustion vehicles. See N. Am. Council for Freight Efficiency, at 28-34.

2. EPA should at least perform sensitivity analyses with technology packages that assign additional GHG reductions to combustion vehicles.

Given the proven and cost-effective combustion vehicle technologies cited above, EPA should at least perform sensitivity analyses that map the GHG reductions that would result from their adoption. The Agency should also model the deployment of several of the combustion vehicle technologies described in this comment, either together as a package or individually, for the portion of the fleet that will remain combustion vehicles. Additionally, EPA should analyze the costs and benefits of alternative compliance pathways that have greater reliance on combustion vehicle technologies and less reliance on ZEVs, which would provide a better illustration of the various technology pathways that will be available to manufacturers under the Phase 3 standards. These analyses will likely reveal that EPA has greater latitude to seek emissions reductions from HD combustion vehicles if these technologies are adopted at higher rates than the Agency initially modeled. [EPA-HQ-OAR-2022-0985-1640-A1, p. 76]

Organization: Clean Fuels Alliance America

E. Technology, Charging Infrastructure, and Operating Costs

As EPA looks to the Inflation Reduction Act (IRA) as a policy to support charging infrastructure in conjunction with the Proposed Rule, it is important for EPA to consider the timeframe of such investments along with the timeframe of growing an electric heavy-duty fleet. Congress demonstrated when passing IRA the need to continue to support biofuels infrastructure growth to supply low carbon biofuels remains a priority. The U.S. Department of Agriculture's Higher Blends Infrastructure Incentive program (HBIIP) increases the sales and use of higher blends of biodiesel by expanding the infrastructure for renewable fuels derived from U.S. agricultural products. The program by design encourages a more comprehensive approach to market higher blends by sharing the costs related to building out biofuel-related infrastructure. The expansion of biofuel infrastructure, as facilitated by HBIIP, broadens the availability of renewable fuels like B20 and higher blends while reducing carbon emissions and harmful tailpipe pollution today. Under HBIIP, the grants support fueling stations, convenience stores, hypermarket fueling stations, and fleet and fuel distribution facilities, including terminal operations and home heating oil distribution centers throughout the country. Federal matching grants have helped and continue to help the industry build or retrofit terminals, storage, and rail capacity to enable broader consumer access to these clean fuels and in turn clean air. [EPA-HQ-OAR-2022-0985-1614-A1, p. 3]

This infrastructure complements existing fueling infrastructure throughout the country and does not require investment in new vehicles and an infrastructure overhaul to realize GHG benefits. EPA must reevaluate this rule to better reflect that the adoption of ZEV in the heavy-duty market is dependent on the timing and availability of infrastructure. [EPA-HQ-OAR-2022-0985-1614-A1, p. 3]

VII. Benefits of the Proposed Program

A. Social Cost of GHGs

When looking at greenhouse gas (GHG) reductions today, biodiesel is a solution that reduces carbon dioxide now. Specifically, when compared to electric vehicles (EVs), utilizing biomass-based diesel now will allow the United States to meet our carbon reduction goals earlier than if we were to rely on EVs alone. It has been shown that the immediate investment in a mature, currently commercialized biomass-based diesel fuel yields higher annual greenhouse gas emissions reductions than waiting for a technology that is still considered immature, such as heavy-duty EVs.6 The benefits of using and increasing the use of biomass-based diesel now will not only provide immediate greenhouse gas reductions, but also will have a positive impact on health in disadvantaged communities. [EPA-HQ-OAR-2022-0985-1614-A1, p. 3.]

6 Frank, Jenny & Brown, Tristan & Haverly, Martin & Slade, Dave & Malmsheimer, Robert. (2020). Quantifying the comparative value of carbon abatement scenarios over different investment timing scenarios.

When considering options to help reduce greenhouse gas emissions from vehicles and equipment, there are two essential elements to consider: the amount of the reduction and when it happens. This is because carbon emissions are persistent and accumulate. The resulting increased levels of GHGs in the atmosphere contribute to global warming now and for decades to come. A reduction in GHG emissions now can avoid decades of associated heating, thus having significantly more value than carbon reductions made in the future. The time value of carbon is key, and the next decade is critical.7 The importance of reducing carbon today cannot be understated as the Intergovernmental Panel on Climate Change (IPCC) clearly reaffirmed in their Sixth Assessment Report: Carbon reductions today are more important than carbon reductions in the future.8 [EPA-HQ-OAR-2022-0985-1614-A1, pp. 3 - 4.]

7 National Biodiesel Board. Biodiesel.org. (2021). Cutting Carbon: Comparing Biomass-Based Diesel & Electrification for Commercial Fleet Use.

8 Intergovernmental Panel on Climate Change. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

The immediate reductions achieved by biodiesel and renewable diesel are crucial to reach our near- and long-term carbon reduction goals. Importantly, biofuels are already reducing GHG emissions. The biodiesel and renewable diesel industry is on a path to sustainably double the market size to 6 billion gallons annually by 2030 if not earlier and eliminating over 35 million metric tons of CO2 equivalent greenhouse gas emissions annually. Removing this important mechanism will be detrimental to meeting our nation’s clear air and energy goals. [EPA-HQ-OAR-2022-0985-1614-A1, p. 4.]

The immediate and compounding benefits that biodiesel and renewable diesel provide cannot be underscored enough. We ask that EPA adjust the performance-based standards to reflect a more appropriate and feasible mix of technologies available in the time frame proposed to meet the revised standards as we work together to decarbonize the heavy-duty sector today and, in the years to come. [EPA-HQ-OAR-2022-0985-1614-A1, p. 5]

Organization: Clean Fuels Development Coalition et al.

VI. The Proposed Rule is Not Feasible.

Section 202(a) requires that standards under that provision cannot take effect until “after such period as [EPA] finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period,” 42 U.S.C. § 7521(a)(2)—commonly known as the Act’s “feasibility” requirement. The proposal acknowledges that its standards, “must be premised on a finding of technological feasibility.” 88 Fed. Reg. 25,948. And the primary reason the proposal gives for believing that the proposed standards are feasible is because it believes “significant [heavy-duty] ZEV adoption rates can be achieved over the next decade." Id. at 25,929. This is an unreasonable assumption. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 19 - 20]

Electric vehicles make up such a small fraction of new heavy-duty vehicles sold as to be virtually zero. This shouldn't be surprising. While there are downsides to electric vehicles across all market segments, battery-electric technology is particularly unsuitable for heavy-duty applications. These vehicles are heavy and need to travel long distances. This means electric heavy-duty vehicles require enormous batteries, driving up costs, driving down range, restricting cargo space, and raising uncertainties about reliability that are unacceptable for most commercial applications. See generally The American Truck Dealers Division, Dkt. No. EPA-HQOAR-2022-0985-1445 (May 3, 2023).9 The very few heavy-duty electric vehicles that have been sold have almost all gone to municipalities and were not purchased because they were cost effective but in an attempt to fulfil idealistic climate goals. See 88 Fed. Reg. 25,940 (explaining that school and transit buses made up 87 percent of these sales). [EPA-HQ-OAR-2022-0985-1585-A1, p. 20]

9 The proposal also arbitrarily ignores the underdeveloped industry standards and safety protocols that exist today for heavy-duty BEVs and FCEVs that it must consider under Section 202(a)(4)(A) that specifically prohibits the use of an emission control device, system or element of design that will cause or contribute to an unreasonable risk to public health, welfare, or safety.

In the cities where electric heavy-duty vehicles have been adopted, many are regretting their purchases and have already put the vehicles out of service. See, e.g., Collin Anderson, Biden Spent $1 Billion to Get Schools Electric Buses. This Michigan District Says Theirs Hardly Work, Washington Free Beacon (May 24, 2023), https://freebeacon.com/biden-administration/biden-spent-1-billion-to-get-schoolselectric-buses-this-michigan-district-says-theirs-hardly-work/ (The electric busses have "'a lot of downtime and performance issues' and aren't 'fully on the road,' despite the fact that they are 'approximately five times more expensive than regular buses.' The infrastructure upgrades required to use the buses, meanwhile, were 'originally estimated to be only about $50,000' but 'ended up being more like $200,000,' according to [Ann Arbor Public Schools Board of Education Environmental Sustainability Director, Emile] Lauzzana. 'I have a number of colleagues in different states who are facing similar challenges,' the district official lamented."); Jordan Pascale, Metro's First Electric Bus Delivery Delayed Due To Battery Fire Recall; DASH Buses Also Affected, DCist (Mar. 10, 2023), https://dcist.com/story/23/03/10/metros-first-electricbus-delivery-delayed-due-to-battery-fire-recall-dash-buses-also-affected/; Jason Clayworth, Des Moines' Electric Buses Are Off the Road for Fixes, Axios Des Moines (Nov. 18, 2022), ("The vehicles were purchased using a nearly $1.5 million federal grant" "two years" ago. The "seven electric buses have been pulled off the road due to maintenance issues" and "transit officials are unsure when they will return."); Patrick Skahill, CTtransit fleet of electric buses remains out of service after summer battery fire, Connecticut Public Radio (Nov. 2, 2022), https://www.ctpublic.org/news/2022-11-02/cttransit-fleet-of-electric-buses-remainsout-of-service-following-summer-battery-fire ("The state Department of Transportation says its fleet of 11 electric buses remains out of service after a battery fire in July that triggered a federal investigation. … The incident sent two maintenance workers to an area hospital."); John Aguilar, RTD's electric 16th Street Mall buses cost nearly 60% more to operate than diesel coaches, The Denver Post (May 14, 2019), https://www.denverpost.com/2019/05/14/rtd-mallride-shuttle-electricdiesel/. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 20 - 21]

The proposal entirely ignores these widespread problems—lack of reliability, cost of recalls, maintenance, downtime, and vehicle replacements—and claims that heavy-duty electrification is not only feasible but will happen at a staggeringly rapid pace. Though less than 1000 heavy-duty electric vehicles were sold in all of North America in 2020, the proposal projects that hundreds of thousands will be sold annually by the end of the decade. The proposal only comes to this conclusion by consistently making the rosiest possible assumptions about what needs to go right, while ignoring all information to the contrary. The proposal projects geometric growth with no support; relies on non-binding company commitments and California's illegal Advanced Clean Trucks rule; makes utterly unrealistic projections of battery cost, mineral availability, charging infrastructure, and the availability of tax credits; and ignores the impact of other pending regulations that would make achieving each of these pre-requisites more difficult. Relying on any one of these assumptions in the final rule would render it arbitrary and capricious. When taken together, they demonstrate that the proposed rule is completely infeasible and thus unlawful. [EPA-HQ-OAR-2022-0985-1585-A1, p. 21]

A. The projections for battery electric vehicle adoption are based on very few—and very small—real-world data points.

The proposal explains that its projections for zero-emissions vehicle sales growth are reasonable because "the HD ZEV market is growing rapidly, and ZEV technologies are expected to expand to many applications across the HD sector." 88 Fed. Reg. at 25,943. Even if true, this does not support EPA's projections. [EPA-HQ-OAR-2022-0985-1585-A1, p. 21]

As EPA notes, "[c]urrent production volumes of HD BEVs originally started increasing in the transit bus market, where electric bus sales grew from 300 to 650 in the United States between 2018 to 2019," 88 Fed. Reg. 25,940, and that "[i]n 2020, the market continued to expand beyond transit, with approximately 900 HD BEVs sold in the United States and Canada combined." Id. (emphasis added). But "[t]otal heavy-duty sales in 2021 were over 750,000 units, with 36.1 percent belonging to Class 3 vehicles (including complete and incomplete), 25.9 percent belonging to Class 4–6 vehicles, and 38.1 percent belonging to Class 7–8 vehicles." DRIA at 11. In other words, these 900 units represent about 0.1 percent of all sales. From this data, EPA boldly projects that 22 percent of some types of heavy-duty vehicles will be electric by model year 2027—effectively three years from now—and 57 percent by 2032. 88 Fed. Reg. 25,932, Table ES-3. This is unreasonable. Projecting hundreds of thousands of sales based on just hundreds of sales a few years earlier makes sense in no economic model. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 21 - 22]

And even the sales EPA points to are not of the type of vehicles EPA expects to be widely adopted in just a few years. First, nearly every one of those sales was made to a government entity and the costs were paid by taxpayers. 88 Fed. Reg. 25,940 (the 900 units consisted "of transit buses (54 percent), school buses (33 percent)"). In other words, EPA is citing mandated sales to justify mandating more sales. Second, EPA also projects that heavy-duty vehicles will operate for 8 hours per day. DRIA at 115. But the proposal does not identify a single extant model capable of operating that long under current market conditions. See Comment of Hill Bros. Inc., EPA-HQ-OAR-2022-0985-1461. It is unreasonable for EPA to project that technology with no commercial market penetration will come to dominate the market in just a few years. [EPA-HQ-OAR-2022-0985-1585-A1, p. 22]

B. The non-binding company commitments and projections EPA cites do not prove feasibility.

EPA also tries to justify its projections of rapid heavy-duty electric vehicle growth by relying on other entities' projections. The proposal states that it expects heavy duty vehicle sales to rise to "54,000 by 2025 based on an [Environmental Defense Fund] analysis of formal statements and announcements by auto manufacturers." 88 Fed. Reg. 25,940. But the auto manufacturers' statements are not binding, and these companies could change their mind at any time.10 Further, many of these statements were made with the expectation that EPA would continue to provide various compliance flexibilities—like multipliers—that reduce the real-world stringency of the standards. As noted, the proposed rule would cut these avoidance strategies. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 22 - 23]

10 Indeed, some already have. For example, just a few weeks before the close of this comment period, Amazon, one of the companies whose pledges EPA references multiple times, abandoned its 2030 decarbonization goal. See, Adele Peters, Amazon quietly ditched its plan to make half of all shipments carbon neutral by 2030, Fast Company (May 30, 2023), https://www.fastcompany.com/90902541/amazon-quietly-ditched-its-plan-to-make-half-of-allshipments-carbon-neutral-by-2030.

More importantly, it is unclear that the 54,000 number EPA points to has any "analysis" behind it. The Environmental Defense Fund report does not say that this number is the product of some analysis but instead states that "[a]cross the industry, the number of electric trucks in use could skyrocket in the near future from 1,215 in 2021 to 54,000 by 2025." Electric Vehicle Market Update: Manufacturer Commitments and Public Policy Initiatives Supporting Electric Mobility in the U.S. and Worldwide, Environmental Defense Fund 33 (Apr. 2022) (emphasis added), https://blogs.edf.org/climate411/files/2022/04/electric_vehicle_market_report_v6_april2022.pdf. To support this speculation, the Environmental Defense Fund does not perform any internal analysis but supports its statement with a citation to a Wood McKenzie case study from August 2020. And that case study doesn't perform any analysis either, but instead examines "vehicle and charging profile data from the project's 23 regional haul e-trucks" and purports only to "highlight[] electric fleet energy and cost management tactics, utility strategies that encourage heavy-duty electrification while minimizing impacts to the grid, and how to use long-term incentives and market mechanisms to improve e-truck economics." Wood Mackenzie, Electric heavyduty trucks and charging infrastructure: A grid edge case study, (Aug. 4, 2020), https://www.woodmac.com/reports/power-markets-electric-heavy-duty-trucks-andcharging-infrastructure-a-grid-edge-case-study-428638/. No systematic projection of electric vehicle sales was undertaken, and it is unreasonable for EPA to rely on these projections. [EPA-HQ-OAR-2022-0985-1585-A1, p. 23]

The rest of the Environmental Defense Fund report doesn't justify the 54,000 sales either. In the section mentioned, the report points to California's Advanced Clean Trucks regulation, which will require "about 300,000 zero-emission M/HD trucks across the state by 2035." Electric Vehicle Market Update: Manufacturer Commitments and Public Policy Initiatives Supporting Electric Mobility in the U.S. and Worldwide, Environmental Defense Fund 33 (Apr. 2022), https://blogs.edf.org/climate411/files/2022/04/electric_vehicle_market_report_v6_april2022.pdf. But a second mandate does nothing to demonstrate the feasibility of the first. The report also suggests that heavy-duty vehicle sales will grow because companies are "making commitments to electrify their light duty fleets." Id. It seems to find particularly significant that "Hertz struck a deal to buy 100,000 [Tesla] Model 3 vehicles by the end of 2022. This investment could be worth over $4 billion." Id. But (1) these are light-duty vehicles, not heavy-duty vehicles, and (2) Hertz only took delivery of a little less than half of its order. See Fred Lambert, Hertz Took Delivery of Half Its Massive Tesla Order of 100,000 Electric Cars, Electrek (Feb. 8, 2023), https://electrek.co/2023/02/08/hertz-half-massive-tesla-order-100000-electric-cars/ ("Hertz's disclosed through its annual filings for 2022 that it ended the year with about 48,344 Tesla electric vehicles."). This is too thin a reed to support such a transformational projection. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 23 - 24]

C. EPA cannot rely on California's Advanced Clean Trucks to justify feasibility.

Like the aforementioned Environmental Defense Fund report, EPA itself points to the adoption of California's Advanced Clean Trucks program as supporting the proposition that "BEVs and FCEVs with no tailpipe emissions (and 0 g CO2 /ton-mile certification values) are capable of supporting rates of annual stringency increases that are much greater than were typical in earlier GHG rulemakings." 88 Fed. Reg. 26,001. But this is unreasonable. The aggressive heavy-duty electric vehicle adoption that would be required by Advanced Clean Trucks is just as infeasible when proposed by California as it is when proposed by EPA. The presence of a second regulation cannot make the first more feasible any more than a second gun to the head can make the first less coercive. [EPA-HQ-OAR-2022-0985-1585-A1, p. 24]

The proposal's reliance on this rule is made worse by the flagrantly illegal nature of these rules. Advanced Clean Trucks—and its companion program for light-duty vehicles, Advanced Clean Cars—are both facing legal challenge. California's standards are allegedly permitted under Section 209 of the Clean Air Act. Section 209(a) preempts states from setting emission standards for new cars and new engines. 42 U.S.C. §7543(a). There are two exceptions. First, §209(b) allows the EPA to give California—and only California—a waiver allowing it to set emission standards more stringent than the federal standards. §7543(b)(1). Second, the Act allows states, in some circumstances, to adopt emission standards "identical to the California standards." Id. §7507(1). In other words, "the 49 other states" may depart from the federal standard if and only if they adopt "a standard identical to an existing California standard." Am. Auto. Mfrs. Ass'n v. Cahill, 152 F.3d 196, 201 (2d Cir. 1998). [EPA-HQ-OAR-2022-0985-1585-A1, p. 24]

As petitioners in those lawsuits make clear, California's standards violate equal sovereignty, are forbidden by the plain text of the Clean Air Act, are preempted by EPCA, and fail to properly account for costs and technology limitations.11 EPA cannot rely on these illegal rules to justify its own rule. [EPA-HQ-OAR-2022-0985-1585-A1, p. 24]

11 For the same reasons, the proposed rule would be contrary to law if finalized in anything resembling its current form.

Organization: Colorado Department of Transportation et al.

Our agencies strongly support EPA's development of robust national Phase 3 heavy-duty vehicle (HDV) greenhouse gas (GHG) emissions standards. The proposed standards, when implemented, have the potential to substantially reduce heavy-duty vehicle GHG, NOx, VOC, fine particulate matter (PM2.5), and air toxics. Our agencies are highly supportive of a national standard that is as robust as possible to ensure strong progress nationwide on air pollution and equity. [EPA-HQ-OAR-2022-0985-1530-A1, p. 2]

A strong national heavy-duty vehicle standard is important to Colorado for at least three reasons. First, a significant percentage of Colorado's heavy-duty truck traffic comes from vehicles that are registered in other states. While Colorado can influence change for trucks registered in our state, strong national GHG emissions standards which also reduce other air pollutants helps us to improve air quality. Cleaner trucks on the roads are especially important for our residents who live in close proximity to freight routes and bear a disproportionate impact from truck emissions. These communities cannot be left behind in the transition to clean transportation. Second, a national heavy-duty standard helps ensure parity for Colorado companies that rely on heavy-duty vehicles versus those in neighboring states. Finally, Colorado is already experiencing the impacts of climate change, including increased wildfires, floods, and drought. Climate change is a global issue that is impacted by all GHG emissions regardless of geographic source, and the reductions in GHG emissions from the proposed national rule will help reduce the long-term risks of climate change in Colorado. [EPA-HQ-OAR-2022-0985-1530-A1, p. 2]

- EPA requested comment on what level of stringency to pursue for different types of heavy-duty vehicles. Given the need for strong national standards to achieve the significant benefits estimated from the proposed rule, we urge EPA to pursue GHG emissions standards reflective of the level of ZEV adoption in California's ACT program, accounting for the implementation needs of Section 177 states. This will ensure a uniform standard that will simplify compliance, ensure emissions reductions from the transportation sector, and improve health outcomes nationwide. In particular, we urge EPA to adopt rules for tractors and vocational vehicles that align with the ACT rule, which are supported by industry commitments for zero emission vehicles and numerous state, federal, and utility funding sources.

Organization: Corporate Electric Vehicle Alliance (CEVA)

Heavy-duty vehicle phase 3 GHG emissions standards that are at least as strong as those proposed, but ideally are stronger to ensure at least 50% zero-emissions vehicle (ZEV) sales across all market segments by 2032. California's Advanced Clean Trucks (ACT) rule,4 manufacturer commitments,5 and the Inflation Reduction Act (IRA) funding are all consistent with such a goal.6 [EPA-HQ-OAR-2022-2674]

4 https://ww2.arb.ca.gov/sites/default/files/2023-06/ACT-1963.pdf (p.5)

5 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf

6 https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23-2.pdf

Similarly, strong heavy-duty vehicle standards that lead to 50% ZEV sales across all market segments by 2032 will drive the electrification of the heavy-duty sector by building on the momentum created by state regulations, manufacturers' commitments, and IRA and Infrastructure Investment and Jobs Act funding. Taken together (in concert with modal shifts) these actions will spur rapid decarbonization of the sector and ensure a diverse supply of ZEVs that meets the needs of commercial fleets and carriers.8 [EPA-HQ-OAR-2022-2674]

8 https://www.atlasevhub.com/data_story/210-billion-of-announced-investments-in-electric-vehicle-manufacturing-headed- for-the-u-s/#:~:text=Vehicle%20manufacturers%20and%20battery%20makers,than%20in%20any%20other%20country.

While medium- and heavy-duty trucks represent only 5% of vehicles on the road, their GHG emissions represent 23% of the transportation sector's carbon footprint, which grew 75% over the last three decades. 9 They are also largely responsible for the harmful pollutant emissions that disproportionally impact historically low-income and BIPOC communities located near fleet depots, major transportation corridors, distribution centers, and ports.10 In fact, the American Lung Association found that one in three Americans live in places with unhealthy air pollution, largely due to transportation sector emissions. As such, vehicle emissions standards serve as a crucial mechanism to protect public health and advance environmental justice.11 Further, with many major companies aiming to deploy 50-100% zero-emission trucks by 2030, EPA's proposed standards fail to stimulate the rate of commercial electric truck production that commercial fleet operators seek.12 By strengthening the proposed Phase 3 standards to ensure at least 50% ZEV sales across all market segments by 2032, EPA will accelerate the industry's necessary investments in heavy-duty ZEV manufacturing and the accompanying investments in charging infrastructure. [EPA-HQ-OAR-2022-2674]

9 https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf (p.2-35, 3-25).

10 BIPOC: Black, Indigenous, People of Color

11 https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf

12 https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf (p.i-19).

Organization: Daimler Truck North America LLC (DTNA)

The proposed CO2 emission standards rely heavily upon EPA projections of HD ZEV adoption rates.

The CO2 emission standard stringency levels in the Proposed Rule rely almost entirely on EPA's projections of HD ZEV adoption rates. For the proposed tractor and custom chassis standards, CO2 standard stringency was derived from a simple equation whereby EPA—after determining projected ZEV and ICE vehicle adoption rates for each regulatory subcategory—multiplied the fraction of ICE vehicles projected to make up each technology package in a given MY by the applicable existing MY 2027 CO2 standards.24 The proposed CO2 emission standard stringency levels for vocational vehicles depend upon a similar equation where the determining factor is EPA's projected ZEV/ICE vehicle adoption rates for each regulatory subcategory of vehicles per MY.25 Because the proposed CO2 standard stringency is a function of EPA's projected adoption rates for each regulated vehicle subcategory in each MY, it is absolutely critical that these projections turn out to be accurate. Indeed, as the Agency acknowledges, these projections (and associated numerical stringency calculations) form the basis for EPA's determination that the proposed standards are achievable.26 [EPA-HQ-OAR-2022-0985-1555-A1, p. 18]

24 See id. at 25,993.

25 See id. at 25,995; Draft Regulatory Impact Analysis (DRIA) at Section 2.9.2.2.

26 See DRIA at 244 (noting that the achievability of EPA's proposed emission standards are supported by the Agency's technology pathway projections and calculation methodology).

HD ZEV adoption depends upon a number of future developments that are difficult to predict.

As a leading HD manufacturer, DTNA appreciates first-hand the difficulty of predicting future market developments in the commercial transportation industry. This is especially the case when it comes to predicting market acceptance of new technologies such as BEVs, FCEVs, and H2-ICE vehicles, as such products have not been widely adopted across all HDV applications. In addition, proliferation of these technologies depends on a number of developments largely outside of the control of truck manufacturers, such as the pace of development and geographic concentration of supporting infrastructure, government policies to mandate or incentivize HD ZEV adoption and to reduce ownership costs, and the relative costs of comparable ICE vehicles. [EPA-HQ-OAR-2022-0985-1555-A1, p. 18]

The Company has studied this issue extensively and models its projections of HD ZEV market uptake based upon a 'transformation equation' that is a function of three main factors: (1) vehicle technology development, (2) cost parity between ZEVs and conventional vehicles, and (3) infrastructure development. The Proposed Rule addresses only the transition in vehicle technology, and it does nothing to address the other two factors, as they are outside of EPA's regulatory authority. It is important for EPA to recognize, however, that without these other two important factors, HD ZEV demand may never materialize—at least at the rates that EPA projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 18]

Another important criteria for projecting future HD BEV adoptions rates is the readiness of electric power generation sources, utilities, and the electric grid to adapt to new demands from increased use of electric vehicles. Similarly, hydrogen infrastructure must be available for FCEV or H2-ICE uptake. This is yet another component of the market uptake equation over which EPA has no regulatory control and is thus difficult to predict or incorporate into the Agency's future projections. [EPA-HQ-OAR-2022-0985-1555-A1, p. 19]

Flaws in the key assumptions underlying EPA's market uptake projections cast doubt on achievability of the Phase 3 CO2 standards as proposed.27

DTNA is concerned that the CO2 stringency levels in the Proposed Rule—and the market projections on which they are based—are not supported by available data and rely on underlying assumptions and projections about the future state of technology, infrastructure, and market conditions that may not be true. As EPA notes, 'there is limited existing data to support [the Agency's] estimations of adoption rates of HD ZEV technologies.'28 Lacking supporting data, EPA should start with more conservative stringency levels and reevaluate the underlying assumptions that inform these levels as new information becomes available. DTNA notes in this subsection a number of specific flaws in EPA's rationale that counsel more conservative stringency levels in the final rule with a mechanism for conducting regular reviews. [EPA-HQ-OAR-2022-0985-1555-A1, p. 19]

27 A number of these flaws—and related issues—are set forth in the comments submitted by the Truck and Engine Manufacturers Association (EMA) on the Proposed Rule. DTNA endorses and adopts EMA's comments by reference, to the extent that they are consistent with the points made herein.

28 DRIA at 231.

The Proposed Rule reflects incorrect assumptions about purchaser behavior, leading to unrealistic adoption rate projections.

EPA excludes a number of other operational, convenience, and other considerations that influence fleet purchase decisions.

In the Proposed Rule, EPA excludes a number of considerations that are integral to the fleet purchase decision, and which exist independent of calculated payback periods: [EPA-HQ-OAR-2022-0985-1555-A1, p. 25]

- Infrastructure Challenges. There is little to no MHD/HHD-accessible public charging available, limiting ZEVs to return-to-base operations and effectively requiring fleet owners to own and operate EVSE.41 Even where fleets are willing to become EVSE owners, not all fleets have the capital and facilities required to install on-site charging infrastructure, and their charging capacity may be limited by grid capacity. In some cases, fleets will need to project their charging needs years in advance, before ordering trucks, to secure future infrastructure when ZEV trucks are needed and meet minimum electricity utilization rates. EPA should separately account for these infrastructure limitations outside of its projected adoption rate schedule, as discussed in Section II.C. Accordingly, the alternative adoption rate schedule proposed by DTNA in Table 1 of these comments does not encompass consideration of nationwide infrastructure availability, as this is factored in as a separate infrastructure scalar to ensure adequate consideration of actual installed EVSE capacity in setting Phase 3 CO2 standard stringency, as described in more detail in Section II.C. [EPA-HQ-OAR-2022-0985-1555-A1, p. 25]

  41 Indeed, this issue may be exacerbated with the proliferation of North American Charging Standard (NACS) chargers primarily designed for passenger cars. General Motors and Ford Motor Company recently announced that they will be partnering with Tesla to deploy NACS charging technology, instead of the current industry-standard combined charging systems (CCS), and that they will equip new vehicles with NACS charging ports starting in 2025. See, e.g., 'Ford EV Customers To Gain Access To 12,000 Tesla Superchargers; Company To Add North American Charging Standard Port In Future EVs' (May 25, 2023), https://media.ford.com/content/fordmedia/fna/us/en/news/2023/05/25/ford-ev-customers-to-gain-access-to-12-000-tesla-superchargers.html. Currently deployed NACS chargers are ill-suited for HDV charging, thus the light-duty sector shift in focus to NACS charging could further impede development of HD-accessible charging stations.

- Reluctance to Adopt New Technology. Fleets are often reluctant to adopt new technology, due to perceived risks to durability, reliability, resale values, and other factors. While some early adopters have already introduced limited ZEVs into their operations to begin to gain experience, many fleets are likely to wait for projected cost and technology improvements to materialize before introducing BEVs into the fleet. FCEV experience is lagging even further behind. [EPA-HQ-OAR-2022-0985-1555-A1, p. 25]

Uncertainty about the residual/resale values of new technology also deters customers from purchasing ZEVs, even if the calculated payback period falls within their vehicle trade cycle. Resale values are largely dictated by market preferences. Despite fuel economy gains, some options like the wheel fairing discussed above, are unpopular in the resale market and bring lower residual values. Weight and route limitations associated with ZEVs further narrow the pool of potential buyers in the resale market. ZEV adoption is likely to remain slow until fleets have confidence in residual values for resale. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 25-26]

Fleets may choose not to adopt new technology if that technology could have a worse payback period in the future. As IRA incentives expire and electricity prices rise, fleets may wait to see if the TCO case will remain positive in the long run without subsidies. [EPA-HQ-OAR-2022-0985-1555-A1, p. 26]

- Vehicle Suitability to Fleet Operations. As EPA acknowledges, commercial vehicles are purchased to perform a variety of operations. Before a calculated payback period is considered, the fleet must decide whether the ZEV will meet required drive cycle and operational requirements. In the HD TRUCS model, EPA sizes BEV and FCEV components to meet 90th percentile VMT needs, stating that the Agency expects manufacturers to design to this condition, as opposed to operational extremes. Unless fleets have exceptionally high confidence their vehicle will see a predictable route and weight that falls within the 90th percentile of operation, they will not purchase a ZEV that can fulfill only the 90th percentile of daily use cases. Furthermore, as discussed above, EPA significantly underestimates the 90th percentile daily VMT for the tractor categories. [EPA-HQ-OAR-2022-0985-1555-A1, p. 26]

Likewise, EPA asserts that most vehicles 'cube out' (fill up with goods or passengers before reaching the maximum vehicle weight) before they 'gross out' (reach maximum vehicle weight before filling up with goods or passengers) and estimates that battery technology is suitable for applications up to a 30% weight penalty.45 EPA references a report prepared by the North American Council for Freight Efficiency (NACFE) in support of this weight penalty threshold.46 The referenced NACFE report explains that vehicle weight distribution data is often misinterpreted, due to the fact that data reflecting vehicle loads 'per run' is often misunderstood as vehicle loads 'per truck,' leading many to conclude that a significant percentage of trucks on the road operate well below their maximum weight capacity.47 As NACFE explains, however, the relevant metric for understanding weight distribution data 'is loads, not trucks.'48 'Because many loads are unpredictable, one day a truck may cube out and the next it might weigh out.'49 Fleets are thus unlikely to purchase vehicles with a weight penalty outside of very specific applications that have predictable loads, as they cannot be used as flexibly as a diesel-powered alternative. For these reasons, EPA's HD TRUCS tool does not adequately consider application suitability with respect to weight. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 26-27]

45 See DRIA at 234.

46 See id. at 271 (citing NACFE, 'Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors—Run on Less Electric Report' (May 5, 2022). Figure 16 (NACFE Report)).

47 See NACFE Report at 38.

48 Id.

49 Id.

Considering the factors discussed above, we propose that EPA incorporate into its HD TRUCS analysis the alternative adoption rate schedule set forth in Table 6 below, to ensure that actual customer purchasing behavior is more accurately reflected in the standards adopted in the final rule. In the Company's experience, even customer willingness to adopt a new technology and to install infrastructure to support this new technology may not positively impact actual infrastructure availability, so DTNA does not include infrastructure considerations here; rather, we propose that an additional infrastructure scalar be applied to the adoption rate percentages that are ultimately adopted in the Phase 3 final rule, as discussed in Section II.C. [EPA-HQ-OAR-2022-0985-1555-A1, p. 27] [Refer to Table 6 on p.27 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

As EPA rightly acknowledges, 'there is limited existing data to support estimations of adoption rates of HD ZEV technologies.'52 Given the lack of data and importance of customer adoption rates to successful implementation of EPA's Phase 3 GHG standards, it is only appropriate that the Agency consider a more conservative adoption rate schedule, such as the one presented above in Table 6, as a starting point and periodically re-evaluate based on actual future market developments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 28]

52 DRIA at 231.

The Proposed Rule overlooks the fact that manufacturers have no control over customer demand and cannot force ZEV adoption.

Vehicle manufacturers control only one part of the ZEV 'transformation equation,' namely the development of technologies and high-quality products designed to meet the needs of an array of applications in the commercial vehicle market. Manufacturers can influence and promote, but do not control, the pace of development of ZEV refueling infrastructure. Further, manufacturers have only limited influence over demand for ZEVs in the HDV market relative to ICE vehicles. Without supporting policies and government-created incentives, it is unreasonable to expect that HD ZEV penetration will happen on its own and within the timeframes that EPA predicts. [EPA-HQ-OAR-2022-0985-1555-A1, p. 39]

Demand remains a barrier for ZEV adoption, despite available supply.

In previous EPA GHG rulemakings, manufacturers had the flexibility to offer customers a variety of technology options that provided incremental improvements in CO2 efficiency. Under the Proposed Rule, by contrast, because ZEVs will make such a significant difference in the GEM score used to certify vehicle families, manufacturers can likely only comply with the proposed CO2 standards by producing, certifying, and selling significant numbers of ZEVs, as EPA acknowledges.80 Manufacturers can, and have, developed products that could enable compliance with the proposed CO2 stringency levels, but are unable to force customers to adopt ZEVs. The technology adoption rates DTNA highlights in Section II.B.3.a of these comments show fleets are more sensitive to indirect TCO and convenience factors than EPA accounts for, and it is unlikely fleets will adopt significant volumes of ZEVs until these issues are resolved. Even if cost parity with conventional vehicles is achieved or prices are subsidized as EPA suggests, fleets will consider a variety of other factors outside of the manufacturer's control when making purchasing decisions. [EPA-HQ-OAR-2022-0985-1555-A1, p. 40]

80 See, e.g., Proposed Rule, 86 Fed. Reg. 26,001.

The statistics included in the DRIA highlight that despite available supply, demand remains a barrier for ZEV adoption. As EPA notes, the EIA's 2022 AEO estimated that BEV and FCEV sales made up less than 1 percent of Class 4-6 sales and less than 0.1 percent of Class 7-8 sales in 2021,81 despite manufacturers offering over 150 heavy-duty BEV models in the same year.82 [EPA-HQ-OAR-2022-0985-1555-A1, p. 40]

81 See DRIA at 11 (citing EIA, AEO 2022, Table 49).

82 See id. at 44, Figure 1-8 (indicating HD electric trucks available in the U.S. by model year).

ZEV sales mandates alone will not drive transformation of the HD transportation sector.

ZEV sales mandates on their own will not drive transformation of the HD transportation sector. Rather, as CARB staff recognized in promulgating the ACT final rule, regulatory ZEV sales requirements can only be successfully implemented when balanced by regulatory policies to drive fleet demand.83 This is why CARB promulgated the ACF regulation in tandem with ACT: to require fleets to buy the ZEVs that ACT requires manufacturers to sell.84 [EPA-HQ-OAR-2022-0985-1555-A1, p. 40]

83 See CARB, Final Statement of Reasons, Advanced Clean Trucks Regulation (March 2021) at 246, available at https://ww3.arb.ca.gov/regact/2019/act2019/fsor.pdf (‘Staff recognizes that ZE fleet rules will be a key factor in ensuring fleet uptake of ZEVs to meet the targets established in the Resolution. Staff has begun the regulatory process for developing the ZE fleet rules with a goal of returning to the Board with a recommendation by the end of 2021.’).

84 Even CARB’s ACF fleet purchase mandates may not fully solve the problem of ensuring that ZEV technologies are adopted at rates consistent with the ZEV volumes that manufacturers are required to produce and sell under ACT. Indeed, it seems likely that the ACF-mandated phase-out of ICE vehicles in drayage applications in California will drive the majority of Class 8 ZEV demand in the earlier years of ACF implementation, as ‘high priority’ and government fleets utilizing the Milestone Path compliance options will have continued flexibility to use ICE vehicles and may not purchase significant volumes of heavier ZEVs early in the program.

In addition to ACF, a number of other California programs serve to require fleets to purchase commercial ZEV products. As examples, CARB’s Innovative Clean Transit regulation requires transit agencies to purchase ZEVs beginning this year and ramps to 100% ZE purchases in 2029.85 CARB’s Zero-Emission Airport Shuttle Bus regulation requires public and private airport shuttle bus operators transition to fully ZEV fleets by 2035.86 California AB 739 requires state-owned fleets to purchase 15% ZEVs at or over 19,000 pounds (lbs.) gross vehicle weight rating (GVWR) starting in 2026, increasing to 30% by 2030.87 The SCAQMD Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program requires warehouses to offset emissions from truck trips to and from their facilities, including through ZEV purchases and/or ZEV infrastructure installation.88 California has in place a number of other incentive programs for ZEV adoption, including the crediting provisions of the Low Carbon Fuel Standard (LCFS)89 and the San Pedro Bay Ports 2017 Clean Air Action plan, which phases in a requirement that trucks entering the ports be ZEVs or compliant with the CARB low-NOx Omnibus Rule or pay a fee.90 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 40-41]

85 See 13 CCR 2023 et seq.

86 See 17 CCR 95690.1 et seq.

87 Cal. Pub. Res. Code 25722.11.

88 See SCAQMD Rule 2305.

89 See 17 CCR 95483(c) (allowing credits to be generated by providers of electricity with a low carbon-intensity that is used as a transportation fuel). See also 17 CCR 95481(150) (defining ‘transportation fuel’ as any fuel used or intended for use as a motor vehicle fuel or for transportation purposes in a non-vehicular source) (emphasis added).

90 See San Pedro Bay Ports, Clean Air Action Plan 2017 (November 2017) at 38, available at https://cleanairactionplan.org/download/205/2017-caap-documents/4984/final-2017-caap-update.pdf.

Without similar supporting policies and sufficient drivers to spur fleet uptake, EPA cannot expect to achieve the ZEV adoption rates projected in the Proposed Rule and certainly cannot approach the ZEV penetration rates that CARB expects under ACT, which rely on a suite of fleet-facing policies to drive demand. Simply stated, ZEV mandates placed on manufacturers will not by themselves influence demand, thus it would be inaccurate for EPA to assume that the imposition of its regulatory requirements based on projected sales will necessarily promote HD ZEV market uptake. [EPA-HQ-OAR-2022-0985-1555-A1, p. 41]

Manufacturers' aspirations should not be used by EPA as a basis for projecting future consumer uptake.

As EPA notes in the Proposed Rule, DTNA has set its own ZEV sales goals and benchmark dates, evincing the Company's strong support for the ZEV transformation.91 It is common for companies to state such aspirational goals to guide their commitments to sustainable product development. However, it is important that these statements are understood in their full context and not used for purposes that were unintended. Use of the Company's statements as the basis for Agency projections of future uptake of certain products by customers in the commercial vehicle market, which DTNA cannot accurately predict or control, is one such unintended purpose. [EPA-HQ-OAR-2022-0985-1555-A1, p. 41]

91 See, e.g., Proposed Rule, 88 Fed. Reg. at 25,941, notes 115, 116.

With regard to the specific goals misattributed to DTNA in the Proposed Rule, the ambition to reach 60% ZEV sales by 2030 was stated by Martin Daum, Board Chair and CEO of DTNA's parent company Daimler Truck Holding (DTG) AG's Board Chair and CEO, during the 2022 IAA Transportation Trade Fair in Hanover, Germany and referred to a target for sales in Europe.92 In these remarks (as well as in many others that preceded and followed), Mr. Daum advocated for the complementary and necessary infrastructure for both battery electric and hydrogen-powered vehicles, to be established concurrent with the growing portfolio of alternative-powered vehicles offered by the Company and its peer manufacturers. Specifically, he called on 'all stakeholders [to] join together to work on it on all levels at the same time—on energy generation, energy distribution and even the physical points where the vehicles recharge.'93 This dynamic must be present in the United States, and on both continents, DTG is making considerable investment to hasten the infrastructure buildout and provide the necessary conditions for ZEV operability and, ultimately, market success.[EPA-HQ-OAR-2022-0985-1555-A1, pp. 41-42]

92 See DTNA, 'Our vision of leading sustainable transportation' (Sept. 18, 2022), available at https://www.daimlertruck.com/newsroom/ceo-news/our-vision-of-leading-sustainabletransportation#:~:text=At%20Daimler%20Truck%2C%20we%20are,demanding%20long%2Dhaul%20use%20cases ('By 2030 we expect our zero-emission vehicles to account for up to 60 percent of our total sales in Europe.').

93 Id.

But manufacturers cannot force this transition on their own. In addition to the necessities of ample support infrastructure and a full portfolio of HD ZEV product offerings, ZEV operating costs must provide an advantageous business model for customers. Business profitability is a key consideration for fleets when procuring HDVs for their commercial transportation needs. If the costs of operation greatly exceed profitability, customers will be disincentivized to purchase these vehicles. The so-called 'transformation equation' of available ZEVs, ubiquitous infrastructure for refueling and/or recharging, and a positive TCO, is one that Mr. Daum and other senior executives of both DTG and DTNA have routinely pointed to as being necessary to achieve the shared goal of HD ZEV market acceptance. [EPA-HQ-OAR-2022-0985-1555-A1, p. 42]

While DTG and DTNA aim to achieve their stated goals, success is ultimately determined by myriad market forces greater than manufacturers alone can control. It is misleading for the Agency to extrapolate from a stated goal the forgone conclusion that such a goal will be achieved, particularly where, as here, it is taken out of context. [EPA-HQ-OAR-2022-0985-1555-A1, p. 42]

Varying levels of state policy support will reduce ZEV adoption rates in some states. The Proposed Rule focuses only on state policies that support ZEV market penetration but fails to account for the growing number of state policies that do the opposite, which invariably will reduce ZEV adoption rates in certain areas of the country and could also inhibit the nationwide build-out of necessary ZEV infrastructure. As examples: [EPA-HQ-OAR-2022-0985-1555-A1, p. 43]

- Wyoming. Earlier this year, a resolution was introduced in the Wyoming Senate to express support for phasing out the sale of new electric vehicles in Wyoming by 2035.99 According to the resolution, widespread use of EV's is 'impracticable' in Wyoming, due to 'vast stretches of highway' and 'a lack of electric vehicle charging infrastructure.'100 The resolution also cites critical mineral scarcity and battery end-of-life issues, as well as deleterious impacts on Wyoming's oil and gas industry from widespread EV deployment. The resolution 'encourages Wyoming's industries and citizens to limit the sale and purchase of new electric vehicles in Wyoming, with a goal of phasing out the sale of new electric vehicles in Wyoming by 2035.'101 While the bill did not make it past committee review, and has been widely characterized as a political messaging bill, it is an example of anti-ZEV advocacy in some states that should be taken into account by EPA. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 43-44]

  99 See Wyoming Senate Joint Resolution No. SJ0004 (introduced January 12, 2023).

  100 Id.

  101 Id.

- North Carolina. As an additional example of state-level political opposition to CO_2 emission-reduction initiatives (in the transportation and utility sectors), an appropriations bill was recently passed in the North Carolina Senate that would prohibit State adoption of cap-and-trade requirements for utility-sector CO_2 emissions, as well as any state-specific new motor vehicle emission standards, including ZEV sale or purchase mandates (notwithstanding the fact that North Carolina was a signatory to the HD ZEV MOU, committing it to certain measures to promote HD ZEV through regulatory and other actions).102 [EPA-HQ-OAR-2022-0985-1555-A1, p. 44]

  102 See North Carolina House Bill 259 (passed and engrossed for consideration by the State's House of Representatives on May 18, 2023), available at https://www.ncleg.gov/BillLookUp/2023/hb259.

- Alternative Fuel Vehicle Fees and Per-Mile Taxes. A number of states seek to recoup gasoline tax revenues that are declining with increased uptake of alternative-fuel vehicles by imposing extra registration fees or per-mile taxes on drivers of alternative fuel vehicles.103 Examples include: [EPA-HQ-OAR-2022-0985-1555-A1, p. 44]

103 See National Conference of State Legislatures, 'Special Fees on Plug-In Hybrid and Electric Vehicles' (March 27, 2023), available at https://www.ncsl.org/energy/special-fees-on-plug-in-hybrid-and-electric-vehicles.

- Georgia. Repealed its EV tax credit and enacted a new 'Alternative Fuel Vehicle Fee,' which is $316.54 for commercial vehicle registrations that begin or have a renewal date between July 1, 2022 and June 30, 2023.104 These fees, which apply to all electric vehicles registered in the state and all plug-in hybrid-electric or flex-fuel vehicles that elect an alternative fuel vehicle license plate, are not charged for registrations of comparable conventional vehicles. [EPA-HQ-OAR-2022-0985-1555-A1, p. 44]
- Oklahoma. Recently enacted a weight-based electric vehicle fee that requires vehicle owners seeking to register EVs in the State to pay—in addition to normal registration fees—a weight-based fee. This fee is $1,687 for Class 7 and 8 vehicles.105[EPA-HQ-OAR-2022-0985-1555-A1, p. 44]

105 68 OK Stat 6511 (2022).

- Oregon. Oregon (another signatory to the Multi-State HD ZEV MOU), like Oklahoma and a number of other states, charges additional registration fees for electric vehicle registration in the State. As of January 1, 2023, electric vehicles are subject to a $115 registration fee in Oregon, several times higher than the fees charged for conventional fuel vehicles.106 In addition, earlier this year a measure was introduced in the Oregon legislature to charge a mileage tax on electric vehicle use in the state roughly comparable to the gasoline tax charged to consumers of conventional fuels.107 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 44-45]

106 See O.R.S. 803.422(3)(d)

107 See Oregon Senate Bill 945 (2023 Regular Session), available at https://olis.oregonlegislature.gov/liz/2023R1/Measures/Overview/SB945.

These state-level initiatives undermine the notion that there is widespread or uniform state political support for ZEV proliferation, even among states that joined the multi-state HD ZEV MOU such as North Carolina and Oregon. To account for these types of initiatives and their potential to impede ZEV uptake across the United States, EPA should project more conservative technology adoption rates than it has in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

DTNA proposes more reasonable adoption rate projections and a revised standard-setting methodology to account for infrastructure availability. [EPA-HQ-OAR-2022-0985-1555-A1, p. 61]

After the three-year stability period discussed above (for MY 2027-2029), DTNA proposes that EPA adopt more conservative Phase 3 CO_2 standards starting in MY 2030 based upon more reasonable ZEV adoption rate projections and a revised standard-setting methodology, as described below:

- More Realistic ZEV Adoption Rate Projections. The Truck and Engine Manufacturers Association (EMA) undertook a detailed analysis of the HD TRUCS methodology and revised the tool to include some costs that EPA overlooked, including FET, state sales tax, and the insurance cost differential. Furthermore, EMA revised some costs DTNA believes EPA is inaccurately projecting, including battery cost, fuel cell stack cost, the learning curve, EVSE costs, and the cost of electricity including grid updates. The results of this analysis are in EMA's comments submitted to this rulemaking docket. In some cases, DTNA believes EMA's HD TRUCS inputs are conservative, but nonetheless, this analysis highlights the vulnerability of EPA's projection-based stringency setting methodology. Using EPA's adoption rate schedule based on payback period (not modified to more realistically reflect purchaser behavior as DTNA recommends), EMA found the resulting stringency to be reduced by more than 50% in some categories, simply by adjusting eight inputs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 61]

- Because of the uncertainties, inaccuracies, and demonstrated sensitivity informing EPA's proposed ZEV adoption rates—including TCO calculations, application suitability, customer adoption rates, and availability of infrastructure—DTNA submits that the more realistic technology adoption rates in Table 1 below more accurately reflect the current state of the commercial ZEV market and should be used to calculate Phase 3 CO_2 standard stringency levels starting in MY 2030 in lieu of the rates presented in Tables ES-3 and II-24 of the Proposed Rule. Even though DTNA believes that EPA should not increase CO_2 standard stringency until 2030, as discussed above, the Company provides its projected ZEV adoption rates for these years to provide a more realistic picture of anticipated market developments over the timeframe covered by the Proposed Rule. This adoption rate schedule reflects the Company's analysis of the ZEV market, including that:
    - ZEV adoption for the HHD vocational vehicle category will not occur until 2033. The HHD vocational category includes diverse applications and vehicle configurations that will require additional research and development time for body builders to produce electrified solutions, in addition to manufacturers' ZEV product development.
    - ZEV adoption for the HHD vocational vehicle category will not scale faster than in the MHD vocational vehicle category starting in MY 2030, contrary to EPA's Table ES-3, as HHD vocational applications are more challenging to electrify than MHD vocational applications..
    - ZEV adoption for Long-Haul Sleeper Cab Tractors will likely not begin until 2033 at the earliest, when FCEV or hydrogen combustion may be viable product solutions. A nationwide network of HD-accessible infrastructure must exist in order to enable long-haul applications. It will likely be a minimum of ten years before this infrastructure exists, with substantial federal support required. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 61-62] [Refer to Table 1 on p. 62 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

132 * Given the Company's position that no new Phase 3 CO_2 standards should apply until MY 2030, DTNA projects ZEV adoption rates for MY 2027-2029 for purposes of completeness and to provide a more realistic picture of anticipated market developments over the timeframe covered by the Proposed Rule—and not as a basis for suggesting that new emission standards should be established for these MYs.

- CO2 Standard Tiers. EPA should set the Phase 3 CO2 emission standards, starting with MY 2030, in three-year tiers to reflect the product cycles manufacturers use to release products, rather than making annual incremental changes to their product lines. A three-year tier structure would also be consistent with the structure of EPA's Phase 2 CO2 standards and the principle of regulatory stability in CAA Section 202, making it more likely that the Phase 3 standards can be successfully implemented. [EPA-HQ-OAR-2022-0985-1555-A1, p. 62]
- Infrastructure Scalar. As EPA acknowledges in the Proposed Rule, significant ZEV penetration will be necessary to ensure that compliance with the proposed CO2 standard stringency levels is feasible.133 Because ZEV adoption rates depend upon the availability of charging and fueling infrastructure,134 the rate of infrastructure development—which is entirely outside of the Agency's regulatory purview—will directly impact whether the Phase 3 CO2 standards are achievable. To address this issue, EPA should incorporate into its stringency calculation a scaling factor (or 'scalar'), which would be set as a ratio of the total installed HD-accessible ZEV charging and fueling capacity in the United States to the total amount needed to support EPA's project vehicle adoption rates for Phase 3 standard implementation. This scalar should be applied to the output of the adoption rate schedule derived from the HD TRUCS analysis, as explained in more detail below. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 62-63]

  133 See Proposed Rule, 88 Fed. Reg. at 26,014 ('EPA . . . anticipates most if not all manufacturers would include the averaging of credits generated by BEVs and FCEVs as part of their compliance strategies for the proposed standards.').

  134 Indeed, EPA should recognize that payback periods and vehicle suitability alone are not sufficient to predict purchasing behaviors. If customers are unable to charge or fuel their trucks, they will not buy them.

- Charging Capacity Scalar. Installed charging capacity is a more accurate measure of the sufficiency of EV infrastructure than the number of chargers alone (and thus should be used as the basis for the proposed infrastructure scalar), as charging needs will vary depending on operational characteristics including dwell time and energy usage, as well as the fact that multiple vehicles can share charging equipment, where charging speeds and operations allow. For each vehicle proposed in HD TRUCS, an average power can be assumed and needed installed capacity extrapolated. As explained above, DTNA estimates that the total installed charging capacity that will be required for EPA's projected BEV volumes for 2027 – 2032 to be approximately 45 gigawatts, which should be used throughout the Phase 3 rule implementation period as the denominator for determining the charging capacity scalar. [EPA-HQ-OAR-2022-0985-1555-A1, p. 63]
- The numerator for this scalar should correspond to total currently installed HD-accessible charging capacity in the United States. There is no centralized data source for determining this number, but our research reveals that it is a very small number. Thus, DTNAs estimates that an appropriate charging infrastructure scalar is currently in the 0 - 0.05 range, as very little public and private HD-accessible infrastructure exists today. As discussed below, this scalar would have to be regularly reviewed and updated as charging infrastructure develops. With substantial policy support for HD BEV infrastructure buildout, this scalar could reach a value of 1 during the Phase 3 program, which would reflect that installed charging capacity is at 100% of that needed to support the adoption rates upon which Phase 3 standards are based. Without the coordinated regulatory,

legislative, and private sector efforts described in these comments, however, this scaling factor is likely to remain significantly lower. [EPA-HQ-OAR-2022-0985-1555-A1, p. 63]

- Hydrogen Fueling Capacity Scalar. EPA should base the hydrogen fueling infrastructure scalar on the build out of HD-accessible hydrogen fueling stations along the National Highway Freight Network (NHFN). Using an average distance of 100 miles between each station, consistent with FHWA's AFC designation criteria, approximately 601 hydrogen stations must be available to have sufficient buildout along the 60,110 miles of the NHFN.135 EPA states there are currently approximately 130 public and private hydrogen fueling stations nationwide based on data from the DOE Alternative Fuels Data Center (AFDC), suggesting a maximum hydrogen infrastructure scaling factor of 0.22 (the ratio of the 130 current hydrogen fueling stations to the 601 stations needed). [EPA-HQ-OAR-2022-0985-1555-A1, pp. 63-64]

135 See FHWA, National Highway Freight Network, https://ops.fhwa.dot.gov/Freight/infrastructure/nfn/index.htm.

- This scaling factor may even be overly generous, given that AFDC data does not indicate 1) whether or not the station is HD-accessible with pull through lanes and wide ingress and egress, or 2) whether the hydrogen is in gaseous or liquid form. Most hydrogen stations today provide gaseous hydrogen, but HDVs are likely to require liquid hydrogen, requiring these stations to undergo upfitting to accommodate both fuels. Based on these two critical criteria, the current hydrogen infrastructure scalar is more likely in the 0 -.05 range. DTNA recommends EPA work with DOE to capture these criteria in the AFDC data for purposes of this infrastructure scalar, and to make fleets aware of where HD-accessible ZEV infrastructure can be located. [EPA-HQ-OAR-2022-0985-1555-A1, p. 64]
- Revised Standard-Setting Methodology. To account for the considerations set forth above and throughout these comments, DTNA proposes a revised methodology for calculating appropriate Phase 3 CO_2 standards starting with MY 2030, which is illustrated in Figure 9 below. Using this methodology, EPA would determine payback period and corresponding adoption rates using the schedules set forth in Section II.3.a of these comments and Table 1, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 64] [Refer to Figure 9 on p. 64 of docket number EPA-HQ-OAR-2022-0985-1555-A1]
- EPA would then multiply the output of its 'ideal' ZEV adoption rates by an infrastructure scalar, discussed above, to generate infrastructure-adjusted ZEV penetration rates, which would form the basis for the Phase 3 CO_2 emission standards. This calculation methodology is designed to more accurately represent what fleets consider when purchasing a ZEV, namely whether: 1) a ZEV is suitable for the fleet's application; 2) the ZEV TCO is better than the ICE TCO within the fleet's trade cycle; 3) there is infrastructure available to use the ZEV. All three of these must be affirmative for fleets to adopt HD ZEVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 64]

The Proposed Alternative Standards Are Unrealistic.

As explained elsewhere in these comments, ZEV sales mandates alone will not drive the ZEV transformation in the medium- and heavy-duty commercial transportation market. For this reason, and the other discrepancies and uncertainties discussed, DTNA believes EPA's Alternate Proposal is unrealistic and unachievable. Furthermore, DTNA believes EPA cannot expect ZEV penetration rates that approach California's ACT ZEV penetration rates without a holistic regulatory approach that addresses infrastructure, TCO, and fleet demand. Similarly, manufacturers' aspirational ZEV goals should not be used as a basis for Agency projections of future uptake of certain products, as manufacturers are unable to force market transformation simply by offering ZEV products for sale. [EPA-HQ-OAR-2022-0985-1555-A1, p. 66]

Timeframe for Remedying End-of-Year CO2 Credit Deficits.

DTNA requests that EPA consider extending the timeframe for manufacturers to remedy end-of-year CO2 credit deficits in 40 C.F.R. 1037.745(a) from 3 to 5 MYs for all regulatory subcategories of vehicles. As noted in these comments, there is substantial uncertainty with respect to near- and long-term development of the HD ZEV market and the pace at which HD-accessible fueling infrastructure will proliferate in the coming years. By extending the timeframe for manufacturers to balance out credit deficits, EPA could alleviate some of the impacts of this uncertainty on manufacturer compliance plans—allowing manufacturers extra time to balance credits and deficits if ZEV uptake is slower than anticipated. The Agency would have assurance that this additional flexibility would not cause emission increases, as it would still have oversight of manufacturer plans to eliminate credit deficits within a specified timeframe under Section 1037.745(d). [EPA-HQ-OAR-2022-0985-1555-A1, p. 76]

EPA Request for Comment, Request #1: We are requesting comment on an alternative set of CO2 standards that would more gradually increase in stringency than the proposed standards for the same MYs. EPA also requests comment on setting GHG standards starting in MYs 2027 through 2032 that would reflect: values less stringent than the lower stringency alternative for certain market segments, values in between the proposed standards and the alternative standards, values in between the proposed standards and those that would reflect ZEV adoption levels (i.e., percent of ZEVs in production volumes) used in California's ACT, values that would reflect the level of ZEV adoption in the ACT program, and values beyond those that would reflect ZEV adoption levels in ACT such as the 50- to 60-percent ZEV adoption range represented by the publicly stated goals of several major original equipment manufacturers (OEMs) for 2030.

- DTNA Response: In Section II of its comments on the Proposed Rule, DTNA provides significant comment on EPA's proposed CO2 standard stringency levels, as well as its alternative view of how EPA could set Phase 3 standard stringency levels to ensure feasibility. DTNA also explains why the proposed alternative CO2 standards are unrealistic. [EPA-HQ-OAR-2022-0985-1555-A1, p. 158]

EPA Request for Comment, Request #46: We welcome comment on how to consider this ACT in our proposed approach or in other approaches.

- DTNA Response: EPA's approach in the Proposed Rule, which does not specifically account for increased ZEV penetration based on the ACT requirements, is the most appropriate approach when setting Phase 3 CO2 emission standard stringency levels. Ultimately, EPA's proposed Phase 3 and California's ACT rulemaking processes both intend to model customer purchasing behavior, but regulate manufacturer sales. California's ACT regulation cannot force customers to buy Zero Emission MHDVs, and customers will not buy products which do not meet their operational needs, cannot reliably be refueled, or do not lead to a positive return on investment. Additionally, while other states have opted into California's ACT provisions, not all other states have the same complete ecosystem of supporting regulations, and it is not clear how many ZEVs will be sold in each state. Since the ACT cannot force customer sales of ZEVs, and it is unclear how many nationwide ZEVs will be sold as a result of the ACT, EPA should not increase the proposed emission standard stringency levels to account for ACT requirements. Even without considering any impact from the ACT, the ZEV uptake projections in the Proposed Rule are overly optimistic, as discussed in Section II.B.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 165-166]

EPA Request for Comment, Request #78: We request comment on this analysis for the alternative set of CO2 standards.

- DTNA Response: See DTNA Response to Request # 1, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 173]

EPA Request for Comment, Request #79: We also are seeking comment on a more stringent set of emission standards that would be based on higher ZEV adoption rates on a national level around the same levels as the adoption rates included in the California ACT rule.

- DTNA Response: See DTNA Response to Request # 1, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 173]

Organization: Delek US Holdings, Inc.

I. EPA's Proposed Rule is Based on Flawed Market Projections.

EPA's proposed standards are based on ZEV adoption rates that are unrealistic and unsupported by any concrete evidence. Because higher rates of ZEV adoption are essentially required for engine manufacturers to even come close to meeting the proposed standards, EPA projects adoption rates for model year ("MY") 2027 through MY2032 will be: 22–57% for light HD vocational vehicles, 19–35% for medium HD vocational vehicles, 16–40% for heavy HD vocational vehicles, and 0–25% for sleeper cab tractors.3 These MY27 estimates are essentially required, despite the reality of the current ZEV market: for MY21, only 0.2% of all HD vehicles certified by the Agency were electric.4 But EPA does little to acknowledge this reality, much less account for the true feasibility of ZEV penetration into the HD vehicle market. [EPA-HQ-OAR-2022-0985-1561-A1, p. 2]

3 Proposed Rule at 25,932 (Table ES–3).

4 Proposed Rule at 25,940.

Rather, EPA's Proposed Rule is based on the flawed notion that vague corporate goals are sufficient to prop up the incredulously stringent standards. EPA relies, in part, on the "50- to 60-percent ZEV adoption range represented by the publicly stated goals of several major [manufacturers] for 2030,"5 but these broad and general statements are just that—goals. In reality, the U.S. Department of Energy forecasts ICE-power cars will continue to dominate U.S. sales through 2050.6 And truck fleets take approximately 25 years to turn over.7 Thus the transition to ZEVs will be, and must be, gradual—regardless of regulatory mandates—and much more gradual than EPA's anticipated growth from 0.2% to upwards of 50% in a mere seven years. EPA's proposed standards must better account for these real market conditions and, at the very least, propose more feasible and realistic GHG emissions standards reflective of actual, practicable ZEV adoption rates. [EPA-HQ-OAR-2022-0985-1561-A1, p. 3]

5 Proposed Rule at 25,929.

6 Notably, adoption rates of light duty electric vehicles are higher than HD electric vehicles and the U.S. Energy Information Administration ("EIA") predicts that the global light-duty electric vehicle fleet will grow to only 31% by 2050, indicating ICE vehicles will continue to dominate global sales through at least that time. EIA, "EIA projects global conventional vehicle fleet will peak in 2038" (Oct. 26, 2021) available at https://www.eia.gov/todayinenergy/detail.php?id=50096.

7 Virginia McConnel and Benjamin Leard, RESOURCES FOR THE FUTURE, "Progress and Potential for Electric Vehicles to Reduce Carbon Emissions" (Dec. 8, 2020) available at https://www.rff.org/publications/reports/potential-role-and-impact-evs-us-decarbonization-strategies/#:~:text=Passenger%20vehicle%20fleets%20take%20approximately,important%20in%20the%20following%20decades.

Organization: District of Columbia Department of Energy and the Environment (DOEE)

National Heavy-duty Greenhouse Gas Standards

DOEE is a signatory of the Medium- Heavy-duty Zero Emission Vehicle Memorandum of Understanding (MHD ZEV MOU) and is therefore committed to the goals outlined in the MHD ZEV MOU. Following the MHD ZEV MOU agreed to by the signatories, Northeast States For Coordinated Air Use Management (NESCAUM), in collaboration with the signatories, developed an action plan to show a path forward for states to achieve the goals of the MHD ZEV MOU. The plan detailed, "Regulatory programs requiring manufacturers to sell increasing percentages of zero-emission trucks and buses, such as California's Advanced Clean Trucks (ACT) regulation, are one of the most effective tools available to rapidly advance the market for MHD ZEVs." [EPA-HQ-OAR-2022-0985-1620-A1, p. 1]

The simplest path forward to meeting the goals of the MHD ZEV MOU would be if EPA were to implement a national equivalent rule, which would avoid the problems of having 18 separate agencies managing their own ACT implementations and the problems of vehicle registrations being moved to non-MHD ZEV MOU states. Of course, we understand EPA may not adopt the ACT regulations exactly. EPA's final rule should set both tractor and vocational standards that mirror the ZEV penetration rate expected due to ACT rule for model years 2027 through 2032. [EPA-HQ-OAR-2022-0985-1620-A1, p. 2]

While some states are pursuing the adoption of ACT rule through their own rulemaking process. Not all states are following California's lead. The lack of national adoption of the CA ACT rule presents a challenge for the District as many heavy-duty vehicles on District roads are registered out of state. To develop a rough estimate of the percentage of heavy-duty vehicles that travel in the District, while not being registered in the District we looked data from the International Registration Plan (IRP).1 The District has a large number of private, out of state, heavy-duty vehicles operating in the District on a daily basis. Even if not registered in the District, there are a large number of heavy-duty vehicles registered in our neighboring jurisdictions that travel to the District for deliveries, bus tours, etc. This is a clear example of the importance of a motor vehicle solution to reduce greenhouse gas emissions in line with the needs dictated by climate science through federal action. [EPA-HQ-OAR-2022-0985-1620-A1, p. 2]

1 The International Registration Plan facilitates registration reciprocity to provide each member jurisdiction a share of the revenue from vehicle registration fees based on distance traveled.

To achieve the necessary levels of greenhouse gas reductions in the District, DOEE finds that EPA should set its heavy-duty greenhouse gas standards at “values that would reflect the level of ZEV adoption used in California’s ACT program” from model years 2027 to 2032. [EPA-HQ-OAR-2022-0985-1620-A1, p. 2]

Organization: Eaton

1. Implementing one national standard is critical for the transportation industry.

The EPA has an opportunity to set nation-wide GHG emissions regulations. For these to be effective, it is critically important that they satisfy needs across the nation to avoid fragmentation in the market due to more stringent local or state restrictions. A successful example is the recent low-NOx rule that achieve a balance of all stakeholders’ needs. [EPA-HQ-OAR-2022-0985-1556-A1, p. 1]

The absence of a single national standard carries serious risks and introduces uncertainties and confusion in the market, ultimately stifling innovation, long-term investment, and the potential for economies-of-scale. This possibility is realistic, as a similar situation happened over the past five years in the light-duty space. In that situation, part of the market decided to adopt more stringent GHG standards, while another part followed less stringent federal standards, introducing significant uncertainty in investment strategies of suppliers like Eaton. Thankfully, the EPA addressed these disparities in its 2022 LD rule. [EPA-HQ-OAR-2022-0985-1556-A1, pp. 1-2]

Besides the uncertainty in the supplier base investments, different emissions levels in some parts of the nation creates the risk of a patchwork of local rules that in effect will lead to disruption in freight with unpredictable effects on the economy. Therefore, it is critically important to ensure congruence through negotiations and limit-setting between the national standard and other state-level actions such as the Advanced Clean Truck and Advanced Clean Fleets. [EPA-HQ-OAR-2022-0985-1556-A1, p. 2]

2. Long term regulatory certainty allows the transportation industry to continue to invest in innovation and product development, and deploy needed capital, while ensuring continued US global technology leadership, with the associated economic and jobs benefits

Emissions levels must be set such that societal needs for air quality, including GHG and future non-attainment, are in fact achieved without the need of additional local restrictions or short-term changes. [EPA-HQ-OAR-2022-0985-1556-A1, p. 2]

The transportation industry needs long term regulatory certainty to enable investments in both Low GHG/low NOx and Zero Emissions technologies and allocate capital to bring these to the market. A standard that does not resolve the long-term emissions needs would insert uncertainty and thus inhibit the bold investments that are needed. For example, the current GHG set of rules, in effect from 2014, drove significant benefits, technology and product cost-out, all possible because these were setting long term and societal-acceptable stringencies. We recommend the Agency apply the same approach to the proposed rule, and fully support its long-term horizon. [EPA-HQ-OAR-2022-0985-1556-A1, p. 2]

Organization: Edison Electric Institute (EEI)

EPA's Proposed Rule is of critical importance to EEI members as they continue to lead this clean energy transformation. A HDV Phase 3 rule that supports the continued electrification of the transportation sector and leverages the existing investment in the electric system and the electric sector's ongoing clean energy transformation will provide both environmental benefits and send appropriate signals to support the continued buildout of infrastructure to support increased electrification. [EPA-HQ-OAR-2022-0985-1509-A2, p. 6]

Organization: Energy Innovation

I. THE U.S. HEAVY-DUTY VEHICLE (HDV) SECTOR MUST ADOPT ZERO-EMISSION VEHICLES QUICKLY TO REDUCE THE SECTOR'S OUTSIZED CONTRIBUTION TO CLIMATE CHANGE AND AIR POLLUTION. STRINGENT TAILPIPE STANDARDS FOR NEW VEHICLES ARE THE MOST EFFECTIVE TOOL TO ACHIEVE THIS GOAL.

We appreciate and agree with the EPA's thorough articulation of the sizable impact HDVs have on climate and public health. The transportation sector is the largest U.S. source of GHG emissions as of 2021,1 and HDVs are the second-largest contributor within the sector at 25 percent.2 HDVs also generate 59 percent of ozone- and particle-forming NOx emissions and 55 percent of particle pollution (including brake and tire particles).3 Yet HDVs make up less than 10 percent of on-road vehicles.4 [EPA-HQ-OAR-2022-0985-1604-A1, p. 3]

1 "Fast Facts on Transportation Greenhouse Gas Emissions," United States Environmental Protection Agency (U.S. EPA), Green Vehicle Guide, 2021, https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.

2 U.S. EPA, "Proposed Rules: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles, Phase 3 (EPA–HQ–OAR–2022–0985; FRL–8952–01– OAR)," Federal Register 88, no. 81 (April 27, 2023), https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf. 25952.

3 "Delivering Clean Air: Health Benefits of Zero-Emission Trucks and Electricity" (American Lung Association, 2022), https://www.lung.org/getmedia/e1ff935b-a935-4f49-91e5-151f1e643124/zero-emission-truck-report.pdf.

4 Peter Johnson, "From EV School Buses to Tractors, US Seeks Zero-Emission Heavy-Duty Transport by 2040," Electrek, November 18, 2022, https://electrek.co/2022/11/18/us-seeks-zero-emission-heavy-duty-transport-by-2040/.

The inherently slow stock turnover challenge in the HDV sector means that new vehicles—and the standards they are built to in the coming years—will have long-lasting effects on the vehicle fleet 10 and even 20 years from now. [EPA-HQ-OAR-2022-0985-1604-A1, p. 3]

Other research from the University of California, Berkeley, Grid Lab, and Energy Innovation, 2035 2.0: Plummeting Costs and Dramatic Improvements in Batteries Can Accelerate Our Clean Transportation Future (April 2021) evaluated the technical and economic feasibility (and associated impacts and benefits) of achieving a future scenario where electric vehicles make up 100 percent of new sales of all vehicles by 2035, combined with a 90 percent clean grid (called the DRIVE Clean Scenario).ii Compared with the No New Policy scenario (which was pre-IRA and BIL), the total transportation sector pollutant iii and carbon dioxide emissions reductions in the DRIVE Clean Scenario would reduce ground transportation sector CO2 emissions by 60 percent in 2035 and by 93 percent in 2050, relative to 2020 levels.7 See Figure 3. The DRIVE Clean Scenario would also avoid approximately 150,000 premature deaths and generate nearly $1.3 trillion in health and environmental savings through 2050.8 Figure [EPA-HQ-OAR-2022-0985-1604-A1, p. 5.] [See Figure 3, CO2 Emissions in the Transportation Sector, on page 5 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

ii In the Drive Rapid Innovation in Vehicle Electrification (DRIVE Clean) Scenario, EVs constitute 100 percent of new U.S. light-duty vehicle sales by 2030 as well as 100 percent of medium-duty vehicle and heavy-duty truck sales by 2035. The grid reaches 90 percent clean electricity by 2035. More details and full study findings are available at https://www.2035report.com/transportation/.

iii Namely, fine particulate matter, nitrous oxides, and sulfur oxides.

7 Amol Phadke et al., “2035 2.0: Plummeting Costs and Dramatic Improvements in Batteries Can Accelerate Our Clean Transportation Future” (Goldman School of Public Policy, University of California, Berkeley, GridLab, April 2021), https://www.2035report.com/transportation/downloads/, iv.

8 Phadke et al., iii.

The EPA notes that its proposed rule will help reduce GHG emissions up to 30 percent in 2055 and provide a cumulative emissions reduction of 18 percent between 2027 and 2055.9 See tables V-4 and V-5 from the proposed rule. [EPA-HQ-OAR-2022-0985-1604-A1, p. 5.] [See Tables V-4 and V-5 (from the Proposed rule), on page 6 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

9 U.S. EPA, “Proposed Rules,” 26042-3.

While the proposed rule is an improvement over the status quo, greater emissions reductions via higher rates of electrification in the HDV sector are needed for climate stability. To be technology-forcing and deliver substantial climate benefits above the baseline, federal standards would need to drive HDV electrification rates higher than 40 percent by 2030 to be compatible with a warming scenario of 2 degrees Celsius.10 [EPA-HQ-OAR-2022-0985-1604-A1, p. 6]

10 Peter Slowik et al., “Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States” (International Council on Clean Transportation and Energy Innovation, January 2023), https://energyinnovation.org/wpcontent/uploads/2023/01/Analyzing-the-Impact-of-the-Inflation-Reduction-Act-on-EV-Uptake-in-the-U.S..pdf. 16: “Buysse, Kelly, and Minjares (2022) find that a heavy-duty ZEV sales share of 46% by 2030 would be needed to be compatible with a scenario of 2 degrees Celsius”.

We recognize the EPA must balance many factors in its determination of these standards, including those that currently limit the uptake of ZEVs across different vehicle classes. Nonetheless, the climate crisis requires actions that push the HDV industry to go faster to achieve more meaningful reductions in GHGs through the adoption of all ZEVs, but primarily BEVs. The International Energy Agency also points to BEV sales as the key transportation metric for reaching net zero by 2050.11 [EPA-HQ-OAR-2022-0985-1604-A1, p. 6]

11 “Net Zero by 2050: A Roadmap for the Global Energy Sector,” May 2021, https://iea.blob.core.windows.net/assets/7ebafc81-74ed-412b-9c60-5cc32c8396e4/NetZeroby2050-ARoadmapfortheGlobalEnergySector-SummaryforPolicyMakers_CORR.pdf, 4.

Beyond their climate benefits, ZEVs eliminate harmful tailpipe pollutants that contribute to air pollution, diminish public health, and disproportionately adversely impact frontline communities, communities of color, and low-income communities.12 HDV tailpipe rules that allow compliance through the continued use of internal combustion engine (ICE) vehicles for another two decades will only further harm communities that already bear the burden of bad air quality from tailpipe emissions, and will only further delay the emissions reductions needed for climate stability. [EPA-HQ-OAR-2022-0985-1604-A1, p. 6]

12 “Disparities in the Impact of Air Pollution,” American Lung Association, April 20, 2020, https://www.lung.org/clean-air/outdoors/who-isat-risk/disparities.

The final rules adopted through this rulemaking will have an outsized impact on climate stability, human health, society, and future generations. The standards set forth in the final rule must be sufficiently stringent to expedite the shift away from polluting ICE vehicles, not just from a climate standpoint but also from a public health and equity standpoint. As noted throughout the proposed rule, the EPA is the agency with the statutory authority to promulgate the most stringent standards feasible.13 [EPA-HQ-OAR-2022-0985-1604-A1, p. 6]

13 U.S. EPA, “Proposed Rules,” 25948-51.

Organization: Environmental Defense Fund (EDF)

Environmental Defense Fund (EDF) respectfully submits the following comments in support of Environmental Protection Agency’s (EPA) Proposed Rule, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles, 88 Fed. Reg. 25926 (April 27, 2023) (“Proposal” or “Proposed Standards”). These comments highlight the importance and urgency of finalizing health protective standards by the end of the year that ensure deep reductions in pollution by leveraging rapid deployment of zero-emission technologies. Near-term emissions reductions are vital to mitigating the effects of climate change and to protecting public health, especially the health of low-income communities and communities of color, which are disproportionately impacted by transportation air pollution. [EPA-HQ-OAR-2022-0985-1644-A1, p. 1]

EPA’s proposal is a vital step forward toward addressing the largest source of greenhouse gas emissions in the United States. EDF urges EPA to finalize protective heavy-duty standards, consistent with and building from the proposals the agency has put forward, that account for the progress already underway thanks to manufacturer and fleet investments and commitments, federal spending, and state policies like the Advanced Clean Trucks (ACT) rule. These standards must help to ensure we are on a path to zero tailpipe emissions from new vehicles by 2035. [EPA-HQ-OAR-2022-0985-1644-A1, p. 1-2]

EPA’s primary proposal is eminently feasible, and in fact, reflects a conservative assessment of zero-emitting vehicle (ZEV) deployment in the coming years. The historic investments in the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL) have rapidly accelerated an American electric vehicle manufacturing renaissance, dramatically advanced purchase price parity for heavy-duty ZEVs, and accelerated already declining costs for vehicles at the same time. Leveraging these trends, some manufacturers and fleets have already made commitments exceeding the levels of ZEV deployment EPA projects in this rule and leading states have continued to adopt California’s ACT rule. We believe all of these factors support even stronger standards that help deliver nationwide levels of ZEVs consistent with the ACT.1 [EPA-HQ-OAR-2022-0985-1644-A1, p. 2]

1 See, e.g., 88 Fed. Reg. 26,007 (seeking comment on standards that help ensure ZEV levels consistent with the ACT).

a) Feasibility, Cost, and Lead Time Support Final Standards Consistent with ACT Levels of ZEV Deployment Nationwide

Emission standards at a level that will deliver ZEVs nationwide comparable to the ACT standards are consistent with EPA's obligations under Section 202 of the Clean Air Act to consider the cost of compliance and to provide adequate lead time to permit the development of requisite technology. [EPA-HQ-OAR-2022-0985-1644-A1, p. 15]

i. Independent Analyses support the feasibility and declining costs of ZEVs

The feasibility and cost-effectiveness of final standards consistent with the ACT rule is clearly evidenced by a large and growing body of analyses that show the declining upfront costs of electrification and the significant cost savings over time. A February 2022 study conducted by Roush Industries for EDF evaluated both the upfront and ongoing costs of electrifying several types of medium and heavy-duty vehicles that are commonly used in urban areas (including Class 8 transit buses, Class 7 school buses, Class 3–7 shuttles and delivery vehicles, and Class 8 refuse haulers).31 These vehicles tend to be concentrated in urban areas where average trip distances are shorter and health and pollution impacts are of most concern, making them particularly important opportunities for deeper electrification. This rigorous, ground-up study found that, when considering up front purchase price alone, by 2027 electric freight trucks and buses will be less expensive than their combustion engine counterparts in nearly all categories. All of these electric vehicle categories will also be less expensive on a total cost of ownership basis producing substantial savings in the same timeframe. Importantly, the study was conducted prior to the passage of the IRA and so does not consider the important impacts those investments will have in further lowering costs (described in the next section). [EPA-HQ-OAR-2022-0985-1644-A1, p. 15-16]

31 Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush Industries for Environmental Defense Fund. See http://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf. (Attachment H).

The 2022 Roush study developed projections for upfront costs and total cost of ownership for electric vehicles in the 2027 to 2030 timeframe and compared the costs of equivalent internal combustion vehicles that meet EPA Greenhouse Gas Phase 1 and 2 rules, as well as California Low NOx regulations.32 The study determined the total cost of ownership for all financial aspects of ownership, including vehicle purchase cost of either an internal combustion engine or electric freight truck or bus, fuel or energy costs, charging or fueling infrastructure costs, maintenance costs, and vehicle mid-life refresh if applicable. It focused exclusively on the direct financial costs and savings related to vehicle ownership and did not include the substantial health and welfare benefits associated with switching to electric trucks. [EPA-HQ-OAR-2022-0985-1644-A1, p. 16]

32 76 Fed. Reg. 57106 (Sept. 15, 2011); 81 Fed. Reg. 73478 (Oct. 25, 2016); California's Heavy-Duty Engine and Vehicle Omnibus Regulation (Dec. 22, 2021).

The study found decreasing upfront costs for electric freight trucks and buses, driven largely by steeply decreasing battery costs. As shown in Table 1, the analysis also concluded that for vehicles purchased in 2027, electric vehicle costs will be less than internal combustion vehicle costs over the life of the vehicle, largely because maintenance and energy costs will be lower.

Total cost of ownership parity will occur immediately for some segments evaluated and very quickly for the rest. [EPA-HQ-OAR-2022-0985-1644-A1, p. 16] [See Table 1 on p. 17 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

National Renewable Energy Lab (NREL) looked at all classes and segments of medium- and heavy-duty vehicles and concluded that with continued improvements in vehicle and fuel technologies, ZEVs can reach TCO parity with diesel vehicles as early as 2026 for some applications and no later than 2035 for all segments, including long-haul trucks.33 NREL also concluded that if economics drive adoption, 42 percent of all medium- and heavy-duty truck sales will be ZEVs by 2030. NREL also concluded that if economics drive adoption, 42 percent of all medium- and heavy-duty truck sales will be ZEVs by 2030. These findings also occurred prior to the passage of the IRA. Without economic incentives, their modeling projects all heavy-duty vehicle segments can reach total cost of driving parity with diesel vehicles by 2035. [EPA-HQ-OAR-2022-0985-1644-A1, p. 17]

33 Muratori, Matteo et al. 2022. Decarbonizing Medium- and Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis. NREL Transforming Energy. https://www.nrel.gov/docs/fy22osti/82081.pdf. (Attachment I)

A study published by Argonne National Laboratory's Energy System Division in April 2021 estimated that electric Class 4 delivery trucks will reach life-cycle cost parity with diesel trucks in model year 2025, while day-cab tractors will reach cost parity in model year 2027, and sleeper-cab tractors will reach cost parity in model year 2032.34 The analysis included all costs of vehicle ownership including vehicle purchase, fuel, and maintenance costs as well as insurance, financing costs, and depreciation. It did not account for the impacts of the IRA or the BIL. [EPA-HQ-OAR-2022-0985-1644-A1, p. 17]

34 A. Burnham et al. 2021. Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classesnd Powertrains, Argonne National Laboratory, Energy Systems Division, ANL/ESD-21/4. (Attachment J)

A study published by Argonne National Laboratory's Energy System Division in April 2021 estimated that electric Class 4 delivery trucks will reach life-cycle cost parity with diesel trucks in model year 2025, while day-cab tractors will reach cost parity in model year 2027, and sleeper-cab tractors will reach cost parity in model year 2032.35 The analysis included all costs of vehicle ownership including vehicle purchase, fuel, and maintenance costs as well as insurance, financing costs, and depreciation. It did not account for the Impacts of the IRA or the BIL. [EPA-HQ-OAR-2022-0985-1644-A1, p. 18]

35 A. Burnham et al. 2021. Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classesnd Powertrains, Argonne National Laboratory, Energy Systems Division, ANL/ESD-21/4.

Another report developed by M.J. Bradley & Associates for EDF in 2021 showed a large and growing opportunity to expand America's zero-emission freight trucks and buses.36 The report evaluated four factors in assessing the readiness of zero-emitting medium and heavy-duty vehicles in different applications – the availability of electric models from manufacturers, the requirements for charging, the ability of electric models to meet operating requirements, and the business case for zero-emitting vehicles. It found that a large number of market segments have favorable ratings across at least three of the categories, which indicates strong potential for near-term zero-emitting vehicle deployment. These market segments, which represent about 66% of the current in-use fleet, include heavy-duty pickups and vans, local delivery and service trucks and vans, transit and school buses, class 3 to 5 box trucks, class 3 to 7 stake trucks, dump trucks and garbage trucks. [EPA-HQ-OAR-2022-0985-1644-A1, p. 18]

36 Dana Lowell and Jane Culkin. 2021. Medium- and Heavy-duty Vehicles: Market Structure, Environmental Impact, and EV Readiness, MJ Bradley & Assoc. for EDF. A. Burnham et al. 2021. Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classesnd Powertrains, Argonne National Laboratory, Energy Systems Division http://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pf (Attachment K).

These analyses demonstrate in a compelling way the feasibility of EPA's proposed standards even before the introduction of recent federal and state incentives, discussed below. [EPA-HQ-OAR-2022-0985-1644-A1, p. 18]

iii. Manufacturers and fleets have committed to electrification

Market developments, including manufacturer investments and commitments are consistent with and reinforce the conclusions of the above-described analyses and likewise support the feasibility of protective EPA standards. For instance, Daimler Trucks, the market leader in the U.S. for Class 7 and 8 truck sales, has a goal of selling only CO2-neutral vehicles in Europe, Japan, and North America by 2039.44 Daimler Trucks' North America Freightliner division has developed electric versions of its Cascadia Class 8 tractor, M2 Class 6 medium-duty chassis, and MT50 medium-duty step van45 and has the capacity to produce around 2,000 eCascadia trucks annually.46 Both Traton SE, the parent company of Navistar, and Volvo Trucks set a global target that 50 percent of all truck sales will be electric by 2030.47 Volvo set a higher target in North America and Europe to reach 70 percent electric trucks sales by 2030. Volvo and Navistar are also market leaders in sales of Class 7 and 8 trucks, school buses, transit buses and coach buses in the U.S.48 In 2021 Volvo Trucks took orders, including letters of intent to buy, for more than 1,100 electric trucks in over 20 countries and in September 2022 started producing electric version of its heavy-duty Volvo FH, FM, and FMX trucks.49 Volvo Trucks also plans to start production in 2023 for electric versions of the Volvo FH, FM, and FMX trucks.50 General Motors launched BrightDrop in 2021, a new business unit that focuses on electric first-to-last-mile products, software and services. It has secured more than 30 commercial customers across industries like retail, rental, parcel delivery and service-based utilities, including FedEx,44 Walmart, Hertz, DHL Express and Purolator.51 Demand for BrightDrop commercial EVs continues to grow, resulting in its 2023 Zevo 600 already sold out. With all its momentum, the company anticipates accelerating production of its electric delivery vans to reach a 50,000 unit annual volume capacity by 2025.52 Tesla Semi Class 8 electric trucks annually starting 2024, after a year of production ramp-up, with the first units (36 electric trucks) delivered to Pepsi in December 2022. to Pepsi in December 2022 and has plans for greater production. These and many other commitments are summarized in ERM's April 2023 EV Market Update.53 [EPA-HQ-OAR-2022-0985-1644-A1, p. 22-24]

44 David Cullen, Daimler to Offer Carbon Neutral Trucks by 2039, Truckinginfo (Oct. 25, 2019), https://www.truckinginfo.com/343243/daimler-aims-to-offer-only-co2-neutral-trucks-by-2039-in-key-markets.

45 Daimler North America, Daimler Truck Electric Commercial Vehicles, https://northamerica.daimlertruck.com/emobility.

46 Alan Adler, Daimler built excess electric truck capacity in ‘22, Freight Waves (Jan. 31, 2023). https://www.freightwaves.com/news/daimler-built-more-electric-truck-capacity-in-22-than-chargers-could-support.

47 De Lombaerde, Geert, Traton boosting its trucking electrification investments, Fleet Owner (16 Mar 2022). https://www.fleetowner.com/emissions-efficiency/article/21236316/traton-adding-to-electrification-investments. Volvo Trucks,Record order from Maersk for Volvo electric trucks, Volvo Trucks. 29 March 2022. https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/mar/volvo-trucks-receives-record-order-for-electric-trucks-from-maersk.html.

48 Ben Sharpe et. al. 2020. Race to Zero: How manufacturers are positioned for zero emission commercial trucks and buses in North America, ICCT, EDF and Propulsion Quebec.

49 Volvo Trucks, Sales start for Volvo’s heavy-duty electric trucks, Volvo Trucks, (2 May 2022). https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/may/sales-start-for-volvos-heavy-duty-electric-trucks.html. Volvo Trucks, Break-through: Volvo Trucks starts series production of heavy electric trucks, Volvo Trucks (14 Sep 2022). https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/sep/volvo-trucks-starts-series-production-of-heavy-electric-trucks.html.

50 “Volvo launches more electric trucks. Volvo Trucks. 12 Dec 2022. https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/dec/volvo-launches-more-electric-trucks.html.

51 Roberts, Daniel and Maria Violette, Order Update: Your BrightDrop EV is on the Way.” Brightdrop. (3 April 2023.) https://www.gobrightdrop.com/newsroom/first-canadian-built-zevos-shipped.

52 Id.

53 Electric Vehicle Market Update: Manufacturing and Commercial Fleet Electrification Commitments Supporting Electric Mobility in the United States. April 2023. ERM for EDF. (Attachment N)

Manufacturer and company commitments to electrification have accelerated the number of medium- and heavy-duty ZEV models available for purchase. ERM’s EV Market Update lists all current medium- and heavy-duty model announcements and availability. The report shows that there are currently 17 Class 2b and 3 ZEV models, more than 40 Class 4-6 ZEV models, nearly 35 Class 7-8 ZEV models and more than 45 ZEV buses available by the end of 2024, with many already available for purchase today (Figure 2).54 [EPA-HQ-OAR-2022-0985-1644-A1, p. 24] [See Figure 2, p. 24 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

54 Id., Appendix C.

Manufacturer commitments have translated into a growing number of ZEV sales and deployments. According to a May 2023 market update from CALSTART, since January 2017, annual zero-emission truck (ZET) deployments increased year-over-year by 104% in 2018, 23% in 2019, 60% in 2020, 397% in 2021, and 163% in 2022.55 Cumulative U.S. medium- and heavy-duty ZET deployments from January 2017 to December 2022 totaled 5,483 vehicles. In 2022 alone, 3,510 MHD ZETs were deployed across the country, surpassing deployments of the previous five years (2017–2021) combined. Of the ZETs with known locations, 59 percent were deployed in states that have adopted the Advanced Clean Trucks (ACT) rule as of December 2022. [EPA-HQ-OAR-2022-0985-1644-A1, p. 25]

55 Calstart. 2023. Zeroing In On ZETs, May 2023 Market Update. https://calstart.org/zio-zets-may-2023-market-update/ (Attachment O).

iv. Fleet deployment of ZEVs is on the rise

As manufacturers continue to expand model availability, fleets have made public commitments to electrification and deployments are growing every year. The April 2023 EV Market Update report published by ERM for EDF summarizes the status of the commercial fleet EV market showing fleet commitments to electrification as well as purchase commitments.56 It finds that the demand from commercial fleet operators for EV options has grown dramatically in the last few years. The report highlights some of the most recent commitments including Zeeba, a California-based fleet leasing and management provider, which signed an agreement to purchase 5,450 EVs from Canoo, with an initial binding commitment of 3,000 units through 2024.57 And Kingbee, a Utah-based work-ready van rental provider, which placed a binding order for 9,300 all-electric last-mile delivery vehicles from Canoo, with an option to increase to 18,600 vehicles.58 EDF maintains an electric fleet tracker that reflects publicly available information about zero-emission truck deployments and commitments.59 As of May 2023, the tracker identified nearly 270 fleets that are deploying or have placed orders for an estimated 244,000 zero-emission medium- and heavy-duty vehicles. The tracker shows widespread and growing interest in electric trucks across nearly every application, including tractors, yard trucks, dump trucks, emergency vehicles, utility trucks, and refuse trucks. [EPA-HQ-OAR-2022-0985-1644-A1, p. 25-26]

56 Electric Vehicle Market Update: Manufacturing and Commercial Fleet Electrification Commitments Supporting Electric Mobility in the United States, ERM for EDF, (April 2023).

57 Canoo. “Zeeba Signs Binding Agreement to Purchase 3,000 Canoo Electric Vehicles.” Canoo. 11 Oct 2022. https://www.press.canoo.com/press-release/zeeba.

58 Canoo. “Kingbee Places Binding Order for 9,300 Canoo Electric Vehicles.” Canoo. 17 Oct 2022. https://www.press.canoo.com/press-release/kingbee.

59 See EDF Tracker at: https://docs.google.com/spreadsheets/d/1l0m2Do1mjSemrb_DT40YNGou4o2m2Ee-KLSvHC-5vAc/edit#gid=680680398

CALSTART tracks the availability and deployment of zero-emission buses (ZEBs). They find that transit ZEBs have grown nationally to 5,480 on the road, awarded or on order in the beginning of 2023, an increase of 66 percent since the beginning of 2021.60 As of December 2022, CALSTART estimates there were 3,043 electric school buses (ESBs) funded, ordered, delivered and deployed across the U.S.61 [EPA-HQ-OAR-2022-0985-1644-A1, p. 26]

60 Rachel Chard, Mike Hynes, Bryan Lee and Jared Schnader, Zeroing in on ZEBs, The Advanced Technology Transit Bus Index: A ZEB Inventory Report for the United States and Canada, CALSTART (February 2023). https://calstart.org/wp-content/uploads/2023/02/Zeroing-in-on-ZEBs-February-2023_Final.pdf).

61 Rachel Chard, Juan Espinoza, Ian Fried, Liza Walsh, Zeroing in on Electric School Buses, The Advanced Technology School Bus Index: A U.S. Electric School Bus Inventory Report, CALSTART (May 2023). https://calstart.org/wp-content/uploads/2023/05/ZIO-ESBs-final-with-May-cover-4.28.23.pdf. (Attachment P)

EDF’s tracker also shows fleet announcements and commitments, which indicate an even greater demand for electric trucks and buses. For example, Republic Services is the 5th largest private truck fleet in the U.S. with over 17,000 trucks. Our tracker lists the three electric vehicles it has currently announced: one acquired in 2020 and two that are to be in service this fall. However, the company has also announced that it “expects EVs to represent half of its new truck purchases in the next five years," which would represent thousands of new EV units.62 [EPA-HQ-OAR-2022-0985-1644-A1, p. 27]

62 Republic Services, News Release: Republic Services is Rolling Out Industry's First Fully Integrated Electric Recycling and Waste Trucks, https://investor.republicservices.com/news-releases/news-release-details/republic-services-rolling-out-industrys-first-fully-integrated.

Similarly, FedEx currently has about 2,600 EVs deployed or ordered, but announced in 2021 that it plans for its entire parcel pickup and delivery fleet to be zero-emission electric vehicles by 2040. In its phased approach to this goal, it committed to have 50% of new vehicle purchases be ZEVs by 2025 and 100% by 2030, which likely translates into many thousands of new units of demand annually by 2025.63 [EPA-HQ-OAR-2022-0985-1644-A1, p. 27]

63 FedEx, Press Release: FedEx Commits to Carbon-Neutral Operations by 2040, https://investors.fedex.com/news-and-events/investor-news/investor-news-details/2021/FedEx-Commits-to-Carbon-Neutral-Operations-by-2040/default.aspx.

Other leading fleets are making clear commitments to reduce emissions and adopt zero-emission solutions. For example, each of the four largest private tractor fleets in the nation are making major investments in electric trucks. PepsiCo has a goal to "reduce absolute greenhouse gas (GHG) emissions across our value chain by more than 40% by 2030, including a 75% reduction in emissions from our direct operations. Achieve net-zero emissions by 2040."64 It has been a leader in deploying electric vehicles for years and is currently deploying 36 Tesla Semis in its operations in California.65 Walmart has committed to have a zero-emission fleet by 2040 and has already acquired thousands of electric cargo vans and recently acquired its first eCascadia truck.66 Sysco has a goal of electrifying 35 percent of its U.S. fleet by 2030 and received its first electric truck in November 2022.67 Finally, US Foods just received its first battery-electric powered Freightliner eCascadia trucks at its La Mirada, California distribution center.68 The company previously announced plans to add 30 electric trucks to its La Mirada fleet in 2023.69 Collectively, these four fleets have nearly 35,000 electric trucks on the road in the U.S. Their collective demand alone will account for thousands of annual orders for zero-emission trucks. For-hire fleets are also making major investments in zero-emission trucks. UPS just received its first 10 electric tractors,70 Schneider just opened a large-scale electric charging depot in California that will support up to 100 Class 8 BEV trucks at one time71 and JB Hunt has set a goal to reduce its emissions by 34% within the decade and is piloting several electric trucks.72 The EV tracker also shows demand for electric trucks from smaller fleets. ENAT Transportation and Logistics, a last mile delivery services company in New Jersey, has been growing its fleet of electric vans and trucks,73 while Sunburst Truck Lines, a Texas-based drayage fleet, is operating an electric tractor in Houston74 and Valley Malt, a Massachusetts-based malt house and one-vehicle fleet, has purchased a Ford E-Transit.75 [EPA-HQ-OAR-2022-0985-1644-A1, p. 27-29]

64 PepsiCo, 2021 ESG Performance Metrics, https://www.pepsico.com/our-impact/sustainability/esg-summary/goals-progress.

65 CNBC, PepsiCo is Using 36 Tesla Semis in its Fleet and is Upgrading Facilities for More in 2023 (Dec. 16, 2022), https://www.cnbc.com/2022/12/16/pepsico-is-using-36-tesla-semis-in-its-fleet-and-is-upgrading-facilities-for-more-in-2023-exec-says.html.

66 Jason Mathers, Walmart Commits to 100% Zero-Emission Trucks by 2040, Signaling Electric is the Future, EDF (Sep. 22, 2020) https://blogs.edf.org/energyexchange/2020/09/22/walmart-commits-to-100-zero-emission-trucks-by-2040-signaling-electric-is-the-future/.

67 Daimler Truck North America, Transforming the Future of Foodservice Delivery: Sysco Receives First Battery Electric Freightliner eCascadia (Nov. 11, 2022), https://www.prnewswire.com/news-releases/transforming-the-future-of-foodservice-delivery-sysco-receives-first-battery-electric-freightliner-ecascadia-301675939.html.

68 US Foods Supports Emissions Reduction Efforts with Initial Delivery of Battery-Electric Trucks (Feb. 14, 2023), https://ir.usfoods.com/investors/stock-information-news/press-release-details/2023/US-Foods-Supports-Emissions-Reduction-Efforts-With-Initial-Delivery-of-Battery-Electric-Trucks/default.aspx.

69 US Foods Supports Emissions Reduction Efforts with Initial Delivery of Battery-Electric Trucks (Feb. 14, 2023), https://ir.usfoods.com/investors/stock-information-news/press-release-details/2023/US-Foods-Supports-Emissions-Reduction-Efforts-With-Initial-Delivery-of-Battery-Electric-Trucks/default.aspx.

70 Rich DeMuro, I Took a Ride in UPS's First All Electric Semi Truck, KTLA 5 (Feb. 6, 2023), https://ktla.com/morning-news/i-took-a-ride-in-upss-first-all-electric-semi-truck/.

71 Schneider says California site can charge 32 battery-powered trucks at once, DC Velocity (June 9, 2023). https://www.dcvelocity.com/articles/57730-schneider-says-california-site-can-charge-32-battery-powered-trucks-at-once.

72 J.B. Hunt, J.B. Hunt Announces Ambitious Goal to Reduce Carbon Emission Intensity 32% by 2034, https://www.jbhunt.com/our-company/newsroom/2022/11/j-b-hunt-ambitious-goal-reduce-carbon-emission-intensity.

73 ENAT Transportation & Logistics, homepage, https://www.enattl.com/.

74 American Journal of Transportation, Port Houston Welcomes First Zero-Emissions Drayage Truck (June 9, 2022), https://ajot.com/news/port-houston-welcomes-first-zero-emissions-drayage-truck.

75 Valley Malt, Facebook Post on Mar. 27, 2022, https://www.facebook.com/photo/?fbid=5311291732223050&set=a.1907173599301564.

For-hire fleets are also making major investments in zero-emission trucks. UPS just received its first 10 electric tractors,76 Schneider just opened a large-scale electric charging depot in California that will support up to 100 Class 8 BEV trucks at one time77 and JB Hunt has set a goal to reduce its emissions by 34% within the decade and is piloting several electric trucks.78 The EV tracker also shows demand for electric trucks from smaller fleets. ENAT Transportation and Logistics, a last mile delivery services company in New Jersey, has been growing its fleet of electric vans and trucks,79 while Sunburst Truck Lines, a Texas-based drayage fleet, is operating an electric tractor in Houston80 and Valley Malt, a Massachusetts-based malt house and one-vehicle fleet, has purchased a Ford E-Transit.81 [EPA-HQ-OAR-2022-0985-1644-A1, p. 29]

76 Rich DeMuro, I Took a Ride in UPS's First All Electric Semi Truck, KTLA 5 (Feb. 6, 2023), https://ktla.com/morning-news/i-took-a-ride-in-upss-first-all-electric-semi-truck/.

77 Schneider says California site can charge 32 battery-powered trucks at once, DC Velocity (June 9, 2023). https://www.dcvelocity.com/articles/57730-schneider-says-california-site-can-charge-32-battery-powered-trucks-at-once.

78 J.B. Hunt, J.B. Hunt Announces Ambitious Goal to Reduce Carbon Emission Intensity 32% by 2034, https://www.jbhunt.com/our-company/newsroom/2022/11/j-b-hunt-ambitious-goal-reduce-carbon-emission-intensity.

79 ENAT Transportation & Logistics, homepage, https://www.enattl.com/.

80 American Journal of Transportation, Port Houston Welcomes First Zero-Emissions Drayage Truck (June 9, 2022), https://ajot.com/news/port-houston-welcomes-first-zero-emissions-drayage-truck.

81 Valley Malt, Facebook Post on Mar. 27, 2022, https://www.facebook.com/photo/?fbid=5311291732223050&set=a.1907173599301564.

v. State leadership further supports the feasibility of protective standards

States have also been leading the way with protective standards. California adopted the Advanced Clean Trucks (ACT) rule in 2021, which requires truck manufacturers to produce an increasing percentage of new zero-emission trucks and buses beginning with model year 2024.82 [EPA-HQ-OAR-2022-0985-1644-A1, p. 29]

82 California Air Resources Board, Final Regulation Order: Advanced Clean Trucks Regulation, https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fro2.pdf.

By 2035, zero-emission truck/chassis sales in the state will need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales. The ACT regulation helps ensure that manufacturers offer affordable zero emission choices to fleets, while delivering air quality benefits to communities across the state. [EPA-HQ-OAR-2022-0985-1644-A1, p. 30]

The ACT rule has garnered widespread support from major business interests across the nation, including more than 85 companies that signed a letter urging governors across the country to adopt the policy.83 On April 21, 2023, Colorado became the eighth state to adopt the ACT regulation, joining California, Massachusetts, New Jersey, New York, Oregon, Vermont and Washington.84 Maryland will soon become the ninth state, having recently passed a law requiring the Maryland Department of Environment to adopt the rule by the end of 2023.8586 With the recent additions of Colorado and Maryland, ACT states now account for 24% of national truck sales based on data from MOVES3. The ACT rule will help ensure sufficient supply for zero-emission trucks and vans to meet the growing demand from businesses. [EPA-HQ-OAR-2022-0985-1644-A1, p. 30]

83 Ceres, 85 Businessses Call for the Advanced Clean Trucks Rule, https://www.ceres.org/policy/state/ACT

84 Environmental Defense Fund, Colorado Adopts Proactive New Standards for Zero-Emission Trucks (Apr. 21, 2023), https://www.edf.org/media/colorado-adopts-protective-new-standards-zero-emission-trucks.

85 Maryland Passes Clean Trucks Act With Key Caveats, Transport Trucking (April 13, 2023). https://www.ttnews.com/articles/md-clean-trucks-act.

86 Maryland Passes Clean Trucks Act With Key Caveats, Transport Trucking (April 13, 2023). https://www.ttnews.com/articles/md-clean-trucks-act.

As a complement to the ACT rule, California recently adopted the Advanced Clean Fleets (ACF) regulation, a requirement for medium- and heavy-duty fleets to purchase an increasing percentage of zero-emission trucks. The rule sets a 100% ZEV truck sales target for 2036, with an on ramp for fleets to meet that goal. The ACF regulation is expected to save $26.5 billion in statewide health benefits from criteria pollutant emissions and provide fleets with net cost savings of $48 billion.87 [EPA-HQ-OAR-2022-0985-1644-A1, p. 30]

87 California Air Resources Board, Advanced Clean Fleets Regulation Summary (May 17, 2023), https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-summary.

States are also providing billions of dollars in grants and incentives to produce and sell electric vehicles, batteries and components. According to EDF and WSP, the more than $120 billion in private EV ecosystem investments over the last 8 years have been spurred by the nearly $14 billion in state and local incentives. [EPA-HQ-OAR-2022-0985-1644-A1, p. 31]

In addition to state rulemakings, a diverse collection of seventeen states and the District of Columbia joined a multi-state initiative to advance and accelerate the market for electric medium- and heavy-duty vehicles.88 Together, the signatories account for 35 percent of the medium- and heavy-duty fleet in the U.S..89 The voluntary initiative set a target of 30 percent of new truck and bus sales being ZEV by 2030 and 100 percent ZEV sales by 2050 with an emphasis on the need to accelerate and prioritize deployment in disadvantaged communities. [EPA-HQ-OAR-2022-0985-1644-A1, p. 31]

88 The current signatories are California, Colorado, Connecticut, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, Nevada, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, the District of Columbia, and Quebec, Canada. “Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding,” (July 14, 2020), https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf/.

89 Arijit Sen, Ray Minjares, Josh Miller, and Caleb Braun. April 2022. “Benefits of the 2020 Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding,” ICCT Briefing. https://theicct.org/wp-content/uploads/2022/04/md-hd-mou-benefits-apr22.pdf.

Together, these state programs and incentives further support the feasibility of strong Phase 3 emissions standards consistent with the ACT that drive the deployment of ZEVs. [EPA-HQ-OAR-2022-0985-1644-A1, p. 31]

b) New Analyses Support More Protective Standards for Tractor Trailers and Buses

In addition to the array of studies, analyses, and market and policy developments discussed in section a) that broadly support more protective standards consistent with the ACT, EDF undertook specific additional analytical work to demonstrate the feasibility and cost-effectiveness of stronger standards for two key HD segments. [EPA-HQ-OAR-2022-0985-1644-A1, p. 31]

i. New Research Supports the Feasibility and Need for Protective Tractor Trailer Standards

Tractor trailers are the largest source of climate destabilizing and health harming pollution from the heavy-duty vehicle sector and so protective pollution safeguards that help to ensure ZEV deployment levels beyond EPA’s proposal are vital and urgently needed. The analysis below supports our recommendation that EPA finalize standards consistent with at least 50% of all new tractor sales in the U.S. being ZEVs by 2032. [EPA-HQ-OAR-2022-0985-1644-A1, p. 32]

EDF undertook new work submitted as part of our comments on this rulemaking with Roush Industries to conduct a robust, bottom up evaluation of both the upfront and total costs of a range of BEV tractors including two battery ranges for each Class 7 day cab, Class 8 day cab, and Class 8 sleeper cab.90 The focus of the study was to better understand the set of tractors that are best suited to be converted to BEVs in the time frame of the EPA proposed rule. Roush modeled the 6 tractor configurations for MYs 2030 and 2032 in GT-Suite, an industry-leading, physics-based simulation tool. They used the tool to calculate energy consumption, battery capacity, motor power, and inverter power. Roush used their internal battery price and physics projections to establish the cost, weight, and volume of the battery packs needed for each of the tractors. The main analysis assumed all depot charging, consistent with the assumption EPA makes in their modeling. [EPA-HQ-OAR-2022-0985-1644-A1, p. 32]

90 Vishnu Nair, Himanshu Saxena, Sajit Pillai. 2023. Class 7 and Class 8 Tractor–Trailer Electrification for MYs 2030 and 2032, Roush Industries for Environmental Defense Fund. (Attachment Q).

With the IRA credits, most BEVs' effective powertrain retail price is the same or less than diesel vehicles.

Roush based their diesel powertrain costs on EPA's modeling. BEV powertrain costs were sourced from teardown studies, the current body of literature, and their expert evaluations. When IRA tax credits including the Commercial Clean Vehicle Credit as well as the production tax credit for domestically made batteries are included, all of the BEVs considered by Roush except the long range Class 8 sleeper cab in MY 2032 were the same price or cheaper than their counterpart ICE vehicles and BEV long rang Class 8 sleeper cab in MY 2032 is projected to be less than a $10,000 increase in cost relative to the diesel ICE vehicle. [EPA-HQ-OAR-2022-0985-1644-A1, p. 32-33]

TCO of BEVs is significantly lower than diesel ICE across all segments in 2030-32

The TCO per mile for BEVs is between 17 and 35% lower than the corresponding ICE vehicle. Roush used the U.S. Energy Information Administration's Annual Energy Outlook 2023 reference case values for electricity and diesel prices. To be conservative they removed the fuel tax from the diesel price to better compare equal fuel costs. Roush calculated maintenance costs for BEVs as 30% lower than ICE vehicles. [EPA-HQ-OAR-2022-0985-1644-A1, p. 32-33] [See Figure 3 on p. 34 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

All of the BEV tractors have a payback period of less than 3 years.

All tractors included in this analysis have attractive payback periods of less than three years. Due to the high annual mileage and the corresponding high fuel and maintenance savings, BEV tractors quickly payback any increased upfront costs associated with their powertrains or EVSE equipment and save fleet owners money for the majority of the vehicles' lifetimes. [EPA-HQ-OAR-2022-0985-1644-A1, p. 35] [See Table 4 on p. 35 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

Substantial lifetime net savings from BEV adoption over ICEV demonstrate the potential for sustained benefits for fleet owners

The vehicles considered in Roush's study also demonstrate that BEV tractors provide impressive lifetime savings. Figure 4 shows the extent of savings possible over the life of the vehicle. A Class 8 long-range sleeper cab purchased in 2030 could see up to $153,000 in savings over its life. The lifetime savings estimates also demonstrate the limitations in using a pure payback period metric for assessing adoption likelihood. For vehicles with high mileage over their lifetime, BEVs provide an even more significant cost savings opportunity. [EPA-HQ-OAR-2022-0985-1644-A1, p. 36] [See Figure 4 on p. 36 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

Higher annual operational VMTs lead to an even shorter payback period for BEVs.

The annual VMT used in the Roush study matches EPA and is the 10 year average annual VMT This represents a conservative estimate of the potential benefits BEVs can provide. For the long range Class 8 day cab, the study assumes the vehicle travels just under 48,000 miles per year which, using EPA's 250 driving days per year, this corresponds with 190 miles per day even though the battery is sized to travel around 400 miles per day. If the vehicle drove 20% more annually, or 57,000 miles per year, it would reduce the payback period by a third - to less than 2 years. Currently, tractors drive the most miles in the first few years and then are transitioned to operations such as drayage with fewer miles.91 This is partly due to the higher maintenance costs of vehicles as they age. BEVs have significantly fewer moving parts and reduced maintenance costs and as a result owners may decide to leave BEVs in higher annual mileage operations increasing their potential savings relative to ICEVs. [EPA-HQ-OAR-2022-0985-1644-A1, p. 37]

91 Population and Activity of Onroad Vehicles in MOVES3. 2021. U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Assessments and Standards Division. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1011TF8.pdf

BEVs have a lower TCO per mile even with significant enroute charging.

The report includes a scenario that investigates the impact on TCO and payback period if vehicles were assumed to use enroute charging for part of the time. The scenario assumes vehicles charge 70% at a depot and 30% enroute using a highspeed, 3 MW charger. Roush used an enroute charging electricity price of $0.23/kWh based on a December 2022 NREL study entitled "Estimating the Breakeven Cost of Delivered Electricity to Charge Class 8 Electric Tractors."92 [EPA-HQ-OAR-2022-0985-1644-A1, p. 38] [See Figure 6 on p. 38 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

92 Jesse Bennett et al. Estimating the Breakeven Cost of Delivered Electricity To Charge Class 8 Electric Tractors. 2022. National Renewable Energy Laboratory, https://www.nrel.gov/docs/fy23osti/82092.pdf (Attachment FF)

Even with higher electricity prices, BEV tractors still showed significant savings relative to ICEVs with TCOs 9% to 20% lower. The payback periods remain attractive in the mixed charging scenarios. All tractors have a payback period less than 5 years. [EPA-HQ-OAR-2022-0985-1644-A1, p. 38] [See Table 5 on p. 39 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

BEV tractors will have comparable cargo capacity to conventional vehicles.

The advancements in battery chemistry and pack construction are highly likely to significantly improve the energy density of the battery pack between 2023 and 2030. Lighter batteries combined with the 2,000 lb gross vehicle weight exemption for BEVs, will minimally affect the cargo capacity of BEVs. As is shown in Figure 7, even the vehicle with the largest battery in the study, the long-range Class 8 sleeper cab, will see a 1,200 lb reduction in payload. [EPA-HQ-OAR-2022-0985-1644-A1, p. 39] [See Figure 7 on p. 39 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

A number of other studies support the findings in Roush's analysis. A 2021 study from NREL looked at all classes and segments of medium- and heavy-duty vehicles and estimated that tractors could reach TCO parity with their diesel counterparts by 2025.93 Another study by the North American Council for Freight Efficiency (NACFE) concluded that a BEV short haul tractor purchased in 2022 would save more than $9,000 annually on fuel costs compared to a diesel truck.94 Both of these studies occurred before the passage of the IRA. A 2023 study by ICCT, which included the economic benefits of the IRA, found that by 2030, the TCO of BEV long-haul trucks will likely be lower than that of their diesel counterparts in all representative states considered in the analysis.95 [EPA-HQ-OAR-2022-0985-1644-A1, p. 40-41]

93 Chad Hunter, Michael Penev, Evan Reznicek, Jason Lustbader, Alicia Birky, and Chen Zhang. 2021. Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks, Nation Renewable Energy Lab, Technical Report. https://www.nrel.gov/docs/fy21osti/71796.pdf (Attachment R)

94 North American Council for Freight Efficiency. 2022. Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors. https://nacfe.org/heavy-duty-regional-haul-tractors/

95 Basma, H., Buysse, C., Zhou, Y., Rodriguez, F., Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States, ICCT, April 2023, https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/ (Attachment S).

The majority of tractors drive daily distances that allow for their transition to BEV in the timeframe of the proposed rule

Tractor use is not homogenous; daily mileage can range from less than 50 miles a day to over 500 miles a day. Understanding this distribution is vital to setting standards given the impact battery range has on vehicle price. EDF used the U.S. Department of Transportation's 2002 Vehicle Inventory and Use Survey (VIUS) and the California Air Resources Board's Large Entity Fleet Reporting to better understand the maximum distances that vehicles travel in a day and calculate the percentage of the fleet that is electrifiable based on VMT and battery range from Roush.96 97 [EPA-HQ-OAR-2022-0985-1644-A1, p. 41]

96 Vehicle Inventory and Use Survey 2002. U.S. Department of Transportation, Bureau of Transportation Statistics, 2004, https://rosap.ntl.bts.gov/view/dot/42632

97 California Air Resources Board. 2022. Large Entity Fleet Reporting: Statewide Aggregated Data. https://ww2.arb.ca.gov/sites/default/files/2022-02/Large_Entity_Reporting_Aggregated_Data_ADA.pdf

VIUS asked vehicle owners to assign percentage of trips that vehicle stook over the year to a set of trip lengths (less than 50 miles, 51 to 100 miles, 101 to 200 miles, 201 to 500 miles, and more than 500 miles). We divided the tractors into day and sleeper cabs. To take into consideration the higher mileage vehicles drive at the beginning of their life compared to the end, we only included vehicles in the first 5 years of their use. This left the dataset with 7,840 tractors – 58% sleeper cab and 42% day cab. [EPA-HQ-OAR-2022-0985-1644-A1, p. 41]

We calculated the 90th percentile of daily trip distances for vehicles allowing for 10% of daily trip lengths to be in the category one above. For example, if a vehicle reported 95% of its trips were between 51 to 100 miles and 5% were 101 to 200 miles, then that vehicle's 90th percentile trip length was 51 to 100 miles. However, if instead the 5% was in 201 to 500 miles, the 90th percentile trip length was 101 to 200 miles. [EPA-HQ-OAR-2022-0985-1644-A1, p. 41-42]

The analysis found that a significant share of tractors, particularly day cab tractors, travel daily distances that are easily electrifiable – 42% of day cabs traveled less than 100 miles a day and 63% traveled less than 200 miles a day. For sleeper cabs, 10% traveled less than 200 miles a day and roughly one third (34%) traveled less than 500 miles a day. [EPA-HQ-OAR-2022-0985-1644-A1, p. 42]

While the VIUS represents the most comprehensive source, it is reporting data that is more than 20 years old. The California Air Resources Board (CARB) collected data operational practices from 2019 in 2021 via an online portal. This report included 61,782 tractors. They asked the fleets responding to estimate the daily mileage for their vehicles. CARB found 31% of day cabs traveled less than 100 miles a day, 49% traveled less than 150 miles a day, 62% traveled less than 200 miles a day, and 78% traveled less than 300 miles a day. Additionally, their results found that 14% of sleeper cabs traveled less than 200 miles a day and 28% traveled less than 300 miles a day. [EPA-HQ-OAR-2022-0985-1644-A1, p. 42]

The lines in Figure 8 shows the relationship between percent of trips for VIUS and CARB day and sleeper cabs with daily mileage. There is fairly large agreement between the two datasets and in particular the shape of the curves, day cabs as concave and sleeper cabs as convex, is the same between the two datasets. [EPA-HQ-OAR-2022-0985-1644-A1, p. 42] [See Figure 8 on p. 43 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

The Roush report includes two battery sizes for each of the three types of tractors considered: Class 7, Class 8 day cabs, and Class 8 sleeper cabs. Since Roush does not include temperature considerations in their analysis, we have reduced the battery range by 10% to be conservative. We used two datasets discussed above, VIUS and CARB, to calculate the % of each tractor and battery size combination could cover based on their daily mileages. Table 6 below, includes the ranges from the Roush report, the conservative battery range, and the % of vehicles each tractor could cover. The VIUS dataset allows for differentiation between Class 7 and Class 8 vehicles, however the % of trips covered by each mileage category is virtual identical between Class 7 and Class 8 vehicles so the combined category of day cabs was plotted in Figure 8. [EPA-HQ-OAR-2022-0985-1644-A1, p. 43]

As shown in Figure 8 and in Table 6, a significant share of tractors, both day and sleeper, are readily electrifiable by 2030. The longer range battery for Class 7 tractors, 225 miles, corresponds with covering 66% of daily mileages day cabs. For Class 8 day cabs, a battery with a range of 405 miles would accommodate 87% of all day cab tractors and their daily mileage requirements. For Class 8 sleeper cabs, 38% of vehicles drive less than 495 miles per day. Combined, this accounts for 57% of all tractors using EPA's sales estimates for the 12 tractor types included in HD TRUCS. [EPA-HQ-OAR-2022-0985-1644-A1, p. 44] [See Table 6 on p. 44 and Figure 8 on p. 43 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

iii. EPA should set the vocational vehicle standard at a level that reflects the feasibility of greater deployment of school buses and transit buses

There is also a critical opportunity for EPA to strengthen the standards for transit and school buses to ensure that 80% of new school and transit buses are ZEV by 2029 and 90% by 2032. The technology is available today and substantial federal, state and local funding opportunities will make the transition entirely feasible and cost-effective over the timeframe of the rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 47]

2. Significant federal and state funding supports more protective standards for buses

There are already thousands of zero-emitting school buses on our roads and across our school districts today, in large part because of significant federal and state funding opportunities. According to WRI, there are more than 5,600 electric school buses in the U.S either on order, delivered or operating.111 Many of these commitments and orders have come in the last year and much of the growth is due to EPA's Clean School Bus Program. With funding from the Bipartisan Infrastructure Law, EPA's Clean School Bus Program provides $5 billion over five years (FY 2022-2026) to replace existing school buses with zero-emission and low-emission models.112 The program has already awarded over $900 million for more than 2,400 electric school buses across 389 school districts.113 As a result of federal, state and local funding and incentives, there are now electric school bus commitments in all 50 states, Washington, D.C., American Samoa, Guam, Puerto Rico the U.S. Virgin Islands and four tribal nations including the Morongo Band of Mission Indians, Mississippi Band of Choctaw Indians, Lower Brule Sioux Tribe and the Soboba Band of Luiseño Indians. [EPA-HQ-OAR-2022-0985-1644-A1, p. 48-49]

111 Lydia Freehafer and Leah Lazer. The State of Electric School Bus Adoption in the US, World Resources Institute, (April 26, 2023). https://www.wri.org/insights/where-electric-school-buses-us

112 EPA, Clean School Bus Program, https://www.epa.gov/cleanschoolbus.

113 Electric School Bus Initiative, All About the Clean School Bus Program, https://electricschoolbusinitiative.org/all-about-clean-school-bus-program.

States municipalities are also helping create momentum toward electrification of the bus sector. California's Innovative Clean Transportation (ICT) regulation was adopted in December 2018 and requires all public transit agencies to gradually transition to a 100 percent zero emission bus (ZEB) fleet.114 Beginning in 2029, 100% of new purchases by transit agencies must be ZEBs, with a goal for full transition by 2040. Through the deployment of zero-emission technologies, the ICT regulation will provide significant benefits across the state, including reducing NOx and GHG emissions, especially in transit-dependent and disadvantaged communities. California is also helping to fund the transition to ZEBs. The 2022-23 State Budget included a total of $150 million for incentives for the procurement of zero-emission school buses and associated infrastructure, $135 million of which will be administered through CARB's Clean Truck and Bus Voucher Incentive Project (HVIP), and $15 million of which will be administered through the California Energy Commission's Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE) Project.115 WRI estimates that HVIP has funded 1,032 zero-emitting school buses to date.116 [EPA-HQ-OAR-2022-0985-1644-A1, p. 49-50]

114 California Air Resources Board, Innovative Clean Transit Regulation Fact Sheet (My 16, 2019), https://ww2.arb.ca.gov/resources/fact-sheets/innovative-clean-transit-ict-regulation-fact-sheet.

115 California Energy Commission, Work Group Meeting #2 to Discuss the FY-22-23 Incentives for Zero0Emission Public School Buses and Supporting Infrastructure, https://www.energy.ca.gov/event/workshop/2023-05/work-group-meeting-2-discuss-fy-22-23-incentives-zero-emission-public-school.

116 Lydia Freehafer and Leah Lazer. The State of Electric School Bus Adoption in the US, World Resources Institute, (April 26, 2023). https://www.wri.org/insights/where-electric-school-buses-us

New York has also set commitments and invested significantly in electrifying buses. In their 2022-2023 budget, New York State established a commitment of purchasing only zero emission school buses starting in 2027 with the intention of transition their entire fleet by 2035. New York State currently has 42,000 school buses and transports 2.3 million students annually.117 Transit authorities across the U.S. have set 100% zero-emission bus fleet commitments. The transit agencies for New York City (MTA), Chicago (CTA), and Philadelphia (SEPTA) have all committed to transitioning their entire bus fleets to zero-emission vehicles by 2040.118 119 120 In Washington, D.C., WMATA has set a target of a fully zero-emission fleet by 2045 with only zero-emission bus purchases starting in 2030.121 King County Metro which serves Seattle and CapMetro which serves Austin plan to have 100% zero-emission fleets by 2035.122 123 A strong final rule must leverage this momentum and ensure that 90% of new school and transit buses are zero-emitting by 2032. [EPA-HQ-OAR-2022-0985-1644-A1, p. 50]

117 New York State Energy Research and Development Authority, Electric School Buses, https://www.nyserda.ny.gov/All-Programs/Electric-School-Buses#:~:text=New%20York%20State’s%20fiscal%20year,to%20be%20electric%20by%202035.

118 Metropolitan Transportation Authority, MTA Zero-Emission Bus Transition Plan, https://new.mta.info/document/91336.

119 Chicago Transit Authority, Electric Buses: We’re Electrifying Our Bus Fleet, https://www.transitchicago.com/electricbus/.

120 Tom MacDonald, SEPTA Gets $24 Million for Adapting Bus Depots for Electric and Hybrid Vehicles, WHYY (Sep. 6, 2022), https://whyy.org/articles/philadelphia-septa-bus-depot-upgrades-electric-hybrid-vehicles/#:~:text=SEPTA%20General%20Manager%20Leslie%20Richards,by%202040%2C%E2%80%9D%20Richards%20said.

121 Washington Metropolitan Area Transit Authority, Zero-Emission Buses, https://www.wmata.com/initiatives/plans/zero-emission-buses.cfm

122 King County Metro, Transitioning to a Zeo-Emissions Fleet, https://kingcounty.gov/depts/transportation/metro/programs-projects/innovation-technology/zero-emission-fleet.aspx.

123 City of Austin, Transportation Electrification Goals, https://data.austintexas.gov/stories/s/Transportation-Electrification-Goal-1/99ez-x3te/.

3. When likely lower battery costs relative to EPA’s modeling are taken into consideration, a more protective school and transit bus standard is reasonable and readily justified.

In the medium- and heavy-duty electrification study performed for EDF in early 2022,124 Roush projected that by 2027, battery electric (BE) school buses and transit buses would have lower up-front costs than their diesel counterparts.125 This was prior to the IRA tax credits for battery production and vehicle purchase. [EPA-HQ-OAR-2022-0985-1644-A1, p. 51]

124 Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush Industries for Environmental Defense Fund. See http://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf.

125 Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush for Environmental Defense Fund.

The BE school bus examined by Roush had a relatively small 60 kWh battery. This was deemed sufficient for many applications that involve the local transport of students. EPA’s methodology assumes school bus segments have larger batteries, 102-166 kWh.126 Using Roush’s battery cost estimates, and accounting for these larger batteries, BE school buses would still have lower up-front costs than diesel school buses again without any tax credits. Even accounting for the cost of the charger and installation leaves the BE school bus cheaper for the

102 kWh battery and only $1000 more expensive with a 166 kWh battery. The IRA vehicle tax credit would not apply in these cases, but the battery production and charging infrastructure credits could, making it highly likely that the BE school bus would have an immediate payback. [EPA-HQ-OAR-2022-0985-1644-A1, p. 51]

126 See supra pg. 55.

The BE transit bus examined by Roush had a smaller battery (400 kWh) than those evaluated by EPA in this proposal (605-649 kWh).127 Again, using Roush's cost estimates and accounting for these larger batteries, Roush's BE transit bus would only cost $8,000-$11,000 more than a diesel transit bus, again without any tax credits. The IRA vehicle tax credit brings the BE transit bus to price parity with the diesel. The cost of the charger and installation is more substantial for a BE transit bus, $130,000 per bus without the IRA tax credit and $90,000 with the tax credit. However, the annual fuel and maintenance savings are substantial, resulting in a 1-2 year payback period with either battery size. [EPA-HQ-OAR-2022-0985-1644-A1, p. 51-52]

127 Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush for Environmental Defense Fund.

When these significant cost reductions relative to EPA's current modeling are taken into consideration, a more protective school and transit bus standard is reasonable and easily justified. [EPA-HQ-OAR-2022-0985-1644-A1, p. 52]

Organization: Environmental Protection Network (EPN)

EPN strongly supports EPA's proposal but believes that it could go substantially further. The revision of the greenhouse gas standards for HDV is a unique opportunity to closely align emission reductions in the sector with President Biden's stated goal of reducing emissions 50-52% below 2005 levels by 2030. A recent study by the International Council on Clean Transportation (ICCT) presented several possible scenarios for the standards, estimates each scenario's potential to align with U.S. climate goals, and quantifies the associated air quality and health benefits through 2050.3 [EPA-HQ-OAR-2022-0985-1523-A1, p. 1]

3 'Potential Benefits Of The U.S. Phase 3 Greenhouse Gas Emissions Regulation For Heavy-Duty Vehicles,' Pierre-Louis Ragon et al. (April 14, 2023)

The analysis finds that fully aligning the sector with climate goals would require a 55% ZEV sales share in 2030, including a 40% ZEV sales share for long-haul tractors. More stringent greenhouse gas emission reduction targets can be met by a combination of ZEV uptake and internal combustion engine efficiency improvements. The analysis finds that cost-effective internal combustion engine vehicle improvements of up to 25% for tractors and 31% for vocational trucks can be achieved beyond 2027. [EPA-HQ-OAR-2022-0985-1523-A1, p. 1]

The proposed heavy-duty truck proposal will reduce carbon pollution by 1.8 billion metric tons, roughly equivalent to the annual emissions of 480 coal-burning power plants, achieving $180-$320 billion in benefits. [EPA-HQ-OAR-2022-0985-1523-A1, p. 2]

Strong State Support

The ambitious EPA standards are well supported by state-based policy pillars already in place. For example, for commercial trucks and buses, a group of states representing 36% of the

U.S. heavy-duty vehicle market signed a coordinated agreement to achieve 30% electric sales of commercial trucks and buses by 2030 and 100% by 2050 with an emphasis on the need to accelerate deployment in disadvantaged communities.5 [EPA-HQ-OAR-2022-0985-1523-A1, p. 2]

5 ‘Multi-State Medium- and Heavy-Duty Zero Emission Vehicle - Memorandum of Understanding,’ https://ww2.arb.ca.gov/sites/default/files/2020-07/Multistate-Truck-ZEV-Governors-MOU-20200714.pdf

California now requires 68% of new car sales and 45% of new truck sales to be zero emissions by 2030. California’s new clean car and truck emissions rules have been adopted by Massachusetts, New Jersey, New York, Oregon and Washington, amplifying their impact for tens of millions of additional drivers and their vehicles. Just recently, Colorado joined the group. This means the California standards requiring much more stringent greenhouse gas standards will cover around 40% of the light-duty and 36% of the heavy-duty vehicle (Class 2b-8?) markets. [EPA-HQ-OAR-2022-0985-1523-A1, p. 2]

Battery Electric Trucks and Buses Will Save Money The Environmental Defense Fund recently commissioned an analysis6 by Roush Industries to evaluate the cost of electrifying vehicles in several medium and HDV market segments, specifically those concentrated in urban areas, in the 2027-2030 timeframe. These included transit buses, school buses, shuttle buses, delivery vans, delivery trucks, and refuse haulers. The analysis concluded that electric vehicles are cost competitive with diesel vehicles in all vehicle segments examined, and in most cases at the time of purchase in 2027. [EPA-HQ-OAR-2022-0985-1523-A1, p. 3]

6 ‘Technical Review of Medium and Heavy Duty Electrification Costs for MY 2027-2030, Final Report’, Vishnu Nair et al. RoushIndustries, Inc., (February 2, 2022)

Another recent analysis by ICCT finds that by 2030, the Total Cost of Ownership (TCO) of battery electric long-haul trucks will likely be lower than that of their diesel counterparts.7 Despite their higher upfront price, battery electric trucks have substantially lower operational expenses than the other trucks studied due to their higher energy efficiency and lower maintenance costs. For very high daily mileages, battery electric trucks can still achieve a better total cost of ownership than their diesel counterparts despite the larger battery size required. [EPA-HQ-OAR-2022-0985-1523-A1, p. 3]

7 ‘Total Cost Of Ownership Of Alternative Powertrain Technologies For Class 8 Long-Haul Trucks In The United States’, Hussein Basma et al. (April 27, 2023).

Among heavy-duty commercial vehicles, electric trucks and buses will be cheaper TCOs than their diesel counterparts between 2024 and 2030 depending on the vehicle segment. [EPA-HQ-OAR-2022-0985-1523-A1, p. 3]

Major Truck Manufacturers Compete Globally, Must Meet Tightest Standards The largest truck manufacturers, including Navistar, Volvo, and Daimler, compete globally and therefore are working to meet the world’s toughest standards. Today, those include the European Union (EU) and California, both of which are more stringent than the EPA proposal. The EU will require 100% zero emissions HDV by 2040 and California by 2036. [See the Overall HDV sales in the EU and the US graphic on p. 3 of docket number EPA-HQ-OAR-2022-0985-1523-A1] [EPA-HQ-OAR-2022-0985-1523-A1, p. 3]

Ambitious EPA Standards Helped By Converging Pillars The bipartisan Infrastructure Investment and Jobs Act (IIJA) adds $100 billion for EV and clean energy policy. The Inflation Reduction Act of 2022 (IRA) includes about $370 billion in climate investments to decarbonize the power and transportation sectors. The law offers up to $7,500 to buy new EVs and up to $4,000 for used EVs, along with tax credits of up to $40,000 for commercial ZEVs and $100,000 for truck charging stations. An additional $1 billion provides funding for zero-emission school buses, heavy-duty trucks and public transit buses. Finally, billions of dollars will be invested in manufacturing loans and investment in EVs and domestic fuel cell production. [EPA-HQ-OAR-2022-0985-1523-A1, p. 5]

A new study by ICCT and Energy Innovation (EI) modeled how the IRA will drive new EV sales, finding that IRA incentives mean sales of new heavier commercial EVs, like tractor trailers, school buses, and delivery vans, could likewise rise dramatically to represent 38% to 48% of new vehicle sales.10 [EPA-HQ-OAR-2022-0985-1523-A1, p. 5]

10 'Analyzing The Impact Of The Inflation Reduction Act On Electric Vehicle Uptake In The United States', Peter Slowik et al. (January 31, 2023).

For HDV, it considers states that have adopted California's ACT rule and ZEV targets. [EPA-HQ-OAR-2022-0985-1523-A1, p. 5]

For both the light- and heavy-duty sectors, the analysis shows rapid electric vehicle uptake when considering both expected manufacturing cost reductions and the IRA incentives, as well as state policies. By 2030, for heavy-duty, ZEV sales shares are estimated to range from 39% to 48% by 2030 and from 44% to 52% by 2032. [EPA-HQ-OAR-2022-0985-1523-A1, p. 5]

The impact of the IRA and IIJA provide strong support for EPA setting more stringent Phase 3 heavy-duty vehicle greenhouse gas standards than would have been possible otherwise, at lower cost and higher benefit to consumers and manufacturers. To meet climate goals, federal standards would need to drive electrification rates above 40% by 2030 for HDV. [EPA-HQ-OAR-2022-0985-1523-A1, p. 5]

Heavy Duty Electric Trucks Are Already Entering the Market Global model availability for medium and heavy-duty EVs rose from 609 models to 808 models available for purchase between 2021 until the end of 2022. Additionally, CALSTART estimates that the U.S. and Canada will experience steady growth from 166 models to 213 models available for purchase between 2021 and 2023.11 [EPA-HQ-OAR-2022-0985-1523-A1, p. 6]

11 'Electric Vehicle Market Update:, April 2023.

Pride Group, the second largest refuse fleet in the U.S., ordered 200 Freightliner eCascadia Class 8 electric trucks and 50 Freightliner eM2 Class 6-7 electric trucks starting in mid-2023, with the intention of switching its local delivery fleet to 100% EVs within the next one to two years. [EPA-HQ-OAR-2022-0985-1523-A1, p. 6]

Volvo Trucks has received a record order for up to 1,000 electric trucks including 130 heavy-duty electric trucks to be delivered by the end of the decade.12 The order, the largest commercial order to date for Volvo electric trucks, was placed by Swiss-based Holcim, a global manufacturer of building solutions. The first 130 electric trucks to be delivered by the end of 2024 will be the heavy-duty electric Volvo FH and Volvo FM trucks, which boast an electric range of up to 300 kilometers depending on what is being carried. Both trucks can move up to 44 tonnes of gross combination weight (GCW). It is expected that by replacing 1,000 of Holcim's existing Volvo FH diesel trucks with Volvo FH electric trucks using green electricity along a typical route, up to 50,000 tonnes of CO_2 could be saved each year. Jan Jenisch, the chairman and CEO of Holcim, said the company aims to reach a share of 30% of zero-emission heavy-duty trucks by 2030. [EPA-HQ-OAR-2022-0985-1523-A1, p. 6]

12 'Volvo secures record order for 1,000 electric trucks', Joshua S. Hill, The Driven (May 23, 2023).

Volvo trucks set a global target of 50% of total sales by 2030 with higher targets of 70% in North America and Europe. Navistar has set a goal of 50 percent heavy-duty ZEV sales by 2030 and 100% EV or fossil free by 2040. Daimler, the leading manufacturer of heavy-duty class 8 trucks in the U.S., has committed to offering only carbon-neutral trucks and buses in the U.S. by 2039 and has allocated $85 billion toward this goal. Tesla plans to produce 50,000 units annually of its semi Class 8 electric truck starting in 2024 after a one-year ramp up, with 36 delivered to Pepsi in December 2022. [EPA-HQ-OAR-2022-0985-1523-A1, p. 6]

Organization: Evergreen Action

As you know, emissions from the freight system as a whole including heavy-duty vehicles, but extending to locomotives, off-road equipment, and marine vessels, is a pressing environmental justice and climate risk. The EPA has not yet articulated plans for emissions standards for the other elements of the system, fully approved all relevant California waivers for the California Air Resources Board's rules for many of these sectors, or articulated incentive programs under the Inflation Reduction Act that can comprehensively address pollution burden. As a result, emissions have, for years, continued to rise – leaving regions from the Inland Empire to California's Central Valley, to Colorado's Front Range, to Wisconsin's southeast warehouse belt, to New York City's Hunts Point market, either out of attainment with federal health standards, or perilously close to health violations. This proposed rule needs to be strengthened and finalized, as part of a comprehensive approach to freight emissions, as communities burdened by pollution have, for years, demanded. [EPA-HQ-OAR-2022-0985-1595-A1, p. 1]

Accordingly, as a down payment on this urgent larger effort, we believe the final rule should drive greater emissions reductions than currently proposed, and chart a path to zero emission vehicles for all vehicle classes. Given the current state of zero emissions vehicle technology and the billions of dollars available through recent federal investments to help truck manufacturers and fleet managers transition to clean vehicles, there is ample opportunity to compel greater emissions reductions. Major engine manufacturers and fleet owners have come forward with their own commitments to transition to zero emissions fleets by the end of the next decade, which means greater emissions reductions than proposed in this rule can be achieved now. [EPA-HQ-OAR-2022-0985-1595-A1, pp. 1-2]

Trucks continue to be the main vehicle for goods movement across the country, and truck emissions continue to impede progress on national ambient air quality standards, which could be overcome with stronger regulations. [EPA-HQ-OAR-2022-0985-1595-A1, p. 2]

We urge the administration to strengthen this rule to better align with commitments from multiple states to achieve a dramatic reduction in heavy duty vehicle emissions over the next decade. In particular, this rule does not go far enough to address emissions from long haul tractors, which state-based policies do. While EPA's proposal only requires that 10% of long haul tractors become electric by model year 2030, California's Advanced Clean Truck (ACT) rule, recently granted a waiver for enforcement by EPA, requires that 30% of long haul tractors be electrified by 2030. California is not alone in amining to curb truck pollution far ahead of EPA's schedule, as 7 other states have signed on to the ACT rule. [EPA-HQ-OAR-2022-0985-1595-A1, p. 2]

California also continues to set the pace and prove that heavy duty vehicles can be electrified, as the Advanced Clean Fleets (ACF) rule was approved in April, mandating 100 percent new vehicle electrification for all on-road heavy duty vehicle classes by 2036, and a full transition to zero emissions trucks (new and existing) across approximately half the state's fleets by 2045. This set of standards, rooted in extensive evidence and analysis, must inform EPA's own stringency considerations as it finalizes this rule. Although we recognize that the full national market is somewhat behind California's, the adoption of the ACT rule in many states, the likely adoption of the ACF rule in the same places, parallel rules and efforts globally, and the resulting massive pivot to electrification among manufacturers all argue for a rule far more ambitious than EPA's proposal, which projects limited electrification into the early 2030s and then stops with no final electrification target. [EPA-HQ-OAR-2022-0985-1595-A1, pp. 2-3]

Indeed, beyond commitments from coastal states, there is national interest in transitioning away from heavily polluting trucks and adopting the latest zero emissions technology, demonstrated in 2020 by the 15 states along with Puerto Rico and Washington DC that signed on to the medium and heavy duty vehicle MOU. This multi-state MOU sets a goal to transition to 30 percent of medium and heavy duty vehicles being electric by 2030, and accounts for nearly a quarter of the national truck market. Given these clear signals of interest to adopt zero emissions trucks by both states and industry actors, EPA should increase the stringency of this rule to match the pace of electric vehicle adoption [EPA-HQ-OAR-2022-0985-1595-A1, p. 3]

Organization: Ford Motor Company

Ford believes the Phase 3 GHG standards will facilitate the transition to electrified and zero-emission vehicles (ZEVs) across the industry, reduce GHG emissions from heavy-duty vehicles, and reduce criteria emissions even beyond the recently finalized heavy-duty criteria emissions standards. Ford supports the 2032 endpoint in the main proposal of the Phase 3 Proposal, including the numeric standards which may result in 50 percent of new heavy-duty vocational vehicles being zero-emission vehicles. [EPA-HQ-OAR-2022-0985-1565-A1, p. 2]

Finally, beyond the regulation proposed here, we encourage EPA, National Highway Traffic Safety Administration, and California to harmonize their GHG standards, fuel economy standards, and ZEV requirements. Each of these requirements are ultimately regulating the same aspects of the same vehicles and fleets, at the same time. During this extraordinary period of transition, automakers need harmonization between these programs. We are concerned that well-intentioned but technically contradictory rules from different agencies—especially those designed to continue to eke out improvements on internal combustion vehicles—will divert resources from electrification and slow down the development, manufacture, and sale of heavy-duty ZEVs. [EPA-HQ-OAR-2022-0985-1565-A1, p. 3]

Program Target ZEV Percentage

Ford supports the 2032MY GHG emission standards in EPA's main proposal and the associated 50 percent vocational vehicle ZEV sales target in 2032MY. This target is ambitious but likely feasible given current knowledge and projections about heavy-duty ZEV adoption and the lead time that will be required to develop, launch, and scale new technologies and heavy-duty vehicle programs. [EPA-HQ-OAR-2022-0985-1565-A1, p. 4]

However, Ford does not believe that a 60 percent vocational vehicle ZEV sales target is feasible nationwide in 2032MY. While this is the sales requirement in California's ACT regulation, California has already invested and continues to invest significantly in medium-duty and heavy-duty ZEV charging and fueling infrastructure and incentives for customers to more rapidly adopt heavy-duty ZEVs (for recent examples, see California Energy Commission's $1.7 billion for medium- and heavy-duty ZEV infrastructure in 2022 - 2026, or California Air Resources Board's $2.6 billion for clean transportation including a Zero-Emission Truck Loan Pilot, building on the existing Truck Loan Assistance Program). California's recently finalized Advanced Clean Fleets (ACF) regulation will also drive fleets to purchase more heavy-duty ZEVs, further supporting the feasibility of the manufacturer sales requirements in ACT. A handful of other states have adopted ACT and may adopt ACF, but in general other individual states have not made investments to support heavy-duty ZEVs at the same level as California. Other parts of the US may also have colder climates or different industry composition that are less conducive to heavy-duty ZEVs. Without these supporting factors, customer acceptance of heavy-duty ZEVs nationally is likely to lag that of California, and a 60 percent vocational vehicle sales target is much less feasible for the US as a whole by 2032MY. [EPA-HQ-OAR-2022-0985-1565-A1, p. 4-5]

Organization: GreenLatinos et al.

For Greenhouse gas (GHG) Phase 3 HDV standards, we urge the U.S. EPA to finalize the strongest possible cleaner trucks standards. The standards must require tighter limits on diesel vehicles, so that we're making diesel trucks increasingly cleaner as manufacturers transition to zero pollution vehicles. [EPA-HQ-OAR-2022-0985-2665-A1, p. 1]

The strongest possible HDV and L/MDV standards will help reach the urgent goal to cut greenhouse gas emissions by 60% by 2030 and will put American cars and trucks on a clear path towards achieving 100% zero emission electric vehicle (EV) sales by 2035 or earlier. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Organization: International Council on Clean Transportation (ICCT)

IMPROVEMENTS IN ICE EFFICIENCY BEYOND PHASE 2 REQUIREMENTS EPA proposes Phase 3 greenhouse gas standards that do not reflect the adoption of new efficiency technologies for internal combustion engines and vehicles beyond those required to meet existing Phase 2 standards. EPA identified a range of technology packages with payback periods no greater than two-years when it finalized its Phase 2 standards in 2016. We find that manufacturers have been able to meet the standards without utilizing all technologies identified in the Phase 2 rule. Our research suggests that utilizing these and other technologies provide a potential additional improvement in ICE vehicle efficiency up to 23% in the high-roof sleeper cab vehicle category or up to 13% if we exclude engine efficiency improvements. Our research also suggests a potential ICE vehicle efficiency improvement of up to 31% for a diesel-fueled

Class 6 multi-purpose vocational vehicle or up to a 20% improvement excluding engine efficiency gains. Certain strategies – including aerodynamic and tire efficiency improvements – are even more likely to be adopted because they can cost-effectively reduce the cost and increase the range of zero-emission vehicles. We conservatively estimate that incorporating such additional technologies in the stringency of the proposed rule – not including engine technology improvements – would generate an additional 537 million tonnes of cumulative CO2 emissions avoided between 2020 and 2050. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 3-4]

We consider the market forecast of ZEV sales that informs this rule to be an upper limit on ZEV deployment in light of the fact EPA has not accounted for any deployment of vehicle efficiency technologies. For every 1% efficiency improvement due to technologies like aerodynamic drag reduction, for example, we estimate the projected ZEV sales share would decline by 0.8% for Class 8 high roof sleeper-cab tractors. EPA can provider greater certainty its ZEV market forecast will be met by adjusting the stringency of its rule to reflect cost-effective ICE efficiency improvements beyond those required to meet Phase 2 standards. Our analysis suggests that a more stringent standard is feasible based on the well-established technology potential we and the agency have previously identified. [EPA-HQ-OAR-2022-0985-1553-A1, p. 4]

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

II. Barriers to Compliance

The EPA's proposed GHG emissions standards for heavy-duty vehicles set out an ambitious target for ZEV adoption. While the proposed standards are performance-based and do not mandate the use of a specific technology, compliance all but requires the increased adoption of ZEV technologies. The EPA projects that one potential pathway for the industry to meet the proposed standards would be through the following mix of ZEV and ICE vehicles: [EPA-HQ-OAR-2022-0985-1596-A1, p. 5] [See Table about ZEV Share Projection on p. 5 of Docket Number EPA-HQ-OAR-2022-0985-1596-A1]

14 Supra note 1 at 25932.

While GHG emissions standards seek to hold manufacturers accountable, many of the factors that make compliance feasible are outside of the control of manufacturers. These factors include consumer demand for EVs (market penetration), reliable charging infrastructure, grid capacity, energy costs, or the costs of key inputs, such as batteries or critical minerals. Together, under the proposed standards, these variables will serve as substantial obstacles to OEM compliance. The UAW supports using regulation to bring new technology to heavy-duty fleets, so long as the technology is proven and cost effective; regulatory timelines are feasible; and manufacturers have flexibility to meet stringency requirements through multiple technology pathways. Through balanced rules, it is possible to take feasibility into account while still making substantial reductions in GHG emissions and meeting key long-term targets. As the EPA highlights, manufacturers have declared their commitment to long-term emissions reductions and electrification targets, but the pathway to those targets must be feasible and strengthen domestic manufacturing. Therefore, we encourage the EPA to calibrate the standards so that the projected adoption of ZEVs reflects more feasible alternatives, increases more gradually, and occurs over a greater period of time. [EPA-HQ-OAR-2022-0985-1596-A1, p. 5-6]

A. EV Market Penetration

The proposed standards' anticipated adoption of ZEVs is incongruent with the current and projected heavy-duty vehicle market. According to the U.S. Energy Information Administration's (EIA) Annual Energy Outlook (AEO) sales estimates from the 2022 AEO report, the battery electric vehicle (BEV), fuel cell electric vehicle (FCEV), hybrid, and alternate fuel vehicle share of class 3-8 vehicle sales is significantly below the proposed standards' projections. The 2022 AEO report estimated that the 2021 sale of these vehicles did not exceed 1% in any vehicle class.15 This suggests the current heavy-duty vehicle market is not at all prepared for or demanding of the EPA's plan for expedited ZEV adoption. What's more, the report projected ZEV adoption in 2050 that is significantly below the proposed standards' projections in 2032. This suggests that the increased stringency of the proposed standards over a short period of time is ill suited to comport with the expected demand of the heavy-duty vehicle market. The proposed standards, therefore, pose a risk to the short- and long-term stability of the heavy-duty vehicle market. [EPA-HQ-OAR-2022-0985-1596-A1, p. 6] [See Figure on p. 6 of Docket Number EPA-HQ-OAR-2022-0985-1596-A1]

15 See EPA, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis at 11 (April 2023), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

16 Id. at 12.

In light of these projections, we urge the EPA to continue to draw upon technical feedback from the industry responsible for implementing this transition and calibrate the standards as explained above. We also encourage the EPA to factor the cost of a disruption to the heavy-duty vehicle market caused by the proposed standards into its economic impact analysis. This contingency planning is necessary because heavy-duty vehicles are integral to the functioning of the U.S. economy as they carry 70% of all freight moved in the country and are "expected to move freight at an even greater rate in the future."17 The domestic economy and heavy-duty vehicle market depend on a reliable supply chain. The proposed standards should be better aligned with these concerns. [EPA-HQ-OAR-2022-0985-1596-A1, p. 6-7]

17 Id. at 1.

Organization: Lion Electric, Co. USA

This rule will accelerate the adoption of zero-emission heavy-duty vehicles and help to reduce greenhouse gas emissions across the United States, especially if the EPA finalizes these standards before 2024. [EPA-HQ-OAR-2022-0985-1506-A1, p. 1]

U.S. Manufacturing and Acceptance of Heavy-Duty Electric Vehicles:

- The demand for battery-electric vehicles is here. Currently, Lion has a total of 2,000+ MHD BEVs on order. This number can be broken down further to 2,270 battery-electric school buses and 295 trucks. As a result of recent policies and market trends, the U.S. is already seeing green manufacturing facilities being created and fleets committing to electrification in the U.S. In fact, 90 percent of the country's largest fleets committed to fully transition to ZETs. Getting to carbon-free commercial transport | McKinsey
- The proposed Phase 3 GHG standard will encourage a quicker adoption of electric heavy-duty vehicles in the U.S. and establish the nation as a leader in this technology. Class 6

> to Class 8 trucks are being designed and built and Lion has successfully put some of these models on the road so customers can begin their zero-emission journey. Our vehicles are purpose-built for electric with battery experience, design and assembly done 100 % inhouse, and we also build our own chassis, truck cabin and bus body. [EPA-HQ-OAR-2022-0985-1506-A1, p. 1-2]

We believe that accelerating the adoption of MHDVs, including trucks and clean, zero-emission school buses help address the critical climate crisis facing the U.S., create a healthier environment, and provide financial benefits for organizations that invest in electric vehicles. [EPA-HQ-OAR-2022-0985-1506-A1, p. 2]

Organization: Lynden Incorporated

We are the leading bulk milk hauler in the Pacific Northwest, responsible for picking up 2 million gallons of milk per day on rural roads for dairy farms. Any disruption in reliability of service would be catastrophic to dairy farmers and the milk supply chain and any increase in operating costs will quite literally raise the price of a gallon of milk and other necessities for American families. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

Similarly, we provide transportation for most of the food, medicine, and other essential goods that reach Alaskan communities, including rural and Native Alaskan communities. This will exacerbate the inflationary impact on food prices that we have seen in the last few years for the people who can afford it least. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

Organization: Manufacturers of Emission Controls Association (MECA)

MECA supports stringent GHG standards founded on technologically feasible and cost-effective solutions that allow the attainment of carbon reduction goals. We concur that the introduction, transition and widespread adoption of battery electric and fuel cell vehicles represents a vital advancement in the decarbonization of heavy-duty vehicles. Further, we believe an important opportunity exists to continue to reduce GHG emissions from heavy-duty vehicles due to the evolution of engine and vehicle efficiency technologies in the 7 years since the Phase 2 standards were last set. It is critically important for clean mobility suppliers that EPA finalizes this rule by the end of 2023 and implements it by 2027 to align with the truck criteria pollutant rule. This will allow for the simultaneous optimization of engine calibration and aftertreatment designs to minimize the emissions of NOx and GHGs. [EPA-HQ-OAR-2022-0985-1521-A1, p. 1]

MECA supports the need to reduce CO2 emissions from heavy-duty vehicles by setting technology neutral, performance standards that continue to improve the efficiency of today’s vehicles while accelerating the introduction of battery and fuel cell electric powertrains across applications where they yield significantly lower GHG emissions as well as meet the needs of end users. We believe the rate of electrification estimated for compliance in EPA’s proposed pathway to be ambitious and we deem that the final rule would be more robust with consideration of additional engine and vehicle technologies in those vehicle applications that may take longer to electrify. [EPA-HQ-OAR-2022-0985-1521-A1, p. 2]

Organization: Mayor Becky Daggett, City of Flagstaff, Arizona et al

EPA should finalize the most stringent standards possible for the Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles (LDV) and the Greenhouse Gas Emissions Standards for Heavy-Duty Engines and Vehicles Phase 3 (HDV). We recommend these car and truck standards:

- Be aligned on rulemaking timelines;
- Account for technological advances and cost-savings in zero-emission technologies, including those made possible by recent legislation;
- Achieve critically necessary reductions in greenhouse gases (GHGs) and other pollutants; and
- Be developed with thorough stakeholder involvement that ensures all affected communities can engage in the rulemaking process. [EPA-HQ-OAR-2022-0985-2007]

Ambitious federal standards, coupled with actions we are taking in our cities and towns to accelerate the use of clean vehicles, will enable our localities to more quickly cut transportation pollution and help ensure our residents and businesses have access to zero-emission technologies. [EPA-HQ-OAR-2022-0985-2007]

Timelines -- The sooner that long-term LDV and HDV standards are in place, the sooner that vehicle manufacturers and related companies will have the regulatory certainty needed to plan their decision-making, product development, and rollout. We urge the EPA to finalize both standards by the end of 2023. [EPA-HQ-OAR-2022-0985-2007]

Technological advances and cost savings -- EPA should ensure the LDV and HDV standards reflect major advancements in zero-emission technologies. Globally, there are more than 839 different models of zero-emission vans, trucks and buses commercially available with new models being introduced at an unprecedented rate.1 [EPA-HQ-OAR-2022-0985-2007]

1 https://globaldrivetozero.org/tools/zeti-data-explorer (Accessed March 15, 2023).

Throughout the rulemaking process, EPA should also recognize and consider investments from the recently enacted Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA). [EPA-HQ-OAR-2022-0985-2007]

Together, these two laws are expected to reduce adoption costs for ZEVs by providing at least $245 billion in federal funds—through tax credits, loans, and grants—to support ZEV charging infrastructure, manufacturing, and purchasing. Long-term regulatory certainty will push domestic manufacturers to take full advantage of these investments. [EPA-HQ-OAR-2022-0985-2007]

Critical pollution reductions -- In 2020, the transportation sector contributed 27 percent of total GHG emissions in the United States—more than any other single sector. Transport also contributes over 55 percent of our nation's total nitrogen oxide (NOx) emissions. NOx and particulate matter pollution pose serious health risks, leading to devastating human health impacts including asthma, other respiratory issues, and even premature death. [EPA-HQ-OAR-2022-0985-2007]

Fast-tracking robust car and truck standards is critical for the United States to meet its GHG targets over the coming decade, meet Clean Air Act requirements and provide long-overdue protections for environmental justice communities. We believe that such standards would be consistent with the U.S. nationally determined contribution to the Paris Agreement, under which the United States committed to cut economy-wide GHG emissions by 50 to 52 percent in 2030, compared to 2005 levels. [EPA-HQ-OAR-2022-0985-2007]

Outcomes -- The final standards should:

- Ensure the LDV and HDV standards support greater zero-emission vehicle adoption by considering market growth expected from IRA and IIJA investments (which will surpass existing commitments outlined in Executive Order 14037);
- Put the nation on a trajectory to ensure 100 percent of all LDVs and HDVs sold in 2035 are zero-emission vehicles including pathway milestones assuring continuous progress; and
- Reflect recently adopted state LDV and HDV emissions standards, consistent with state authority under the Clean Air Act. [EPA-HQ-OAR-2022-0985-2007]

By implementing these recommendations, we believe that the resultant standards will not only meet the Clean Air Act's statutory command to protect public health, but will also help lower fuel costs for consumers, create good, green jobs, and reduce burden on frontline communities. [EPA-HQ-OAR-2022-0985-2007]

Organization: Missouri Farm Bureau (MOFB)

EPA's proposed rule on heavy-duty (HD) vehicle emissions usurps the marketplace's role in developing the most efficient and lowest-cost technologies that can both protect the environment and keep our nation's economy running at full speed. While EPA stated it has 'historically not required the use of any particular technology, but have allowed manufacturers to use any technology that demonstrates a vehicle meets the standards over applicable procedures,'1 this proposed rule picks winners and losers through its heavy emphasis on battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs). The proposed rule doubles-down on electric vehicle (EV) technology that is not ready for wide-scale adoption, especially in regard to the HD truck sector. [EPA-HQ-OAR-2022-0985-1584-A1, p. 1]

1 EPA Greenhouse Gas Standards for Heavy-Duty Vehicles – Phase 3, Vol. 88, Fed. Reg. 25926, p. 25949 (Apr. 27, 2023) (to be codified at 40 C.F.R. pts. 1036, 1037, 1054, 1065 & 1074).

As we stated previously, the proposed rule is not ready for wide-scale adoption. EPA readily admits: 'At present there are few manufacturing plants for heavy-duty vehicle batteries in the U.S….but this will take several years to come to fruition.'5 The proposed rule also states: 'commenters provided specific recommendations for ZEV adoption rates to include in our analysis, and these adoption rates are on the order of 40 percent or more electrification by MY 2029.'6 However, this is a very questionable estimate. The proposed rule states: 'an increasing number of vehicles are powered by zero emission vehicle (ZEV) technologies such as battery electric vehicle (BEV) technology…EPA certified 380 HD BEVs in MY 2020 but that number jumped to 1,163 HD BEVs in MY 2021,' 7 which EPA declares is: 'representing 0.2 percent of the HD vehicles.'8 [EPA-HQ-OAR-2022-0985-1584-A1, p. 2]

5 Ibid., 25945.

6 Ibid., 25933.

7 Ibid., 25938.

8 Ibid., 25940.

We are all too familiar with the supply-chain and logistics problems that resulted from the COVID-19 pandemic. In MOFB's estimation, the proposed rule's mandates on the transportation sector risk turning back the clock to those days because of its unrealistic assumption that long-haul trucks can efficiently transition to EVs without causing major shipping disruptions for the majority of Americans. [EPA-HQ-OAR-2022-0985-1584-A1, p. 2]

Organization: Moving Forward Network (MFN) et al.

Our organization's deep commitment to advancing environmental justice, equity, economic justice, and a just transition is core to MFN's values. Following MFN's core values, it urges the EPA to strengthen the proposed Phase 3 GHG Rule. [EPA-HQ-OAR-2022-0985-1608-A1, p. 2]

The EPA must strengthen the proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. Protective standards must ensure that emissions are reduced in environmental justice communities. Stringent standards should use state regulations like the Advanced Clean Truck Rule as a baseline, and adopt more stringent controls. This Administration's commitment to environmental justice cannot end with words, a meeting, a press event, or money; policy and regulations are needed to ensure that frontline/fenceline communities are protected and thrive. [EPA-HQ-OAR-2022-0985-1608-A1, p. 3]

"We need to address the environmental racism now. My community is filled with thousands of trucks that spew toxic pollution and affects our residents on a daily basis. We recently did a truck count across the street from where over 800 senior citizens live and recreate. Our teams counted over 1,000 trucks per hour. Our community does not deserve to be forgotten and polluted. [EPA-HQ-OAR-2022-0985-1608-A1, p. 3]

The Phase 3 Greenhouse Gas Rule must guarantee reductions from heavy-duty trucks, especially in communities of color. When it comes to zero-emission trucks, we have the technology, we have the ability, but we need the regulations to make sure that these solutions are being implemented. Stop choking our residents on rhetoric, and show that you care about our lives. That our lives matter more, too. " -Asada Rashidi, South Ward Environmental Alliance 4 [EPA-HQ-OAR-2022-0985-1608-A1, p. 3]

4 Asada Rashidi. South Ward Environmental Alliance. (June 2, 2023). http://www.southwardea.com/.

On March 15, 2023, thirty-seven members from the Moving Forward Network met with the EPA Administrator and staff to reiterate what must be included in the GHG draft rule to uphold the Administration's commitments to environmental justice and reach the intended goals from the GHG rule. [EPA-HQ-OAR-2022-0985-1608-A1, p. 4]

The outcome of that meeting was a stated commitment from the Administration to continued engagement with MFN and our members. For MFN, we are committed to this continued engagement but also must reinforce our commitment to our proposed solutions and the urgency that the Administration move beyond rhetoric and into action. In summary, unless and until EPA's proposal is strengthened significantly, this rule would perpetuate an already dangerous and deadly status quo and squander a critical opportunity to address the impacts from medium and heavy-duty trucks and buses that are killing people. [EPA-HQ-OAR-2022-0985-1608-A1, p. 5]

Even though the evidence for a transition to ZEVs is clear, the standing draft Phase 3 GHG Rule made considerable conservative assumptions, resulting in an indefensibly weak proposal. Throughout its proposal, the EPA acknowledges that its assumptions are "conservative"—it did not consider the full impacts of the Inflation Reduction Act, nor did the agency consider how state standards would already provide a robust platform for growth for zero-emission vehicles. Eight states have already adopted California's Advanced Clean Truck rule that provides the platform for growth, making the assumptions taken by EPA unjustifiable. And, there is an unprecedented level of federal funding available to invest in infrastructure that will support the prioritization and deployment of zero-emission vehicles in the most impacted EJ communities. MFN calls for the final rule to include zero-emission targets stronger than the proposal and better reflect zero-emission heavy-duty technology's technical feasibility and availability. [EPA-HQ-OAR-2022-0985-1608-A1, p. 5]

The following comments set forth a detailed, comprehensive proposal, on behalf of the MFN membership, to align EPA's heavy-duty emission standards with the Administration's stated commitment to environmental justice communities. In addition to strengthening the proposed rule, we urge the Administration to adopt a comprehensive policy and programmatic agenda that aims to eliminate the toxic emissions and cumulative impacts that are a direct result of the heavily-polluting freight system. [EPA-HQ-OAR-2022-0985-1608-A1, p. 5]

- Address the gaps from the 2022 Heavy-Duty Engine and Vehicle Standards Rule (NOx). This rule did not address the critical demands set forth by MFN members to ensure that there will be meaningful emission reductions within environmental justice communities from heavy-duty trucks and create a clear pathway for zero-emission vehicles. [EPA-HQ-OAR-2022-0985-1608-A1, p. 5]
- Ensure a clear pathway to zero emissions by mandating all new vehicles be zero emissions by 2035, including a sales mandate. This mandate for zero-emission vehicles must include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities. There is a critical opportunity right now to leverage federal funding, such as funds committed under the Inflation Reduction Act, to deploy zero-emission infrastructure in overburdened EJ communities. A whole-of-government approach is needed to ensure these investments advance equity and to begin planning today in order to support large-scale deployment of zero-emission trucks on the road. [EPA-HQ-OAR-2022-0985-1608-A1, p. 5]
- Include environmental justice and public health analyses to ensure a sufficiently stringent rule and its implementation. [EPA-HQ-OAR-2022-0985-1608-A1, p. 6]
- Even though EPA did not add it, MFN still maintains that the rule must include a multi-pollutant standard that regulates greenhouse gas emissions and additional pollutants, including nitrogen oxides (NOx) and particulate matter (PM), to prevent dangerous combustion-based fuel source alternatives and false solutions like natural gas from being considered as part of "zero-emission". [EPA-HQ-OAR-2022-0985-1608-A1, p. 6]
- As it stands, all of the options in EPA's Phase 3 proposed rule will not relieve the daily burdens caused by the freight transportation system, in particular heavy-duty trucks. Our demands detailed throughout the letter center on a goal to eliminate emissions from freight transportation, prioritize environmental justice communities and address the cumulative impacts caused by the freight sector. EPA must finalize standards stronger than its preferred proposal. The agency should set a strong standard paired with a sales

mandate, that would ensure a clear pathway to 100% new heavy-duty vehicles being zero emissions by 2035. Additionally, this mandate for zero-emission vehicles would include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities. A whole-of-government approach is needed to ensure these investments advance equity and to begin planning today to support large-scale deployment of zero-emission trucks on the road. [EPA-HQ-OAR-2022-0985-1608-A1, p. 9]

- Our comments also touch on several key points: Firstly, EPA has the authority to adopt a strong standard as provided by Clean Air Act (Act) section 202(a). While the Clean Air Act contemplates that EPA might limit the stringency of standards based on its assessment of what is feasible, in the case of the Phase 3 rule, the agency's refusal to adopt the strongest standard is not based on the identification of any technological or engineering barriers. In fact, EPA's proposal even undercuts state action underway through the Advance Clean Trucks rule (which has been adopted by approximately 20 percent of the medium- and heavy-duty trucks market) and manufacturer commitments to sell only zero-emission trucks, offering no reasons for why those predictions are not achievable. [EPA-HQ-OAR-2022-0985-1608-A1, p. 9]
- Secondly, given the weak stringency of standards in EPA's Main Proposal and that the proposed standards do not require or mandate the use of a specific technology for compliance, EPA leaves room for scenarios where the industry can comply with fewer ZEVs than those projected under its preferred approach ("EPA's Main Proposal"). Additionally, EPA fails to analyze the impacts of non-zero emission vehicle trucks properly. The proposal is structured in a manner that does not provide certainty that truly clean technologies will be used to comply with the standard. To strengthen its proposal, EPA must not allow "false solutions" like alternative combustion fuels (e.g., hydrogen combustion and natural gas) to be included in its zero-emission definition and should explore incorporating other structural additions to the rule that will provide certainty that truly clean, zero-emission vehicles will be deployed at the rate needed to provide relief to our communities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 9-10]
- Thirdly, our comments provide analytical justifications for why a strong standard is feasible and challenges the agency's flawed assumptions around feasibility. We show that the technology exists, that there will be enough materials and battery supply chain production to electrify these vehicles, and that significant public and private investments are being made for this transition to occur. Additionally, we show that adopting a strong standard is economical, provides cost savings, and we urge EPA to account for more than just the effects of emissions standards on job growth and ensure that its policies consider the importance of a just transition with high quality jobs. [EPA-HQ-OAR-2022-0985-1608-A1, p. 10]
- Lastly, we show that the potential benefits the agency associates with the various policy scenarios are more likely to be realized under a policy scenario that reflects the MFN recommended approach (where 100 percent of all new vehicle sales are zero emissions by 2035) —which would also satisfy the law, meet moral obligations, and allow the agency to live up to its promise to provide relief to environmental justice communities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 10]

5. EPA Must Finalize Stronger Standards than its Preferred Proposal

EPA's authority for adopting these Phase 3 standards is provided by Clean Air Act (Act) section 202(a). Section 202(a)(1) directs EPA to "prescribe (and from time to time revise)... standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). The Supreme Court in Massachusetts v. EPA, 549 U.S. 497, 529 (2007), ruled that greenhouse gases are "unambiguously" air pollutants that may be regulated under section 202. EPA has found that the emissions of these pollutants from motor vehicles, including medium and heavy-duty trucks, contribute to pollution that is anticipated to endanger public health and welfare. 74 Fed. Reg. 66496, 66499 (Dec. 15, 2009). [EPA-HQ-OAR-2022-0985-1608-A1, p. 22]

As courts have recognized, the task assigned in section 202(a) is to "utilize[e] emission standards to prevent reasonably anticipated endangerment from maturing into concrete harm." Coal. For Responsible Regulations, Inc. v. EPA, 684 F.3d 102, 122 (D.C. Cir. 2012). Regulations prescribed under section 202(a)(1) must "take effect after such period as the Administrator finds necessary to permit the development of the requisite technology, giving appropriate consideration to the cost of compliance within such period." 42 U.S.C. § 7521(a)(2). Congress' expectation was that EPA would "press for the development and application of improved technology rather than be limited by that which exists today." NRDC v. EPA, 665 F.2d 318, 328 (D.C. Cir. 1981) (quoting S.Rep.No. 1196, 91 st Cong., 2d. Sess. 24 (1970)). [EPA-HQ-OAR-2022-0985-1608-A1, p. 22]

The exercise envisioned by the statute is to assess the need for emission reductions from vehicles and determine what reductions are feasible. In the feasibility analysis, "[i]n the absence of theoretical objections to the technology," EPA's task is "to identify the major steps necessary for the development of the technology], and give plausible reasons for its belief that the industry will be able to solve those problems in the time remaining." NRDC, 655 F.2d at 333. [EPA-HQ-OAR-2022-0985-1608-A1, p. 22-23]

EPA's Phase 3 proposal appears wholly disconnected from the exercise anticipated by the statute and described by the courts. EPA's proposed standards are not tied to any assessment of what emission reductions are needed to address the endangerment posed by greenhouse gas emissions from medium- and heavy-duty trucks. As part of the U.N. Framework Convention on Climate Change, President Biden committed the United States to reach net-zero emissions economy-wide by no later than 2050. The President's National Climate Task Force, in turn, established a 2030 emissions target of 50 to 52 percent reductions in U.S. greenhouse gas pollution from 2005 levels ("nationally determined contribution" or "NDC"). Given the average useful life of a heavy-duty truck is around 15 years, to reach net-zero by 2050 means ending the sale of new combustion trucks in the 2035 timeframe. A 2023 ICCT report modeled a NDC-consistent scenario for the Phase 3 standards. 44 EPA's proposal neither aligns with a NDC-consistent scenario nor puts the U.S. on a trajectory consistent with requiring all zero-emission trucks beginning in 2035. EPA must offer some rationale for not adopting standards commensurate with addressing the endangerment it has identified, or the commitments made to reduce economy-wide GHG emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 23]

44 Pierre-Louis Ragon, Claire Buysse, Arijit Sen, Michelle Meyer, Jonathan Benoit, Josh Miller, Felipe Rodríguez. Potential Benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles. The International Council on Clean Transportation. (April 2023).

The Act contemplates that EPA might limit the stringency of standards based on its assessment of what is feasible, but EPA's refusal to adopt the standards necessary to address the identified problem is not based on the identification of any technological or engineering barriers. Zero-emission technology already exists and is commercially available for virtually every category of medium and heavy-duty truck. 45 As the proposal notes, manufacturers have announced commitments to sell only zero-emission trucks, and EPA has offered no reasons why those predictions are not achievable. Cf. NRDC, 655 F.2d at 335 ("[T]he industry's own predictions, while not determinative, support the view that success in this kind of research can realistically be expected within the proposed time frame."). As outlined below, there is every reason to believe that zero-emission technologies will advance to the point that deployment levels well above EPA's proposed standards are feasible and cost-beneficial. [EPA-HQ-OAR-2022-0985-1608-A1, p. 23]

45 See CARB, Advanced Clean Fleets Regulation, Initial Statement of Reasons, App. J (Aug. 30, 2022) (available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appj.xlsm).

Instead of looking at what is needed and possible, EPA equates technological "feasibility" with a projection of the voluntary "adoption rate" of zero-emission technologies and sets the proposed standard based on its assessment of the number of zero-emission trucks consumers will be willing to purchase. 88 Fed. Reg. at 25958; id. at 26003 ("In this proposal, we considered willingness to purchase (such as practicability, payback, and costs for vehicle purchasers including EVSE) in determining the appropriate levels of the proposed standards."). There is no statutory basis for this approach, and it has no rational connection to the standard-setting exercise outlined by Congress. [EPA-HQ-OAR-2022-0985-1608-A1, p. 23-24]

At a superficial level, one might claim that it is not feasible for manufacturers to sell cleaner trucks if purchasers are unwilling to buy them, but that is not a rational measure of what is technologically feasible because such a superficial claim ignores the ability of manufacturers to influence those purchaser decisions. The Act cannot be read to allow consumer preferences—especially "edge-case" outlier preferences—to trump the adoption of feasible controls necessary to protect public health and welfare. In Int'l Harvester Co. v. Ruckelshaus, 478 F.2d. 615, 640 (D.C. Cir. 1973), the Court agreed with EPA's position that "as long as feasible technology permits the demand for new [vehicles] to be generally met, the basic requirements of the Act would be satisfied, even though this might occasion fewer models and a more limited choice of engine types," and concluded, "[t]he driving preferences of hot rodders are not to outweigh the goal of a clean environment." Even in the worst-case scenario, i.e., that zero-emission technology could not meet the needs of every single purchaser – a scenario that has no actual record basis and is inconsistent with the manufacturers' own views on where the market is headed – there is no indication that Congress intended EPA to use such assertions to reject feasible and necessary emission standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 24]

EPA's statutory task is not to ensure all future trucks can operate in the same manner that they currently do, nor should that be EPA's task—that is the manufacturers' task. As they have since EPA started adopting vehicle standards, manufacturers can decide how to make vehicles that purchasers want and that comply with the emission standards required to protect public health and welfare. This may involve marketing, pricing adjustments, financing incentives, adding other features or functionality that are more desirable, or innovating technology to meet those consumer demands. See, e.g., RMI, "Reality Check: Electric Trucks are Viable Today," at (May

25, 2022) (available at: https://rmi.org/reality-check-electric-trucks-are-viable-today/) (noting that driver retention is a problem in the industry and drivers love electric trucks because they offer multiple advantages over combustion trucks). Today's trucks, even as they meet the EPA standards that have been adopted over the years, are more technologically advanced and capable of doing much more than the trucks that consumers demanded before EPA's standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 24]

EPA's elevation of consumer willingness to purchase as the key indication of feasibility is undermined by EPA's own statements noting the manufacturers' ability to influence purchaser decisions. For example, EPA notes that "manufacturers typically price certain products higher than average and others lower than average (i.e., they cross-subsidize)" to influence purchase decisions. 88 Fed. Reg. at 26027; see also id. at 26029. EPA also notes that putting more zero-emission trucks on the road will increase purchaser exposure and comfort with these new technologies and that manufacturers can also influence adoption by educating purchasers on the benefits of zero-emission trucks (i.e., marketing). Id. at 26069; see also Draft Regulatory Impact Analysis, at 417 (April 2023). EPA's projected adoption rate includes no analysis of how that rate might be influenced by the very tools EPA highlights in its own proposal. [EPA-HQ-OAR-2022-0985-1608-A1, p. 24]

EPA cannot simply propose any standard that it finds is feasible and claim that Congress' directive has been met. The statutory language in section 202(a) is broad but not without criteria. Congress cabins the standard-setting process by highlighting the need to address endangerment to the degree technologically feasible. EPA's refusal to propose standards based either on what is necessary to address the endangerment posed by truck GHG emissions or on the limits of what is technologically feasible unmoors the standards from any statutory criteria and is arbitrary and capricious. EPA must finalize the strong, feasible standards that are necessary to address the impacts posed by these emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 25]

Given the urgency of the climate crisis and the impact that heavy-duty vehicle pollution has on our climate and the air we breathe, EPA should adopt the strongest and most protective rule that puts us on a trajectory to all new vehicle sales being 100 percent zero-emission vehicles (ZEVs) by 2035. The most stringent option posed by the EPA results in the deployment of 42 percent of new vehicles 46 sold being ZEVs in 2032 and a 10 percent reduction of greenhouse gas emissions by 2032 (relative to 2026). The finalized rule must go further than even the strongest of the two scenarios that the EPA requested comment on in the draft rule. Any final version of this rule that does not accomplish this will be insufficient to address the public health and environmental harms caused by diesel heavy-duty vehicle pollution, especially when not paired with requirements for non-combustion-based, zero-emission solutions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 25]

46 Specific to heavy-duty vehicles as defined by the rule.

EPA projects that its preferred approach would only achieve 50 percent of ZEV sales by 2032 for vocational vehicles, 35 percent for short-haul tractors, and 25 percent for long-haul tractors, but the Agency's preferred proposal fails even to match publicly committed goals from prominent industry figures, such as Daimler, Ford, Navistar, and Volvo, who have made a range of commitments to increase their share of ZEV sales. These commitments range from 50 percent to 67 percent of sales by 2030, to 100 percent of sales as soon as 2035. Most, if not all, of the Agency's justifications for the EPA Main Proposal are equally, if not more, applicable to

Industry Commitments Alternative Proposal. While the Industry Commitments Alternative Proposal ultimately falls short of what is needed for achieving 100 percent zero emissions by 2035, this proposal includes the stringency levels that are the least inappropriate of all the variations of the proposal offered up for comment by the EPA, and these stringency levels are also feasible to meet for all model years of the program. Additionally, the necessary benefits to the climate and for public health and welfare will only be realized by a rule that ensures all new vehicles sold are zero emissions by 2035, and certainly not likely with any scenarios weaker than the Industry Commitments Alternative Proposal. [EPA-HQ-OAR-2022-0985-1608-A1, p. 25]

Phase 3 follows a trend in which solutions to address the deadly harms of diesel pollution are looking to include unproven, potentially dangerous "alternatives" to diesel by allowing for alternative fuel sources such as natural gas and, in the case of this policy, hydrogen. These "bridge" fuels only further the environmental injustices caused by freight, and risk exchanging one source of pollution for another, arguably increasing the impacts because of pollution from pipelines and production to stacks and waste. [EPA-HQ-OAR-2022-0985-1608-A1, p. 25]

States across the country are leading the transition to zero-emission trucks, and EPA's proposal fails to match state ambition or account for the ZEV adoption rates that would result from compliance with the Advanced Clean Trucks (ACT) program. The ACT has already been adopted by 8 states—representing about 20 percent of the medium- and heavy-duty trucks market —and more states are considering following suit. 47 In fact, in May of 2023, Rhode Island announced its intention to adopt the ACT rule. EPA projects that if it set a national standard that aligns with the ZEV adoption levels under the ACT rule, this would result in 60 percent ZEV sales for vocational vehicles and 40 percent ZEV sales for tractors – ZEV deployment levels that exceed those expected under EPA's Main Proposal . This, too, serves as another justification for why EPA's Main Proposal is insufficient (as well as any proposals weaker than the Industry Commitments Alternative Proposal and the MFN recommended approach). [EPA-HQ-OAR-2022-0985-1608-A1, p. 26]

47 Larissa Koehler. Nearly Two Dozen U.S. and Canadian States Endorse Roadmap to 100% Zero-Emission Trucks by 2050. Environmental Defense Fund. (July 27, 2022). https://www.edf.org/media/nearly-two-dozen-us-and-canadian-states-endorse-roadmap-100-zero-emission-trucks-2050#:~:text=The%20Advanced%20Clean%20Trucks%20(ACT,and%20heavy%2Dduty%20vehicle%20marketplace.

6.4. EPA's Analysis Fails to Properly Analyze Impacts of Non-ZEV Trucks

Phase 3 follows a trend in which solutions to address the deadly harms of diesel pollution are looking to include unproven, potentially dangerous "alternatives" to diesel by allowing for alternative fuel sources such as natural gas and, in the case of this policy, hydrogen combustion technologies. These "bridge" fuels and technologies only further the environmental injustices caused by the freight, and exchange one source of pollution for another, arguably increasing the impacts because of pollution from pipelines and production to stacks and waste. [EPA-HQ-OAR-2022-0985-1608-A1, p. 37]

Given the weak stringency of EPA's Main Proposal and that the proposed standards do not require or mandate the use of a specific technology for compliance, EPA leaves room for scenarios where the industry can comply with fewer ZEVs than those projected under the Agency's preferred approach. [EPA-HQ-OAR-2022-0985-1608-A1, p. 37-38]

8. Even Using EPA's Flawed Impact Assumptions, MFN's 100% by 2035 Recommendation Would Deliver Over Three Times the GHG Emission Reductions, Greater Public Health Benefits and Economic Benefits Compared to EPA's Main Proposal

Environmental Resources Management, Inc (ERM), one of the largest sustainability consultancies globally, was commissioned by NRDC as part of the Moving Forward Network to provide independent, third-party analysis of the Agency's proposed Phase 3 HDV standards and alternative proposals, as well as the MFN recommended alternative proposal. The methodology, assumptions, and results are described throughout this section. [EPA-HQ-OAR-2022-0985-1608-A1, p. 50]

8.1. EPA's Proposal Does Not Actually Project ZEVs

This analysis uses EPA's assumptions about the grid, which does not reflect the grid being cleaned up to the degree necessary for truly zero-emissions technologies to be used for compliance. Accordingly, no ZEVs as defined by MFN are actually deployed under any aspect of the policy scenarios explored in this section. Also, for the purpose of this data, the MFN approach focuses on only the electric truck market share and thus only a portion of our 100% ZEV by 2035 recommendation, neglecting both the focus on EJ deployment and prioritization and the deployment of complementary policies to ensure that electric trucks are truly zero-emission vehicles. [EPA-HQ-OAR-2022-0985-1608-A1, p. 50]

8.2. EPA's "No Action Baseline"

ERM's analysis employed a modeling framework that leveraged EPA's tools to inform and develop inputs to ERM's Benefit-Cost Analysis (BCA) framework. It is important to note that while this analysis is based on EPA's "baseline" scenario, we believe this "baseline" is ultimately not an accurate reflection of a "No Action" scenario and is erroneous and overly conservative. For example, EPA's "Baseline" fails to reflect the Advanced Clean Trucks rule and related EV adoption expectations, commitments from industry, key critical and historic public and private investments, and other actions underway that will lead to a higher EV sales share than what EPA's analysis is assuming (see Sections 9.2 and 9.3). [EPA-HQ-OAR-2022-0985-1608-A1, p. 50]

As a result, all the projected benefits from EPA's Main Proposal and all projected benefits associated with the various alternative policy scenarios modeled in this section are overinflated and should only be viewed in comparison to each other or viewed in comparison to a more accurate business as usual baseline, which EPA's Main Proposal more accurately reflects. Even still, as noted above, the benefits associated with each policy scenario will be overinflated since the rule structure doesn't account for upstream emissions, leaving room in each policy scenario for technologies that are not truly clean (like hydrogen combustion technology). [EPA-HQ-OAR-2022-0985-1608-A1, p. 50-51]

8.3. Methodology

ERM adopted EPA's methodology to keep the approach to this analysis and resultant comparisons consistent with EPA's approach in the proposed rule and to allow for an apples-to-apples comparison. MFN believes that EPA's analytical approach is inherently incorrect and flawed, especially since it involves overly conservative assumptions and does not reflect the grid being cleaned up to the degree necessary for truly zero-emissions technologies to be used for compliance, among other concerns. In other words, this fleetwide analysis should be considered independently of the technology-focused analysis of Section 7, as it was completed with different assumptions and for a different purpose. [EPA-HQ-OAR-2022-0985-1608-A1, p. 51]

EPA's updated MOVES model (MOVES3.R3) was utilized to model EV adoption rates (sales and in-use), vehicle miles traveled (VMT), and pollutant emissions by vehicle type. Although EPA's HD TRUCS tool was not explicitly used to generate EV adoption scenarios, cost assumptions (battery costs, incremental vehicle costs, EVSE costs, etc.) and vehicle classification/identification information and sales shares were incorporated into both ERM's BCA framework and its modification and application of MOVES3.R3 data outputs. ERM's BCA framework was applied to compare and evaluate the impacts across several scenarios, including:

- EPA's Baseline: EPA's "no action" scenario that, as explained above, MFN believes is erroneous and overly conservative. This involves EV adoption rates defined in MOVES3.R3 associated with EPA's No Action scenario, as provided by EPA.
- EPA's Main Proposal (EPA's Preferred Scenario): EPA's preferred scenario that MFN believes is a more accurate reflection of a "no action" baseline. This includes EV adoption rates developed in HD TRUCS and MOVES3.R3 outputs associated with EPA's Proposal scenario, as provided by EPA.
- Industry Commitments (Alternative Proposal): Represents an alternative set of assumptions to incorporate stated OEM goals of 50-67% EV sales share by 2030. This scenario assumed 50% EV sales share by 2030 for combination trucks and 55% EV sales for all other HDVs by 2030, with all HDV sales increasing to 90% EV sales share by 2040 (to align with longer-term carbon-neutral and/or net zero targets of manufacturers).
- MFN Recommendation (100% by 2035) : Consistent with MFN's recommended scenario of achieving 100% ZEV sales share by 2035. 108 Vehicle-specific adoption rates are informed by an HDV EV adoption scenario recommended by the International Council on Clean Transportation (ICCT). [EPA-HQ-OAR-2022-0985-1608-A1, pp. 51-52]

108 As noted elsewhere, because the grid is not being cleaned up, this is not identical to MFN's recommendation but merely the most consistent given constraints related to a comparison to EPA's modeling.

ERM utilized EPA's CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool to assess the public health benefits of the scenarios versus what EPA views as the baseline if no action occurs. [EPA-HQ-OAR-2022-0985-1608-A1, p. 52]

ERM's BCA model looks at five interconnected analyses:

- Fuel Use and Emissions: Specifically, it looks at changes in fuel consumption (for diesel, gasoline, and electricity) and the tailpipe and upstream emissions associated with each fuel change for GHGs (CO_2, CH_4, N_2O) and criteria pollutants (NOx and PM) for the various policy scenarios. Reductions in emissions are then monetized using EPA's COBRA model and IPCC's Social Cost of GHGs. Because EPA's analysis, which this is meant to mirror, does not reflect any policies to clean up the grid nor a future grid consistent with the administration's climate goals, this likely understates disparities between scenarios with differing electric truck deployment.

- Health Impacts: This analysis takes reductions in NOx and PM under the various policy scenarios to understand the resulting public health implications associated with reducing these emissions and calculates changes in premature deaths, hospital visits, and lost workdays. The analysis also monetizes these net health benefits. As above, these impacts are inherently understated in an effort to mirror EPA's work.
- Economic Analysis: This analysis looks at changes in vehicle purchasing behaviors and costs, fuel costs, and maintenance practices and how that could change from a more electrified fleet. This analysis also examines capital expenditures for charging infrastructure investments (i.e., purchase, installation, and maintenance).
- Utility Impacts Analysis: This analysis looks at impacts on utilities and their customers, including an analysis of electricity used to charge vehicles and the incremental load to the grid. The analysis also calculates utility net revenue (revenue minus costs) and potential reduction in electric bills for all utility customers that results from this net revenue. The gap analysis shows the infrastructure needs and associated costs under the different policy scenarios. [EPA-HQ-OAR-2022-0985-1608-A1, p. 52]

8.5. ERM Sales Share, In-Use Fleet Share, and In-Use Fleet Population

The EV adoption sale shares assumed over time for the various scenarios are shown below in Figure 8 and 9; the corresponding in-use fleet EV share and populations are also shown in Figure 10 and 11 respectively. [EPA-HQ-OAR-2022-0985-1608-A1, p. 55] [Refer to Figure 8, Comparison of EV Adoption Rate Scenarios on p. 55 of docket number EPA-HQ-OAR-202-1608-A1.]

112 Note that motor home sales were not included in EV count or share calculations (Figures 8, 9, 10, and 11).

Figure 9 depicts the distribution of different vehicle types that make up the unused vehicles in the new data sets. This figure shows that the EV sales share will be 80 percent in 2032 to ensure that we are on a path to 100 percent zero emissions from all new heavy-duty trucks by 2035. The EV penetration projections in EPA's Main Proposal (Market BAU) (the Agency's preferred approach) are projected to only reach 48 percent 113 by 2032, leaving necessary emissions benefits on the table compared to the MFN recommended approach. This is worsened by the fact that all of these projections are overstated since there is no certainty that electric trucks will be used as a form of compliance. Additionally, even if EPA finalized the Industry Commitments Alternative Proposal version of the rule, there would still be a delay in life-saving reductions, but less of a delay (5 years) compared to the delay that would be experienced through EPA's Main Proposal (Market BAU) when compared to the MFN recommended approach. This, too, is unacceptable, and EPA should work to finalize a version of the rule that sets us on a path to achieving 100 percent zero emissions by 2035. [EPA-HQ-OAR-2022-0985-1608-A1, p. 56] [Refer to Figure 9, Comparison of EV Adoption Rate Scenarios (by Technology Type) on p. 56 of docket number EPA-HQ-OAR-202-1608-A1.]

113 42 percent if motorhomes included in calculation.

Figure 10 shows how the in-use fleet is impacted by the different EV adoption scenarios. Compared with EPA's erroneous no action baseline, EPA's Main Proposal (Market BAU) results in a 6-percentage point increase in EV sales by 2032, while the Industry Commitments Alternative Proposal sees greater penetration of EVs and reaches 12 percent by 2032. These scenarios are compared to the levels achieved if EPA were to take a stronger and more impactful approach and finalize a rule that reflects the MFN recommended approach for 100 percent new vehicles sales being zero emissions by 2035, which results in 17 percent EV in-use share by 2032 and 46 percent in-use vehicles by 2040, twice as much as projected under EPA's Main Proposal (Market BAU). [EPA-HQ-OAR-2022-0985-1608-A1, p. 57] [Refer to Figure 10, EV Share of In-Use Fleet, by Scenario on p. 57 of docket number EPA-HQ-OAR-202-1608-A1.]

114 Note that motorhome sales were not included in ZEV share calculations.

The graphs in Figure 11 provide the actual number of EVs in use broken down by vehicle type, rather than just the percentage of the in-use EV fleet (as shown in Figure 10). [EPA-HQ-OAR-2022-0985-1608-A1, p. 58] [Refer reader to Figure 11, In-Use EVs by Vehicle Type on p. 58 of docket number EPA-HQ-OAR-202-1608-A1.]

2.1 million EVs are expected to be on the road by 2032 under MFN's recommended approach (which gets the nation to 100 percent of new heavy-duty vehicles sold being zero emissions by 2035). This is approximately 640,000 more EVs than would be possible under the Industry Commitments Alternative Proposal and over 1.05 million more EVs than is projected to occur under EPA's Main Proposal (Market BAU) within the same timeframe. [EPA-HQ-OAR-2022-0985-1608-A1, p. 58]

8.6. Emissions and Public Health Impacts

The ERM modeling results on GHG tailpipe and upstream emissions, shown below in Figure 12, show the emissions reductions possible from achieving 100 percent of new HDV sales being EVs by 2035 from 2026-2040, consistent with MFN's recommended, as well as the cumulative reductions from the other policy scenarios and the monetized value of these reductions. These benefits are compared to the EPA baseline and do not reflect actual net benefits, since EPA's baseline is not actually reflective of what market conditions are expected to be in a no action scenario. [EPA-HQ-OAR-2022-0985-1608-A1, p. 58] [Refer to Figure 12, Comparison of Possible Climate Benefits on p. 59 of docket number EPA-HQ-OAR-202-1608-A1.]

115 Note: The grid mix was modeled using the light-duty and medium-duty draft regulatory impact analysis (DRIA), since the DRIA for this Phase 3 rule did not include the identified grid factors. This analysis assumes that EPA is using consistent heavy-duty analyses (since the agency did not provide the heavy-duty IMP modeling data). Again, this ERM analysis makes use of the very conservative EPA numbers, assumptions, and baseline, which differs from other analyses explored in this comment letter (in particular the analysis on the relative benefits of different truck technologies) and do not actually reflect fully MFN's recommendations.

A final rule aligned with MFN's recommendation would be expected to achieve over a 50 percent reduction in emissions of CO_2 by 2040 compared to 2026 and result in nearly $115 billion in climate benefits by 2040 – approximately $81 billion more than would be possible from EPA's Main Proposal (Market BAU) during the same timeframe. In comparison, EPA's Main Proposal (Market BAU) would only result in approximately a 20 percent reduction in emissions of CO_2 by 2040 compared to 2026. Additionally, the Industry Commitments Alternative Proposal, while not as strong as the targets called for by MFN, would certainly be more impactful than EPA's Main Proposal (Market BAU) and would be expected to achieve just under a 40 percent reduction in emissions in 2040 compared to 2026 and over $53 billion more in climate benefits than EPA expects from its preferred approach. Accordingly, EPA's failure to finalize a rule that aligns with our recommended approach would be unnecessarily leaving significant climate benefits on the table. Again, all of these projections are overstated since EPA uses an erroneously conservative baseline and since EPA has failed to do a comprehensive analysis on how this regulation would impact frontline and fence-line communities. Accordingly, even under the strongest action taken of the proposed options, EPA has failed to predict what benefits could occur for these impacted communities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 59] [Refer to Table 2, Possible Cumulative Reduction and Monetized Value (per Policy Scenario) on p. 60 of docket number EPA-HQ-OAR-202-1608-A1.]

8.7. Comparison of Criteria Emissions and Possible Health Benefits

As touched on earlier in this section, ERM adopted EPA's methodology to keep the approach to this analysis consistent with EPA's approach and allow for an apples-to-apples comparison. MFN believes that this approach is inherently incorrect and flawed and does not reflect the grid being cleaned up to the degree necessary for truly ZEV technologies to be used for compliance, among other concerns. In particular, ERM utilized EPA's COBRA model to estimate the public health benefits associated with all the scenarios. ERM's analysis shows that with stricter standards and increased deployment of battery electric trucks, there are greater gains in terms of consumer savings and avoided public health impacts (such as premature death, hospital admissions and emergency room visits, respiratory symptoms, and reduced activity and lost workdays). The scenario aligned with MFN's recommendations achieves the most reductions, followed by the [EPA-HQ-OAR-2022-0985-1608-A1, p. 60]

8.8. Industry Commitments Alternative Proposal

ERM's analysis incorporates EPA's assumed changes in tailpipe emission reductions, EPA's upstream assumptions that rely upon the Integrated Planning Model (IPM) for electricity generated units, and ERM assumptions on changes from reduced demand on refining of finished products for diesel (and gasoline) based on the use of Argonne National Laboratory's Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model. [EPA-HQ-OAR-2022-0985-1608-A1, p. 60]

Table 3 shows the various scenario criteria emissions (NOx and PM) aggregated from 2026-2040 for each of the policy scenarios, possible reduced health incidences, and the monetized value of these reductions (if realized) compared to EPA's erroneous "no action" baseline. To assess more realistic net benefits of these proposals, they would be compared to a scenario closely reflecting EPA's Main Proposal (Market BAU). [EPA-HQ-OAR-2022-0985-1608-A1, p. 60] [Refer to Table 3, Comparison of Possible Health Benefits on p. 61 of docket number EPA-HQ-OAR-202-1608-A1.]

If electric trucks were deployed according to the market levels consistent with EPA's HD TRUCS model, EPA's Main Proposal (Market BAU) could result in about a 64 percent NOx reduction and a 60 percent reduction in PM relative to the agency's erroneous baseline. The possible reductions associated with the Industry Commitment Alternative Proposal scenario could be just under an 80 percent NOx reduction and a 58 percent reduction in PM 2.5, while wholly electrifying new vehicle sales by 2035, consistent with MFN's recommendations, would result in the highest reductions achieved of the policy scenarios offered for comment, especially if EPA combined that policy approach with policies to provide certainty that only truly clean, EVs were used for compliance (not modeled). EPA must not hesitate to finalize MFN's recommended approach for the rule if the agency and the Biden Administration truly wants to live up to its commitment to provide relief to frontline and fence-line communities.[EPA-HQ-OAR-2022-0985-1608-A1, p. 60-61]

8.9. Comparison of Utility Impacts

ERM's results also point to the potential for utilities to receive net revenue from the electrification of heavy-duty trucks (see Figure 12). Specifically, this analysis looks at all of the costs associated with providing and distributing electricity, as well as any revenue based on the identified utility rate from HD TRUCS (which is approximately 10.5 cents per kilowatt hour). The portion of the figure focused on peak load is based on peak energy charging demand for each of the vehicles summed up for each of the policy scenarios. [EPA-HQ-OAR-2022-0985-1608-A1, p. 61]

As required by public utility commissions, additional revenues in excess of authorized revenue requirements generally must be returned to all utility customers, so this would help put downward pressure on rates. Accordingly, electrifying heavy-duty trucks could lead to up to $2.2 billion in net utility revenue under the MFN recommended approach and a slight reduction in the electricity bills of the average U.S. household, below what the bills would otherwise be without truck electrification, by up to $12 per year and up to $86 per year for the average commercial customer. [EPA-HQ-OAR-2022-0985-1608-A1, p. 61] [Refer reader to Figure 13, Incremental Utility Net Revenue and Peak Load from M/HDV ZEV Charging on p. 62 of docket number EPA-HQ-OAR-202-1608-A1.]

8.10. Comparison of Incremental Fleet Costs and Savings

The analysis depicted in Figure 14 incorporates several different cost categories (including purchasing chargers, charger maintenance, incremental purchase price between ICE and BEVs, vehicle maintenance savings associated with EVs, and the difference in fuel costs between purchasing gasoline and diesel fuel versus electricity). [EPA-HQ-OAR-2022-0985-1608-A1, p. 62]

We note that numerous manufacturers have raised concerns about the costs associated with shifting to zero-emission trucks, however, the ERM analysis overall shows that the average ZEV reaches life-cycle cost parity with diesel and gasoline vehicles before model year 2027. Additionally, from a cost and savings perspective for fleets, purchasing an average MY2032 EV would save its owner nearly $86,000 over the life of the vehicle. The results are shown in Figure 14. [EPA-HQ-OAR-2022-0985-1608-A1, p. 62] [Refer reader to Figure 14, Possible net lifecycle costs of a battery electric truck (EV) versus the comparable diesel or gasoline alternative on p. 63 of docket number EPA-HQ-OAR-202-1608-A1.]

8.11. Comparison of Overall Societal Benefits

Due to EPA's failure to ensure that truly clean, zero emissions trucks will be used by manufacturers for compliance, the market share projected for EPA's rule is likely overstated. The only way EPA can truly prove that the rule will be beneficial to frontline and fence-line communities (as well as society at large) would be to have structured the rule to account for upstream emissions and to provide certainty that projected levels of ZEVs will actually occur as a part of industry compliance. [EPA-HQ-OAR-2022-0985-1608-A1, p. 63]

The results from ERM's analysis (depicted in Figure 15) show that on a net societal basis – inclusive of the benefits and costs to fleets, air quality benefits, climate benefits, net utility revenues that would be returned back to all utility customers in the form of lower bills – the MFN recommended alternative would achieve two-and-a-half times the benefits of EPA's Main Proposal (Market BAU) by 2040. The Industry Commitments Alternative Proposal would achieve nearly twice as many benefits as EPA's Main Proposal (Market BAU) in 2040. [EPA-HQ-OAR-2022-0985-1608-A1, p. 63] [Refer to Figure 15, Possible Annual Net Societal Benefits for Various Scenarios on p. 64 of docket number EPA-HQ-OAR-202-1608-A1.]

Over the entire period of the analysis (2026 - 2040), the cumulative net societal benefits discounted at a 3% rate could achieve $225 billion under MFN's recommended approach compared to $166 billion with the Industry Commitments Alternative Proposal, and only $87 billion with EPA's Main Proposal if compliance was done through EVs. [EPA-HQ-OAR-2022-0985-1608-A1, p. 63-64]

9. EPA's Weak Proposal is Built On Flawed Assumptions Around Feasibility

The discussion above demonstrates that EPA's preferred alternative is not a rational choice based on the need for emission reductions to address identified impacts. Stronger standards are necessary to meet emission reduction goals and would be cost-beneficial. The following sections demonstrate that EPA's weak preferred alternative also cannot be justified based on claims that these necessary more protective standards are not feasible. [EPA-HQ-OAR-2022-0985-1608-A1, p.64]

9.1. EPA's Analysis Fails to Account for Feasible Improvements in Combustion Technologies

EPA notes that "in developing the Phase 2 CO 2 emission standards, we developed technology packages that were premised on technology adoption rates of less than 100 percent. There may be an opportunity for further improvements and increased adoption through MY 2032 for many of these technologies included in the HD GHG Phase 2 technology package used to set the existing MY 2027 standards." 88 Fed. Reg. at 25960. Yet despite identifying technologies for internal combustion engine powered trucks that could exceed the Phase 2 standards, it did not base its Phase 3 standards on any such additional deployment. [EPA-HQ-OAR-2022-0985-1608-A1, p.64-65]

Below we walk through a number of the technologies that the EPA should assume will be deployed by truck manufacturers in the timeframe of the Phase 3 proposal. [EPA-HQ-OAR-2022-0985-1608-A1, p.65]

9.2. State Actions Support the Feasibility of More Protective Standards

For Class 4-8 vehicles, EPA estimates their proposed rule would increase ZEV sales by about 44% nationally by 2032. This falls short of the Advanced Clean Trucks (ACT) rule, which will result in 60% ZEVs as a portion of new vehicle sales by 2032. States have demonstrated that more stringent truck standards are feasible and better prepared to safeguard public health. [EPA-HQ-OAR-2022-0985-1608-A1, p. 70]

One of the fundamental benefits of the ACT rule, that EPA's regulation lacks, is the fact that the rule mandates an increasing percentage of zero-emission trucks and buses be sold within a state, which creates a market and consistent supply of zero-emission trucks and buses, ensuring that states can meet their climate and air quality goals over the next two decades. This important ZEV sales component is incredibly effective because while alternative combustion technologies may reduce greenhouse emissions, they are not nearly as effective as ZEVs at reducing emissions. These technologies can still emit air pollution that threatens public health. [EPA-HQ-OAR-2022-0985-1608-A1, p. 70]

The eight states that have adopted the Advanced Clean Trucks rule have done so to significantly improve air quality and health, while doing their part to reduce greenhouse gas emissions. Collectively, these states represent over 20% of the medium and heavy-duty trucks market, and more states are joining this share of the overall M/HDV market. In fact, Rhode Island announced that the state will pursue ACT adoption on May 10, 2023. [EPA-HQ-OAR-2022-0985-1608-A1, p. 70]

A stronger EPA rule is technologically, legally, and economically feasible, and zero-emission trucks and buses are the fastest way to curb greenhouse gas emissions from the transportation sector. Additionally, truck manufacturers have shown they are capable of bringing ZEVs to the market. As of October 2020, there were 20 zero-emission models commercially available across all bus types and Class 2b-8 trucks. By the end of 2022, 544 total models were available across those vehicle classes. Based on manufacturer announcements, there will be multiple companies selling EVs in virtually all medium- and heavy-duty market segments by 2025, including 58 percent of the major OEMs. 128 Significant advancements in range and efficiency in the upcoming years can be expected, expanding suitability for a wider spectrum of zero-emission vehicle uses and classes. Combined with the historic federal investments under the Inflation Reduction Act and the Bipartisan Infrastructure Law, more stringent Phase 3 greenhouse standards for heavy-duty vehicles would accelerate this ongoing ZEV transition. [EPA-HQ-OAR-2022-0985-1608-A1, p. 70]

128 MJ Bradley & Associates, Medium- And Heavy-Duty Vehicles: Market Structure, Environmental Impact & EV Readiness at 22, Figure 10, (July 2021), available at http://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf

9.3. The Zero-Emission Heavy-Duty Vehicle Market Supports the Feasibility of Stronger Standards

9.3.1. Zero-Emission Heavy Duty Vehicle Market and Availability

EPA's proposal is inconsistent with its own comprehensive review of the current markets and technologies, OEM electrification commitments, related state regulations, and significant federal investments. Despite the vast literature and ample industry data on the subject, EPA chose to base the proposal on an original "physics-based tool" that was largely uninformed by the specifications of vehicles available on the market today. 129 We urge EPA to reconsider this decision and to review and emulate the methodologies in the current literature. [EPA-HQ-OAR-2022-0985-1608-A1, p. 71]

129 U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 204. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

9.3.2. Zero-Emission Trucks are Available Today

In the US and Canada, over 180 models of zero-emission medium- and heavy-duty vehicles (ZE MHDVs) – including trucks and coach, school, and shuttle buses – are available on the market, according to CALSTART's Zero-Emission Technology Inventory (ZETI). 130 This represents significant growth in availability over the past few years, up around 30 percent from 2021 to 2023. EPA's review of the ZE MHDV market relied on data from MY2021, which may have limited the Agency's ability to capture a realistic review of the current market and outlook for future development. 131 Given the consistent and significant year-over-year growth in the market, we recommend that this analysis be revisited with more recent information. [EPA-HQ-OAR-2022-0985-1608-A1, p. 71]

130 Global Drive to Zero. Zero-Emission Technology Inventory. https://globaldrivetozero.org/tools/zeti/ (last accessed: May 2023).

131 U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 5. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

Other nations are adopting ZE MHDVs at rates much higher than in the US. Model availability in China far outpaces that in the US, where over 260 models are available. Furthermore, the growth in availability in the Chinese market is more than double that in the US market over the past two years. The wide and growing availability of zero-emission trucks in China has affected a concentration of adoption there, where over 90 percent of the world's zero-emission trucks and buses were sold in 2021. 132 A more stringent Phase 3 regulation will help to accelerate the market for ZE MHDVs in the US. [EPA-HQ-OAR-2022-0985-1608-A1, p. 71]

132 Mao, S. et al. Zero-emission bus and truck market in China: A 2021 update. The International Council on Clean Transportation. (January 2023). https://theicct.org/wp-content/uploads/2023/01/china-hvs-ze-bus-truck-market-2021-jan23.pdf

While buses make up the lion's share of currently deployed ZE MHDVs in the US, the vehicle types with the most significant growth in availability are tractor trucks and cargo vans, which had a 75 percent and 230 percent increase, respectively from 2021 to 2023. 133 This is noteworthy given the significant and disproportionate amount of pollution created by tractor trucks and the strong ability for cargo vans to electrify today given their typical duty cycle. 134 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 71 - 72]

133 Global Drive to Zero. Zero-Emission Technology Inventory. https://globaldrivetozero.org/tools/zeti/. (Last accessed: May 2023).

134 Union of Concerned Scientists. Ready for Work. (2019). https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf

Truck manufacturers are taking note of this trend, and several of the largest players have committed to fully transitioning to electric trucks. Daimler, the largest Class 7 and 8 truck manufacturer in the US, committed to 100-percent zero-emission sales by 2040; two other major players – Volvo Trucks and Navistar – have similar goals set for 2040. 135, 136, 137 Today, 62 OEMs are producing ZE MHDVs for the US and Canadian markets, and more are joining each year. Since 2021, the number of OEMs producing ZE MHDVs has increased by over 40 percent. 138 [EPA-HQ-OAR-2022-0985-1608-A1, p. 72]

135 Nick Carey. Daimler Truck 'all in' on green energy as it targets costs. Reuters. (May 2021). https://www.reuters.com/business/autos-transportation/daimler-truck-all-in-green-energy-shift-targets-costs-2021-05-20

136 Global Drive to Zero. Volvo Group Pledges to 'Drive to Zero' Program. (February 2022). https://globaldrivetozero.org/2022/02/15/volvo-group-pledges-to-drive-to-zero-program-2-15-22/

137 Jason McDaniel. Navistar launches new truck with its 'last' internal combustion engine. Bulk Transporter. (August 2022). https://www.bulktransporter.com/equipment/trucks/article/21248846/navistar-launches-new-truck-last-ice-powertrain

138 Global Drive to Zero. Zero-Emission Technology Inventory. https://globaldrivetozero.org/tools/zeti/. (last accessed: May 2023).

While the growing availability and adoption of ZE trucks along with these OEM commitments are noteworthy, the current pace of the market falls far short of what is needed to address historic and ongoing inequities in access to healthy air and protection from the climate crisis. EPA has an opportunity through the Phase 3 standards to accelerate the transition towards zero-emission trucks and buses. A stronger Phase 3 rule that exceeds, rather than trails, current market projections would help to put us on a path towards addressing the most dire environmental crises our nation faces today. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 72 - 73]

9.3.3. ZE MHDV Adoption

EPA suggests that the proposal is expected to accelerate model availability and adoption. 139 However, a Phase 3 standard that trails current market expectations will do little to stimulate either (see Section 8.8). The Phase 3 GHG standard must recognize both the consistent and significant market growth for ZE MHDVs and the dire need to address climate change and air quality inequities – the current proposal accomplishes neither. [EPA-HQ-OAR-2022-0985-1608-A1, p. 73]

139 U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 417. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

Chapter V of the proposal references several prominent studies on the projected adoption rates of ZE MHDVs, including those from ICCT, NREL, and EDF, and suggests that these studies did not include "several important real-world factors which would, in general, be expected to slow down or reduce ZEV sales" without further explanation. 140, 141, 142, 143 Instead of relying on existing literature and previously used methods, EPA estimates the reference case ZEV adoption rate using novel methods. EPA correctly notes that this resulted in highly conservative results that do not align with the results of the existing literature. 144 [EPA-HQ-OAR-2022-0985-1608-A1, p. 73]

140 Claire Buysee, et al. Racing to Zero: The Ambition We Need for Zero-Emission Heavy-Duty Vehicles in the United States. (April 2022). https://theicct.org/racing-to-zero-hdv-us-apr22/ICCT

141 Catherine Ledna, et al. Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis. (March 2022). https://www.nrel.gov/docs/fy22osti/82081.pdf

142 Ellen Robo and Dave Seamonds. Technical Memo to Environmental Defense Fund: Investment Reduction Act Supplemental Assessment: Analysis of Alternative Medium- and Heavy-Duty Zero-Emission Vehicle Business-As-Usual Scenarios. ERM. (August 2022). https://www.erm.com/contentassets/154d08e0d0674752925cd82c66b3e2b1/edf-zev-baseline-technical-memoaddendum.pdf.

143 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 360 https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

144 Id. p. 361

While we agree it was appropriate for EPA to consider the market and adoption influence of the ACT as well as the incentives and investments provided by the IRA and BIL, EPA's reference case is significantly out of alignment with the larger body of existing research. 145 This is particularly meaningful given that a highly conservative reference case overinflates the environmental, human health, and economic benefits of the proposal. EPA notes the possibility of the reference case being "underestimated, and adoption of ZEVs, and other technologies will occur more rapidly than EPA predicts." 146 However, if the adoption moves faster than the proposed standards, as estimated by current literature, the standard will do little to accelerate the market as EPA predicts. 147 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 73 - 74]

145 Id. p. 358

146 U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 417. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

147 Id. p. 418

In nearly every case, EPA's projected ZEV Adoption Rates trail ZE MHDV market assumptions in the scientific literature. This is particularly true in the near-term. Where the proposal is estimated to affect the adoption of 10 percent ZE day cab tractors for MY2027, a recent study by ICCT suggests adoption at 27 percent. 148 Similarly, the proposal estimates medium-heavy-duty vocational adoption rates of 27 percent in 2030, but ICCT's study estimates 55 percent adoption. [EPA-HQ-OAR-2022-0985-1608-A1, p. 74]

148 Slowik, P. et al. Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Update in the United States. The International Council on Clean Transportation. (January 2023). https://theicct.org/publication/ira-impact-evs-us-jan23/

Adopting a standard that trails current market projections for ZEV adoption is unacceptable and could actually allow combustion trucks to get dirtier over time. EPA must review the current and updated literature, revisit its reference case, and adopt a rule that pushes the market forward meaningfully. [EPA-HQ-OAR-2022-0985-1608-A1, p. 74]

9.3.4. Zero-Emission Trucks are Affordable

At several points in the proposal and DRIA, EPA notes the significant total-cost savings offered by ZEVs, due in large part to reduced fuel, maintenance, and repair costs. Specifically, the DRIA states:

For the vehicle types for which we propose new CO2 emission standards, we expect that the ZEV will have a lower total cost of ownership when compared to a comparable ICE vehicle (even after considering the upfront cost of purchasing the associated EVSE for a BEV), due to the expected cost savings in fuel, maintenance, and repair over the life of the HD ZEV when compared to a comparable ICE vehicle. 149 [EPA-HQ-OAR-2022-0985-1608-A1, p. 74]

149 U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 417. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

EPA recognizes the positive economics of ZE MHDVs, but does not alter the stringency of the proposed standards accordingly. While clean air and climate change regulations are often viewed as inherently increasing the cost of doing business for regulated entities, this is not necessarily the case for commercial vehicle electrification. In fact, the opposite can be true. Although the current upfront costs associated with ZE MHDVs can be higher than their comparable ICE models, several types of zero-emission trucks show preferable sticker prices today when considering IRA incentives. 150 What's more, multiple studies estimate that virtually all battery-electric MHDV models will have a preferred total cost of ownership by the end of the decade. 151, 152 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 74 - 75]

15. Conclusion

"If we are talking about ending diesel, then we are talking about ending the shipment of diesel, then we're talking about ending the production of diesel, ending the piping of diesel, and ending the extraction of diesel, right? All of that comes to an end. So, it's not just about 1 truck, or that we want a 5% reduction of [diesel-using] trucks. We want to end the system [entirely]." - mark! Lopez, East Yard Communities for Environmental Justice 279 [EPA-HQ-OAR-2022-0985-1608-A1, p. 124]

279 mark! Lopez. East Yard Communities for Environmental Justice. (May 2021). https://eycej.org/

The above critical recommendations on how EPA needs to strengthen this rule and move in an intentional and significant way to zero-emission vehicles for ending a deadly diesel pollution system. MFNs position and demands will ensure public health benefits, and are economically feasible given that zero-emission trucks are commercially available, economically compelling, and the single most effective solution for reducing freight emissions. EPA must:

- Address the gaps from the 2022 Heavy Duty Engine and Vehicles Standards Rule (NOx). This rule did not address the critical demands set forth by MFN members to ensure that there will be meaningful emission reductions within environmental justice communities from heavy-duty trucks and create a clear pathway for zero-emission vehicles.
- Ensure a clear pathway to zero emission by mandating all new vehicles be zero emissions by 2035, including a sales mandate. This mandate for zero-emission vehicles must include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities.
- Prioritize zero emissions for freight trucks, i.e., Class 7 and 8 (short-haul) drayage trucks. These trucks have never been prioritized in heavy-duty truck regulations, and are some of the oldest and most-polluting vehicles in frontline and fence-line communities.
- Include environmental justice and public health analyses to ensure a sufficiently stringent rule and its implementation.
- Include a multi-pollutant standard that regulates greenhouse gas emissions and additional pollutants, including nitrogen oxides (NOx), and particulate matter (PM), to prevent dangerous combustion-based fuel source alternatives and false solutions like natural gas from being considered as part of "zero-emission" [EPA-HQ-OAR-2022-0985-1608-A1, pp. 124 - 125]

The current two options for emission standards fall dangerously short and leave environmental justice communities and the millions of people who live in them at great risk for many years to come. MFN is committed to working with EPA to ensure that the regulations around freight impacts does actually meet the intended call to action that these comments set forth. We need EPA to act as the leaders the President is referencing and prioritize solutions that protect and prioritize overburdened and underserved communities. This Rule in its current draft does not meet this call to action. We cannot wait for future rules or proposals to address these impacts. We need every rule, program, and incentive that comes from EPA to prioritize addressing environmental racism and promote environmental justice now. The lives of our communities are at stake. [EPA-HQ-OAR-2022-0985-1608-A1, p. 125]

Organization: National Association of Clean Air Agencies (NACAA)

NACAA has supported EPA's 2011 adoption of the Phase 1 greenhouse gas (GHG) emission standards for heavy-duty vehicles and engines, which took effect with model year (MY) 2014,2 and the agency's 2016 adoption of the Phase 2 GHG standards, which took effect with MY 2021.3,4 We now welcome EPA's Phase 3 proposal and the opportunity it presents to enhance this important program in a way that optimally reflects the rapidly growing heavy-duty zero-emission vehicle (ZEV) market, the unprecedented financial incentives provided under the Bipartisan Infrastructure Law and Inflation Reduction Act and the impacts of state leadership, to best protect human health and our planet and lay the path for a future rule that will establish additional standards to begin with MY 2033. [EPA-HQ-OAR-2022-0985-1499-A1, p. 1]

2 https://www.4cleanair.org/wpcontent/uploads/2021/01/NACAAFinalCommentsonEPANHTSAProposedHDGHGStds013111_0.pdf

3 https://www.4cleanair.org/wp-content/uploads/EPANHTSAJointPhase2Prop-09292015.pdf

4 https://www.4cleanair.org/wp-content/uploads/GHG-CAFE-Phase2FuelEcon-03182015.pdf

Today's proposal would establish regulations designed to transition the market for new commercial vehicles to zero-emissions. We fully support that goal – demonstrated by the billions of dollars already invested by EMA members to develop and bring to market zero-emission powertrains and vehicles. In that regard, EPA's historic goal – forcing new technology to lower emissions – already is being met. Unlike previous technology forcing rules, the challenge is not in forcing the development of zero-emission vehicles and powertrains, the challenge is forcing the development of the infrastructures needed to recharge and refuel them.'9 [EPA-HQ-OAR-2022-0985-1499-A1, p. 4]

9 https://static1.squarespace.com/static/624ddf53a2360b6600755b47/t/64513b1fc8c66c7771fdc539/1683045152019/2023+05+02+EMA+Testimony+on+GHG+Phase+3+NPRM+FINAL.pdf

Given the factors we outline at the beginning of this section on NACAA's comments and recommendations – the evolution of heavy-duty ZEVs, investments and commitments by fleets and manufacturers, historic monetary incentives provided under BIL and IRA and state leadership in accelerating electrification –EPA should, in its final rule, improve upon its proposal by adopting federal Phase 3 GHG emission standards that, at a minimum, are based on values that reflect ACT ZEV sales percentages through MY 2032 but with more rigorous standards for several types of heavy-duty vehicles: 1) transit buses and school buses, for which federal funds for electrification are specifically targeted and various states have laws and policies setting electric vehicle and ZEV purchasing goals and requirements and 2) refuse and concrete trucks, for which EPA already projects substantial ZEV market uptake. [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

In addition to federal action, states and local areas are demonstrating leadership by undertaking their own infrastructure initiatives. These are helping to drive private investment to capitalize on these opportunities. The following a few examples. [EPA-HQ-OAR-2022-0985-1499-A1, p. 7]

Maryland fully supports and recommends that EPA begin moving toward electrification in the medium- and heavy-duty (MHD) truck sector. Over the past few years Maryland has implemented several programs and projects to aid in this transition to electric trucks. As part of this support, the Maryland General Assembly passed legislation requiring the Maryland Department of the Environment (MDE) to adopt ACT by the end of 2023. In addition, the legislation requires MDE to perform a needs assessment study for MHD electrification. The needs assessment study seeks to identify barriers and issues that will need to be addressed for Maryland to successfully transition the MHD sector to electric. The study will be completed by the end of calendar year 2024. Maryland will use this information to aid in the implementation of MHD ZEVs in the state. Additionally, legislation introduced by Governor Moore passed this year and will provide at least $10 million dollars annually for incentives for both MHD vehicles and charging infrastructure. [EPA-HQ-OAR-2022-0985-1499-A1, p. 7]

The Oregon Zero Emission Fueling Infrastructure Grant is a one-time $15-million pilot grant program to support private and public fueling infrastructure for zero-emission medium- and heavy-duty vehicles. The goal of the grant program is to accelerate Oregon's transition from older, more polluting vehicles and equipment to new zero-emission trucks, buses and equipment. In addition, the Oregon Department of Environmental Quality seeks to facilitate development of a robust infrastructure to support a diverse range of Oregon fleets and fueling locations. The rolling application period began in January 2023. [EPA-HQ-OAR-2022-0985-1499-A1, p. 7]

The District of Columbia enacted the Clean Energy DC Omnibus Amendment Act of 2018, which required the development of a “comprehensive clean vehicle transition plan.” The District of Columbia Transportation Electrification Roadmap was finalized in September 2022 and lays out concrete plans to meet charging needs, transition District government fleets, work with stakeholders, educate the public and ensure equity. Regarding the charging network, the plan includes steps to 1) conduct a charging gap analysis, 2) expand the level 2 charging network to meet a ratio of 2 percent of registered electric vehicles by 2025 with a focus on historically overburdened communities, 3) build out level 2 charging in workplaces, 4) provide more public charging at District-owned facilities, with a focus on historically overburdened communities, 5) pursue grants to electrify existing gas stations and 6) work with federal agencies to expand charging stations at their facilities, specifically parks. [EPA-HQ-OAR-2022-0985-1499-A1, p. 7]

Through a Memorandum of Understanding administered by the Midcontinent Regional Electric Vehicle Partnership (Mid REV) Minnesota, Illinois, Indiana, Michigan and Washington collaborate to accelerate medium- and heavy-duty fleet electrification and ensure consistency for creating an interconnected electric vehicle charging network within the region. Also in Minnesota, the state Department of Transportation is completing a research project with the University of Minnesota on medium- and heavyduty electric vehicle charging corridor feasibility. [EPA-HQ-OAR-2022-0985-1499-A1, p. 7]

Annually, the Bay Area Air Quality Management District (BAAQMD) in San Francisco has approximately $100 million in incentive funding available for the replacement of eligible medium- and heavy-duty vehicles and equipment. Applications for mobile source projects are typically reviewed on a first-come-first-served basis and evaluated for eligibility under the respective governing policies and guidelines established by each funding source; the Carl Moyer Program guidelines established by the California Air Resources Board (CARB) are used to review most projects. In 2022, BAAQMD awarded funding to 21 projects including two standalone zero-emission infrastructure projects and 19 projects that will deploy supporting refueling infrastructure in combination with medium- and heavy duty zero-emission vehicles. Thirty-eight percent of these projects will be in disadvantaged communities. Of the 21 projects, 20 are electric-fueled equipment (10 electric yard truck projects, four electric school bus projects, two electric heavy-duty truck projects and one project each for electric transit buses, electric construction equipment, electric forklifts and electric shore power for ocean-going vessels) and one is a hydrogen-fueled tank for a station that serves transit buses. More detailed information on BAAQMD's initiatives to develop charging infrastructure for medium- and heavy-duty vehicles and address related issues is provided in this white paper prepared by Bay Area staff. [EPA-HQ-OAR-2022-0985-1499-A1, p. 8]

New Jersey adopted ACT in November 2021 and CARB's Omnibus heavy-duty NOx standards for medium- and heavy-duty vehicles and inspection requirements for medium-duty vehicles in April 2023. New and used electric medium- and heavy-duty vehicles are exempt from state sales tax. In 2022, New Jersey passed a law establishing a $45-million grant program for electric school buses, to be administered by the state's Department of Environmental Protection. Since 2019, New Jersey has used Volkswagen settlement funds and proceeds from the Regional Greenhouse Gas Initiative to fund the purchase of electric medium- and heavy-duty vehicles and associated charging infrastructure, including 286 electric trucks and cargo vans, 242 electric buses and shuttle buses and 162 electric airport and port vehicles and equipment. The state's Board of Public Utilities published a draft framework under which all electric utilities are required to provide grants for the Make-Ready portion of medium- and heavy-duty charging stations. In addition, the state has passed a law to ensure that all municipalities permit/approve electric vehicle charging stations in a streamlined, consistent manner. [EPA-HQ-OAR-2022-0985-1499-A1, p. 8]

New York State has established state-specific goals for purchases of zero-emission transit buses serving major urban centers, school buses and medium- and heavy-duty vehicles overall. A state executive order requires applicable state fleets of medium- and heavy-duty vehicles to be 100 percent ZEV by 2040. The Joint Utilities of New York Make-Ready program supports the development of electric infrastructure and equipment necessary to accommodate an increased deployment of electric vehicles within New York State by reducing the upfront costs of building charging stations for electric vehicles while also providing fleet assessment services. To assist with ZEV outgrowth, New York has leveraged funds from the Volkswagen settlement to provide incentives for new medium- and heavy-duty ZEV purchases through the New York Truck Voucher Incentive Program and New York City Clean Trucks Program. A municipal ZEV rebate program provides incentives to encourage medium-duty ZEV adoption. Finally, New York's Public Service Commission is working to mitigate demand charges through a relief program to further improve the economics of ZEV use (Case 22-E-0236) and has commenced a proceeding to address barriers to medium- and heavy-duty electric vehicle charging infrastructure (Case 23-E-0070). [EPA-HQ-OAR-2022-0985-1499-A1, p. 8]

California has taken a multi-faceted approach to address infrastructure needs for medium- and heavy-duty vehicles, as described in the California Energy Commission's Zero-Emission Vehicle

Infrastructure Plan. This plan summarizes the state's electrical grid planning, assessment of needed infrastructure and planning for deployment as well as the state's substantial funding programs. Additionally, in April, eight California state agencies signed a Zero-Emission Infrastructure Joint Agency Statement of Intent outlining the state's commitment to coordination across energy, transportation, business development, state operations and air quality programs to share data, plan jointly, engage stakeholders together and link vehicle and infrastructure funding programs. [EPA-HQ-OAR-2022-0985-1499-A1, pp. 8-9]

In Washington, the Department of Ecology is providing $14 million for scrapping and replacing diesel school buses with new zero-emission school buses. Funding is also available for charging or fueling infrastructure for the new school buses. Eligible entities are school bus owners that transport students to K-12 schools identified by the Washington Office of Superintendent of Public Instruction or private K-12 schools approved by the Washington State Board of Education for the 2022-2023 school year. Approximately $1 million of additional grant funding will be made available for one or more of the following projects, including charging or fueling infrastructure: 1) scrapping and replacing diesel yard trucks with zero-emission yard trucks, 2) scrapping and replacing diesel transit buses with zero-emission transit buses and 3) replacing the oldest diesel marine engines with all-electric or hybrid-electric systems. The Washington Department of Ecology is also providing approximately $16 million in competitive grants to support public and Tribal governments in replacing, with zero-emission models, diesel street sweepers, refuse vehicles, freight switcher locomotives and port cargo handling equipment. Eligible vehicle replacements include class 4-8 zero-emission vehicles. Grants will also support the purchase and installation of associated charging or fueling infrastructure. The application period will be open from July 26, 2023 to October 26, 2023. [EPA-HQ-OAR-2022-0985-1499-A1, p. 9]

NACAA urges EPA to set Phase 3 CO2 standards that, at a minimum, reflect ACT ZEV sales percentages through MY 2032, but with more stringent standards for transit and school buses and refuse and concrete trucks; eliminate the advanced technology multipliers after MY 2026; and end the Phase 2 credit exchange between vocational vehicles and tractors. A third phase of federal emission standards for heavy-duty trucks will yield important reductions in GHG emissions. By increasing the performance of heavy-duty ZEVs to meet CO2 emissions standards the rule will also deliver co-benefits in terms of reductions of criteria and toxic air pollutants. Reductions in all of these pollutants will benefit every area of the country, assisting them in achieving their air quality, climate protection and environmental justice goals. [EPA-HQ-OAR-2022-0985-1499-A1, p. 13]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

While we support the development of electric vehicle ('EV') technologies2 and the associated refueling network, we are opposed to the approach taken by EPA in the Proposed Rule. Broadly, our commercial experience and communications with others in the value chain—including electric utilities, trucking fleets, and truck manufacturers—lead us to believe that (1) the current state of HD EV charging technology render the electrification timeline proposed under this rulemaking unachievable; and (2) EPA is exacerbating the adverse emissions impact of this reality by stacking the deck in favor of one technology rather than harnessing the near-term decarbonization potential of other low-carbon options like renewable liquid fuels, in addition to incentivizing more aspirational longer-term technologies. [EPA-HQ-OAR-2022-0985-1603-A1, p. 1]

2 This includes zero emissions vehicles ('ZEV') as used in the Proposed Rule, such as battery electric vehicles ('BEVs') and fuel cells ('FCV'). For simplicity, 'EV' is used throughout these comments.

The Associations believe that a technology-neutral approach to transportation decarbonization will help to mitigate costs, promote innovation, and address the practical challenges associated with heavy-duty electrification. With the right alignment of policy incentives, our industry is best equipped to facilitate a faster, more widespread, cost-effective transition to petroleum alternatives – including electricity – in the coming years. To shepherd that transition without sacrificing near-to-medium-term emissions, EPA should revise the Proposal to lower carbon emissions in a market-oriented, technology-neutral, and consumer-focused manner. [EPA-HQ-OAR-2022-0985-1603-A1, pp. 1-2]

All fuels and technologies should be treated equally within the context of emissions standards. The Proposed Rule's focus solely on tailpipe emissions, however—rather than lifecycle emissions—artificially tilts the scale towards EVs. This means that rather than measuring overall emissions reductions, the Proposal will account only for emissions in one segment of the value chain: vehicle tailpipes. This approach ignores—and thus threatens to exacerbate—technological and market challenges. It also exceeds EPA's statutory authority. [EPA-HQ-OAR-2022-0985-1603-A1, p. 2]

The enormous practical and logistical challenges associated with electrifying trucks necessitate that the Agency not rely entirely on a prodigious pace of HD electrification to decarbonize the trucking sector. Instead of depending on one technology to act as a silver bullet, the Agency should adopt an agnostic approach to low-carbon technologies that can deliver substantial emissions savings in the HD sector without compromising the market's ability to gravitate toward electrification as it becomes commercially viable and practical at scale. The best way to address practical impediments to electrification is to inject flexibility into the Proposed Rule while simultaneously promoting near-term emissions reductions. [EPA-HQ-OAR-2022-0985-1603-A1, p. 2]

EPA should continue its collaborative efforts with the National Highway Traffic Safety Administration ('NHTSA') to incrementally decrease GHG emissions.3 This approach will allow vehicle manufacturers to decrease GHG emissions in new HD vehicles (including electric vehicles) while also reducing emissions in the current fleet. A flexible, workable timeline will allow the market to reduce both tailpipe emissions and lifecycle emissions in the most cost-effective and efficient way, ultimately benefiting consumers. [EPA-HQ-OAR-2022-0985-1603-A1, p. 2]

3 The Associations note that nothing in these comments takes a position regarding the legality of EPA's approach in previous HD vehicle emissions rules.

Organization: National Parks Conservation Association (NPCA)

EPA has a Statutory Mandate to Develop Strong Rules to Reduce Climate Pollution from Heavy-Duty Vehicles.

The Clean Air Act (CAA) explicitly calls on EPA to promulgate emission standards for motor vehicles that ‘cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.’1. As held by the Supreme Court in Massachusetts vs. EPA, GHGs qualify as air pollutants that endanger public welfare under § 202(a)(1), and EPA has statutory authority to regulate those emissions from sources like HD vehicles.2 Subsequently, EPA in their 2009 endangerment finding held that GHG emissions from motor vehicles, including HD vehicles, ‘contribute to the total greenhouse gas air pollution, and thus to the climate change problem, which is reasonably anticipated to endanger public health and welfare.’3 [EPA-HQ-OAR-2022-0985-1613-A1, p. 1]

1 42 U.S.C. 7521(a)(1).

2 See generally, 549 U.S. 497, 531 (2007).

3 74 Fed. Reg. at 66499.

EPA, thus, has an affirmative duty to develop GHG standards for HD vehicles that reflect the ‘greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the model year to which such standards apply.’4 While the CAA provides some room for considerations of cost, energy, and safety,5 ‘it must place primary importance on achieving the greatest degree of emissions reduction.’6 It is through this mandate that we urge EPA to both finalize these heavy-duty vehicle regulations as quickly as possible, as well as to strengthen its proposal to achieve the greatest degree of reductions that protect public health and welfare. [EPA-HQ-OAR-2022-0985-1613-A1, p. 2]

4 42 U.S.C. 7521(a)(3)(A)(i).

5 Id.

6 See Husqvarna AB v. EPA, 254 F.3d 195, at 200 (D.C. Cir. 2001).

EPA Must Strengthen the Proposal to Achieve Greater GHG Emission Reductions

Following the historic passage of the Bipartisan Infrastructure Law and Inflation Reduction Act, NPCA is pleased with EPA’s decision to improve upon its initial proposal to address HD vehicle GHGs. Moving ahead with this separate Phase III HD vehicle GHG rulemaking will better control one of the largest remaining sources of climate pollution in the US. While this proposal is a significant step in the right direction, NPCA believes that numerous improvements must be made to ensure the final rule is in line with the CAA’s mandate that the agency enact the greatest level of emission reductions achievable to protect public health and welfare.15 [EPA-HQ-OAR-2022-0985-1613-A1, p. 3]

15 See Supra note 1, 3, and 5.

Firstly, NPCA urges EPA to promulgate a nationwide standard that is at least as stringent as the Advanced Clean Trucks (ACT) rule that has already been adopted in numerous states. Such a high level of stringency is necessary to reach the widely recognized goal of putting the U.S. on a path to achieve 100% zero emission vehicle (ZEV) HD sales by no later than 2045. The level of GHG emission reductions outlined in the preferred alternative is drastically inadequate compared to what many experts believe is needed to limit global temperatures below 2° C, which it itself is .5° C above the IPCC’s stated goal of limiting warming to 1.5° C. For example, an analysis conducted by the International Council on Clean Transportation (ICCT) found that new heavy-duty ZEV sales of 46% or higher by 2030 are necessary to avoid a greater than 2° C increase in warming.16 With such high levels of HD ZEV penetration needed in the near term to keep us within the 2° C threshold, ensuring additional stringency at or even above nationwide ACT levels should be the highest priority for this rulemaking. [EPA-HQ-OAR-2022-0985-1613-A1, p. 4]

16 C. Buysse et al., Racing to Zero: The Ambition We Need for Zero-Emission Heavy-Duty Vehicles in the United States, International Council on Clean Transportation (Apr. 8, 2022), https://theicct.org/racing-to-zero-hdv-us-apr22/.

NPCA also believes that more stringent Phase III GHG standards for HD vehicles in line with national ACT adoption are technically and economically feasible, as demonstrated in the growing number of states that have already finalized or are in the process of adopting ACT requirements. The technology exists today, and as EPA outlines in the proposal, battery prices are projected to continue to drop significantly into the future while simultaneous improvements are expected in battery and fuel cell technology and grid infrastructure.17 Such advancements coupled with recent and expected public and private funding for HD ZEV technology should continue to accelerate the HD ZEV market transition. Stringent rules will provide the certainty needed for companies and the wider public to invest in HD ZEV technology long term. [EPA-HQ-OAR-2022-0985-1613-A1, p. 4]

17 88 Fed. Reg. at 25930.

Organization: Navistar, Inc.

2. Navistar supports EPA's gradual phase-in alternative, but would not modify the proposed stringency of the standards in MY 2032.

In the proposed rule, EPA requested comment on whether to consider a slower phase in alternative with a more gradual phase-in of CO2 emission standards for MY 2027 through MY 2031 and a less stringent final standard in MY 2032. Navistar supports the slower phase-in alternative for MY 2027 through MY 2031. However, consistent with Navistar's ZEV goals, we do not at this time believe that changes to the stringency of the MY 2032 standards are warranted, as long as the necessary charging infrastructure is widely available. As discussed below, we recommend that the feasibility of the rule, including the MY 2032 standards, be reassessed by EPA during a mid-term evaluation. Such evaluation should include whether the requisite ZEV infrastructure is likely to be in place prior to the compliance deadlines.

6. Navistar supports EMA's comments and echoes its concerns regarding EPA's underlying assumptions in support of the proposed rule.

Navistar is a member of the Truck and Engine Manufacturers Association ('EMA'). Navistar supports the comments submitted by the EMA on EPA's proposed rule, and incorporates them into these comments as though they were fully set forth in this document. In particular, Navistar shares EMA's concerns that many of EPA's underlying assumptions are overly optimistic. For example, EPA's cost assessments fail to account for any potential necessary upgrades to the national electrical grid or distribution system. Draft RIA, p. 201. Nor does EPA account for the upfront capital costs and time required to plan for, obtain permitting for and build-out the necessary infrastructure. Navistar agrees with EMA's critique of EPA's version of HD TRUCS model. In particular, EPA's failure to consider public battery-recharging stations for medium and heavy-duty ('MHD') ZEVs in its model is a significant and fundamental flaw. As we noted above, public charging infrastructure is critical and must come first to provide fleets that operate over long-distance routes the confidence to electrify their fleets. Due to their size and power demands, MHD ZEVs cannot utilize the charging infrastructure that is being developed for passenger ZEVs. EPA should revise its assumptions and data inputs in its version of HD TRUCS to take into account that public battery-recharging stations for MHD ZEVs are necessary and critical infrastructure components in support of a successful rule. [EPA-HQ-OAR-2022-0985-1527-A1, p. 6]

Organization: Neste US

II. THE PROPOSED RULE MISSES OPPORTUNITIES FOR FASTER DECARBONIZATION

Neste agrees with the latest Intergovernmental Panel on Climate Change (IPCC) Report:

"There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all… The choices and actions implemented in this decade will have impacts now and for thousands of years." 3 [EPA-HQ-OAR-2022-0985-1615-A1, p. 2]

3 IPCC, 2023: Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, (in press)

So while Neste supports more stringent GHG standards for heavy-duty vehicles, there is concern the proposed rule's singular focus on EVs and hydrogen fuel cells crucially ignores other, more widely available and lower cost GHG reduction options. [EPA-HQ-OAR-2022-0985-1615-A1, p. 2]

The majority of heavy-duty vehicles run on diesel fuel, with Class 8 vehicles as high as 97%. Renewable diesel, because it has the same chemical composition of fossil diesel, can be used as a one-to-one replacement in vehicles already built to run on diesel. Renewable diesel is significantly cleaner than fossil fuel and can reduce GHG emissions by up to 75% over the fuel's life cycle today, with the potential to improve as producers reduce GHG emissions from their own operations and additional lower carbon intensity feedstock are developed. In fact, in California, the use of renewable diesel in the transportation sector has accounted for more than 30% of the state's total GHG emissions reductions.4 [EPA-HQ-OAR-2022-0985-1615-A1, p. 2]

4 California Energy Commission. 2020. Low Carbon Fuel Standard Dashboard. https://www.dieselforum.org/images/dmImage/StandardImage/biofuel-co2-reductions-2021.png

Those emissions reductions came at a far lower cost - and faster - than they would have from electrifying the same fleets. Research conducted by Stillwater Associates for the Diesel Technology Forum in July 2022 evaluated options for reducing GHG emissions from commercial vehicles over a 10-year period (2022-2032) in Connecticut, Delaware, Massachusetts, Maryland, Maine, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. That study found that, "[o]n a cumulative fleet conversion cost basis, turning over a medium and heavy-duty fleet of 10,000 vehicles in the aforementioned 10 state region to EV carries a price tag more than three times higher than the equivalent cost for new technology diesel vehicles."5 [EPA-HQ-OAR-2022-0985-1615-A1, p. 2]

Fueling those vehicles with 100% renewable diesel offers three times larger cumulative GHG reductions by 2032 than electrification according to the research. Unfortunately, the proposed rule makes just one reference to renewable fuels that are available today. [EPA-HQ-OAR-2022-0985-1615-A1, p. 2]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Finalize GHG Standards that Align with the Requirements of the ARB ACT Regulation

We encourage EPA to finalize HD GHG standards that align with the requirements of the ARB ACT regulation for tractors and vocational vehicles through MY 2035. In developing final HDV CO2 standards, we encourage EPA to re-evaluate its reference case for the status of the MHD ZEV market. Eight MOU signatory states – California, Colorado, Massachusetts, New Jersey, New York, Oregon, Vermont, and Washington – have already adopted the ACT regulation. These states comprise 25% of heavy-duty vehicle registrations in the U.S. Additional states are planning to adopt the ACT regulation in 2023, which if finalized, will bring the ACT state registrations to over 30% of the nation's total HDV registrations. Other states may follow suit. As more states adopt ACT, the requirement will represent an even greater share of the national HDV market. To fully capture current ACT adoptions, EPA's reference case should be updated to include Vermont and Colorado. ARB's adoption of the Advanced Clean Fleets (ACF) regulation should also be incorporated. [EPA-HQ-OAR-2022-0985-1562-A1, p. 9]

In addition, the substantial initiatives outlined above to spur the market for HD ZEVs should be taken into consideration in stringency setting. As was shown from the above examples, state energy, transportation and environmental departments, utilities, private industry, counties, and municipalities are planning for public and private infrastructure to support the transition to 100% zero emission heavy-duty vehicles. Moreover, the ACT requirements that eight MHD ZEV MOU states have adopted are aligned with industry announcements. Major original equipment manufacturers (OEMs) and fleets have made public commitments to phase out internal combustion engine vehicles by 2040.25 [EPA-HQ-OAR-2022-0985-1562-A1, p. 9]

25 See, e.g., Cary, N., Reuters, "Daimler Truck 'All In' On Green Energy as it Targets Costs," May 2021, https://www.reuters.com/business/autos-transportation/daimler-truck-all-in-green-energy-shift-targets-costs-2021-05-20/; NPR, "From Amazon to FedEx The Delivery Truck is Going Electric," March 17, 2021, https://www.npr.org/2021/03/17/976152350/from-amazon-to-fedex-the-delivery-truck-is-going-electric; Navistar, "Environmental Footprint," Environmental Footprint | Navistar®.

Finally, as EPA notes in its NPRM, many technologies and powertrains have been demonstrated and are considered technically feasible for HD vehicles. EPA's Draft Regulatory Impact Analysis (DRIA) states a diverse range of technologies may be used to comply with the proposed standards to reduce GHG emissions, including internal combustion engine (ICE), hybrid, and plug-in hybrid powertrains, hydrogen ICEs, battery electric vehicles (BEVs), and fuel cell electric vehicles (FCEVs). [EPA-HQ-OAR-2022-0985-1562-A1, p. 9-10]

Given the diverse range of technologies available to reduce HDV GHGs, and the rapidly advancing HD ZEV market, we urge EPA to increase stringency of the standards in the final rule. We encourage EPA to incorporate recent actions to spur the market for HD ZEVs into its reference case for HD ZEV adoption and more fully evaluate the potential for ICE vehicle CO2 improvements. [EPA-HQ-OAR-2022-0985-1562-A1, p. 10]

Tractor CO_2 Standards

Tractor trailers are responsible for 60% of total heavy-duty truck fuel consumption even though they represent only 13% of the total U.S. heavy-duty fleet.26 Given the outsized importance of tractor-related fuel consumption and GHG emissions to overall heavy-duty vehicle GHGs, it is important that EPA establish the most stringent technically feasible standards for this category of vehicles. As shown in Figure 1, freight truck ton-miles are projected to increase in future years. Projected growth in freight ton-miles will increase the associated emissions from these vehicles. Absent the most stringent regulation of tractors, GHG emission standards will be eclipsed by tractor vehicle miles travelled (VMT) increases over time. [EPA-HQ-OAR-2022-0985-1562-A1, p. 10]

26 81 Fed. Reg. 73478 (October 25, 2016).

NESCAUM and OTC respectfully request that EPA finalize tractor CO_2 emission standards that are aligned with the ACT requirements for tractors. ARB has established an ACT tractor ZEV sales requirement by 2032 of 40%. This sales mandate exceeds the ZEV adoption rate that would be required to meet the EPA proposed standards of 48.2 grams CO_2/ton-mile (g CO_2/ton-mile) to 68.2 g/ton-mile CO_2 for class 7 and 8 low, mid, and high roof tractors in 2032. [EPA-HQ-OAR-2022-0985-1562-A1, p. 10]

EPA's proposed stringencies for MY 2032 tractors assume a 25% zero emission vehicle penetration rate as shown in Table IX-6 of the NPRM. The table provides ZEV technology adoption rates for short-haul and long-haul tractors in the technology packages considered for the proposed standards. The assumed ZEV adoption rates for tractors are significantly lower than the 40% tractor ZEV requirement in the ACT regulation. [EPA-HQ-OAR-2022-0985-1562-A1, p. 10]

ZEV tractor introduction could advance more quickly than EPA estimates in its NPRM. EPA states in the NPRM that technology adoption rates were selected based on the payback period calculated for tractors.27 Battery sizing is an important factor in overall battery electric vehicle BEV cost, and, according to EPA, "battery sizes we used in our assessment are conservative because they could meet 100 percent of the daily operating requirement using the 90th percentile VMT at the battery end of life."28 EPA's analysis assumes tractor batteries would be sized to meet an entire day's travel with no opportunity charging.29 As a result, EPA estimates a battery size of 1.5 megawatt-hours (MWh) or greater is needed for some tractors, a significantly larger battery than would be needed if these tractors are charged during the day. EPA requested comment on this approach. [EPA-HQ-OAR-2022-0985-1562-A1, p. 10-11]

27 88 Fed. Reg. 25926 (April 27, 2023), p. 25974.

28 Ibid., p. 25977.

29 U.S. EPA, "Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3 Draft Regulatory Impact Analysis," April 27, 2023, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

We note that a recent ICCT study found that with opportunity charging, a battery size of 1 MWh or smaller would be sufficient to support the duty cycles of long-haul tractors.30 We believe the substantial investments states, utilities, and industry are making to develop MHD ZEV charging infrastructure will provide opportunity charging for tractors. Opportunity charging can extend the daily range of tractor trailers, in turn facilitating deployment of heavy-duty zero emission vehicles with smaller batteries and thus lower overall upfront costs than those assumed by EPA in its modeling for the NPRM. [EPA-HQ-OAR-2022-0985-1562-A1, p. 11]

30 Hussein B. et al., The International Council on Clean Transportation, “Total Cost of Ownership of Alternative Powertrain Technologies For Class 8 Long-Haul Trucks In The United States,” April 2023.

We request that EPA evaluate recent analyses such as the ICCT study as well as state, utility, county, and municipality efforts to establish infrastructure and adjust assumptions about tractor battery sizing, costs, and ZEV penetration rates in the final rule. [EPA-HQ-OAR-2022-0985-1562-A1, p. 11]

Establish More Stringent Standards for a Subset of Vocational Vehicles

EPA requested comment on a standards structure for Phase 3 that would establish unique, mandatory, application-specific standards for some subset of heavy-duty vehicle applications. We encourage EPA to finalize more stringent application-specific g CO2/ton-mile emission standards for urban buses, school buses, refuse haulers, and cement mixers.

- State, county, transit authority, and municipality actions are speeding the transition to electric urban buses in the U.S. Most of the largest transit fleets in the country have committed to transition to zero emission buses. New York’s Metropolitan Transportation Authority (MTA) will require all new urban bus purchases to be ZEVs by 2029, with a commitment to replace its entire fleet of 5,800 buses with zero-emissions buses by 2040.31 Five additional New York transit agencies have the goal to transition their fleets of 1,300 buses to 100% zero-emissions buses by 2035, with an interim goal of 25% zero-emission buses by 2025.32 New Jersey requires that all new urban bus purchases be ZEVs by 2032, and Maryland requires that all new urban bus purchases be ZEV by 2023. California, Washington, Colorado, Connecticut, and Massachusetts also have requirements that urban bus fleets transition to 100% ZEVs by a specific calendar year. The District of Columbia and Chicago’s transit bus fleets are transitioning to zero emissions. These jurisdictions taken together have 9 of the top 10 transit agencies by bus fleet size in the nation.33 Additional states will likely put in place requirements for zero-emitting urban buses. Given the high percentage of the nation’s urban buses that are already required to transition to zero emissions, we believe more stringent g CO2/ton-mile standards for urban buses should be finalized. We encourage EPA to evaluate the state of the urban bus market in more detail and finalize more stringent CO2 g/ton-mile standards for this category. For many years, urban buses were held to more stringent emission standards than other heavy-duty vehicles given they are operated in densely populated urban areas and in communities overburdened by pollution.
- Likewise, New York, California, and Michigan all have adopted mandates, and/or funding programs to convert school bus fleets to zero emissions.34 Massachusetts, Illinois, Washington, and Hawaii all have proposed electric school bus legislation. In New York, no later than July 1, 2027, school districts and school bus contractors shall operate and maintain only zero-emissions school buses.35 New York State’s Environmental Bond Act (2022) includes $500 million for school bus electrification to help reduce zero emission school bus purchase and charger costs.36 New Jersey in 2022 established a $45 million grant program for electric school buses to be administered by the New Jersey Department of Environmental Protection. Other states also have incentives to aid in the transition to zero emission school buses. Furthermore, EPA’s

Clean School Bus Program will provide $5 billion in funding between 2022 and 2026 for school buses.

- Other vehicles currently in the custom chassis category, such as refuse haulers and concrete mixers, should be required to meet significantly more stringent CO2 standards, based on the projections for ZEV penetration for these categories of vehicles. As noted by EPA on page 240 of its RIA, ZEV sales of refuse truck and concrete mixers will reach 35% by 2032. [EPA-HQ-OAR-2022-0985-1562-A1, p. 11-12]

31 MTA, "Transitioning to a zero-emissions bus fleet," updated July 25, 2022, https://new.mta.info/project/zero-emission-bus-fleet.

32 NYSERDA, Governor Cuomo Announces Initiatives to Electrify Transit Buses, Boosting Access to Clean Transportation and Building Healthier Communities, December 29, 2020, https://www.nyserda.ny.gov/About/Newsroom/2020-Announcements/2020-12-29-Governor-Cuomo-Announces-Initiatives-to-Electrify-Transit-Buses-Boosting-Access-to-Clean-Transportation-and-Building-Healthier-Communities.

33 Federal Transit Administration, U.S. Department of Transportation, "Transit Profiles: 2020 Top 50 Reporters," September 2021, https://www.transit.dot.gov/sites/fta.dot.gov/files/2021-11/2020%20Top%2050%20Profiles%20Report_0.pdf.

34 CALSTART, "Zeroing in on Zero Emission School Buses," ZIO-ESBs-final-with-May-cover-4.28.23.pdf (calstart.org).

35 NYS (Chapter 56 of the Laws of 2022).

36 The New York State Senate, Section 3638, "Zero Emission School Buses," https://www.nysenate.gov/legislation/laws/EDN/3638.

The Administration's Inflation Reduction Act (IRA)37 and the bipartisan Infrastructure Investment and Jobs Act (IIJA)38 will further accelerate the transition to a zero-emission future by supporting zero emission vehicles and charging infrastructure. Recent analysis of electric vehicle sales trends coupled with the anticipated impact of the IRA indicate the 2030 U.S. National Blueprint for Transportation Decarbonization39 targets will be exceeded in 2030 without any additional regulatory actions by EPA.40 [EPA-HQ-OAR-2022-0985-1562-A1, p. 12-13]

37 Public Law 117-169 "Inflation Reduction Act of 2022," August 16, 2022, https://www.congress.gov/bill/117th-congress/housebill/5376/all-info.

38 Public Law 117-58 "Infrastructure Investment and Jobs Act," November 15, 2021, https://www.govinfo.gov/content/pkg/PLAW117publ58/pdf/PLAW-117publ58.pdf.

39 Office of Energy Efficiency & Renewable Energy (EERE), "U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation," January 2023, https://www.energy.gov/eere/us-national-blueprint-transportation-decarbonization-joint-strategy-transform-transportation.

40 Slowik, P., et al., Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States, White Paper, International Council on Clean Transportation, January 31, 2023, https://theicct.org/publication/ira-impact-evs-us-jan23/.

In summary, based on the ongoing collective state efforts, the rapid advance of electric vehicle technologies, falling costs, and significant federal funding for ZEVs and infrastructure, we believe tractor and vocational vehicle GHG standards can be and should be more ambitious. Furthermore, urban buses, school buses, refuse trucks, and concrete mixers should be required to meet more stringent, application-specific emission standards. NESCAUM and OTC are ready upon request to provide additional information to EPA on state requirements and incentives. [EPA-HQ-OAR-2022-0985-1562-A1, p. 13]

Organization: Nuvve Holding Corporation

Given that the transportation sector is the largest source of domestic greenhouse gas ("GHG") emissions, Nuvve strongly supports this NPRM and encourages the EPA to consider moving forward with adopting the strongest policies, or targets, that will reduce GHG emissions from heavy-duty ("HD") vehicles, while continuing to expedite the Nation's transition to net-zero emissions and a more electrified transportation future, consistent with this Administration's overall clean energy, climate, and sustainability goals. [EPA-HQ-OAR-2022-0985-1572-A1, p. 1]

EVs emit substantially fewer GHG emissions and other harmful air pollutants than internal combustion engine ("ICE") vehicles, while also being less expensive to "fuel" and maintain over their lifetimes. Thus, the EPA's NPRM presents an opportunity to decarbonize the largest source of emissions in the U.S. economy, while supporting the continued acceleration of an emerging domestic EV market for HD vehicles. [EPA-HQ-OAR-2022-0985-1572-A1, p. 2]

Organization: Our Children's Trust

As the Nation's only law firm dedicated to representing youth whose constitutional rights are being infringed by their government's conduct that causes climate change, we write to advise EPA to strengthen the federal emission standards for heavy-duty highway vehicles so that they meet the urgency of the climate crisis and align with the deep emission reductions scientists say are needed to protect the climate system and the constitutional rights of youth. [EPA-HQ-OAR-2022-0985-1633-A1, p. 1]

- Specifically, EPA should at minimum align the rule with California, which has recently adopted a regulation that requires all truck sales by zero emission vehicles by 2036, illustrating the economic and technical feasibility of stronger rules that ensure internal combustion engines are phased out for medium- and heavy-duty vehicles in a manner that comports with the Administration's goals to decarbonize transportation. The National Renewable Energy Laboratory reports that "with continued improvements in vehicle and fuel technologies (in line with U.S. Department of Energy targets and vetted with industry), zero emission vehicles (ZEVs) can reach total-cost-of-driving parity with conventional diesel vehicles by 2035 for all medium- and heavy-duty (MD/HD) vehicle classes (without incentives)."1 ZEV sales of medium- and heavy-duty vehicles could reach 42% by 2030 and >99% of the market by 2045, assuming charging and refueling infrastructure is deployed to accommodate these levels of ZEV adoption.2 [EPA-HQ-OAR-2022-0985-1633-A1, p. 1]

  1 Catherine Ledna et al., NREL, Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis 2 (Mar. 2022), https://www.nrel.gov/docs/fy22osti/82081.pdf (emphasis in original).

  2 Id.

- EPA must increase the stringency of its standards for heavy-duty trucks, and other combustion engines, that tracks with and signals the end of production and sales of the internal combustion engine at minimum by 2036. It is EPA's job to do as much as it can to push the transition to zero emissions to protect the air and climate for children and future generations. These standards need to go further faster so that the entire transportation sector, and supporting industrial sectors, can plan and respond as quickly as feasible. The technology is there to expedite the transition away from the internal combustion engine and eliminate their sales at minimum by 2036 for heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1633-A1, p. 2]

Decarbonization of the transportation sector and other combustion engines is critical to achieving greenhouse gas emission reduction goals. Experts have opined that "[t]ransportation electrification is the most critical sector to achieve these electrification goals in due to the volume of liquid fuels it currently consumes."3 [EPA-HQ-OAR-2022-0985-1633-A1, p. 2]

3 Ben Haley et al., Evolved Energy Research, 350 PPM Pathways for the United States 38 (2019).

To learn more about how young people are being harmed, please watch the award-winning, independent feature-length documentary film now streaming on Netflix, YOUTH v GOV. These stories constitute just a small sample of what American children are experiencing due to the climate crisis the federal government continues to exacerbate by and through its national energy system. We request that the EPA incorporates the protection of children's fundamental rights to a safe climate system, defined by the best available science, into future rulemaking, policies, and initiatives. Human laws must respect the laws of nature; our government ignores the natural laws of energy imbalance and climate destabilization at the peril of our children. [EPA-HQ-OAR-2022-0985-1633-A1, p. 5]

Organization: Owner-Operator Independent Drivers Association (OOIDA)

The Phase 3 rule also attempts to rush production of battery electric vehicles (BEVs) while a national charging infrastructure network remains absent for heavy-duty trucks. Professional drivers are skeptical of BEV costs, mileage range, battery weight and safety, charging time, and availability. Yet, EPA estimates that adoptions rates for Class 8 BEVs will jump from zero percent in 2029 to 25 percent just three years later. This is another example of EPA overreach as it effectively forces sales of BEVs and zero emission vehicles (ZEVs). [EPA-HQ-OAR-2022-0985-1632-A1, p. 2]

EPA must consider a more feasible implementation timeline that would provide reliable and affordable heavy-duty vehicles for consumers, particularly small trucking businesses and individual owner-operators. This can be accomplished through a diverse vehicle approach that protects consumer choice and values the input from the men and women of the trucking industry. [EPA-HQ-OAR-2022-0985-1632-A1, p. 2]

OOIDA has supported the administration's emphasis on improving driver recruitment and retention. Instead of taking actions to benefit those who make their living behind the wheel, such as expanding truck parking capacity, increasing driver compensation, and improving working conditions, this proposed rule would make small-business truckers' jobs more difficult and push some out of the industry. The final rulemaking should reflect more practical timelines and vehicle considerations that do not force drivers out of business or make it more challenging for new drivers to enter the industry. [EPA-HQ-OAR-2022-0985-1632-A1, p. 4]

Organization: POET

EPA's Projections for Zero-Emissions Vehicles are Overly Optimistic and Largely Ignore the Significant Infrastructure that Must Be Built to Support the Switch to a Heavy-Duty ZEV Fleet. [EPA-HQ-OAR-2022-0985-1528-A1, p. 13]

The Proposed rule is deficient in other significant ways. It relies on overly optimistic projections for heavy-duty ZEV adoption that fail to account for several key factors that will be essential to meeting the projected targets. POET engaged Jim Lyons of Trinity Consultants ('Trinity'), an international consulting firm specializing in, among other things, environmental sustainability, to review EPA's technology assessments. In his report, Attachment A to this letter, Mr. Lyons explains: (1) the 'payback' analysis EPA used to estimate ZEV adoption rates is inadequate and likely significant overstates adoption rates and the ability of manufacturers to comply with the Proposed Rule; (2) there are a number of concerns with EPA's estimates regarding GHG emissions reductions resulting from the Proposed Rule, suggesting those reductions are overestimated; and (3) EPA failed to incorporate provisions into the Proposed Rule that recognize ethanol and other renewable fuels' ability to create GHG emission reductions.45. The Proposed Rule's technology assessment also fails to account for the major infrastructure overhaul that will be necessary to accommodate the many new heavy-duty ZEVs EPA is projecting will need to be on the road to comply with its proposed standards. [EPA-HQ-OAR-2022-0985-1528-A1, p. 13] [Refer to Attachment A on pp. 22-41 of docket number EPA-HQ-OAR-2022-0985-1528-A1].

45 Attachment A at 1.

EPA's Predictions Regarding the Volume of EVs Far Exceed Current Adoption Rates without Providing Sufficient Analysis. [EPA-HQ-OAR-2022-0985-1528-A1, p. 13]

The Proposed Rule relies on aggressive adoption rates for heavy-duty ZEVs. As the Trinity Report explains, EPA is assuming those adoption rates or sales fractions will jump to 10 to 30 percent for vehicles other than tractors and certain buses by MY 2027—that is, in just three years.46 Those adoption rates then double for most vehicles by MY 2032, or 'increase by greater rates such that they range from 15 to 57%.'47 Those rates far exceed the data shown by the U.S. Energy Information Agency ('EIA') in its 2022 Annual Energy Outlook, which EPA displays in its Draft Regulatory Impact Analysis.48 Those projected adoption rates—current (2022) and future (2050) heavy-duty ZEV sales fractions—range from 0.10% (current) to 0.75% (future).49 EPA's projections thus exceed EIA's current rate by 150 to 570 times.50 [EPA-HQ-OAR-2022-0985-1528-A1, pp. 13-14]

46 Id. at 2.

47 Id.

48 Id.

49 Id.

50 Id.

EPA’s analysis in the Proposed Rule fails to demonstrate why it believes that the heavy-duty vehicle industry will grow this quickly. As the Trinity report explains, EPA has failed to address ‘key factors including realistic lead time requirements that accurately account for research and development, prototyping, development of production and assembly facilities, availability of tooling and parts including batteries and fuel cells in sufficient quantities, and existing supplier agreements among others.’51 Omitting those factors seriously undermines EPA’s projections. [EPA-HQ-OAR-2022-0985-1528-A1, p. 14]

EPA’s ‘Payback’ Analysis is Flawed

The Trinity report also identifies deficiencies in EPA’s ‘payback’ analysis supporting its heavy-duty ZEV predictions. That analysis proceeds in two steps: (1) it compares the cost of conventional vehicles and ZEVs over the first ten years of those vehicles lives; and (2) it calculates a ‘payback period’ required ‘to amortize the incremental cost of ZEV[s].’52 The analysis assumes that, if the ‘HD ZEV costs less to purchase than a conventional vehicle (even by $1),’ 80 percent ‘of operators using that vehicle type will immediately purchase the ZEV.’53 That is unrealistic. The payback analysis assumes that supply will match demand but ignores the significant hurdles to maintaining and growing the supply of ZEVs. The mismatch between supply and demand also affects the price comparison. EPA assumes that the price comparison remains constant, even as supply and demand fluctuate. EPA does not provide support for this assumption. It is more likely that prices will fluctuate with supply and demand. As the Trinity report explains:

- Greater demand for HD ZEVs will lead to greater demand for components such as batteries and fuel cells which are also likely to be in demand for light-duty vehicle applications both in the U.S. and around the world. Greater demand will lead to higher prices for HD ZEVs regardless of the cost of production and, following the logic of U.S. EPA’s payback analysis, lower adoption rates.54 [EPA-HQ-OAR-2022-0985-1528-A1, p. 14]

52 Id. at 4.

53 Id. at 5 (emphasis added).

54 Id. at 4.

Additionally, as the Trinity report observes, EPA simply assumes that heavy-duty vehicle operators will buy ZEVs instead of conventional vehicles if the operators believe ‘they will save money in the near term.’55 Yet EPA’s Draft Regulatory Impact Analysis – Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 (‘DRIA’) contradicts that assumption when it discusses the ‘energy efficiency gap,’ wherein ‘available technologies that would reduce the total cost of ownership for the vehicle . . . have not been widely adopted or the adoption is relatively slow despite their potential to repay buyers’ initial investments rapidly.’ 56 EPA acknowledges the many factors that contribute to this gap: ‘constraints on access to capital for investment, imperfect or asymmetrical information about the new technology (for example, real-world operational cost savings, durability, or performance), uncertainty about supporting infrastructure (for example, ease of charging a BEV), uncertainty about the resale market, and first-mover disadvantages for manufacturers.’57 EPA has done little to account for these factors in its analysis. [EPA-HQ-OAR-2022-0985-1528-A1, p. 15]

55 Id. at 3.

56 Id. at 3-4 (quoting DRIA at 417).

57 Id. at 4 (quoting DRIA at 417-18).

EPA also relied on the ACT Research method for its payback period and adoption rate estimates. However, EPA states that it applied an adoption rate that exceeded ‘the ACT schedule in each payback period range that is greater than 4 years, due to the assumed impact of this proposed regulation.’58 Other than this circular reasoning, EPA provides no justification for adopting faster rates. The reasoning cannot readily be discerned from the ACT Research method itself because it is not publicly available and must be purchased.59 The publicly available information suggests that EPA has grossly inflated heavy-duty ZEV adoption rates. [EPA-HQ-OAR-2022-0985-1528-A1, p. 15]

58 Id. at 5 (quoting DRIA at 232).

59 Id. at 5.

EPA’s Adoption Rate Analysis Is Also Flawed Because It Fails to Accurately Consider the Costs Of ZEVs and the Significant Infrastructure that Will Be Needed to Support a Massive Rollout of New Heavy-Duty ZEVs.

EPA’s technology assessment largely ignores another critical factor: the necessary infrastructure that must be built to support ZEVs at scale. This omission threatens the rule’s aggressive GHG reduction goals and exposes the rule to legal challenges for failure to consider a key aspect of the problem the rule is meant to address. [EPA-HQ-OAR-2022-0985-1528-A1, p. 15]

EPA’s ZEV projections rely on three factors:

- Changes in the market in which some ZEV models are in use now and expected to expand given falling costs and manufacturer commitments to invest more heavily in ZEVs.60
- The BIL and IRA, which include significant ZEV incentives.61
- California’s announcement that new heavy-duty duty vehicles must be ZEVs by 2035, and other states commitments to supporting electrification of the heavy-duty fleet.62 [EPA-HQ-OAR-2022-0985-1528-A1, p. 16]

60 88 Fed. Reg. at 25930.

61 Id.

62 Id. at 25930-31.

Those factors, and EPA’s modeling, focus mainly on whether it is technologically feasible to build individual heavy-duty ZEVs that can meet the standard. EPA largely ignores whether the supply-chain and infrastructure needed to support ZEVs at the scale EPA is predicting. In short, the proposal completely fails to demonstrate that ‘the development and application of the requisite technology’ of ZEV’s would be feasible over the lifetime of the Proposed Rule.63 [EPA-HQ-OAR-2022-0985-1528-A1, p. 16]

63 42 U.S.C. 7521(a)(2).

EPA relies on the 'HD TRUCS model' to 'evaluate the design features needed to meet the energy and power demands of various HD vehicle types when using ZEV technologies.'64 'The overarching design and functionality of HD TRUCS is premised on ensuring each of the 101 ZEV types could perform the same work as a comparable ICE vehicle counterpart.'65 Yet this modeling largely ignores many critical factors. It does not predict how charging and other refueling infrastructure will grow to meet the demands for ZEVs. It does not assess whether the funds appropriated for that infrastructure in either the BIL or IRA are enough or will result in the buildout of that infrastructure in time to accommodate the proposed standards, or whether corporate commitments to building supporting infrastructure will be enough to meet the need for ZEVs. Nor does it address the significant need for support services and personnel to maintain the growing ZEV fleet. [EPA-HQ-OAR-2022-0985-1528-A1, p. 16]

64 88 Fed. Reg. at 25974.

65 Id.

To the extent EPA analyzes charging and refueling infrastructure, its assessment focuses myopically on costs. That cost assessment purports to include 'labor and supplies, permitting, taxes, and any upgrades or modifications to the on-site electrical service.'66 For one, this analysis is incomplete. As EPA acknowledges, 'there may be additional infrastructure needs and costs beyond those associated with charging equipment itself.'67 EPA recognizes that 'the buildout of public and private charging stations (particularly those with multiple high-powered DC fast charging units) could in some cases require upgrades to local distribution systems.'68 Yet EPA largely shrugs off the need for those upgrades, while acknowledging the 'considerable uncertainty associated with future distribution upgrade needs,' and noting, in conclusory fashion, that 'in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners.'69 [EPA-HQ-OAR-2022-0985-1528-A1, pp. 16-17]

66 Id. at 25982.

67 Id.

68 Id.

69 Id. at 25983.

This observation is flawed in several ways. First, it fails to address considerable uncertainty surrounding electric system upgrades—a critical aspect to the success of implementing charging infrastructure for BEVs at scale. Second, EPA focuses primarily on whether new charging infrastructure will compromise grid reliability. The agency ignores that reliability is only one consideration that affects whether new electric infrastructure is built. Many other factors play a role in the decision to build new electric infrastructure, even if that new infrastructure will not compromise reliability. EPA assumes that utilities will simply pay to upgrade the system, without assessing how those upgrades occur, the permitting and other requirements that may hinder the upgrades, whether utilities will be reluctant to fund those upgrades, or whether ratepayers will bear what may be seen as excessive or disproportionate costs associated with the upgrades. [EPA-HQ-OAR-2022-0985-1528-A1, p. 17]

The Trinity report also identified the following additional overly optimistic assumptions:

- 'Assuming that IRA tax credits for battery producers will result in cost savings to battery purchasers (Table 2-44 of the DRIA);

- ‘Failure to properly account for development and integration costs incurred by vehicle manufacturers associated with the production of HD ZEVs by assuming that they will be equal on a percentage basis to those associated with conventional vehicles (Table 3-3 of the DRIA); and

EPA also makes optimistic assumptions about the costs of electricity and hydrogen to fuel heavy-duty ZEVs. EPA assigns a cost of 10.7 cents/kWH for electricity to charge BEVs and to produce hydrogen via electrolysis, which represents the EIA 2022 value for commercial end users.73 EPA chose this value over the 2023 EIA value for transportation, which is 3 cents/kWH or 30 percent higher than the value EPA relies upon.74 The Trinity report explains that it is unclear whether those rates reflect what heavy-duty vehicle operators will have to pay, particularly if they are using public direct current fast charging stations.75 [EPA-HQ-OAR-2022-0985-1528-A1, p. 18]

73 Id. at 7.

74 Id.

75 Id.

In any event, costs also are only part of the equation. Just because a course of action is cost-effective does not mean it will necessarily occur. This is particularly true with infrastructure. Infrastructure requires building new facilities in cities, towns, and other communities that may be sensitive to further industrialization. It requires navigating often complex and overlapping permitting requirements in which a variety of state and municipal governments may have veto power and may exercise it for a variety of reasons unrelated to costs. Focusing only on costs also ignores permitting timelines that are susceptible to significant delays, changing officials, changing politics, and uncertain appeals processes. Similar issues arise with wind and solar projects. Those projects will require significant transmission system upgrades, but those upgrades are struggling to catch up with incentives for wind and solar development. They are simply not being built on the time horizon seen as necessary.76 [EPA-HQ-OAR-2022-0985-1528-A1, p. 18]

76 And, of course, it is worth noting again that delays in building out the transmission infrastructure necessary to electrify the grid also means that upstream emissions from the use of ZEVs will remain significant for an extended period of time.

Additionally, EPA’s cost analysis of hydrogen infrastructure is rudimentary, focusing on storage, without addressing other significant infrastructure issues facing hydrogen. While it is true that the BIL and IRA incentivize hydrogen production, and that the BIL appropriates billions of dollars to establish regional ‘Hydrogen Hubs,’ applicants are anticipating long lead times for those regional hydrogen networks to materialize: 10 to 12 years, according to New York, Massachusetts, and six other Northeastern states, who recently applied for Hub funding up to $1.25 billion.77 EPA mentions the funding but omits the timeline. [EPA-HQ-OAR-2022-0985-1528-A1, p. 19]

77 NYSERDA, Seven States in NE Regional Clean Hydrogen Hub Announce DOE Proposal for Funding and Designation as a National Hub (Apr. 7, 2023), https://www.nyserda.ny.gov/About/Newsroom/2023-Announcements/2023-4-7-Seven-States-in-Northeast-Regional-Clean-Hydrogen-Hub.

Hydrogen infrastructure has a long way to go. According to DOE, ‘[t]he major hydrogen-producing states are California, Louisiana, and Texas. Today, almost all the hydrogen produced in the United States is used for refining petroleum, treating metals, producing fertilizer, and processing foods.'78 DOE has observed that '[m]ost hydrogen used in the United States is produced at or close to where it is used—typically at large industrial sites.'79 Hydrogen is not being produced at scale as transportation fuel. And, as DOE has recognized, the 'infrastructure needed for distributing hydrogen to the nationwide network of fueling stations required for the widespread use of fuel cell electric vehicles still needs to be developed.'80 DOE has explained that the 'initial rollout for vehicles and stations focuses on building out these distribution networks, primarily in southern and northern California.'81 [EPA-HQ-OAR-2022-0985-1528-A1, p. 19]

78 U.S. Dep't of Energy, Alternative Fuels Data Center, Hydrogen Production and Distribution, https://afdc.energy.gov/fuels/hydrogen_production.html#:~:text=The%20major%20hydrogen%2Dproducing%20states,producing%20fertilizer%2C%20and%20processing%20foods (last visited June 16, 2023).

79 Id.

80 Id.

81 Id.

DOE has identified other significant challenges:

Creating an infrastructure for hydrogen distribution and delivery to thousands of future individual fueling stations presents many challenges. Because hydrogen contains less energy per unit volume than all other fuels, transporting, storing, and delivering it to the point of end-use is more expensive on a per gasoline gallon equivalent basis. Building a new hydrogen pipeline network involves high initial capital costs, and hydrogen's properties present unique challenges to pipeline materials and compressor design.82 [EPA-HQ-OAR-2022-0985-1528-A1, p. 19]

82 Id.

EPA's analysis fails to account for all these critical factors. [EPA-HQ-OAR-2022-0985-1528-A1, p. 19]

The omission of any meaningful analysis of the necessary infrastructure buildout is significant. Building the supporting infrastructure will be critical to the success of implementing ZEVs at scale and will require a major reimagining of our transportation infrastructure. As EPA knows, heavy-duty vehicles are not a monolith. EPA's modeling addresses over 101 different types of heavy-duty vehicles.83 Its standards range from class 2b to class 8 vehicles, which vary differently from one another and serve a broad range of purposes. There can be no one-size-fits-all solution to the necessary infrastructure to support those heavy-duty ZEVs at scale. [EPA-HQ-OAR-2022-0985-1528-A1, p. 20]

EPA is also aware that heavy-duty vehicle manufacturers have concerns about the infrastructure buildout:

EPA has heard from some representatives from the heavy-duty vehicle manufacturing industry both optimism regarding the heavy-duty industry's ability to produce ZEV technologies in future years at high volume, but also concern that a slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards.84 [EPA-HQ-OAR-2022-0985-1528-A1, p. 20]

84 Id. at 25934.

Heavy-duty vehicle manufacturers have asked EPA to address this concern, and EPA has specifically requested comment on the topic.85 This concern must be addressed. [EPA-HQ-OAR-2022-0985-1528-A1, p. 20]

85 Id.

EPA must take a harder look at the data and incorporate the challenges to ZEV infrastructure development into its modeling. EPA should also consider other technologies, such as renewable fuels, that could significantly reduce heavy-duty vehicle emissions in conjunction with ZEVs. EPA knows that courts may invalidate rules when agencies have ‘entirely failed to consider an important aspect of the problem’ or ‘offered an explanation for [their] decision[s] that runs counter to the evidence before the agenc[ies].’86 The Proposed Rule risks a challenge under those basic administrative law principles. [EPA-HQ-OAR-2022-0985-1528-A1, p. 20]

86 State Farm, 463 U.S. at 43.

In both the Proposed Rule and the Draft Regulatory Impact Analysis (DRIA), U.S. EPA focuses extensively on the need for widespread deployment of heavy-duty battery electric vehicle (HD BEV) and heavy-duty fuel cell electric vehicle (HD FCEV) technologies as key elements in manufacturer efforts to comply with the proposed greenhouse gas (GHG) standards. Also mentioned are HD vehicles powered by hydrogen fueled internal combustion engines (H2-ICE). Chapters 1 and 2 of the DRIA provide the bulk of the analysis of the assessment of the technological feasibility of HD BEV, HD FCEV and H2-ICE technology. [EPA-HQ-OAR-2022-0985-1528-A1, p. 22]

The first key issue identified with findings of U.S. EPA’s HD ZEV technology assessment are the shear volumes of new vehicles that are assumed by the agency to be sold in the U.S. by the 2027 to 2032 model-years given that model-year 2024 engines and vehicles are already entering the market. The agency’s assumptions are presented at various places in the Proposed Rule and DRIA but can be illustrated through Table 2-82 of the DRIA which is reproduced below. As shown, U.S. EPA’s assumed adoption rates or sales fractions for HD ZEV technology in model-year 2027 (three years from now) are on the order of 10 to 30% for all applications other than tractors and certain types of buses. Further, by model-year 2032 (eight years from now) the assumed adoption rates for most applications double or increase by greater rates such that they range from 15 to 57%. [EPA-HQ-OAR-2022-0985-1528-A1, p. 23]

The values shown in Table 2-82 can be contrasted with current and forecast sales of HD ZEV technology published by the U.S. Energy Information Agency in its 2022 Annual Energy Outlook which is presented in Table 1-4 of the DRIA. Based on the information presented in Table 1-4, the current (2022) and future (2050) HD ZEV sales fractions (or adoption rate) for the three groupings of HD vehicles range from 0.10% to 0.75%, respectively. As these data show, outside of U.S. EPA’s analysis growth in the adoption rate of HD ZEV technology is forecast to increase by 7.5 times, but still amount to less than 1% of heavy-duty vehicle sales at the end of a 28 year period much less the eight year period over which U.S. EPA assumes that HD ZEV vehicle adoption rates will increases from 150 to 570 times the current adoption rate of about 0.10%. [EPA-HQ-OAR-2022-0985-1528-A1, p. 23] [Refer to Table 2-82, Projected ZEV Adoption Rates, on p. 24 of docket number EPA-HQ-OAR-2022-0985-1528-A1]

Further, U.S. EPA has not provided any analysis or evidence that the heavy-duty vehicle industry can actually accomplish this level of growth even in light of requirements of the Proposed Rule. Such an industry analysis would have to address key factors including realistic lead time requirements that accurately account for research and development, prototyping, development of production and assembly facilities, availability of tooling and parts including batteries and fuel cells in sufficient quantities, and existing supplier agreements among others. As a result of U.S. EPA's failure to perform this type of analysis there is no underlying support for the agency's HD ZEV adoption rates or its determination that compliance with the proposed rule will be technically feasible via the adoption of HD ZEV technology. [EPA-HQ-OAR-2022-0985-1528-A1, p. 23]

Another way in which the unsupported and highly optimistic nature of U.S. EPA's assumptions regarding HD ZEV technology adoption rates can be seen is through a comparison of the historical adoption rates of ZEV technology in light-duty vehicles. The figure below, which was prepared by EIA shows that as of the end of 2021 the market share of ZEVs (e.g. battery electric vehicles) in the U.S. was only 3.4% despite the facts that the State of California adopted the first regulation mandating the sale of ZEVs in 1990 and that numerous states have adopted the same requirements under Chapter 177 of the Clean Air Act. Given that ZEV technology is more amenable to light-duty vehicles than heavy-duty vehicles, the only historical evidence available directly contradicts U.S. EPA's assumptions that the Proposed Rule can drive HD ZEV adoption rates from near zero to 15 to 57% in such a short period of time. [EPA-HQ-OAR-2022-0985-1528-A1, p. 23] [Refer reader to the Figure, Quarterly Light-Duty Sales, on p. 24 of docket number EPA-HQ-OAR-2022-0985-1528-A1]

As explained in Chapter 2 of the DRIA, U.S. EPA's adoption rates for HD ZEV technologies are based on a 'payback' analysis which relies completely on the assumption that HD operators will purchase ZEVs rather than conventional vehicles if they believe that they will save money in the near term. The only factors considered by U.S. EPA in estimating HD ZEV adoption rates are incremental differences in the cost of powertrains, operation and maintenance between HD ZEVs and conventional HD vehicles. The appropriateness of using this very narrowly focused payback analysis to determine ZEV technology adoption rates appears to be contradicted by U.S. EPA itself in Chapter 6.2 of the DRIA where it is stated that:

- …as discussed extensively in the HD Phase 2 rule and 'energy efficiency gap' or energy paradox' has existed where available technologies that would reduce the total cost of ownership for the vehicle (when evaluated over their expected lifetimes using conventional discounts rates) have not been widely adopted or the adoption is relatively slow despite their potential to repay buyers initial investments rapidly.' [EPA-HQ-OAR-2022-0985-1528-A1, pp. 23-24]

Also in Chapter 6.2, U.S. EPA add that:

- Economic research offers several possible explanations for why the prospect of these apparent savings might not lead HD manufacturers and buyers to adopt technologies that would be expected to reduce operating costs, though existing research focuses on adoption of ICE technology that results in decreased fuel costs. Explanations include constraints on access to capital for investment, imperfect or asymmetrical information about the new technology (for example, real-world operational cost savings, durability, or performance), uncertainty about supporting infrastructure (for example, ease of charging a BEV), uncertainty about the resale market, and first-mover disadvantages for manufacturers. [EPA-HQ-OAR-2022-0985-1528-A1, p. 25]

Further, as described above, U.S. EPA's failure to perform an analysis of the whether or not it is even feasible for the industry to produce the number of HD ZEVs assumed by U.S. EPA in the assumed timeframe has to be added to the list of contradictions to use of the 'payback' analysis in forecasting adoption rates. Such an analysis would begin with an assessment of the ZEV technology supply chain and need to demonstrate, in light of worldwide demand for ZEV technology, that sufficient raw materials, finished batteries, electric motors, fuel cells, controllers, regenerative braking system components, will be available with sufficient lead time and at the costs assumed by U.S. EPA in its payback analysis. [EPA-HQ-OAR-2022-0985-1528-A1, p. 25]

It should be noted that U.S. EPA also states in Chapter 6.2 that:

- When it comes to HD ZEVs, we are seeing increasing demand for, and increasing investment in, ZEV technology in the absence of the proposed standards. It is possible that EPA's reference case is underestimated, and adoption of ZEVs, and other technologies, will occur more rapidly than EPA predicts in this proposal. [EPA-HQ-OAR-2022-0985-1528-A1, p. 25]

However, even this scenario contradicts U.S. EPA's reliance on the payback analysis presented in the DRIA. Greater demand for HD ZEVs will lead to greater demand for components such as batteries and fuel cells which are also likely to be in demand for light-duty vehicle applications both in the U.S. and around the world. Greater demand will lead to higher prices for HD ZEVs regardless of the cost of production and, following the logic of U.S. EPA's payback analysis, lower adoption rates. [EPA-HQ-OAR-2022-0985-1528-A1, p. 25]

Turning to the details of the payback analysis, as discussed below, it rests on unreasonable, overly optimistic, and unsupported assumptions. The basic payback analysis methodology involves two steps. The first step involves a comparative analysis of the cost of conventional and ZEV vehicles over only the first ten years of the vehicles' lives (DRIA Chapter 2.2.1.1.2) while the second step involves calculation of the 'payback period' required to amortize the incremental cost of ZEV vehicles. The result of the payback period calculation is then used by U.S. EPA to determine the assumed rate of HD ZEV technology adoption as is shown in Table 2-73 of the DRIA and Table II-23 of the Proposed Rule which is reproduced below. [EPA-HQ-OAR-2022-0985-1528-A1, p. 25]

As shown in Table II-23, the adoption rates for model-year 2027 apply only to HD BEVs while the rates for model-year 2032 apply to both HD BEVs and FCEVs and that only some of the adoption rates are higher in 2032 than in 2027. If the payback period is less than zero years, e.g. if the HD ZEV costs less to purchase than a conventional vehicle (even by $1), it is assumed that 80% of operators using that vehicle type will immediately purchase the ZEV thereby adopting HD ZEV technology. For longer payback periods, lower assumed operating costs (fuel and maintenance) for HD ZEVs relative to conventional vehicles are assumed to ultimately offset higher initial purchase costs. Lower penetration rates apply to longer payback periods although some adoption of HD ZEV technology is assumed even if the payback period is longer than the ten year time horizon of the comparative cost analysis – e.g. the operator will ultimately not be able to recoup the incremental cost of the HD ZEV. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 25-26]

The basis for the HD ZEV technology adoption rates shown in Table II-23 is discussed in Chapter 2.7.9 of the DRIA. While a number of references are cited, U.S. EPA ultimately states that:

- Of these methods explored, only ACT Research's work directly related payback period to adoption rates. Based on our experience, payback is the most relevant metric to the HD vehicle industry, and thus we relied on the ACT Research method to assess adoption rates, which we modified to account for the effects of our proposed regulations. [EPA-HQ-OAR-2022-0985-1528-A1, p. 26] [Refer to the Table II-23, Adoption Rate Schedule in HD TRUCS, on p. 26 of docket number EPA-HQ-OAR-2022-0985-1528-A1]

However, the ACT Research method is not publicly available and has to be purchased1 making a review of that method difficult and beyond the scope of this review given time and resource limitations. U.S. EPA does however indicate that it 'applied a faster adoption rate than the ACT schedule in each payback period range that is greater than 4 years, due to the assumed impact of this proposed regulation…' Overall, given the lack of publicly available information regarding the ACT method and the lack of any supporting basis for U.S. EPA's application of faster adoption rates, it appears that the HD ZEV adoption rates used by U.S. EPA are questionable at best and likely to be overstated. [EPA-HQ-OAR-2022-0985-1528-A1, p. 26]

1 https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-0931 Attachment A Page 5 of 20

As discussed in Chapter 2.1 of the DRIA, the comparative costs analysis, is based only on differences in the powertrain, fuel, and maintenance costs between in the conventional vehicles and HD ZEVs assumed to occur over the first ten years of the vehicles' lifetime. This limited list of costs ignores important factors that an HD vehicle owner would be expected to consider when making purchase decisions regarding conventional vehicles and HD ZEVs. These include differences in:

- Vehicle insurance costs;
- Resale value;
- Costs associated with the need for purchase of more than one ZEV or the continued use of conventional vehicles following purchase of a single HD ZEVs due limited range, limited cargo carrying capacity, as well as poor gradeability when fully loaded; and
- Costs associated with vehicle downtime due to inoperability, repair, and recharging/refueling. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 26-27]

Based on reports related to light-duty vehicles insurance costs are higher2 and resale values lower3 for ZEVs than for conventional vehicles both of which would increase the cost of ZEV ownership if accounted for in the payback analysis. The same is true of the need to supplement a ZEV that is not fully capable of replacing a conventional vehicle as well as excessive downtime which has been widely reported as an issue with HD ZEV buses.4 [EPA-HQ-OAR-2022-0985-1528-A1, p. 27]

2 See for example, https://www.caranddriver.com/car-insurance/a35600058/insure-electric-car/

3 See for example, https://www.sciencedirect.com/science/article/abs/pii/S0967070X22002074

4 See for example, https://www.latimes.com/local/lanow/la-me-electric-buses-20180520-story.html#:~:text=A%20Times%20investigation%20found%20its%20buses%20stalled%20on,heat%2C%20the%20cold%20or%20the%20way%20drivers%20braked.

In addition, U.S. EPA’s analysis of differential powertrain costs between conventional and ZEV vehicles is based on a number of optimistic assumptions that reduce the apparent cost of ZEV vehicles. These include:

- Assuming that IRA tax credits for battery producers will result in cost savings to battery purchasers (Table 2-44 of the DRIA);
- Failure to properly account for development and integration costs incurred by vehicle manufacturers associated with the production of HD ZEVs by assuming that they will be equal on a percentage basis to those associated with conventional vehicles (Table 3-3 of the DRIA) and
- Application of an aggressive ‘learning curve’ for HD ZEV powertrains (Table 3-2 of the DRIA) which lowers the main element of HD ZEV cost by about 25% over the period from 2027 to 2032 and by 46% by 2055 while assuming virtually no reductions (2% by 2032 and 8% by 2055) in the cost of conventional powertrains. These cost reductions are claimed despite that fact that substantial learning related to the production of batteries, fuel cells, and other ZEV componentry has already occurred in the light-duty vehicle sector and further learning curve benefits are expected to be much smaller than those forecast by U.S. EPA. [EPA-HQ-OAR-2022-0985-1528-A1, p. 27]

Another key factor in U.S. EPA’s assessment of the incremental cost of HD ZEV technology is the agency’s assumptions that IRA vehicle tax credits will continue to be place over the period from 2027 through 2032: they could be eliminated or modified by future legislation. This is key as the availability of these tax credits dramatically reduces the incremental cost of HD ZEVs estimated by U.S. EPA for many types of HD vehicles in the near term. Further, given the elimination of these credits beginning with 2033 – one could consider U.S. EPA’s selection of an aggressive learning curve for HD ZEV technology to be fortuitous as adoption rates based on payback analysis would have otherwise declined beyond 2032. [EPA-HQ-OAR-2022-0985-1528-A1, p. 27]

U.S. EPA also makes optimistic assumptions regarding the costs of electricity and hydrogen used to assess differences in fueling costs between conventional and HD ZEV vehicles. More specifically, with respect to electricity, U.S. EPA assumes that the cost of electricity used both to charge BEVs and to produce hydrogen via electrolysis will be approximately 10.7 cents/kWh (Table 2-50 of the DRIA). This value was developed by EIA for AEO 2022 for commercial end users of electricity rather than for use of electricity for transportation purposes. U.S. EPA claims that this is appropriate because ‘most HD vehicles are commercial vehicles’. However, in AEO 2023,5 the differential between the average transportation and commercial cost of electricity is about 3 cents/kWh. In other words, the average cost of electricity used in the transportation sector is about 30% higher than the value used by U.S. EPA. It is also not clear that these electricity rates are representative of what HD vehicle operators will have to pay for electricity particularly from public direct current fast charging (DCFC) stations. [EPA-HQ-OAR-2022-0985-1528-A1, p. 28]

5 See Table 8 https://www.eia.gov/outlooks/aeo/tables_ref.php

Another issue is that U.S. EPA's Program Cost analysis described in Chapter 3 of the RIA indicates (DRIA Chapter 3.4.5.1) that the EIA AEO commercial electricity rates were used through the 2055 end date of the overall cost analysis while the emission factors used for electricity generation in the Emissions Inventory analysis presented in Chapter 4 of the DRIA (Table 4-8) were adjusted to reflect emission reductions expected to result from the Inflation Reduction Act (IRA - DRIA 4.3.3.2). It is not clear that the AEO electricity costs are compatible with these IRA adjusted emission factors. [EPA-HQ-OAR-2022-0985-1528-A1, p. 28]

Similarly, U.S. EPA assumes that the retail cost of hydrogen for use as a transportation fuel will drop from $6.10 per kg in 2027 to $4 per kg in 2030 and remain at the level through 2055 (Table 2-57 of the DRIA and DRIA Chapter 3.4.5.1). These values are reported to be taken from the Department of Energy's 'Liftoff' report6 which shows that prices of hydrogen produced from fossil fuels will be considerably less than that for hydrogen produce from renewable resources. This is important because, as is discussed later, U.S. EPA's assessment of the GHG reductions associated with HD FCEVs is based on the assumption that the hydrogen used in the vehicles is produced by electrolysis from grid electricity. [EPA-HQ-OAR-2022-0985-1528-A1, p. 28]

6 Microsoft PowerPoint - Pathways to Commercial Liftoff - Clean Hydrogen - March 20 - FINAL (energy.gov)

Further, it is not clear that the hydrogen prices that U.S. EPA assumes accurately reflect the impacts that demand that would be imposed by the widespread use of hydrogen in HD FCEVs would have on supply or the infrastructure development required to provide hydrogen for use in the HD sector. Finally, it is difficult to understand the basis for U.S. EPA's assumption that the cost of hydrogen for use as a transportation fuel will reach its lowest level in 2032 after dropping about 50% from 2027 levels and then remain at the level for another 23 years. Again, a more gradual decline in what are already optimistic 2027 hydrogen prices would reduce the operating cost benefit for HD FCEVs leading to lower adoption rates through U.S. EPA's payback analysis. [EPA-HQ-OAR-2022-0985-1528-A1, p. 28]

Overall, it is clear that U.S. EPA's cost estimates for HD ZEV technologies are based on a number of highly optimistic assumptions which are unlikely to be realized in actuality. Further, U.S. EPA has performed no sensitivity analysis that would indicate the impact of the invalidity of any these assumptions to be realized on the cost of compliance with the Proposed Rule. However, it is clear based on Table II-23 shown above, that even a one- to two-year increase in the real payback period for HD ZEVs will lead to substantially lower adoption rates and a much greater compliance challenge for the HD industry using U.S EPA's methodology. [EPA-HQ-OAR-2022-0985-1528-A1, p. 28][Refer to the Table II-23, Adoption Rate Schedule in HD TRUCS, on p. 26 of docket number EPA-HQ-OAR-2022-0985-1528-A1]

Beyond the issues with HD ZEV technology cost and U.S. EPA's payback analysis, there are other issues with the agency's technology assessment that led to overestimation of adoption rates for HD ZEVs. These include the assumption that vehicle purchasers will deem a HD ZEV with a 30% lower cargo carrying capacity as equivalent to a conventional vehicle (Chapter 2.8.1 of the DRIA) and the assumption that purchasers of HD BEVs will accept the relatively low electric ranges upon which the U.S. EPA has based its cost estimates for HD BEVs (Table 2-33) – many of which are considerably less than 100 miles. Further, although U.S. EPA considered gradeability in determining electric motor sizes for HD BEVs (Chapter 2.4.1.2) it is not clear how U.S. EPA accounted for the impact of grade on BEV range which would increase the need for larger more expensive batteries again making a favorable payback analysis more difficult to achieve. [EPA-HQ-OAR-2022-0985-1528-A1, p. 29]

Overall, it is clear that the HD ZEV technology adoption rates arrived at by U.S. EPA rest on a number of overly optimistic assumptions and that a more reasonable analysis or sensitivity analysis would likely lead to far lower estimates of adoption rates. [EPA-HQ-OAR-2022-0985-1528-A1, p. 29]

Organization: Proterra

Based on the industry's technological maturity and track record, Proterra supports the strongest possible approach to accelerating the path to electric vehicles in the heavy-duty sector - heavy-duty GHG standards that are aligned with the Advanced Clean Trucks (ACT) regulation. Other states like Oregon, Washington, New York, New Jersey Massachusetts, Colorado and Rhode Island have also led with the adoption of the ACT in the past few years. A convergence in regulatory consistency at the federal level, rather than a multitude of different standards at the state level, will provide industry with the certainty needed to invest in American manufacturing. [EPA-HQ-OAR-2022-0985-1628-A1, p. 2]

These standards are supported by the significant investment that is currently made by the federal government in growing the medium and heavy duty sectors. Billions of dollars will be invested through programs like the Federal Transit Administration's Low or No Emission program for zero-emission transit buses, the EPA's Clean School Bus program for zero-emission school buses, Clean Ports program for zero-emission port equipment, and Clean Trucks program for zero-emission Class 6 and 7 trucks. In addition, the 45W Commercial Vehicle Tax Credit and the 30C credit for charging equipment will drive significant adoption by private and public fleets. [EPA-HQ-OAR-2022-0985-1628-A1, p. 2]

As this demand has grown, emission standards like the ones proposed are critical to ensuring the supply chain is provided the regulatory certainty to grow and will propel U.S. manufacturing forward. [EPA-HQ-OAR-2022-0985-1628-A1, p. 2]

Setting these standards will also ensure that American manufacturers such as Proterra continue to invest in medium and heavy-duty EVs, which deliver marked environmental and public health benefits as well as help build a domestic manufacturing base here in the U.S., providing good-paying jobs of the future, and building a strong American economy. [EPA-HQ-OAR-2022-0985-1628-A1, p. 2]

Organization: RMI

RMI commends EPA's proposal to drastically cut smog and soot-forming emissions from heavy-duty trucks and urges the EPA to finalize strong and protective GHG standards for heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1529-A1, p. 1]

The proposed rule includes new CO2 emission standards that are an essential step forward to cut the emissions needed from the most polluting sector in the US, transportation. Medium- and heavy-duty trucks in the United States produce over 20 percent of transportation greenhouse gas emissions even though they only make up 4 percent of vehicles on the road. The United States has over 4 million heavy-duty trucks that travel over 150 billion miles and create over 260 million tons of greenhouse gas (GHG) emissions per year. RMI analysis predicts trucking demand is expected to grow by two thirds through 2050, making reducing emissions from this sector exponentially important. Pollution from medium- and heavy-duty diesel trucks is a significant contributor to poor air quality.1 [EPA-HQ-OAR-2022-0985-1529-A1, p. 1]

1 Kahn et al., The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, RMI, 2022, https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

Organization: ROUSH CleanTech

We caution EPA against using California's adoption projections as the basis for a national rule. California is unique in many ways, but specifically in this case has developed a unified set of standards that complement each other (Low Carbon Fuel Standard, Advanced Clean Truck, Advanced Clean Fleet). The sales projections used in California's development assumed high gas/diesel prices and low electricity pricing from the LCFS; assumed high fleet demand from the ACF; and high vehicle availability from ACT. There is no other state in the country with this unified approach. In addition, California's main population centers have uniquely mild climates which allow for far cheaper BEV designs than are practical nationally—coastal vehicles simply don't need to be designed with elaborate heat pumps and oversized batteries that are required in cold and extreme hot climate cities experienced elsewhere. [EPA-HQ-OAR-2022-0985-1655-A1, p.3]

As noted above, we do not think EPA should include HD-BEV's in the same standards and credits as SI and CI engines, which would eliminate the need for EPA to make specific regulatory decisions based on forecasted adoption rates. However, if EPA does continue with this path, we believe the lower adoption rates presented in Table II-34 are a better alternative (although potentially still too high depending on deployment rates and electricity costs of megawatt charging in the Midwest) and should only apply to sales in states that do not adopt the ACT. [EPA-HQ-OAR-2022-0985-1655-A1, p.3]

We believe that instead of developing unique federal standards for state of health and other BEV monitoring functions, EPA should simply adopt California's Zero Emissions Powertrain (ZEP) requirements, and then work with ARB and stakeholders over time to improve those rules for national consistent implementation. While we don't believe the ZEP program is perfect by any means, it is at least something that everyone has seen and intends to implement. While EPA and ARB clearly do not intend to have a national GHG standard, we suggest that (like ICE OBD) the EPA could potentially let ARB lead the ruling, since they developed it first, and not create a new and unique requirement for manufacturers to also follow. [EPA-HQ-OAR-2022-0985-1655-A1, p.4]

Organization: South Coast Air Quality Management District (South Coast AQMD)

Technologies that reduce NOx and PM should be prioritized to make sure public health remains at the forefront of this rulemaking. We have two recommendations. First, the standards should speed up the transition to zero emissions technology and be aligned with non-attainment needs throughout all parts of the country. CARB's ACT and ACF regulations provide examples of faster phase-ins of zero emission requirements that U.S. EPA should adopt in the final rule. These state rules also have requirements that continue to tighten beyond 2032, consistent with a 2037 attainment date for the 2015 ozone standard in much of California. Most heavy-duty vehicles operating in California are first purchased out of state and operated as part of a nationwide fleet. Federal regulation aligned with California's ZEV requirements for heavy-duty vehicles would require additional ZEVs to be manufactured, sold and/or imported, thus increasing the supply of ZEVs, and supporting California's efforts to reduce emissions and improve public health and welfare. Second, if a technology like hydrogen combustion is allowed to comply with this rule due to zero tailpipe carbon emissions, it should also be required to have zero emissions for criteria pollutants and their precursors. We recognize the importance that hydrogen is expected to have, especially for heavy-duty applications where electric charging and battery technology present limitations. This may be especially true in regions such as ours with a significant amount of goods movement activity. However, it is not clear that allowing hydrogen internal combustion engines in trucking applications will meaningfully accelerate the transition to hydrogen fuel cell vehicles. Given our challenges with attaining air quality standards, it is important to transition to the cleanest technologies as quickly as possible. This rule should not prolong the use of technologies that continue to contribute to our air pollution challenges. [EPA-HQ-OAR-2022-0985-1575-A1, p. 2]

Organization: Southern Environmental Law Center (SELC)

Heavy-duty vehicles are a major source of greenhouse gases (GHGs) and other harmful pollutants that have serious environmental, public health, and economic impacts. These adverse impacts are particularly significant in the South. As we noted in comments on the notice of proposed rulemaking for prior heavy-duty engine and vehicles standards, technology already exists that eliminates, not just minimizes, tailpipe emissions from these vehicles. EPA has the authority to adopt "technology forcing" standards for GHG emissions from heavy-duty vehicles under the Clean Air Act.2 We therefore urge EPA to adopt the strongest possible standards to accelerate the transition to zero-emission vehicle (ZEV) technology in this part of the transportation sector. [EPA-HQ-OAR-2022-0985-1554-A1, p. 1]

2 Id.at 25949.

We support the adoption of stronger standards for model year 2027 and the elimination of credit multipliers for battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) in that model year. For model years 2028 and later, EPA should adopt standards that are more stringent than the current proposal. The Phase 3 standards should result in ZEV adoption rates that are at least as high as those required under California's Advanced Clean Trucks program. We also support EPA's adoption of progressively more stringent standards for model years 2033 through 2035, or until as many heavy-duty vehicles as feasible are ZEVs. [EPA-HQ-OAR-2022-0985-1554-A1, p. 1]

Beyond model year 2027, however, the current proposal does not go far enough. Increases in—and continued acceleration of—ZEV deployment in the heavy-duty vehicle sector, along with cost-effective improvements available for internal combustion engine vehicles, mean more stringent standards than those currently proposed are feasible. For model years 2028 through 2032, we urge EPA to adopt standards that would result in ZEV adoption in the heavy-duty sector at levels the same or greater than those that would be achieved under California's Advanced Clean Trucks (ACT) program. EPA must continue to increase the stringency of the GHG emission standards until the heavy-duty vehicle sector has substantially transitioned to ZEVs, and we therefore support the development of progressively stronger standards that are technology forcing and would apply beyond the model years proposed. The need for stricter standards in later model years is heightened by the fact that tax credits for the purchase of heavyduty vehicles under the Inflation Reduction Act (IRA) expire in 2032. Having a strong regulatory standard in place will be key to avoiding the backsliding of tailpipe emissions in heavy-duty vehicles.49 [EPA-HQ-OAR-2022-0985-1554-A1, p. 6-7]

49 See e.g., Peter Slowik et al., INT'L COUNCIL ON CLEAN TRANSP., Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States (Jan. 2023), https://theicct.org/wp-content/uploads/2023/01/iraimpact-evs-us-jan23-2.pdf.

54 Press Release, Earthjustice, New York State Advances Clean Trucks Rule to Electrify Vehicles (Dec. 30, 2021), https://earthjustice.org/news/press/2022/new-york-state-advances-clean-trucks-rule-to-electrify-vehicles.

55 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 26009-10 (Apr. 27, 2023).

56 Compare id. at 25989 ("The approach we used to select the proposed standards . . . does not specifically include accounting for ZEV adoption rates that would result from compliance with the California ACT program.") with Phase 3 Draft Regulatory Analysis, supra note 51, at 317-18 ("Because the ACT waiver was only recently granted, for this proposal EPA used the ZEV sales volumes projections that could be expected from ACT in the reference case as an overall projection for national ZEV sales volumes, as we made this projection prior to the granting of the ACT wavier.").

Finally, EPA should assume robust implementation and deployment of funds and incentives available under the Bipartisan Infrastructure Law (BIL) and IRA in its modeling of baseline ZEV adoption rates.63 These programs offer significant funding and incentives for states, local governments, private individuals, and businesses related to ZEV manufacturing, charging infrastructure, and vehicle purchases, and many states and localities have made it a priority to maximize funding opportunities under these laws. In at least some instances, however, it appears that EPA has made conservative estimates about the impact of these provisions on ZEV adoption rates.64 Additionally, the currently proposed standards do not consider the availability of public charging infrastructure for heavy-duty vehicles, even though federal infrastructure funding and other investments are spurring growth in electric vehicle charging and alternative fueling infrastructure deployment.65 [EPA-HQ-OAR-2022-0985-1554-A1, p. 8-9]

63 EPA notes that an International Council for Clean Transportation and Energy Innovation analysis found the IRA could significantly impact electric vehicle uptake in the heavy-duty vehicle sector, "projecting between 39 and 48 percent Class 4-8 ZEV sales in 2030 across three scenarios and between 47 and 56 percent in 2035." Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 25941 (Apr. 27, 2023).

64 For example, EPA only quantified the impacts of two IRA provisions as part of its assessments of costs and feasibility of the proposed standards and admits that its "assessment of the impacts of these provisions of the IRA on ZEV adoption rates are, therefore, somewhat conservative." Id. at 25946.

65 See CLEAN AIR TASK FORCE, Fact Sheet: Federal Funding Programs to Support Advanced Clean Trucks Implementation, (Apr. 13, 2023), available at https://www.catf.us/resource/federal-funding-programs-supportadvanced-clean-trucks-implementation/ (summarizing various federal incentives and grants to facilitate adoption of heavy-duty ZEVs).

Beyond improvements to the modeling of the baseline ZEV adoption rate, EPA must also consider improvements in technologies for internal combustion engine vehicles as part of this proposal. Currently, the proposed standards assume no technological improvements for these vehicles beyond what is required under the Phase 2 standards. Studies have shown, however, that

GHG emissions from these vehicles can be further reduced by existing vehicle efficiency technologies, and that this technology can be deployed in a cost-effective manner.66 Relatedly, EPA must also ensure that deployment of ZEV technology does not erode the stringency of the requirements intended for internal combustion engine vehicles. One way to do this would be to establish minimum ZEV production requirements—like the requirements in the ACT program—to separate the regulation of ZEVs and internal combustion engine vehicles. [EPA-HQ-OAR-2022-0985-1554-A1, p. 9]

66 Pierre-Louis Ragon et al., supra note 50, at app. A.

Organization: State of California et al. (2)

C. Changed Circumstances Support Increasing the Stringency of the Federal GHG Standards for Heavy-Duty Vehicles

The current Proposal would tighten the Phase 2 GHG standards for certain classes of heavy-duty vehicles for model year 2027. It would also set progressively more stringent GHG emissions standards for numerous vocational vehicles and tractor subcategories for model years 2028 through 2032. As these States and Cities noted in their 2022 comments on the Heavy-Duty NOx Proposal, and as EPA acknowledges here, there have been significant changes in the heavy-duty vehicle landscape since the Phase 2 GHG standards were finalized. For example, evidence demonstrating that ZEV technologies are technologically feasible across this sector much sooner than EPA projected in 2016, the development of fuel-cell electric vehicle technology, and increased adoption of existing and cost-effective emission control technologies in conventional heavy-duty vehicles.146 [EPA-HQ-OAR-2022-0985-1588-A1, p.20]

146 88 Fed. Reg. at 25,939-25,948.

While EPA's proposed standards would mark an important step in ensuring the heavy-duty vehicle sector continues to reduce its GHG emissions, the States and Cities urge EPA to consider more stringent standards, with values that would encourage at least the level of ZEV adoption as in California's ACT standards.228 In light of the vast strides made and expected in the deployment of heavy-duty battery-electric vehicles, the development and adoption of fuel-cell electric vehicle technology, and increased adoption of existing and cost-effective emission control technologies in conventional heavy-duty vehicles, more stringent final standards are feasible and appropriate in the lead time provided. And, while further ZEV deployment is not the only way manufacturers can and will comply with more stringent GHG standards, the increasing use of ZEVs has numerous advantages, including the reduction of toxic and criteria pollution that already overburdens environmental justice communities located near highways, railyards, distribution centers, and other sites that experience large volumes of heavy-duty vehicle traffic. [EPA-HQ-OAR-2022-0985-1588-A1, pp.32-33]

228 88 Fed. Reg. at 25,929.

Organization: Stellantis

As members of EMA, Stellantis helped compile the comments submitted by the Truck and Engine Manufacturer Association (EMA). We support EMA's points of concern including but not limited to:

- GHG Stringency - Concerns with assumptions used in EPA's newly-created HD TRUCS modeling (e.g., battery and charging costs to determine assumed EV penetrations)
- EV Market Enablers - Availability of needed charging infrastructure and purchase incentives
- CAA Lead time and Stability requirements not being met
- Battery Durability/Warranty - EPA lacks statutory authority to adopt requirements for ZEV powertrain components [EPA-HQ-OAR-2022-0985-1520-A1, p. 2]

Organization: TeraWatt Infrastructure, Inc.

TeraWatt supports the intention of the EPA in the proposed rule to reduce emissions from medium- and heavy-duty (MHD) vehicles in an effort to accelerate the transition to zero-emission vehicles (ZEV) in the commercial sector. This rule can provide the necessary market signals to increase availability and domestic production of MHD ZEVs, as well as attract a significant increase in private capital investment in ZEV charging infrastructure. [EPA-HQ-OAR-2022-0985-1587-A1, p. 1]

Organization: Tesla, Inc. (Tesla)

Given the acceleration of public health and welfare impacts associated with climate change, it is incumbent upon the EPA to recognize the crucial role battery electric vehicle (BEV) technology plays today and how widespread commercial availability of BEVs in the U.S. today should inform the implementation of a more stringent finalized standard as part of this rulemaking. As provided below, the rapid pace of medium and heavy-duty electrification strongly supports efforts to address the significant public health and community impacts of air pollution associated with the current heavy-duty vehicle fleet. This transformative technology has been amply demonstrated, is being rapidly deployed, and has rapidly decreasing competitive costs. Accordingly, Tesla encourages the agency to finalize Phase 3 greenhouse gas (GHG) standards that are more stringent than the preferred proposed emission reduction standards and align with the stringency of the California Advanced Clean Truck (ACT) Rule beginning in MY 2027.2 More specifically, EPA should increase the stringency of the proposed grams/ton-mile stringency in the Class 7-8 category to align with ACT and raise the projected Class 8 Day Cab Tractor BEV deployment from 20% in 2030 to 30% in 2030 and 40% by 2035.3 [EPA-HQ-OAR-2022-0985-1505-A1, p. 1]

2 See, California Air Resources Board, Advanced Clean Trucks, available at https://ww2.arb.ca.gov/sites/default/files/2023-06/ACT-1963.pdf

3 Compare 88 Fed. Reg. at 25932 (Table ES-3) and 88 Fed. Reg. at 25947 (Table I-1).

Stringent Emissions Standards Will Yield Significant Public Health and Welfare Benefits

Tesla supports EPA's efforts to accelerate heavy-duty vehicle electrification as it is essential for reducing GHG and criteria pollutants and addressing the rapidly escalating climate crisis. Regardless of the application, EPA has long considered BEVs to be the most effective mobile source pollution mitigating technology, stating over a decade ago, 'From a vehicle tailpipe perspective, EVs are a game-changing technology.'41 Additionally, study after study shows BEVs are a superior technology for reducing air pollution and GHG emissions over their lifetime.42 On a well to wheels analysis including upstream emissions, the U.S. Department of Energy (DOE) has repeatedly found BEVs to be far superior in emission performance than internal combustion engine (ICE) technology.43 Moreover, as the carbon intensity of domestic electricity generation continues to decline, BEV emission performance becomes better and better over time. In short, consistent with Clean Air Act Section 202(a)(3)(A), in the medium and heavy-duty vehicle space, deployment of BEVs ‘reflect the greatest degree of emission reduction achievable through the application of technology.’44 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 7-8]

41 77 Fed. Reg.62624, 62815 (Oct. 15, 2012).

42 See e.g., ICCT, A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger cars (July 20, 2021) available at https://theicct.org/publications/global-LCA-passenger-cars-jul2021; National Academies of Science, Accelerating Decarbonization of the U.S. Energy System (Feb. 2, 2021) at 97 (‘Further, light-duty trucks and buses should be electrified, particularly in urban areas. Over the next decade, the United States needs to ensure that electric vehicles become the predominant share of new purchases.’); available at https://www.nap.edu/read/25932; Environment International, Assessing the health impacts of electric vehicles through air pollution in the United States (Nov. 2020) available at https://www.sciencedirect.com/science/article/pii/S016041202031970X

43 See Department of Energy, Alternative Fuels Data Center, Emissions from Hybrid and Plug-In Electric Vehicles available at https://afdc.energy.gov/vehicles/electric_emissions.html

44 42 U.S.C. 7521(a)(3)(A).

As the agency highlights, medium- and heavy-duty trucks are major emitters of climate-warming greenhouse gases (GHGs), stating: Transportation is the largest U.S. source of GHG emissions, representing 27 percent of total GHG emissions. Within the transportation sector, heavy duty vehicles are the second largest contributor to GHG emissions and are responsible for 25 percent of GHG emissions in the sector. The reduction in GHG emissions from the standards in this proposal . . . would contribute toward the goal of holding the increase in the global average temperature to well below 2 °C above pre-industrial levels, and subsequently reduce the probability of severe climate change-related impacts including heat waves, drought, sea level rise, extreme climate and weather events, coastal flooding, and wildfires.45 [EPA-HQ-OAR-2022-0985-1505-A1, p. 8]

45 88 Fed. Reg. at 26047.

As EPA has already determined, vehicle GHG emissions endanger public health and welfare.46 Since the issuance of the Endangerment Finding continued peer-reviewed scientific analysis has further elucidated the level of GHG emission reduction needed to protect adequately the public welfare. In finalizing the requisite level of emissions reduction in the Phase 3 standards, the agency should look first toward the consensus UNFCCC and IPCC goal of limiting global warming to below 1.5 degrees Celsius compared to pre-industrial levels as its baseline.47 The U.S. has adopted an international commitment to put policies in place consistent with this protective aim.48 To meet this new target the U.S. has committed is to achieve a 50-52 percent reduction from 2005 levels in economy wide GHG pollution in 2030.49 This commitment is part of the national effort to prevent significant domestic impacts from climate change50 and embodies near term action commensurate with meeting this benchmark.51 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 8-9]

46 74 Fed. Reg. 66496 (Dec. 15, 2009) (Endangerment Finding).

47 See generally, UNFCCC, Key aspects of the Paris Agreement available at https://unfccc.int/process-and-meetings/theparis-agreement/the-paris-agreement/key-aspects-of-the-paris-agreement

48 The United States of America Nationally Determined Contribution Reducing Greenhouse Gases in the United States: A 2030 Emissions Target (April 21, 2021) at 23. available at https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf ('As noted above, the United States' NDC is consistent with the Paris Agreement temperature goal of holding the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 degrees Celsius above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change (Article 2.1(a)).'

49 White House: FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies (April 22, 2021) available at https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030- greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-onclean- energy-technologies/

50 See, President Biden, Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, 86 Fed. Reg. 7619 (Feb. 1, 2021). available at https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-athome-and-abroad

51 See Nature, Realization of Paris Agreement pledges may limit warming just below 2 °C (April 13, 2022) available at https://www.nature.com/articles/s41586-022-04553-z?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosgenerate&stream=top (Limiting warming not only to 'just below' but to 'well below' 2 degrees Celsius or 1.5 degrees Celsius urgently requires policies and actions to bring about steep emission reductions this decade, aligned with mid-century global net-zero CO2 emissions.)

As part of this effort, numerous studies have highlighted that electrifying the medium- and heavy-duty fleet as rapidly possible will enable the U.S. to meet its commitment and equitably contribute to emissions reductions that adequately protect the country's health and welfare.52 For example, a central component of the U.S. long-term climate strategy in transportation is the 'rapid expansion of zero-emission vehicles—in as many applications as possible across light-, medium-, and heavy-duty applications.'53 More specifically, 'addressing legacy diesel vehicles and emissions associated with ports, including from ships, port equipment, and trucks, would further contribute to meeting national climate, health, and climate justice goals.'54 Moreover, the American Lung Association (ALA) found that the environmental benefits from electrifying the transportation in the form of avoided climate change impacts, as expressed as the social cost of carbon,55 could surpass $113 billion in 2050 as the transportation systems combust far less fuel and our power system comes to rely on cleaner, non-combustion renewable energy.56 Critically, as one analysis recently noted, 'Heavy duty trucks in particular are far behind the net-zero trajectory and should be a priority focus for policymakers.'57 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 9-10]

52 See e.g., IPCC, AR 6, Working Group III, Climate Change 2022: Mitigation of Climate Change (April 4, 2022) at 1109 available at https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/ (finding in a 1.75 degrees scenario decarbonization happens primarily through a switch to hybrid electric and full battery-electric trucks, which leads to a 60% reduction in GHG emissions from freight in 2050 relative to 2015. Khalili et al. 20 (2019) also find substantial shifts to alternative fuels in HDVs under aggressive climate mitigation scenarios. Battery electricity, Hydrogen fuel cell, and plug-in hybrid electric vehicles constitute 50%, 30%, and 15% of heavy-duty vehicles, respectively, in 2050. They also find 90% of buses would be electrified by 2050.); See also, UNFCCC, Nationally determined contributions under the Paris Agreement; Synthesis report by the secretariat (Feb. 26, 2021) at 32 available at https://unfccc.int/documents/268571 (In terms of specific technologies that Parties intend to use for

achieving their adaptation and mitigation targets, the most frequently identified were energy efficient appliances and processes, renewable energy technologies, low- or zero-emission vehicles and hydrogen technologies) (emphasis added).

53 United States Executive Office of the President, The Long-Term Strategy of The United States Pathways to Net-Zero Greenhouse Gas Emissions by 2050 (Nov. 2021) at 31. available at https://www.whitehouse.gov/wpcontent/uploads/2021/10/US-Long-Term-Strategy.pdf

54 Id. at 42.

55 See White House, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 (Feb. 2021). available at https://www.whitehouse.gov/wpcontent/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

56 ALA, The Road to Clean Air Benefits of a Nationwide Transition to Electric Vehicles (2020) at 6 available at https://www.lung.org/clean-air/electric-vehicle-report/electric-vehicle-report-2020#:~:text=The%20%22Road%20to%20Clean%20Air,diesel%20power)%20and%20toward%20electric

57 BloombergNEF, Electric Vehicle Outlook 2023, Executive Summary (June 8, 2023) at 4 available at https://about.bnef.com/electric-vehicle-outlook/

Further, numerous studies show that the medium- and heavy-duty trucking sector must rapidly decarbonize beginning this decade to meet the U.S. commitments. A recent ICCT study found that a 2030 target of 45% zero-emission sales in the U.S. heavy-duty vehicle sector is compatible with limiting warming to less than 2°C.58 Even more is needed to ensure that the protective limiting of overall warming to 1.5°C is reached.59 Another recent analysis found that if 70% of the Class 8 regional haul tractors in the U.S. and Canada were electrified, it would result in the avoidance of almost 29 MMT CO_2e annually.60 Other analyses indicate reaching net zero emissions requires 100% BEV sales in the heavy- duty sector by no later than 2045.61 Still another has found that for the industry to limit temperature increases to no more than 1.5°C, two-thirds of trucks sold this decade must be zero-emission.62 [EPA-HQ-OAR-2022-0985-1505-A1, p. 10]

58 ICCT, Emissions Reduction Benefits of a Faster, Global Transition to Zero-Emission Vehicles (Mar. 8, 2022). available at https://theicct.org/publication/zevs-global-transition-benefits-mar22/

59 Id.

60 NACFE, HD Regional Haul Tractors (Dec. 15, 2021). available at https://nacfe.org/wp-content/uploads/2022/01/HDRegional- Haul-RoL-E-Fact-Sheet.pdf

61 Energy Innovation, The Cost of Delays (Feb. 3, 2020) available at https://energyinnovation.org/wpcontent/uploads/2021/01/Cost_of_Delay.pdf?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosgenerate&stream=top; See also, McKinsey, Climate math: What a 1.5-degree pathway would take (April 30, 2020) available at https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-math-what-a-1-point-5-degree-pathway-would-take?cid=climate-eml-alt-mcqmck&hlkid=f11ebae680e94eec9228fb44287c32f5&hctky=10204926&hdpid=f93fd3a0-3585-44b1-be49-c0ece38169e3; WHO, COP26 Special Report on Climate Change and Health (Oct. 12, 2021) available at https://www.who.int/publications/i/item/cop26-special-report.

62 World Economic Forum, Road Freight Zero: Pathways to faster adoption of zero-emission trucks (Oct. 2021) available at https://www.weforum.org/reports/road-freight-zero-pathways-to-faster-adoption-of-zero-emissiontrucks/#:~:text=reach%20this%20target.-,Road%20Freight%20Zero%3A%20Pathways%20to%20faster%20adoption%20of%20zero%2Demission,out%20of%20trucks%20and%20infrastructure.

In addition to medium- and heavy-duty vehicles being one of the largest sources of GHG pollutants that negatively impact public health, they are also one of the largest sources of criteria and air toxic pollutants, including PM and NOX. To that end, Tesla fundamentally agrees with the agency that:

- Emissions from heavy-duty vehicles contribute to poor air quality and health across the country, especially in overburdened and underserved communities. Without further reductions, heavy-duty vehicles will continue to be one of the largest contributors to mobile source emissions of NOX, which react in the atmosphere to form ozone and particulate matter.63 [EPA-HQ-OAR-2022-0985-1505-A1, p. 10]

  63 EPA, Heavy-Duty 2027 and Beyond: Clean Trucks Proposed Rulemaking (March 2022) at 2. available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1014874.pdf

In short, electrifying the medium- and heavy-duty sector will provide significant improvements in air quality and benefits to all Americans through reduced GHG, NOX, PM, and other air pollutant emissions. Tesla believes it is essential for EPA to establish longer-term medium- and heavy-duty Phase 3 emission standards that actively embrace a more rapid transition to BEVs, and that the time for doing so is now. EPA's failure to finalize a Phase 3 GHG rule that substantially puts the heavy-duty sector on a path to full electrification and sufficiently reduces U.S. emissions commensurate with the country's commitment to holding global warming to well below 2 degrees Celsius would not meet the legal benchmark of the Clean Air Act to protect the nation's public health and welfare. [EPA-HQ-OAR-2022-0985-1505-A1, p. 12]

To that end, strengthening the proposed Phase 3 regulations will create a significant manufacturer incentive that supports the President's decarbonization commitments. More directly, the U.S. recently signed the Global Memorandum of Understanding on Zero-Emission Medium and Heavy-Duty Vehicles (MOU) which sets nonbinding targets for 30% of those new vehicles - which include commercial delivery vehicles, buses and trucks - to be zero-emission by 2030 and 100% by 2040.75 Importantly, as proposed, the EPA Phase 3 standards would fall short of the MOU's commitment with only certain sub-categories of vocational trucks surpassing 30% deployment in 2030, and Class 8 day tractors new sales falling short at 20%.76 Tesla believes increasing the stringency of the proposed Phase 3 regulation will further establish a marketplace environment that will, along with other recent Congressional and regulatory actions, support accelerating deployment past the MOU's 2030 goal.77 [EPA-HQ-OAR-2022-0985-1505-A1, p. 13]

75 Global Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles (Nov. 2022) available at https://globaldrivetozero.org/mou-nations/; See also, U.S. State Department, Driving the Clean Energy Transition: A Progress Report on Implementing U.S. Efforts to Advance Clean Energy (Nov. 18, 2022) available at https://www.state.gov/driving-the-clean-energy-transition-a-progress-report-on-implementing-u-s-efforts-to-advanceclean- energy/

76 88 Fed. Reg. at 25932

77 See generally, Infrastructure Investment and Jobs Act of 2021 (IIJA), Pub. Law No. 117-58 (Nov. 15, 2021); Inflation Reduction Act of 2022, Pub. Law No. 117-169 (Aug. 16, 2022); California Advanced Clean Cars II (ACC II) Regulations (Aug. 25, 2022) available at https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii

EPA's Proposal for the Phase 3 GHG Standards Should Be Strengthened

Tesla welcomes the EPA's proposal to reduce GHG emission standards across the many medium- and heavy-duty sub-categories. Further, it encourages the agency to quickly implement more stringent Phase 3 GHG emissions standards for heavy-duty engines and vehicles, and to finalize standards well-before the end of the calendar year. To that end, Tesla encourages the agency to amend the proposed grams/mile-ton emission standards to reach stringency levels that ensure BEV deployment reaches the levels in California's ACT rule for MY 2027-2029 and continues increasing the stringency through MY 2032. 163 [EPA-HQ-OAR-2022-0985-1505-A1, p. 22]

163 See generally, CARB, Advanced Clean Trucks Fact Sheet (Aug. 20, 2021) available at https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet (Zero-emission truck sales: Manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines would be required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales would need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales).

In its proposal, EPA lays out several factors it utilizes when assessing the 'requisite technology' that will support establishing a level of stringency in the standard. When analyzing feasibility and these factors, it should be clear that electrification technology – which is already commercialized – should form the basis for the agency implementing a far stronger GHG standard than proposed. As discussed supra, in considering all these factors and the record before it, the agency should recognize that its proposed increases to the various sub-category stringency levels are inadequate and need to be strengthened. [EPA-HQ-OAR-2022-0985-1505-A1, p. 22]

Organization: Truck and Engine Manufacturers Association (EMA)

ii. The regulated OEMs cannot ensure EPA's mandated regulatory outcomes

As EMA has discussed with EPA on numerous occasions, any successful regulatory program to accelerate the manufacture and sale of ZEV trucks must be seen as a three-legged stool. The legs of that regulatory stool are: (i) reasonable mandates directly or indirectly imposed on OEMs to design, build and sell more ZEV trucks; (ii) a comprehensive coordinated program at the federal and state level to ensure the build-out, on-time and at scale, of the necessary battery-recharging and hydrogen-refueling infrastructures to operate ZEV trucks in a commercially viable manner; and (iii) sufficient purchase incentives to spur fleet owners and others to buy ZEV trucks, which currently can cost more than two times the purchase price of ICE-powered trucks. EPA's Phase 3 proposed mandates only attempt to erect the first leg of the stool. While the Agency does cite to the recent BIL and IRA as means to provide incentives for building the other two legs of the regulatory stool, those incentives are likely to be utterly insufficient, both in scope and in pace, when gauged against the scope and pace of the NPRM's indirectly mandated penetration and adoption rates for ZEV trucks. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 4 - 5]

HDOH OEMs certainly have the capacity and intent to design and build more ZEV trucks, to the extent that there are willing ZEV-truck purchasers in the market. But those OEMs most definitely do not have the capacity (or responsibility) to fund and build-out the required ZEV-truck infrastructures (which necessarily will involve the efforts and expertise of utility operators and public service commissions, state and local transportation departments, service station operators, urban planners and permitting agencies, large fleet operators, and infrastructure equipment companies), nor do OEMs have the power to unilaterally change the total cost of ownership (TCO) calculations that are likely to dissuade many fleet operators and others from buying ZEV trucks during much of the envisioned timeline of the Phase 3 program. [EPA-HQ-OAR-2022-0985-2668-A1, p. 5]

In the past, when an EPA emission-control program for HDOH vehicles has required action on the part of non-OEMs to ensure the program's success, the Agency has taken steps upfront to ensure that those non-OEM actions were taken. For example, when EPA, in effect, mandated the use of diesel particulate filters (DPFs), the Agency first ensured the widespread availability of ultra-low sulfur diesel fuel so that the DPFs could function in-commerce as expected. Similarly, when EPA's subsequent mandate, in effect, required the use of selective catalytic reduction (SCR) systems, the Agency took steps to authorize and specify "inducements" to ensure that HDOH vehicle operators would regularly refill their diesel exhaust fluid (DEF) tanks with sufficient high-quality DEF. [EPA-HQ-OAR-2022-0985-2668-A1, p. 5]

But here, in the Phase 3 rulemaking, the Agency is taking few if any actual affirmative steps to ensure that the other two legs of the three-legged stool are erected, or to provide any mechanisms for regulatory relief for OEMs if the absence of one or both of those other two legs makes the implicit ZEV-truck sales mandates unworkable. In that regard, EPA's request for comments on the infrastructure "concern" – the Agency's only practical acknowledgement of this fundamental issue in the NPRM – is not enough. Nor is it sufficient for the Agency to assume that the IRA and BIL will ensure that the relevant TCO calculations will work out in favor of the acquisition of more and more ZEV trucks across-the-board over the next nine years. In fact, that is likely not the case. For example, a $40,000 tax credit is barely enough to cover the 12% federal excise tax on the increased relative cost of a new ZEV truck, which currently is more than two times the cost of a conventionally-fueled truck. Moreover, tax incentives are only valuable to those trucking firms that operate with significant levels of taxable net profits. Many trucking firms (and many more independent or small operators) are not in a position to prioritize or maximize tax incentives. In addition, the newly enacted tax incentives for the installation of ZEV infrastructure come with multiple strings attached (e.g., prevailing wage, registered apprentice programs, construction principally in rural and historically disadvantaged or Environmental Justice communities), which may make those incentives unworkable for much of the HDOH market. Further, since the recipients of infrastructure incentive funding are not required to design and build stations specifically for ZEV trucks4 (which have different size and power requirements) it is abundantly clear that the vast majority of those infrastructure incentives (including available National Electric Vehicle Infrastructure (NEVI) funds) are being and will be consumed by the light-duty sector in any event. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 5 - 6]

4 See NPRM, 88 Fed. Reg. at 25944.

iv. EPA's likely flawed assumptions

Multiple projection-based assumptions underlie EPA's NPRM, including those pertaining to advances in ZEV powertrains, battery sizing and costs, the availability of "clean hydrogen," the availability of critical minerals and rare earth metals, and the pace and extent of the development and installation of the necessary HDOH battery-recharging and hydrogen-refueling infrastructures. Indeed, those multiple assumptions apply to each one of the Agency's predictions of the appropriate ZEV penetration and adoption rates for each of the 101 truck types and applications that the Agency chose to evaluate. Moreover, while EPA has expressed confidence that Congress and the Administration have initiated measures to address the multiple relevant supply chain concerns, those measures are almost certainly inadequate to support the Agency's projection-based assumptions. Consequently, to the extent that any or all of those compounding multiple assumptions are incorrect, so too are the resultant proposed GEM-based Phase 3 CO2 standards. [EPA-HQ-OAR-2022-0985-2668-A1, p. 7]

As discussed in detail below, many of the Agency's specific underlying assumptions are likely incorrect. Moreover, certain other of the Agency's more general assumptions and methods could be similarly unrealistic, such that they could serve to compound the extent and impact of the Agency's more specific errors. For example, in its cost assessments, the Agency does not account for any potential necessary upgrades to the national electrical grid or distribution system, nor does the Agency account for the upfront capital costs required to plan for, obtain permitting for and build-out the necessary HDOH ZEV hydrogen infrastructure. Rather, EPA has simply assumed that all of the projected BEVs will be recharged overnight at fleet-operated depots, and that those costs can be amortized on a per-vehicle basis beyond the timeframe of the Phase 3 standards. But that overly-simplistic methodology fails to account for: (i) which entities will actually plan for, install and pay out-of-pocket for the hundreds of thousands of necessary HDOH charging stations (and hydrogen-refueling stations) that will be required by 2032, and most of which will need to be 150kW or more; (ii) how long it will actually take to obtain permits for and to construct the hundreds of thousands of necessary HDOH charging stations; (iii) what role the nation's electric utilities and rate-setting agencies will need to play in this massive undertaking, including through tens of thousands of inter-connection upgrades, and at what cost over what timeline; (iv) whether the supply chains for transformers and switchgears will be capable of meeting the demands of the overlapping ZEV programs; (v) what the actual requirements will be for non-depot-based public HDOH charging stations along the nation's transportation corridors, and what the costs and timelines for those necessary major installations will be (both for BEVs and FCEVs); and (vi) the impact that the overwhelming demands on the ZEV market from the near wholesale conversion of the light-duty sector over the same 2027 to 2032 time period will have on the necessary development and expansion of the HDOH ZEV sector. Indeed, the Agency appears not to have calculated the specific numbers and sites (or aggregate upfront costs) of the battery-recharging and hydrogen-refueling stations that will be required to support the NPRM. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 7 - 8]

In a similar vein, EPA generally assumes that, within the next few years, nearly all of the production of the required batteries and fuel cells, perhaps including the mining and processing of all of the critical minerals as well, will occur domestically in the U.S., so that nearly 100% of all of the potential incentives available under the IRA and BIL – down to the last dollar – will be fully utilized between now and 2032. The assumption that battery and fuel-cell manufacturing plants can be built, domestically sourced, and made operational at exponentially increased capacities within the next few years does not match any marketplace reality. Indeed, the expertise does not currently exist in this country to build and operate battery-manufacturing plants capable of producing at scale the size of batteries (with 4000+ cycles) necessary to power ZEV-trucks. It also is unrealistic to assume that battery manufacturers will pass on 100% of the IRA and BIL incentives that they might receive to OEMs in the form of one-to-one battery-cost reductions. Indeed, it can take well more than a year for a manufacturer to realize any net benefits from tax credits. Thus, to treat tax credits as a functional equivalent of dollar-for-dollar cost reductions, as EPA has done in its HD TRUCS model, is unreasonable. [EPA-HQ-OAR-2022-0985-2668-A1, p. 8]

EPA's Draft Regulatory Impact Analysis (RIA) actually highlights many of the questionable assumptions that underly the NPRM. For example, the Draft RIA describes more fully the Agency's unreasonable assumptions about the tax credits potentially available under the BIL. In particular, the Draft RIA notes that, EPA has included the battery tax credit by reducing the direct manufacturing cost of batteries in BEVs and FCEVs, [even though] there are few manufacturing plants for HD vehicle batteries in the United States, which means that few batteries [if any] would qualify for the tax right now. We [nonetheless] expect that the industry will respond to this tax credit incentive by building more domestic manufacturing capacity in the coming years, but this will take several years to come to fruition. Draft RIA, p. 18. [EPA-HQ-OAR-2022-0985-2668-A1, p. 8]

There is very little basis for that assumption. Similarly, EPA makes unsupported assumptions about the prospects for domestic sourcing of battery manufacturing notwithstanding that "currently, most mining and refining of the crucial minerals occurs outside of the U.S. and they are largely imported as refined products," and that "relatively little mining and refining capacity is in operation." Draft RIA, p. 31. [EPA-HQ-OAR-2022-0985-2668-A1, p. 9]

In that regard, the corporate "announcements" that EPA cites regarding the potential construction of domestic battery-manufacturing plants (an inherently aspirational metric) do not comprise a sufficient basis for assuming that sufficient tax-credit-qualifying battery production will be available for the HDOH market, especially when the overwhelming demands from the light-duty sector are factored in, and when "there is no alternative to lithium in manufacturing automotive BEV batteries." Indeed, EPA concedes that "at present, there are few manufacturing plants for HD vehicle batteries in the United States." (See Draft RIA, pp. 33, 35, 172.) Nonetheless, EPA models the domestic battery-manufacturing tax credit "such that HD BEV and FCEV manufacturers fully utilize the module tax credit and generally increase their utilization of the tax credit for MY 2027-2029 until MY 2030 and beyond when they earn 100 percent of the available cell and module tax credits." Draft RIA, p. 172. (Emphasis added.) That is not realistic, especially within the next seven years. [EPA-HQ-OAR-2022-0985-2668-A1, p. 9]

EPA's assumptions regarding infrastructure costs, as further described in the Draft RIA, are highly questionable as well. EPA acknowledges that more infrastructure will be needed as BEV adoption grows, and notes that approximately 127,000 public and private charging ports could be needed by 2030 to support approximately 100,000 ZEV tractor-trailers, something that will require more than a $12 billion investment. EPA also cites an Atlas analysis, which estimates that it will cost $100 to $166 billion by the end of 2030 to install the necessary infrastructure to support one million Class 3 through 8 vehicles. That would cover 500,000 depot-charging ports, and over 100,000 public en-route direct current fast charging (DCFC) ports for long-haul trucks. Draft RIA, p. 67. [EPA-HQ-OAR-2022-0985-2668-A1, p. 9]

EPA also acknowledges that: all BEV-charging sites need to have sufficient space for charging equipment, with some stations potentially needing to accommodate onsite storage and generation equipment as well; the viability of installing the necessary electric vehicle supply equipment (EVSE) can depend on landlord-tenant relationships; the construction of any new charging stations requires compliance with various building and safety regulations; and that "permitting times can be a challenge and vary by region and site specifics." (Draft RIA, pp. 69-

70.) The Agency further concedes that both permitting and utility interconnection times could be longer for larger, more complex, and/or higher-power charging stations, and that special permits for trenching and easements may be required. “If upgrades to the electricity distribution system are required, this could further extend the timeline.” On that point, EPA notes that new charging loads of several megawatts or higher “could take months to several years to implement.” Draft RIA, pp. 69-70. [EPA-HQ-OAR-2022-0985-2668-A1, p. 9]

Yet notwithstanding all of the foregoing, EPA’s NPRM is based on the assumption that all of the required BEV charging will be provided for and managed through privately owned and operated depot-charging stations. More specifically, EPA states that,

[F]or this analysis, we estimate infrastructure costs associated with depot charging to fulfill each BEV’s daily charging needs off-shift with the appropriately sized EVSE. BEV owners will opt to purchase and install sufficient EVSE ports at or near the time of vehicle purchase to ensure operational needs are met. Each depot charging station will be unique depending on the number of vehicles that the station is designed to accommodate and their expected duty cycles, site conditions, and the charging preferences of BEV owners. (Draft RIA, p. 195.) [EPA-HQ-OAR-2022-0985-2668-A1, pp. 9 - 10]

That is a bold – and fundamentally unreasonable - assumption given that EPA recognizes that “the cost for 150 kW EVSE is estimated to be $94,000-$148,000 per port, and the cost for 350 kW EVSE is estimated to be $154,000-$216,000 per port.” (Draft RIA, p. 197; emphasis added.) Indeed, based on that, EPA is forced to admit in the Draft RIA that “not all BEV or fleet owners may choose to purchase and install their own EVSE.” Nonetheless, EPA “does not estimate any upfront hardware and installation costs for any public or other en-route electric vehicle charging infrastructure because all BEV charging needs are met with depot charging in our analysis.” (Draft RIA, pp. 63, 195, 197; emphasis added.) Once again, that core assumption is simply not reasonable. Commercial trucking fleets will not be able to absorb all of the ZEV infrastructure costs at issue over the next nine years. That simply will not happen. [EPA-HQ-OAR-2022-0985-2668-A1, p. 10]

Compounding that questionable core assumption, EPA includes no direct accounting for any hydrogen-refueling infrastructure costs. Rather, EPA asserts that “we included hydrogen infrastructure costs in our per-kilogram retail price of hydrogen.” Draft RIA, p. 186. That is not a realistic approach, since we are dealing with a refueling infrastructure that has yet to be fully conceived, let alone built-out. [EPA-HQ-OAR-2022-0985-2668-A1, p. 10]

Another seemingly obvious flaw in EPA’s analysis is that the Agency fails to take into account any of the costs or supply chain constraints that will be associated with the necessary upgrades to the nation’s electricity grid and distribution systems. In that regard, EPA recognizes that “some depot-charging sites may require upgrades to the electricity distribution system to meet new or additional charging loads.” Indeed, “loads of just 200 kW or higher could trigger the need for an onsite distribution transformer.” “New charging loads of 5 MW or higher could require more significant and costly distribution system upgrades, such as those to feeder circuits or breakers.” Draft RIA, p. 201. Here again, though, EPA “does not include any of those costs in the Agency’s analysis.” (Id. Emphasis added.) That too is simply not reasonable. [EPA-HQ-OAR-2022-0985-2668-A1, p. 10]

The foregoing types of likely unreasonable assumptions – particularly those regarding whether and how the necessary ZEV infrastructures and grid upgrades will be deployed at sufficient scale on the required timeline – amount to major defects in the foundation of the Phase 3 rulemaking. Yet notwithstanding the potential magnitude of those defects, EPA makes no effort to cure them with any corresponding mandates for infrastructure or with any potential adjustments to the proposed Phase 3 standards if the required infrastructure does not develop in time. Instead, all that EPA says regarding this foundational issue is: EPA requests comment on this [infrastructure] concern, both in the Phase 3 rulemaking process, and in consideration of whether EPA should consider undertaking any future actions related to the Phase 3 standards with respect to the future growth of the charging and refueling infrastructure for ZEVs. EPA requests comment on what, if any, additional data EPA should consider collecting and monitoring during the implementation of the Phase 3 standards. (88 Fed. Reg. at 25934.) [EPA-HQ-OAR-2022-0985-2668-A1, pp. 10 - 11]

A general request for comment is not nearly enough to address an issue that goes to the very heart of the feasibility of the Phase 3 proposal. Rather, the Agency should take it upon itself to calculate and determine the number and location of ZEV-truck recharging and refueling stations that will be required to support the ZEV truck adoption rates that the Agency has built into the Phase 3 standards. The Agency also should start now to monitor and report on the year-by-year progress made in the deployment of the necessary numbers and location of HDOH ZEV recharging/refueling stations. Finally, the Agency should establish mechanisms to adjust the implementation of the annually decreasing GEM-based CO2 standards to the same extent that the annual deployment of ZEV truck recharging/refueling stations falls short of the previously calculated infrastructure-deployment benchmark. [EPA-HQ-OAR-2022-0985-2668-A1, p. 11]

Without that type of linkage between the implementation of the Phase 3 standards and the actual implementation and readiness of the requisite underlying HDOH ZEV infrastructure, the Phase 3 standards, premised as they are on EPA’s overly-aggressive assumptions regarding ZEV truck adoption rates, likely will prove to be unworkable, and as a worst case, could lead to an increase in the use and retention of older vehicles, rather than a decrease. [EPA-HQ-OAR-2022-0985-2668-A1, p. 11]

Increasing GHG Reducing Technologies on ICE Vehicles – The Phase 3 regulation is based on converting ICE vehicle sales into ZEV sales. In that process, fleets and purchasers that are focused on reducing costs and/or have a commitment to environmental stewardship will be among the first to begin the process of converting their fleets. It is those same purchasers, however, that already optimize their vehicles and fleets for performance and fuel economy. The lower fuel consumption of those vehicles directly translates into lower GHG scores in EPA’s GEM program, which is used for OEM regulatory compliance. As those low GHG vehicles become ZEVs, the remaining sales of ICE vehicles must improve to offset the loss of the industry-leaders’ purchases of low GHG-scoring ICE vehicles. [EPA-HQ-OAR-2022-0985-2668-A1, p. 49]

The loss of low-scoring GHG vehicles from the mix of traditional ICE vehicles will amount to a de facto increase in required GHG technologies for the remaining ICE vehicles. The more ZEVs that are sold during the initial regulatory years, the greater the increase in GHG reducing technologies that must be deployed to the shrinking sales numbers of ICE vehicles. Thus, there is no need for additional EPA action to increase the requirements on ICE vehicles. The addition of

ZEVs into the stringency calculation yields the same effect. [EPA-HQ-OAR-2022-0985-2668-A1, p. 49]

The ACT regulation is structured as a strict ZEV-truck sales mandate directed to OEMs. A mandated percentage of an OEMs sales must be either a BEV or FCEV. In contrast, EPA's approach has always been technology-neutral. The GHG vehicle regulations, both Phase 1 and Phase 2, are clear examples of the technology-neutral approach. EMA firmly believes that the non-technology-neutral approach employed by the ACT Rule is not appropriate for a national standard and should not be included in any alternative approaches being considered by the Agency. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

Organization: Truck Renting and Leasing Association (TRALA)

Establishing One National Decarbonization Pathway is Critical

Harmonization between the proposed Phase 3 rule and the CARB ACF rule and the Advanced Clean Trucks (ACT) Rule are essential. In an industry that is mobile by nature and geographically operational in every state, regulatory consistency is critical in our operations and for the uninterrupted flow of interstate commerce. National carbon reduction milestones must also align to afford manufacturers the necessary lead-time and ability to conduct thorough research and development to ensure all competing emissions regulatory objectives are achieved. [EPA-HQ-OAR-2022-0985-1577-A1, p. 8]

TRALA is particularly concerned over CARB sunsetting the ACT rule and replacing it with a 100% ZEV sales requirement for model year (MY) 2036 trucks and beyond. While the Phase 3 proposal is requesting comment on whether to set carbon metrics similar to those under the ACT rule, EPA's recommended alternative stands in stark contrast to the ACT implementation glidepath. What remains more worrisome is that eight states beyond California have already opted into the ACT rule (Colorado, Massachusetts, Maryland, New Jersey, New York, Oregon, Vermont, and Washington) with several others likely to follow. The ACT rule requires annual manufacturer ZEV sales percentages for MYs 2035 of 55%, 75%, and 40% for Class 2b-3, Class 4-8, and Class 7-8 tractors respectively. TRALA does not support mandating a national ACT-like approach since the milestones are both unachievable and include a quantum ZEV sales leap between MYs 2035 and 2036 that is highly speculative and irresponsible given such mandates are 13 years into the future. [EPA-HQ-OAR-2022-0985-1577-A1, p. 8]

States opting into the ACT rule will also likely adopt the ACF rule which mandates ZEV purchase requirements for identified truck categories beginning as early as 2024. While EPA does not have authority to impose a national truck electrification mandate on fleets, the agency has the legal authority to determine whether California can begin implementing and enforcing the ACF rule under Section 209 of the federal Clean Air Act. TRALA requests EPA require CARB to seek a waiver on the ACF rule and carefully assess and ensure CARBs regulation satisfies the three-prong waiver test under Section 209. [EPA-HQ-OAR-2022-0985-1577-A1, p. 9]

Organization: U.S. Tire Manufacturers Association (USTMA)

Overall, USTMA supports the goals of this rulemaking and appreciates the opportunity to partner with other stakeholders in contributing to further reduce GHG air pollution from highway heavy-duty engines and vehicles across the United States. [EPA-HQ-OAR-2022-0985-1635-A1, p. 1]

Organization: United Steelworkers Union (USW)

Our union supports reasonable and well-researched regulations to ensure that our shared-environment and communities are protected. However, EPA's proposed rule for GHG Emissions Standards for HDVs is far-reaching, and recklessly hits the accelerator on the transition to Zero Emission Vehicles (ZEVs). As our union represents the majority of unionized workers in both the auto supply chain and the oil sector, we have grave concerns regarding this proposed rule's impact on their livelihoods and the negative impact that the rapid implementation of ZEVs will have on our domestic supply chain. [EPA-HQ-OAR-2022-0985-1514-A1, p. 1]

In 2006, the USW co-founded the BlueGreen Alliance, one of the nation's leading voices for environmental responsibility, because of the conviction that America can have both good jobs and a clean environment. Unfortunately, the EPA's plan – unacceptably, needlessly – sacrifices one for the other. If we work together, we can deliver solutions that improve air quality, and help to reduce the risks of climate change, while ensuring that workers are not left behind and are meeting our society's growing energy needs. [EPA-HQ-OAR-2022-0985-1514-A1, p. 1]

This proposed rule is just one of three rulemakings under EPA's Clean Trucks Plan that applies to vocational HDVs (e.g. delivery trucks, public utility trucks, and transit, shuttle, and school buses) and tractors (e.g. day cabs and sleeper cabs on tractor-trailer trucks). Specifically, the agency's proposal reopens Phase 2 regulation for model year (MY) 2027 and sets very stringent carbon dioxide (CO2) standards for HDVs that would begin to apply in MY 2028, with progressively lower standards each model year through MY 2032. [EPA-HQ-OAR-2022-0985-1514-A1, p. 2]

The proposed rule intends to limit the amount of pollution each automaker is allowed to generate, effectively outlawing the internal combustion engine (ICE). Additionally, unlike the Phase 1 and Phase 2 rules, which were jointly developed by EPA and the National Highway Traffic Safety Administration (NHTSA), EPA is moving forward with the Phase 3 proposed rule on its own. Further, this proposed rule does not fully consider the impact on jobs and job quality, speed of infrastructure rollout and domestic supply chain revitalization, and alternative measures to reduce emissions of ICE vehicles. [EPA-HQ-OAR-2022-0985-1514-A1, p. 2]

Additionally, even with the investments from the IRA and IIJA, the zero-emission technology for HDVs is not readily available and it will take many more years to develop and deploy, which makes compliance with the EPA's proposal for HDVs unattainable for the foreseeable future. The White House has noted that 72 percent of goods in this country are moved by truck, placing the industry at the center of our critical supply chains and economic competitiveness.5 However, the technology is nowhere near ready to meet the demand necessary to keep our supply chain moving at the same rate it is today. More to this point, the Administration continues to delay rollout of the Build America, Buy America provisions in the IIJA, which is hindering domestic manufacturing investments for a variety of products, including products contributing to the transition to low-emissions vehicles. [EPA-HQ-OAR-2022-0985-1514-A1, p. 4]

5 U.S. White House, "Fact Sheet: The Biden-Harris Administration Trucking Action Plan to Strengthen America's Trucking Workforce", December 16, 2021.

While the proposed rule is "technology neutral", there is an underlying assumption in the proposed rule that the shift will be to ZEVs, rather than low-emission vehicles. This means that automakers can choose to produce a variety of different types of ZEVs, but the fast pace of lowering emission standards forces manufacturers to choose the production of battery electric vehicles (BEVs). The BEVs market is the most economically feasible for manufactures of HDVs even though the domestic supply chain for components and the charging infrastructure isn't close to being readily available. For example, charging HDVs requires significantly more expensive conduits and transformers and consumes vastly more electricity, than what is necessary for charging light- and medium-duty vehicles. [EPA-HQ-OAR-2022-0985-1514-A1, pp. 4 - 5]

Lower Emissions for ICE Vehicles

In the proposed rule, the EPA's approach to lowering emissions is termed the Clean Vehicle Transition in Technology-Neutral Way, which envisions using more clean-running gas vehicles, hybrids, fuel cell vehicles, and other innovations to meet stricter standards. However, in this proposed rule, EPA did not consider improvements to ICE vehicles with off-the-shelf technology. EPA's proposal will outlaw ICE vehicles without considering or encouraging manufacturers to invest in engine and fuel efficiency technologies that would lower emissions. [EPA-HQ-OAR-2022-0985-1514-A1, p. 5]

Engine efficiency and aftertreatment systems can help achieve CO2 reductions, while protecting both workers in the ICE vehicle supply chain and oil refinery workers during the transition to low-emission vehicles. Existing and new technologies ranging between engine improvements and hybridization can achieve between 5 and 50 percent GHG reductions. For example, gasoline particulate filters significantly reduce fine particulates black carbon.8 [EPA-HQ-OAR-2022-0985-1514-A1, p. 5]

8 Diesel Net, "Gasoline Particulate Filters", Revised June 2021.

Additionally, EPA considered technology improvements for ICE vehicles in the Phase 2 rule. These technologies included: high compression ratio engines, waste heat recovery, cylinder thermal insulation, reduced friction losses, aerodynamics, and efficient transmissions. We also encourage EPA to consider highlighting new engine efficiency technologies to include in Phase 3: cylinder deactivation, high efficiency turbochargers, 48V energy recovery and management systems, engine-off while coasting, anti-idle and hoteling modes, efficient electrical accessories, and HDVs hybridization technologies. [EPA-HQ-OAR-2022-0985-1514-A1, pp. 5 - 6]

Technology that lowers emissions for ICE vehicles should be elevated in this proposal. EPA could do this by keeping the rule technology neutral and finalizing a more practical timeline for emissions reductions. These technologies protect jobs in the current auto supply chain and ensure our nation is actively pursuing policy to lower vehicle emissions. Standards must be reassessed with the inclusion of these technologies because the current proposal will eliminate the ICE vehicle all together, and is not an economically or socially viable rule. [EPA-HQ-OAR-2022-0985-1514-A1, p. 6]

Organization: Valero Energy Corporation

I. The HD BEV and FCEV technologies, industries, and markets are not mature enough to support EPA's proposed Phase 3 GHG vehicle emission standards.

EPA proposes to set GHG emission standards for the U.S. commercial heavy-duty vehicle fleet that are intended to force adoption of ZEV technology. As detailed below in these comments, the projected rates of adoption are grossly inconsistent with everything we know regarding the readiness of the domestic commercial freight industry to make the proposed fundamental shift in transportation technology. [EPA-HQ-OAR-2022-0985-1566-A2, p. 1]

A. The proposed rates of ZEV adoption are belied by current sales data.

EPA's projected rates of ZEV adoption are at odds with real-world data regarding the heavy-duty vehicle market. Specifically, of the estimated 850,000 new heavy-duty vehicle sales per year in the U.S.,1 EPA projects that 142,000 (16.8%) will be ZEVs in MY 2027 and 390,000 (46.0%) will be ZEVs in MY 2032.2 By contrast, in 2021, only 543 new HD ZEVs were sold in the U.S. (refer to Figure 1).3 [EPA-HQ-OAR-2022-0985-1566-A2, p. 1] [See Figure 1: Zero-emission Sales by Vehicle Type on page 2 of docket number EPA-HQ-OAR-2022-0986-1566-A2]

1 EPA HD TRUCS spreadsheet (Document ID EPA-HQ-OAR-2022-0985-0830), "1_Veh Prop" tab, Column T.

2 EPA HD TRUCS spreadsheet (Document ID EPA-HQ-OAR-2022-0985-0830), "4_Adoption Rates" tab, Cells T7 and U7. In MY 2027, EPA projects that all of the HD ZEV will be BEVs. In MY 2032, EPA projects that the 46.0% ZEV sales will break down as 40.1% BEVs and 5.9% FCEVs.

3 ICCT "Zero-emission bus and truck market in the United States and Canada: A 2021 update," September 2022, https://theicct.org/wp-content/uploads/2022/09/update-ze-truck-bus-market-us-can-sept22.pdf. The 75 medium truck and van sales are excluded from the sum, as EPA is proposing in separate rulemaking to categorize these as Medium-Duty Vehicles (refer to Docket EPA-HQ-OAR-2022-0829).

EPA's projections and ambitions in this proposed rulemaking would represent a staggering 63,000% growth in HD BEV adoption over 2021 to 2032 and 1,250,000% growth in HD FCEV adoption over the same period.4 [EPA-HQ-OAR-2022-0985-1566-A2, p. 1]

4 Id., Figures 3 and 4. In 2021, FCEV sales accounted for 7% (per Figure 4) of the 51 heavy duty truck sales (per Figure 3) – or 4 vehicles – with the remainder being BEV.

As of 2021, the U.S. saw a cumulative 3,023 sales of new HD ZEVs.6,7 The body of actual design, production, performance, and operational data available to EPA is woefully insufficient to support its impacts and feasibility analyses. EPA acknowledges that "…assumptions were difficult to compare across analyses given that ZEVs are still nascent in heavy-duty markets and actual data is limited. Most authors acknowledge there is uncertainty in their projections. We applied our technical judgment in assessing relevant trends and used engineering judgement where necessary."8 But EPA's technical expertise does not lie in vehicle design and manufacturing, economics, transportation logistics, or other key areas that bear upon transformation of the domestic heavy-duty vehicle fleet. "Engineering judgment" may be appropriate to employ when EPA must weigh different data points and considerations to make technical decisions – for example, to set a minimum calibration frequency for equipment to detect fugitive emissions. In this context, "engineering judgment" amounts to nothing more than subjective opinion informed more by the current administration's policy objectives than by any hard data. This term cannot be used as a substitute for dispassionate assessment of credible and reliable data, and as of today, that information simply does not exist. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 2 - 3]

6 Id. Figure 3 shows 492 + 51 = 543 HD ZEV sales in the U.S. in 2021.

7 ICCT "Zero-emission bus and truck market in the United States and Canada: A 2020 update," September 2021. Figure 5 shows 2,480 cumulative HD ZEV sales in the U.S. through 2020.

8 EPA "Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis" ("DRIA") (Document ID EPA-HQ-OAR-2022-0985-1428), April 2023, at 114-115.

Beyond the data from those 3,023 sales, EPA relies on assumptions9 and aspirational goals – either their own or those of third parties – to support and justify the proposed standards. Courts have outright rejected EPA rules that are based on incorrect data and "blithe[] assum[ptions]" regarding the feasibility of a proposed rule.10 Despite the degree of conjecture in every step of the regulatory impact analysis, EPA fails to incorporate an adequate uncertainty analysis that accounts for the probabilities relating to its guesswork, as outlined in Circular A-4, nor does it "clearly set out the basic assumptions, methods, and data underlying the analysis and discuss the uncertainties associated with the estimates."11 This hardly rises to the level of "reasoned decisionmaking" required by the Supreme Court and elucidates a process that is anything other than the "logical and rational…consideration of…relevant factors."12 The following sections highlight examples of EPA's reliance on unrealistic assumptions, estimates and aspirational goals in the regulatory impact analysis, as well as examples of EPA's lack of transparency regarding uncertainties. [EPA-HQ-OAR-2022-0985-1566-A2, p. 3]

9 The word "assume" appears 515 times in EPA's 515-page Draft Regulatory Impact Analysis ("DRIA"). "Estimate" is used 717 times in the DRIA.

10 Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 544 (D.C. Cir., 1983).

11 Circular A-4, Office of Management and Budget, https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/.

12 Michigan v. EPA, 576 U.S. 743, 750 (2016).

Due the nascent state of the HD BEV and FCEV technologies, industries, and markets, it is simply not possible for EPA to prepare a thorough and credible impact analysis to support its proposed standards. EPA's attempt in this rulemaking to represent its DRIA as such is unreasonable, arbitrary and affirmatively misleading. [EPA-HQ-OAR-2022-0985-1566-A2, p. 3]

D. EPA's reliance on OEM announcements is unreasonable.

EPA's conclusion that it is feasible within the next decade to force transition of the domestic HDV fleet to BEV and FCEV inappropriately relies on third-hand sources and news articles taken out of context. For example, to support the proposition that U.S. truck fleets are already moving in this direction, EPA claims "[a] report by the International Energy Agency (IEA) provides a comprehensive accounting of recent announcements made by UPS, FedEx, DHL, Walmart, Anheuser-Busch, Amazon, and PepsiCo for fleet electrification."91 But IEA's report also cautions that "[e]ven with the recent success of EV deployment, reaching a trajectory consistent with climate goals is a formidable challenge."92 Additionally, per the IEA report, auto "[m]anufacturers' electrification targets align with the IEA's Sustainable Development

Scenario."93 But "for the Sustainable Development Scenario targets to be met, efforts must be made to ensure that all the announced [battery] production capacity is built on time and that factories rapidly increase their capacity factors."94 As detailed below, this is an extremely big "if." [EPA-HQ-OAR-2022-0985-1566-A2, pp. 20 - 21]

91 EPA's HD Phase 3 GHG Proposal at 25941 (citing to International Energy Association. Global EV Outlook 2021. April 2021. Available online at: https://iea.blob.core.windows.net/assets/ed5f4484- f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook 2021.pdf).

92 International Energy Association. Global EV Outlook 2021 at 6. April 2021. Available online at: https://iea.blob.core.windows.net/assets/ed5f4484- f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf.

93 Id. at 26.

94 Id. at 86.

Similarly, EPA states that "in December 2022, PepsiCo added the first of 100 planned Tesla Semis to its fleet."95 Yet EPA's source article further provides that "[s]till, industry experts remain skeptical that battery electric trucks can take the strain of hauling hefty loads for hundreds of miles economically."96 To date, no pricing data is publicly available for the Tesla Semi truck. It is unreasonable to read any significance into PepsiCo's purchase other than the fact it was made; it was not necessarily cost-effective, or effective, period. It may have been driven more by commitments to ESG shareholders than by any bottom-line considerations, and it is unreasonable to assume that this acquisition by an international manufacturing titan with a market capitalization of $255 billion means that similar purchases are likely to be feasible or desirable for the vast majority of U.S. truck owners and operators. [EPA-HQ-OAR-2022-0985-1566-A2, p. 21]

95 EPA's HD Phase 3 GHG Proposal at 25942.

96 Akash Sriram. ''Musk delivers first Tesla truck, but no update on output, pricing.'' Reuters. December 2, 2022. https://www.reuters.com/business/autos-transportation/musk-delivers-first-tesla-semi-trucks-2022-12-02/. See also Hyunjoo Jin. "Must set to finally take wraps of Tesla truck – to tough crowd." Reuters. December 1, 2022. https://www.reuters.com/technology/musk-set-finally-take-wraps-off-tesla-truck-tough-crowd-2022-12-01/ ("The whole reason for a truck is to haul around 40,000 to 45,000 pounds of freight," said Roeth, a former executive at U.S. truck maker Navistar. "And if your batteries weigh too much, or they cost too much ... that doesn't work."

Per the proposal, "Daimler Trucks North America has committed to offering only what they refer to as 'carbon-neutral' trucks in the United States[] by 2039 and expects that by 2030 as much as 60 percent of its sales will be ZEVs."97 But in one of EPA's source articles cited to in support of this point, Martin Daum, head of Daimler Trucks & Buses "emphasized the reality on the ground," stating that "'[l]ocally CO2-neutral trucks and buses won't sell themselves, because even in 2040 -- despite all efforts by manufacturers -- the acquisition and total cost of ownership of trucks and buses with electric drives will be still higher than for diesel vehicles.'"98 [EPA-HQ-OAR-2022-0985-1566-A2, p. 21]

97 EPA's HD Phase 3 GHG Proposal at 25941.

98 David Cullen, 'Daimler to Offer Carbon Neutral Trucks by 2039,' (October 25, 2019) (emphasis added) https://www.truckinginfo.com/343243/daimler-aims-to-offer-only-co2-neutral-trucks-by-2039-in-key-markets.

In EPA's other source article regarding the Daimler Trucks carbon-neutrality announcement, EPA neglects to mention other obstacles facing Daimler Trucks North America.99 According to John O'Leary, President and CEO of Daimler Trucks North America LLC (DTNA), "'[o]ur teams conduct yeoman efforts to secure chips all around the globe… looking for little caches of chips here and there. We've had good weeks and bad weeks.' He [further] explained that yes, DTNA has been building vehicles it can't necessarily deliver . . .. He [is also quoted as saying] pricing has been a big issue — unlike chips, the company is able to obtain many raw materials and components, 'but only at a significantly higher price.' DTNA already has announced a price increase for next year to help cover those increased costs, he said."100 [EPA-HQ-OAR-2022-0985-1566-A2, p. 22]

99 EPA's HD Phase 3 GHG Proposal at 25941.

100 Deborah Lockridge, "What Does Daimler Truck Spin-off Mean for North America?", Trucking Info (November 11, 2021). https://www.truckinginfo.com/10155922/what-does-daimler-truck-spin-off-mean-for-north-america.

EPA also cites to Scania's Electrification Roadmap throughout its proposal to support the assertion that publicly stated goals meet EPA's HD ZEV penetration trajectory.101 But Scania's Electrification Roadmap clearly specifies that "[f]or this to happen, we must have access to charging infrastructure and renewable electricity."102 [EPA-HQ-OAR-2022-0985-1566-A2, p. 22]

101 EPA's HD Phase 3 GHG Proposal at 25929, 25933, 25941, etc.

102 Scania, 'Scania's Electrification Roadmap,' Scania Group, November 24, 2021.

E. ZEVs are not fit for purpose as HDVs.

EPA's presumptions regarding consumer acceptance of ZEVs overlook these vehicles' unsuitability for the purpose of long-haul freight transport. Factors EPA has not fully considered that are material to HD ZEV feasibility include, among other things: reduced payload capacity; battery weight requirements; range; impacts to trucking industry jobs; charging/re-fueling infrastructure availability; the rate of infrastructure buildout; permitting challenges; upstream environmental impacts inherent to ZEV production; upfront ZEV costs; the HD payback period; electricity price projections; and battery efficiency in different climate conditions. [EPA-HQ-OAR-2022-0985-1566-A2, p. 23.]

Regarding "fitness for purpose," while ZEVs may provide options to help reduce GHG emissions, neither BEV nor FCEV technology is compatible with the full range of use, duty and demand required by the HD transportation sector, and therefore neither one is suitable to replace the ICEV and adequately serve the nation's freight and transit needs. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 23 - 24.]

The transition of a large and complex transportation system to a BEV or FCEV technology is a massive undertaking, requiring the establishment of new manufacturing, assembly and supply chains; build-out of new charging/fueling infrastructure; interface with public utilities; re-conception of fuel distribution logistics; and ultimate design of end-of-life resource recovery strategies. Renewable diesel, on the other hand, can utilize existing infrastructure (i.e., pipelines, terminals, and retail distribution supply chains), requiring far less investment when compared against BEV charging and FCEV hydrogen fueling build-out. [EPA-HQ-OAR-2022-0985-1566-A2, p. 25]

There are other complexities associated with a transition to HD ZEVs that EPA should also consider, including:

- Significant environmental impacts arising from other aspects of the ZEV lifecycle, including raw material acquisition and processing, and battery production, transport, disposal, and recycling.116

116 See UC Davis, Achieving Zero Emissions with More Mobility and Less Mining, at 10 (January 2023) https://www.climateandcommunity.org/_files/ugd/d6378b_3b79520a747948618034a2b19b9481a0.pdf ("Under prevailing technologies, lithium is an essential ingredient in the batteries that power EVs, as well as other consumer electronics and forms of electric mobility such as e-buses, e-trucks, and e-bikes. Lithium mining—currently concentrated in Australia, Chile, China, and Argentina—is, like all mining, environmentally and socially harmful"). See also Perry Gottesfeld, Electric cars have a dirty little recycling problem–batteries, CANADA'S NATIONAL OBSERVER, Jan. 22, 2021, https://www.nationalobserver.com/2021/01/21/opinion/electric-cars-have-dirty-little-recycling-problem-their-batteries.

Along with their higher upfront capital expenditure, electric HDVs also must contend with electricity price projections, where utility demand charges are difficult to determine and electricity costs carry uncertainties such as whether there will be additional costs for trained personnel to operate a high-powered fast charging system. According to an Atlas Public Policy report, "[r]elying on public charging networks to charge [HD] EVs was not a viable option due to the high cost of charging."121 The substantial electricity demand requirements of HDVs coupled with limited downtime to charge larger class vehicles greatly reduces any financial savings associated with electricity, if they exist at all, over diesel based on current rates. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 26 - 27]

121 Satterfield, Charles and Nigro, Nick, Assessing Financial Barriers to Adoption of Electric Trucks, at ES-6 (Feb. 2020), https://atlaspolicy.com/wp-content/uploads/2020/02/Assessing-Financial-Barriers-to-Adoption-of-Electric-Trucks.pdf.

II. EPA fails to adequately consider important aspects and consequences of the proposed rule.

In accordance with the policy directive established by the Biden Administration in Executive Order 14037, EPA assumes without serious, critical, and independent analysis that the heavy-duty vehicle fleet should be forced to transition to BEV and FCEV technologies. In its haste to fulfill the Administration's predetermined policy objectives, EPA fails to adequately consider important aspects of the rule and overlooks significant impacts and consequences that will inevitably result if the rule is adopted as proposed. [EPA-HQ-OAR-2022-0985-1566-A2, p. 27] Moreover, EPA should not merely rely on and extrapolate from third-party data and analysis without adequately considering differences in scale, climate, terrain, and state economies that will have profound impacts on America's experience implementing the proposed rule. State specific and regional factors are material and must be considered to ensure that the proposed rule is properly and thoroughly vetted for application in each state. [EPA-HQ-OAR-2022-0985-1566-A2, p. 36]

According to the U.S. Department of Transportation, Bureau of Transportation Statistics, "[a] total of 14.9 million persons (10.2 percent of the U.S. labor force) worked in the transportation and warehousing sector and related industries (e.g., automotive manufacturing) in 2021—up 3.9

percent from 2020. In 2021, total employment in transportation reached the highest level since 1990, surpassing the 2019 level.” EPA should quantify the economic impact of supply-chain disruptions and bottlenecks likely to occur if fleet owners are forced to acquire ZEVs that are not supported by adequate infrastructure in certain parts of America. In addition, EPA should address how consumers will be impacted by higher costs of food and goods as the costs of replacing existing vehicles with ZEVs are passed through to customers. [EPA-HQ-OAR-2022-0985-1566-A2, p. 37]

EPA asserts that it has statutory authority to adopt technology-forcing standards for reducing emissions from motor vehicle tailpipes. CAA Section 202(a) does not authorize the agency to force grid operators to manage electrical loads in completely new ways, or to dictate vehicle charging behavior to fleet owners and independent vehicle operators. Yet EPA must account for the costs and impacts on the grid in the RIA for the rule and consider such costs and impacts and the availability and reliability of the grid. [EPA-HQ-OAR-2022-0985-1566-A2, p. 39.]

V. EPA should neither align the proposed rule with the Advanced Clean Trucks program (ACT), nor rely on ACT or any other state standards.

To the extent EPA is considering extending the model years at issue and increasing the stringency of the proposed standards in the final rule to align with and/or reflect California’s Advanced Clean Trucks program or any other state greenhouse gas emission standards, or is otherwise relying on any such state standards, such changes would be unlawful. State greenhouse gas emission standards and ZEV sales mandates are preempted by both EPCA and the RFS, making any reliance on such standards by EPA equally unlawful. Moreover, such a radical departure from the proposed rule would require EPA to reopen the comment period to allow for meaningful public comment on these issues and their related impacts. [EPA-HQ-OAR-2022-0985-1566-A2, p. 73]

EPCA prohibits States from adopting or enforcing “a law or regulation related to fuel economy standards or average fuel economy standards for automobiles.” 49 U.S.C. § 32919(a) (emphasis added). The Supreme Court has described “related to” preemption provisions like this one as “deliberately expansive,” Pilot Life Ins. Co. v. Dedeaux, 481 U.S. 41, 46 (1987), and “conspicuous” in their breadth, FMC Corp. v. Holliday, 498 U.S. 52, 58 (1990). As the Court has explained, a state requirement “relate[s] to” a federal law or regulation as long as it has a “connection with,” or contains a “reference to,” the regulated topic. Rowe v. New Hampshire Motor Transport Ass’n, 552 U.S. 364, 370 (2008) (quoting Morales v. Trans World Airlines, Inc., 504 U.S. 374, 384 (1992)). [EPA-HQ-OAR-2022-0985-1566-A2, p. 73]

State electric-vehicle mandates have a clear “connection with” fuel economy. Electric-vehicle mandates like California’s require manufacturers to make a certain number of “vehicles that produce zero exhaust emissions of any criteria pollutant (or precursor pollutant) or greenhouse gas, excluding emissions from air conditioning systems.” Cal. Code Regs. tit. 13, § 1962.2(a). Because emissions of the greenhouse gas carbon dioxide are “essentially constant per gallon combusted of a given type of fuel,” the fuel economy of a vehicle and its carbon-dioxide emissions are two sides of the same coin. 75 Fed. Reg. at 25,324, 25,327 (May 7, 2010). Accordingly, “any rule that limits tailpipe [greenhouse gas] emissions is effectively identical to a rule that limits fuel consumption.” Delta Constr. Co., 783 F.3d at 1294 (citation omitted). EPA has previously found California’s ZEV mandates are expressly and impliedly preempted by EPCA. 83 Fed.Reg. 42,986, 43,238-39 (Aug. 24, 2018). That is consistent with the court’s finding in Central Valley Chrysler-Plymouth v. California Air Resources Board, No. CV-F-02-5017 REC/SMS, 2002 WL 34499459 (E.D. Cal. June 11, 2002), that "Plaintiffs have shown that the 2001 ZEV amendments "relate to" fuel economy standards because they "clearly have the purpose of regulating the fuel economy performance of ... the advanced technology hybrids that the Executive Officer predicts the industry will sell in California...." Id. at *3. As a result of that litigation, CARB has "removed all references to fuel economy or efficiency," Fact Sheet: 2003 Zero Emission Vehicle Program Changes, California Air Resources Board (Mar. 18, 2004),256 in its ZEV mandates, but removal of the reference does not equate to removal of the fact that these regulations relate to fuel economy standards. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 73 - 74]

256 The Fact Sheet clarifies that the changes made were a direct result of the EPCA preemption finding: "In June 2002, due to a lawsuit against the ARB, a federal district judge issued a preliminary injunction that prohibited the ARB from enforcing the 2001 ZEV amendments with respect to the sale of new motor vehicles in model years 2003 or 2004. The lawsuit was focused on the assertion that AT PREV provisions pertaining to the fuel economy of hybrid electric vehicles were preempted by the Energy Policy and Conservation Act of 1975 – the law directing the National Highway Traffic Safety Administration to establish corporate average fuel economy (CAFE) standards. Since adopting the 2003 Amendments to the ZEV regulation, the parties to the lawsuit have agreed to end the litigation…. ¶ In order to address the preliminary injunction … staff proposed additional modifications to the ZEV regulation in March 2003.". Id. at 1.

Separately, electric-vehicle mandates also relate to "average fuel economy" because they restrict manufacturers' choices as to how to meet those standards. EPCA allows manufacturers to meet NHTSA's fuel-economy standards by producing any combination of vehicles that the national market will bear, using whatever technological approach to fuel economy they think best. State electric-car mandates, by contrast, require automakers to comply in a specific way: either by selling a certain percentage of zero-emission vehicles or purchasing credits from competitors. The state mandates thus relate to federal fuel-economy standards because they "force [a manufacturer] to adopt a certain scheme" and "restrict its choice" of compliance, and are thus preempted. New York State Conf. of Blue Cross & Blue Shield Plans v. Travelers Ins. Co., 514 U.S. 645, 668 (1995); accord Ophir v. City of Boston, 647 F. Supp. 2d 86, 93 (D. Mass. 2009). [EPA-HQ-OAR-2022-0985-1566-A2, p. 74]

State electric-vehicle mandates are also impliedly preempted by a separate statutory provision, the RFS. State laws are impliedly preempted when they "stand[] as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress." Arizona v. United States, 567 U.S. 387, 406 (2012) (citation omitted). A "conflict in technique can be fully as disruptive to the system Congress erected as conflict in overt policy." Id. (citation omitted); see Geier v. American Honda Motor Co., 529 U.S. 861, 881 (2000). [EPA-HQ-OAR-2022-0985-1566-A2, p. 74]

Here, state electric-vehicle mandates conflict with Congress's objectives in enacting the RFS. The RFS reflects Congress's policy decision to "move the United States toward greater energy independence and security" in a specific way: by "increas[ing] the production of clean renewable fuels" to be blended with fossil fuels. ACE, 864 F.3d at 697 (citations omitted). Mandating electrification—in other words, eliminating vehicles that use liquid renewable fuels—puts severe pressure on regulated entities' ability to comply with the RFS by reducing the percentage of vehicles that use those renewable fuels. [EPA-HQ-OAR-2022-0985-1566-A2, p. 74]

By contrast, Congress has never included electric-vehicle mandates in its energy-security plans and in fact has rejected several bills that would have imposed such mandates. See, e.g., Zero-Emission Vehicles Act of 2019, H.R. 2764, 116th Cong. (2019); Zero-Emission Vehicles Act of 2018, S. 3664, 115th Cong. (2018). State electric-vehicle mandates wreak havoc on Congress's carefully crafted scheme in favor of an option that Congress has consistently rejected. Cf. West Virginia v. EPA, 142 S. Ct. 2587, 2614 (2022). [EPA-HQ-OAR-2022-0985-1566-A2, p. 74]

Because these state standards and mandates are themselves preempted and unlawful, any reliance on, or consideration of, such standards by EPA would be equally unlawful. Any such change(s) at this juncture without reopening the public comment period would also deny stakeholders an opportunity for meaningful comment, particularly because EPA has not made available for review the factual or legal basis for any such proposed changes or its analysis of their economic impact and related policy considerations. Moreover, the final rule would constitute a radical departure from the proposal without fairly apprising stakeholders of the standards or their underlying bases. [EPA-HQ-OAR-2022-0985-1566-A2, p. 74]

EPA's HD Phase 3 GHG proposal is unsupported. Additional challenges related to accelerated ZEV deployment in the HD fleet have not been accounted for in the proposed rulemaking. EPA must fully consider factors such as cost, EV supply, mineral and component supply, infrastructure, and other challenges inherent to its proposal. Specifically, economic costs for commercial freight must be carefully considered by EPA, as these costs will directly impact the prices of essential consumer goods. Valero believes that a HD ZEV mandate, as proposed, represents a serious risk to American consumers and will impede efforts to achieve transport decarbonization at the lowest societal. These issues call into question the assumptions underpinning the HD Phase 3 GHG Proposal's central trajectory for HD ZEV sales. Pivoting towards a technology neutral approach that assesses vehicle emissions on a lifecycle basis would allow consumer choice to determine the preferred technology pathway at the lowest societal cost, and bypass the forgoing issues. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 75 - 76]

Organization: Volvo Group

Packaging Challenges

As we modify products to comply with 2027 stringencies, new components consuming valuable frame space are required, making our ability to meet a 43" trailer gap for day cabs while maintaining the fuel capacity to meet our customers' requirements increasingly difficult. The Exhaust After Treatment System (EATS) requires more 'immediate' on demand heat and the exhaust stream requires additional Diesel Exhaust Fluid (DEF). As the EATS grows in size, the DEF volume increases, requiring frame rail extensions to accommodate necessary components. Despite consideration of numerous alternatives in packaging concepts as the rear bogie(s) move rearward, the ability to meet a 43" trailer gap is less likely with the prescribed trailer configuration outlined in 1037.501. If we were to push out our standard 'best aero' day cab configuration to ~48" trailer gap, we would expect overall aerodynamics to be negatively impacted by 1.5%. To continue to achieve a 43" trailer gap we must weigh the spend (millions of USD) it takes to re-package components, perform simulations, and ultimately accrue mileage to achieve the expected reliability growth targets before putting a solution into production. [EPA-HQ-OAR-2022-0985-1606-A1, p. 12]

Conventional Vehicle Stringency

Volvo Group supports EPA's inclusion of only BEV and FCEV penetrations in the stringency calculations. As traditional heavy-duty vehicle manufacturers transition to zero-emission technologies, we must be able to focus our limited investments on developing and commercializing zero-emission vehicles (ZEVs), while continuing to support our internal combustion engine (ICE) technologies in order to meet the needs of the transportation industry and, ultimately, all consumers during this technology transition. Additionally, the largest greenhouse gas emission reductions will come from zero and near-zero-emission technologies and greater utilization of sustainable liquid fuels, not from minor engine and vehicle improvements. [EPA-HQ-OAR-2022-0985-1606-A1, p. 15]

For these reasons we do not believe that conventional vehicle stringencies should be increased beyond the current model year 2027 levels set in the Phase 2 rulemaking. Furthermore, if EPA determines to re-evaluate either, or both of the 2027 engine and conventional vehicle levels, the agency must take all of the factors noted above into consideration, especially the impact of NOx and increased engine emissions useful life on engine fuel maps used in EPA's Greenhouse Gas Emissions Model (GEM) to calculate a vehicle's Family Emission Limit (FEL). [EPA-HQ-OAR-2022-0985-1606-A1, p. 15]

Alternative Stringencies

Volvo Group believes that the proposed stringency levels are inflated due to incorrect assumptions and inputs used in the agency's analysis as further explained in EMA's comments. As such, we believe penetration levels above the proposal are likely not feasible.
Specifically: [EPA-HQ-OAR-2022-0985-1606-A1, p. 20]

- EPA should not consider applying CARB's Advanced Clean Truck (ACT) volumes on a national level. As noted earlier, California has instituted many financial and policy incentives to accelerate the penetration of medium- and heavy-duty ZEVs, and yet we already see conditions challenging the realization of ACT volumes in that state due to the lack of timely charging infrastructure deployment. California's passage of the Advanced Clean Fleets (ACF) rule was meant to further support heavy-duty ZEV adoption, yet importantly acknowledges infrastructure challenges and includes provisions to postpone requirements and prevent non-compliance for up to five years if fleets are unable to acquire infrastructure. The Volvo Group encourages EPA to include analogous provisions for OEMs if their customers face similar infrastructure challenges within the Phase 3 regulation.
- EPA should not incorporate ACT mandated volumes on top of the estimated ZEV penetration levels anticipated from the Phase 3 proposal itself. California will account for the majority of EV sales during the Phase 3 period, especially in the early years, where most other states will lag substantially due to the lack of similar HVIP-like purchase incentives and charging infrastructure. As a result, incorporating additional ACT related sales on top of the national deliveries coming out of Phase 3 is not feasible. [EPA-HQ-OAR-2022-0985-1606-A1, p. 20]

Organization: World Resources Institute (WRI)

These negative impacts to children and communities from diesel school bus pollution should be addressed with the strongest possible standards. Therefore, WRI supports the strongest proposed standard of 50-60% zero-emission vehicle adoption by 2030, that comports with the levels of the California Air Resource Board (CARB) Advanced Clean Trucks (ACT) Rule. WRI also encourages EPA to consider even stronger standards that accelerate the timeline and increase the adoption rate for new school bus purchases to help support the transition of the nation's entire school bus fleet to electric by 2030. The transition of the nation's school bus fleet to electric is already underway, with increasing investments from both state and federal programs, and interest and engagement from manufacturers and utilities. Strong standards for school buses will advance equity and environmental justice goals. Moreover, school districts are showing high demand, manufacturers are increasing the availability of models, and states are setting their own accelerated transition timelines. [EPA-HQ-OAR-2022-0985-1601-A1, p. 1]

Schools Are Moving to Electric School Buses

The experience of the first round of funding from the U.S. EPA Clean School Bus Program provides a strong indication of schools' high level of interest in a transition to electric school buses. In 2022, EPA announced nearly $1 billion in awards to 389 school districts in all 50 states and Washington, DC, along with several federally recognized Tribes and U.S. territories, to help purchase over 2,400 buses as part of the new Clean School Bus Program. In response to the overwhelming interest from school districts, 95% of the buses funded will be electric school buses. [EPA-HQ-OAR-2022-0985-1601-A1, p. 2]

EPA's $5 billion Clean School Bus Program was created under the bipartisan 2021 Infrastructure Investments and Jobs Act (IIJA). This program is designated as part of President Biden's Justice40 Initiative which seeks to ensure at least 40 percent of benefits from climate programs go to underserved communities disproportionately impacted by pollution. Nearly all of the awards, or 99 percent, were provided to school districts serving low-income, rural or tribal students. [EPA-HQ-OAR-2022-0985-1601-A1, p. 2]

EPA received application requests totaling nearly $4 billion for the rebate program – eight times the $500 million initially announced for this round. This overwhelming response is one strong indication of the high level of interest in school bus electrification from school districts across the U.S., and in all climates and geographies. [EPA-HQ-OAR-2022-0985-1601-A1, p. 2]

States Are Already Taking Action

Momentum for school bus electrification is already underway in states all across the country and EPA's standards should reflect and support this momentum. Governors from 17 states and the District of Columbia have signed a Multi-State Memorandum of Understanding to work collaboratively to advance and accelerate the market for zero-emissions medium- and heavy-duty vehicles with the overall goal to ensure that 100 percent of all new trucks and bus sales are zero-emission vehicles by 2050, with an interim target of at least 30 percent by 2030. Further, eight states have already adopted a version of the ACT – California, Oregon, Washington, New Jersey, Massachusetts, New York, Vermont, and Colorado – and there are three other states in the adoption process – Connecticut, Maine, and Maryland. These states represent a large percentage of the country's medium- and heavy-duty vehicle market, and directly impact school bus electrification efforts. [EPA-HQ-OAR-2022-0985-1601-A1, p. 2]

Specifically relating to school bus electrification, four states have passed electric school bus fleet transition targets – New York, Connecticut, Maryland, and Maine. In 2022, New York established a nation-leading electric school bus transition commitment, requiring all new school buses to be electric by 2027, and all school buses to be electric by 2035. Focusing on the disparate impacts of diesel emissions, Connecticut set an earlier transition target of 2030 for buses operating in environmental justice communities. Maryland required all new school buses to be electric by 2025. Lastly, Maine requires that 75% of new school bus purchases be electric by 2035. Collectively, these state transition targets are consequential and timely, covering roughly 64,000 school buses and over 1,600 school districts, which is roughly 13% of the nation's school bus fleet. The momentum does not stop there. According to our latest data collection and analysis, which covers school bus electrification data through December 2022, there are currently 5,612 committed electric school buses in the country. [EPA-HQ-OAR-2022-0985-1601-A1, pp. 2-3]

These electrification commitments by states underscore the setting of the strongest possible standard established under this proposed rule. [EPA-HQ-OAR-2022-0985-1601-A1, p. 3]

The Electric School Bus Market is Expanding

The electric school bus market is primed for this transition. The unprecedented interest expressed by school districts in the first round of EPA's Clean School Bus Program has prompted more school bus manufacturers to focus on electric school bus production. There are currently more than 22 models of ESBs available from a total of 8 manufacturers. Industry-wide, manufacturers are anticipated to more than double their existing capacity for Type C and D ESBs by the end of 2024 with longer-term expansion growing five-fold (Lee and Chard 2023). For more information on the electric school bus market, please see: Electric School Bus U.S. Market Study and Buyer's Guide: A Resource for School Bus Operators Pursuing Fleet Electrification | World Resources Institute (wri.org). (Update is forthcoming in Summer 2023). [EPA-HQ-OAR-2022-0985-1601-A1, p. 3]

Organization: Zero Emission Transportation Association (ZETA)

ZETA appreciates the work that went into this proposal and we encourage the agency to finalize heavy-duty GHG standards that are more stringent than proposed and align with California's Advanced Clean Trucks (ACT) regulation. To meet the country's commitments under the Paris Climate Agreement and the National Blueprint for Transportation Decarbonization, more than 55% of total class 4-8 vehicle sales must be zero-emission by 2030. Without a quicker transition, older, more-polluting vehicles will remain on the roads well into the future. [EPA-HQ-OAR-2022-0985-2429-A1, p. 1]

Emission standards like these are critical to ensuring the supply chain has the necessary regulatory certainty in order to put the sector on a glide path to a zero-emission future. We urge EPA to finalize these standards before the end of calendar year 2023 to ensure they take effect as soon as permitted under the Clean Air Act as doing so would maximize the potential emissions reductions, consistent with Executive Order 14037. We also encourage EPA to support the EV supply chain by providing forums for coordination between the agency, large fleets, utilities, and other stakeholders that will be needed to support the adoption of the electrification technologies necessary to meet these emissions reductions targets. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 1 - 2]

Beyond the environmental, public health, and climate benefits, HDV electrification will help ensure the United States maintains its economic competitiveness with the rest of the world. Governments around the world are establishing more ambitious electrification goals to align with recent announcements from global manufacturers. Ensuring U.S. regulations match or exceed these ambitions is vital to encouraging domestic investment in the industry. [EPA-HQ-OAR-2022-0985-2429-A1, p. 2]

EVs are now available in all heavy-duty classes, with many models presenting fleet operators with a favorable total cost of ownership today. That should be expected to improve further over the timeframe covered by EPA's proposed standards, and continued innovation by industry will only increase product offerings and vehicle capabilities in the coming years. [EPA-HQ-OAR-2022-0985-2429-A1, p. 2]

The entire EV supply chain is preparing today to meet the demand needs of tomorrow. The certainty that EPA provides in the form of emissions standards like these is critical to helping de-risk capital expenditures and providing future demand clarity. As domestic manufacturing capacity continues to grow, ZETA's members are leading the way to ensure the United States is well positioned to lead the EV revolution. [EPA-HQ-OAR-2022-0985-2429-A1, p. 2]

ZETA supports many of the provisions included in the proposed rule. We also believe there are a few key areas where EPA clarification could strengthen the rule to further protect public health and the environment. [EPA-HQ-OAR-2022-0985-2429-A1, p. 2]

When coupled with EPA's final rule setting multi-pollutant emission standards for HDVs,3 this rule will drive investment in electric technologies that will lead to significant emissions reductions and improved health outcomes. With an average lifespan of over 15 years and increasing, most HDVs spend more time and miles on the road before retirement than light-duty vehicles.4 Therefore, failing to electrify these HDVs now means that fossil fuel-powered vehicles rolling off assembly lines today will remain on the road well beyond 2040, adding hundreds of thousands of vehicle miles and associated deadly emissions over the coming decades. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 4 - 5]

3 See 88 FR 4296 (January 24, 2023)

4 "Aging Trucks Create More Service Opportunities," accessed May 5, 2023 https://www.ntea.com/NTEA/Member_benefits/Industry_leading_news/NTEANewsarticles/Aging_trucks_create_more_service_opportunities.aspx?fbclid=IwAR3mkimdcKilEbdqwvYYSwODX5Hop5g6odQWuQdIt9cJ37I30kwxgv209PU

Electrification presents the strongest pathway to reducing pollution from our transportation sector and unlocking tangible environmental and public health benefits. Each year, more than 12.2 million HDVs across the U.S. travel 297 billion miles and consume 46 billion gallons of gasoline and diesel.5 HDVs produce about a quarter of all emissions across the transportation sector, making them major contributors to U.S. emissions of particulate matter ($PM_{2.5}$), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and carbon dioxide (CO_2).6 Such pollutants are directly linked to long-term respiratory, cognitive, and autoimmune impairment, and studies expect the rate of HDEV deployment to have a direct relationship with improved health outcomes, particularly for individuals living near high traffic areas.7 [EPA-HQ-OAR-2022-0985-2429-A1, p. 5]

5 "Colorado Medium- and Heavy-Duty (M/HD) Vehicle Study," Colorado Energy Office (September 2021) https://drive.google.com/file/d/1N8tQp0v1RPK86Kle08ZQ83rKsY4Ja5Tx/view

6 "Federal Vehicle Standards," C2ES, accessed May 18, 2023 https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/

7 "PM2.5 polluters disproportionately and systemically affect people of color in the United States," Science Advances (April 28, 2021) https://advances.sciencemag.org/content/7/18/eabf4491

e. HDEV Manufacturing and New Model Availability

The increase in electric vehicle manufacturing spurred by more stringent Phase 3 GHG emission standards will drive down the upfront cost of production through economies of scale. This shift will drive demand for production of component parts, chargers, and battery packs. The increased demand will drive down the cost of EVSE and batteries necessary for long-haul electrification, will boost EV growth in other vehicle segments, and will inform electrification strategies for other vehicle classes. [EPA-HQ-OAR-2022-0985-2429-A1, p. 51]

Among trucks, the shorter-haul vehicle segment is currently more cost-competitive to electrify than long-haul trucking—although technological improvements are accelerating the timeline for the latter. At present, transit buses, delivery vans, and school buses are well suited to electrification: they travel shorter distances, regular routes, and benefit from return-to-base operations ideal for depot charging. Increasing the proportion of EVs in this vehicle segment will demonstrate the viability of this technology, increasing consumer confidence and paving the road for larger scale electrification. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 51 - 52]

With a growing number of fleet operators intending to decarbonize their fleets, HDV OEMs have begun ramping up their electric model production. HDEV sales have begun to rise rapidly in recent years, largely driven by a growth in available models, in addition to the growing policy support, improving technology, and cost-savings of electric trucks. More than 300 commercial EV models are available globally and this number is expected to double in the coming years.167 [EPA-HQ-OAR-2022-0985-2429-A1, p. 52]

167 "Zero-Emission Technology Inventory," Global Commercial Vehicle Drive To Zero, CALSTART, 2021, https://globaldrivetozero.org/tools/zero-emission-technologyinventory/

Major HDV manufacturers have made commitments to increase their zero-emission vehicle offerings. Company commitments range from 50%.67% of MHDV sales by 2030 to 100% of sales by 2040.168

- Paccar, which comprises 30% of U.S. HDV market share, has committed to be 100% zero-emission by 2040.169
- In 2020, Volvo committed to 35% ZEVs by 2030 and to be 100% net-zero emissions by 2040.170 Volvo has a market share of more than 10% of heavy-duty trucks in North America.171
- In 2021, Daimler announced their goal for 60% ZEV sales by 2030. Today, they sell over 500,000 trucks and buses per year with a 40% market share in North America.172

- Navistar set their ambitions on a goal for 50% ZEV sales by 2030 and 100% by 2040.173 They comprise 40% of school buses on the roads of North America and more than 12% of Class 8 trucks.
- Swedish-based Scania committed to make 30% of global sales ZEVs by 2030 and 90% by 2040.174 [EPA-HQ-OAR-2022-0985-2429-A1, p. 52]

168 Id. at Page 5

169 Id. at Page 51

170 Letter from Volvo Group North America to David S Kim dated May 21, 2021 https://calsta.ca.gov/-/media/calsta-media/documents/volvo-group-2021-05-21-comments-capti-final.pdf

171 “Record year for Volvo Trucks in 2022 – all-time high volumes and market share increase in 41 countries,” Volvo Trucks, (February 6, 2023) accessed June 5, 2023 https://www.volvotrucks.com/en-en/news-stories/press-releases/2023/feb/record-year-for-volvo-trucks-in-2022.html#:~:text=The%20global%20truck%20manufacturer%20delivered,when%20122%2C525%20trucks%20were%20delivered

172 “Daimler Truck sets out ambitions as an independent company,” PR Newswire, (May 20, 2021) accessed June 5, 2023 https://www.prnewswire.com/news-releases/daimler-truck-sets-out-ambitions-as-an-independent-company-301295906.html

173 Navistar, accessed June 5, 2023 https://www.navistar.com/en/sustainability/our-commitments

174 “Scania’s commitment to electrification – our initiatives so far,” Scania, (December 21, 2021) accessed June 5, 2023 https://www.scania.com/group/en/home/newsroom/news/2021/Scanias_commitment_to_electrification_our_initiatives_so_far.html

In addition to the conventional HD manufacturers, there is an ever-growing list of EV manufacturers in North America committed to increasing model availability, including:

- Arrival
- BYD
- GreenPower Motor Company
- Lightning eMotors
- Lion Electric Company
- Nikola Corporation
- Proterra
- SEA Electric
- TransPower
- Volta Trucks
- Workhorse [EPA-HQ-OAR-2022-0985-2429-A1, p. 53]

In North America, there are 97 heavy-duty models available today, up from 75 in 2021.175 The models span vehicle types including HD tractors, transit, coaches, school buses, and more. HD trucks alone have 27 available models in 2023, making them one of the fastest growing segments. See Appendix Figure A.3 for a list of the available HD models in North America for model years 2021-2023. [EPA-HQ-OAR-2022-0985-2429-A1, p. 53.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, pages 59-62, for Figure A.3]

175 “Zero-Emission Technology Inventory (ZETI) Data Explorer,” Global Commercial Drive to Zero, accessed June 5, 2023 https://globaldrivetozero.org/tools/zeti-data-explorer/

Transit buses have seen the greatest growth in EV adoption as a result of policy incentives and strong economics. These examples of early adoption can assist with building up economies of scale to drive down costs and build out supply chains in the U.S. In addition, exposing consumers to these vehicles increases overall trust and familiarity with the new, electric drivetrains.176 [EPA-HQ-OAR-2022-0985-2429-A1, p. 53]

176 Id. at Page 14

Today, there are fourteen heavy-duty Class 7 and 8 electric trucks and an additional eight electric heavy-duty yard tractors on the market in the U.S. Buses have seen some of the greatest model availability, with eighteen electric school bus models available for sale in the U.S. These numbers are comparable to diesel truck models, with the vast majority being sold by three major manufacturers (Daimler, Paccar, and Navistar).177 [EPA-HQ-OAR-2022-0985-2429-A1, p. 53]

177 "ATD Truck Beat: Commercial Truck Sales Increase 3.8% in 2022 over 2021," National Automobile Dealers Association, accessed June 5, 2023 https://www.nada.org/atd/research/truck-beat

From 2021 to the end of 2022, electric HD truck model availability grew 88%—from 57 models to 107. This does not include electric transit buses, which had 285 available models at the close of 2022.178 Out of all the vehicle segments, heavy-duty trucks have seen the greatest growth in model availability every year, shown in Figure 8. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 53 - 54.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 54, for Figure 8]

178 "Zero-Emission Truck and Bus Market Update," CALSTART; Global Commercial Drive to Zero, accessed June 5, 2023 https://globaldrivetozero.org/site/wp-content/uploads/2022/10/ZE_TruckBus_update.pdf

Even without robust incentives and regulatory certainty, OEMs have dramatically scaled their HDEV offerings. With more stringent emissions standards, incentives from the Bipartisan Infrastructure Law and the Inflation Reduction Act, and acceleration of corporate sustainability commitments, the stock of EV models should be reasonably expected to grow substantially over the next few years before Phase 3 GHG standards take effect. [EPA-HQ-OAR-2022-0985-2429-A1, p. 54]

i. ZETA members' HDEV manufacturing announcements

The Inflation Reduction Act helps bolster HDEV supply and demand. Production tax credits for the construction of vehicles and charging infrastructure are coupled with funding to build new facilities or retool existing locations into EV manufacturing plants. This includes $60 million to reduce diesel emissions, $2 billion in grants to upgrade facilities, and $20 billion for the construction of new EV manufacturing facilities. These funds spur new manufacturing and build market confidence. [EPA-HQ-OAR-2022-0985-2429-A1, p. 54]

ZETA member Proterra announced a new $76 million battery facility in South Carolina near its existing Greenville bus facility capable of producing 400 buses annually.180 Lion Electric, a ZETA member and manufacturer of medium and heavy-duty EVs, has factories in Illinois and Quebec with production capacity expected to reach 22,500 electric trucks and buses per year.181 Arrival is planning to build several U.S. based "microfactories," with the first being a $46 million investment in South Carolina.182 Their second facility will be a $41 million investment near Charlotte, North Carolina.183 GreenPower's bus manufacturing plant is expected to have an economic impact of $500 million per year for the state of West Virginia.184 Finally, Tesla plans to build a $3.5 billion semi-truck manufacturing facility in Nevada, its second plant in the state.185 [EPA-HQ-OAR-2022-0985-2429-A1, p. 55]

180 “Proterra Announces EV Battery Factory in South Carolina as Demand for Commercial Electric Vehicles Grows,” Proterra, (December 14, 2021) https://www.proterra.com/press-release/proterra-sc-battery-factory/

181 “Lion Electric Inaugurates Its Battery Manufacturing Factory for Medium and Heavy-Duty Vehicles” PR Newswire, (April 17, 2023) accessed June 5, 2023 https://www.prnewswire.com/news-releases/lion-electric-inaugurates-its-battery-manufacturing-factory-for-mediumand-heavy-duty-vehicles-301799083.html

182 “Arrival to build its first U.S. electric vehicle Microfactory in York County, South Carolina,” Arrival, (October 13, 2020) accessed June 5, 2023 https://arrival.com/news/arrival-to-build-its-first-us-electric-vehicle-microfactory-in-york-county-south-carolina

183 “Arrival to open a second US microfactory to build electric vans for UPS,” Arrival, (March 17, 2021) accessed June 5, 2023 https://techcrunch.com/2021/03/17/arrival-to-open-a-second-us-microfactory-to-build-electric-vans-for-ups/

184 “GreenPower Motor Co. to begin manufacturing at South Charleston, West Virginia facility ‘this quarter’,” The State Journal, (January 16, 2023) accessed June 5, 2023 https://www.wvnews.com/statejournal/greenpower-motor-co-to-begin-manufacturing-at-south-charleston-west-virginia-facility-this-quarter/article_4c7f8440-92bb-11ed-a2c8-6bc5445cbe85.html

185 “Tesla Will Build Heavy Trucks at a New Factory in Nevada,” New York Times, (January 24, 2023) accessed June 5, 2023 https://www.nytimes.com/2023/01/24/business/tesla-truck-factory-nevada.html

ZETA member companies like Arrival, SEA Electric, GreenPower Motor Company, Lion Electric, Proterra, and Tesla are all working to manufacture sufficient HDEVs to meet demand. These companies are capable of producing tens of thousands of HDEVs annually. These production capacities are proven in part by these companies’ investments in new manufacturing plants like Tesla’s Gigafactory in Texas, Rivian’s plant in Georgia, Lion Electric’s plant in Illinois, Proterra’s heavy-duty battery manufacturing facility in South Carolina, and GreenPower Motor Company’s plant in West Virginia. [EPA-HQ-OAR-2022-0985-2429-A1, p. 55]

EPA Summary and Response:

General Summary:

Lion Electric, Nuvve Holding, RMI, and TerraWatt commented in support of the proposal. Others expressed support for certain aspects of the proposal, including a single national standard (AESI, Eaton, Ford, Proterra), or the goals of the proposal and GHG standards for heavy-duty vehicles in general (Neste, EEI, USTMA). MECA commented in support of the proposal noting their particular support for commencing the standards in MY 2027. Ford and Navistar supported the 2032 standards, but said the early year standards were overly ambitious. Ford noted particular concern given the large jump in stringency between the model year 2026 standard and the proposed 2027 MY standard. Navistar expressed support in response to EPA’s request for comment on a slower phase-in alternative for MYs 2027-2031.

Several commenters expressed support for standards that are the “most stringent” or “strongest possible” (CATF et al., Energy Innovation, GreenLatinos et al., Mayor Becky Daggett et al., NESCAUM/OTC, Proterra, SELC, WRI), and indicated the rule was needed ensure the

U.S. achieves high levels of EV adoption by 2035 (ATS, CleanAirNow, EDF, GreenLatinos et al., Mayor Becky Daggett et al., MFN). Some of the commenters stating that the proposed standards were insufficiently stringent centered their arguments on general legal and policy grounds, maintaining that the standards must be stringent to meet the overriding public health and welfare protection goals of the Act and of section 202(a)(1). They pointed to the on-going climate crisis and indicated that emission reduction levels should be commensurate with the degree of harm posed by that endangerment. (See e.g., CALSTART, CATF, MFN.)

Other commenters expressed concerns with EPA's assessment of the feasibility of the proposed standards (AmFree, American Highway Users Alliance, API, AFPM, CFDC et al., DTNA, Delek, UAW, OOIDA, POET, EMA, Valero, Volvo) and some provided adverse comment on the broader proposal claiming it to be arbitrary and capricious (AmFree, AFPM, Arizona State Legislature, CFDC et al., NADA, Steven Bradbury, Valero). Some urged the agency to simply leave the 2027 phase 2 standards in place, maintaining on general grounds that further technological improvements are too nascent to form the basis for more stringent standards (American Highway Users, AmFree, NACS et al., TRALA, see also summaries in section 2.3 of this RTC document). These commenters generally cited the uncertainties associated with sufficiency of supportive electrical infrastructure, especially in the program's initial years.

Many commenters recommended standards at least as stringent as the California ACT standards (Allergy and Asthma Network et al., ACEEE, ATS, CARB, CARB et al., Ceres BICEP, CATF et al., Colorado DOT, District of Columbia DOEE, EDF, MFN, NACAA, NPCA, NESCAUM/OTC, Out Children's Trust, South Coast AQMD, SELC, State of California et al., Tesla, WRI, ZETA), and in some cases argued for standards even more stringent (MFN, Our Children's Trust, and Energy Innovation). Some requested the standards reflect California ACF standards in the national standards (NESCAUM/OTC), or suggested the standards include the ACT sales mandates (South Coast AQMD). Others commented against adopting ACT at a national scale (ATA, DTNA, ROUSH, EMA, TRALA, Valero, Volvo).

<u>General Response:</u>

We appreciate the expressed support for the proposal and the goals of this rulemaking. We also appreciate the information commenters shared to support their statements on the feasibility of the proposal and their requests for more or less stringent standards. As support for more stringent standards, commenters cited five primary factors, which we summarize and respond to below as individual comment themes:

- EPA's CAA section 202(a)(1) obligation to "utilize[e] emission standards to prevent reasonably anticipated endangerment from maturing into concrete harm" *Coal. For Responsible Regulations, Inc. v. EPA*, 684 F.3d 102, 122 (D.C. Cir. 2012);
- Evidence of greater ZEV adoption considering manufacturer announcements, introduction of HD ZEVs in the U.S. and European market, and deployment of ZEVs by fleets;
- State commitments to adopt ACT and availability of federal, state, and local financial incentives;

- Further improvements that can be made to vehicles powered by internal combustion engines (ICE vehicles); and
- Federal standards themselves will provide needed certainty for investment in both ZEVs, critical materials, and infrastructure

We also summarize and respond to two additional themes: the range of comments requesting EPA update the feasibility analysis for the rule and EPA's consideration of CARB's ACT regulation. We conclude this section 2.4 with summaries and responses to other discrete themes brought up in comments.

<u>Summary of Comment Theme: EPA is legally compelled to adopt standards more stringent than those proposed</u>

Commenters' legal arguments in support of more stringent standards centered on the purpose of section 202(a)(1)-- to use emission standards to forestall the endangerment to which the emissions contribute (*Coal. For Resp. Regulation*, 684 F.3d at 122)-- arguing that emission standards must be of a stringency commensurate with that goal. (See, e.g., CATF, MFN, NPCA, Energy Innovation; see also Comments of, e.g., ACEEE, Tesla and ZETA maintaining that the more stringent standards are needed to satisfy United States' commitments in the Paris Agreement). These commenters acknowledged that section 202(a)(1) is technology based and affords EPA discretion in how to balance the enumerated statutory factors, but asserted that the overriding statutory protectiveness imperative, the magnitude of the climate crisis endangerment, and the technology-forcing directive in section 202(a)(1) not to be limited to current technological developments in formulating emission standards. (CATF, MFN, CARB.) Both CATF and MFN suggested that by making payback period a key metric in developing standard stringency, EPA had impermissibly either considered or over-emphasized the factor of consumer acceptance in setting the standards. That is, they allege that standards so predicated were likely to reflect merely business as usual, and so would not achieve emission reductions beyond those which would occur in any case, at odds with the requirements of section 202(a)(1) to require emission reductions which would not otherwise occur. These commenters cited the D.C. Circuit's International Harvester case as support (*International Harvester v. Ruckelshaus*, 478 F. 2d 615 (D.C. Cir. 1973). CATF et al. stated: "As detailed in Section II, Congress intended EPA's standards to push the industry toward greater emission reductions and did not expect them to preserve the market dominance of any particular type of powertrain or power source. EPA should not give oversized weight to arguments questioning purchaser preferences, which is not a factor Congress identified in section 202(a)(1)–(2)." NPCA and Tesla cited 202(a)(3) and EPA's obligation for standards to reflect "the greatest degree of emission reduction achievable."

<u>Response to Comment Theme: EPA is legally compelled to adopt standards more stringent than those proposed</u>

EPA agrees with NGO commenters that the text of section 202(a)(1) directs EPA to establish emission standards which limit heavy-duty vehicles' contribution to the air pollution which causes or contributes to endangerment, and that reducing such emissions that contribute to endangerment is a central purpose of the Act. *Coalition for Responsible Regulation*, 684 F. 3d at 122. As noted in previous comment responses and elsewhere, EPA has considered the Act's text and this central purpose in determining the final standards and in making subsidiary technical and policy decisions, including the technologies we considered and included in the modeled and additional example potential compliance pathways, and in rejecting manufacturer commenters' arguments for not revising certain Phase 2 MY 2027 standards. Nonetheless, section 202(a)(1) is not a health-based standard like some CAA programs such as the NAAQS: the standards under 202(a)(1) are technology-based, not health based. So they cannot be predicated on achieving a given environmental result as some of the commenters would have it, but rather on consideration and balancing of the statutory and relevant factors, including technical feasibility, reasonableness of costs, and sufficiency of lead time. EPA has carefully weighed and balanced the statutory and relevant considerations, and taken a balanced and measured approach in adopting the final Phase 3 standards.

Willingness to purchase, including costs to purchasers and payback period, is an appropriate factor for EPA to consider in setting standards under CAA section 202(a)(1). The statute directs EPA to consider technical feasibility and cost of compliance in setting such standards. As discussed in Preamble Section II.F.1 and RIA Chapter 6.2, we consider payback, along with total cost of ownership, to be key metrics for HD vehicle purchasers. We expect that payback will impact purchasing behavior and purchaser acceptance, which, in turn, can impact compliance strategies for manufacturers, particularly if vehicles go unsold due to lack of purchaser acceptance. Therefore, this is a relevant metric related to implementation of the Phase 3 standards. It is appropriate to consider purchaser acceptance as an aspect of feasibility. If new vehicles are not purchased, achievement of the emission reduction goals of the statute are impacted; the standard, as a practical matter, may not be able to be complied with through the projected potential compliance pathways. Payback period is one reasonable measure of assessing feasibility. In addition, we note that our consideration of payback is not new and is a metric we previously considered in the heavy-duty Phase 2 program. See 81 FR at 73622/1 (Oct. 25, 2016) (considering payback period in assessing appropriateness of the Phase 2 tractor standard); id. at 73719/1-2 (consideration of payback period in assessing appropriateness of Phase 2 standard for vocational vehicles). The metric relates to consideration of cost as well, since if few new vehicles are sold, the regulated industry has fewer vehicles over which to recover fixed costs and may also incur stranded capital assets. See also *MEMA I*, 627 F. 2d at 1118 ("Congress wanted to avoid undue economic disruption in the automotive manufacturing industry and also sought to avoid doubling or tripling the cost of motor vehicles to purchasers. It therefore requires that emission control regulations be technologically feasible within economic parameters. Therein lies the intent of the "cost of compliance" requirement").

Second, as a factual matter, while EPA considered payback as one consideration in setting the standards, we disagree that the standards or the consideration of payback means that the rule reflects "business as usual." Our projected estimated GHG reductions make clear that the rule will achieve meaningful reductions of harmful GHG emissions. Specifically, we project significant emission reductions from the rule in states which have not adopted the California ACT program, as well as reductions (albeit fewer) in states which have. Thus, we project that each non-ACT state will see reductions in HDV emissions from the transportation sector above those in the reference case (baseline) attributable to the Phase 3 standards of between less than 1% in 2027, 4 % to 5% in 2032, and approximately 16% cumulatively over the entire program (i.e., by 2055).[260]   Furthermore, as explained in preamble Section II.F.1, the portion of the

[260] Murray, Evan. Memorandum to Docket EPA-HQ-OAR-2022-0985. "Calculations of the Impacts of the Final Standards at Various Geographic Scales". February 2024.

overall HD sales in MY 2027 that are ZEVs included in the reference case compared to the modeled potential compliance pathway in MY 2027 through MY 2032 are shown in Table 2-2.

Table 2-2 HD ZEV Nationwide Percentages in Reference Case and Modeled Potential Compliance Pathway

	MY 2027	MY 2028	MY 2029	MY 2030	MY 2031	MY 2032
Reference Case	7%	10%	13%	16%	18%	20%
Modeled Potential Compliance Pathway	11%	15%	19%	23%	34%	45%

Similarly, the TEIS projects in 2032 that there would be 540,000 HD BEVs in the no-action case (which reflects the ACT regulation), but 920,000 in the action case reflecting the phase 3 rule again showing appreciable impacts of Phase 3 standards in non-ACT states. [261]

We therefore disagree with the commenters' assertion that the final standards will have no or minimal impact beyond what the existing market would provide. While we include a modeled potential compliance pathway that includes ZEVs as well as additional example potential compliance pathways without including additional ZEVs to comply with this rule, if manufacturers choose the use of BEVs as part of a compliance path, we have considered whether there would be sufficient distributive buildout supporting infrastructure to support the feasibility of the standards. Notwithstanding the fact that dedicated HD charging infrastructure may be limited today, we expect it to expand significantly over the next decade; at the same time, we recognize that there are still uncertainties regarding infrastructure buildout and have taken that into consideration when determining the feasibility and the level of stringency of the final standards, including the needed lead time for their successful implementation. The final standards reflect a balanced and measured approach in consideration of the statutory and other relevant factors, including our assessment—in consultation with DOE—regarding infrastructure availability.

The commenters' citation of *International Harvester* is not persuasive. The commenters quote the following language from the opinion: "as long as feasible technology permits the demand for new passenger automobiles to be generally met, the basic requirements of the Act would be satisfied, even though this might occasion fewer models and a more limited choice of engine types. The driving preferences of hot rodders are not to outweigh the goal of a clean environment." The Phase 3 standards are not least common denominator standards (i.e., analogous to "preferences of hotrodders"). While the standards are technology based, they reflect a careful balancing of the statutory and other relevant factors, including the cost of compliance and lead time. We also note that *International Harvester* pertained to light-duty vehicles, a more homogeneous market segment than the heavy-duty segment. The vehicle types within the HD market are numerous and varied and many of these vehicles serve specific functions and perform specific types of work, so the 'hotrodder' outlier analogy does not hold. The Phase 3 standards reflect a careful balancing of factors to ensure feasibility of the standards for the various HD TRUCS vehicle types.

[261] TEIS Executive Summary at vi.

Several additional commenters provided specific suggestions to revise our consideration of the payback period and we address those comments later in this section 2.4.

We note that NPCA and Tesla cited 202(a)(3)(A)'s "greatest emission reductions achievable" statutory language in support of their advocacy of more stringent standards, but this provision is the incorrect authority for regulating GHG emissions from heavy-duty vehicles. As discussed elsewhere in RTC Chapter 2, CAA section 202(a)(3)(A) only applies to air pollutants other than the ones at issue in the Phase 3 rule.

Summary of Comment Theme: Manufacturers' announced product plans, and fleets' and municipalities' purchase announcements impact on feasibility of standards more stringent than proposed

Many commenters in support of more stringent standards referred to recent introductions of ZEVs in the U.S. and European markets, fleet purchases and purchase announcements, and manufacturer production and announcements as indications that ZEVs are more widely available than indicated by EPA's projected adoption rates in the proposal.

Commenters requesting more stringent standards pointed to manufacturer announcements about planned ZEV production goals (Allergy and Asthma Network et al., CALSTART, Ceres BICEP, CATF et al., Energy Innovation, EDF, EPN, Evergreen Action, GreenLtinos et al., MFN, NPCA, Our Children's Trust, Tesla, WRI, ZETA) and introduction of HD ZEVs into the U.S. market (ACEEE, CARB, CleanAirNow, EDF, MFN). Specifically, EDF cited purchases, purchase announcements, and aspirational goals of several fleets, including instances of purchase orders. Among the fleets EDF cited are Walmart, Sysco, UPS, Schneider, and US Foods. See generally EDF Att. O (2023 Cal Start Market Update), and Att. P (Cal Start report on zero emission bus availability and deployment).

EDF noted that Tesla alone intends to produce 50,000 Class 8 day cabs for MY 2024, which percentage alone would exceed the percentage on which EPA predicated the proposed MY 2027 standard. CARB staff found (in the administrative record for the ACF program) that ZEVs are available in every weight class of trucks, and each weight class includes a wide range of vehicle applications and configurations. CARB staff also found that there are currently 148 models in North American where manufacturers are accepting order or pre-orders, and there are 135 models that are actively being supported and delivered (CARB). Commenters also noted the introduction of HD ZEVs in European markets, and the need for U.S. manufacturers to remain internationally competitive (Env. Protection Network, Ceres BICEP (who noted that European manufacturers have already announced commitments to meet standards more stringent than EPA proposed).

Other commenters (DTNA, AmFree, AFPM, CFDC et al., Valero) argued that manufacturer statements are non-binding commitments, and it is inappropriate for EPA to base its projected adoption rates on those statements. DTNA specifically noted goals described in EPA's proposal that were misattributed to DTNA when, in fact, the 60% ZEV sales was made by DTNA's parent company, Daimler Truck Holding, and were in reference to European sales. CFDC et al. noted that manufacturers could change their mind at any time (citing a recent change by Amazon) and that many manufacturers based those plans on availability of multipliers that are being "cut" under the proposed rule.

Response to Comment Theme: Manufacturers' announced product plans, and fleets' and municipalities' purchase announcements impact on feasibility of standards more stringent than proposed

EPA agrees with commenters that manufacturers' announcements and goals, including aspirational purchase announcements, cannot, in and of themselves, serve as the sole basis for standards of a given stringency and thus disagrees with commenters arguing that such announcements and goals should serve as the basis for EPA's final standards being more stringent than proposed. As described in preamble Section II and RIA Chapter 2, EPA has considered these announcements and viewed them as supportive of the feasibility of the final standards, but also carefully considered other potential developments, including vehicle suitability and availability of supporting charging and refueling infrastructure, that could impact manufacturers' announced goals. More generally, as EPA explains in section II of the preamble, our feasibility assessment considers a wide array of data and analysis, including EPA's independent assessment of technology availability, costs, lead-time, and infrastructure; as well as our examination of the literature and expert analyst reports, and our coordination with the Department of Energy and other expert organizations. The agency's decision as to the final standards reflects our holistic and comprehensive review of these and other relevant materials.

EPA also considered the recent introductions of ZEVs in the US and globally, as discussed in preamble II. The agency is projecting that manufacturers may choose to produce and sell significantly more HD ZEVs by the MY 2027-32 time frame than they are doing now. EPA's analysis comprehensively considers the features of the US market, including for instance the incentives provided by the BIL and IRA, the development of infrastructure in the US, access to raw materials domestically and from FTA and other US allies, and so forth.

See preamble Section III and RTC section 10 regarding response to comments on credit multipliers.

Summary of Comment Theme: State commitments to adopt CARB's ACT standards, and other federal/State/local financial incentives and initiatives impact on feasibility of standards more stringent than proposed

Several commenters noted State commitments to adopt the ACT standards in a July 2022 MOU organized by NESCAUM (CATF, EDF, Allergy & Asthma Network et al., WRI). NPCA and RMI commented that adoption of ACT by other States indicates national feasibility. Other commenters stated that the California ACT program is not a proper basis for demonstrating feasibility of federal standards like those proposed (e.g., CFDC et al.). The program has been adopted by only a small number of additional states, and other states' aspirational MOUs regarding adoption are just that, aspirational (AmFree). Several other commenters were skeptical that the California program would be implementable as enacted. (e.g., DTNA, CFDC et al.)

Commenters in support of more stringent standards noted availability of federal, state, and local incentives (NESCAUM/OTC, Proterra, EPN, Tesla, WRI). EDF also submitted further analyses of the potential impacts of the BIL, IRA. The earlier cost projections by Roush in 2022 also showed that BEV operating costs are always lower than internal combustion engine vehicle (ICEV) operating costs. Because of this, the original analysis found that the time needed for a BEV to achieve total cost of ownership (TCO) parity with an ICEV could occur at the time of purchase in 2027 for a few of the segments analyzed and 1-4 years later for other segments. As shown in Table 3, the new IRA credits for BEVs and chargers will reduce the amount of time needed for BEVs to achieve TCO parity with ICEVs by an additional 1-2 years so that many segments analyzed will see TCO parity at the time of purchase as early as 2024. EDF Att. M.

In terms of buses, NESCAUM noted that many programs have zero emission urban and school buses should be reflected in the standards. Those initiatives include urban bus initiatives in New York City, California, Washington, Maryland, Connecticut, and school bus initiatives in Massachusetts, Illinois, Hawaii, Washington, Colorado, and Chicago. EDF commented at length about the feasibility and importance of maximizing zero emission opportunities for the school bus sector, given the well-documented adverse impacts of diesel fumes on children. Standards for school buses should be predicated on 50% zero emission by MY 2027, and 90% by MY 2032. They also stress that transit buses are a ready candidate for standards predicated on the use of zero emission vehicles. They note that even in the pre-IRA medium- and heavy-duty electrification study performed for EDF in early 2022.

Commenters opposing the proposed standards made the following points:

- The subsidies may not be available in many instances, due to insufficient taxable revenue to qualify (EMA, AmFree (also noting insufficient staff to do the necessary paperwork)), purchase incentives for tractors being offset, almost to the dollar, by federal excise taxes (EMA, POET), or lack of domestic production (EMA, AmFree);
- States are using NEVI funds almost exclusively for light-duty infrastructure, which may not be suitable for HDV (DTNA App. 2, a state-by-state survey of state planning for NEVI funding, showing in most instances that states' plans are for light-duty charging networks, not heavy-duty);
- The active opposition to subsidization of HD ZEVs in several states, including Wyoming, North Carolina, Georgia, and Oregon (DTNA), indicating there is no "widespread or uniform state political support" for ZEVs;
- EPA's estimates of the effect of the BIL and IRA are significantly misaligned with those of the Congressional Budget office (DTNA);

<u>Response to Comment Theme: State commitments to adopt CARB's ACT standards, and other federal/State/local financial incentives and initiatives impacts on feasibility of standards more stringent than proposed</u>

As urged by many commenters, and as we signaled at proposal (see 88 FR at 25989), we have accounted for State's adoption of ACT in our baseline (reference case) scenario for our cost and emissions impacts analyses. See RIA Chapters 3 and 4. Regarding relevance of the inclusion of ACT in our reference case to stringency of the final standards, see our response below in this section 2.4 to the theme EPA's consideration of CARB's ACT regulation. We address comments relating to our consideration of federal and state measures in section 2.7 of this RTC document. The DTNA Appendix B survey of State infrastructure plans is addressed in RTC 6.1. See preamble Section II and RIA Chapter 2 for our discussion of federal excise taxes.

<u>Summary of Comment Theme: EPA's consideration of ICE vehicles</u>

Regarding ICE vehicles, a number of these commenters also stressed the need for further improvements to ICE vehicles and the engines in the Phase 3 program (ACEEE, CARB, CALSTART, Ceres BICEP, CATF et al., ICCT, SELC, USW, Neste). US Tire Mfrs urged EPA set ICE vehicles standards in lieu of ZEV-predicated standards.

ICCT urged EPA to consider both vehicle and engine improvements to further increase the stringency of the Phase 3 standards. ICCT also indicates that vehicle improvements to ICE vehicles would be both cost-effective and could lead to appreciable further reductions from conventional vehicles. Specifically, ICCT estimates possible ICE vehicle improvements of nearly 7% for high-roof sleeper cabs (aero, tires, intelligent controls, weight reduction, axle efficiency, reduced accessory load); nearly 10% for multi-purpose vocational vehicles (stop-start, weight reduction, tires, axle efficiency, aero, reduced accessory load); 6-12% for class 7 and 8 tractors; and 15-20% for vocational vehicles (all percentages reflecting incremental improvements beyond the 2027 MY Phase 2 standard). Further improvements are possible if engine improvements are considered. (More of ICCT's recommendations for ICE vehicles are summarized in Section 9 of this RTC document).

ACEEE echoed the ICCT comments urging that the standards reflect further improvements for ICE vehicles. Acknowledging that these improvements could be viewed as a different compliance pathway (a "flexibility") to meet the proposed standards (incidentally supporting EPA's view that the proposal and final rules are not an "EV mandate"), the commenter urged that these improvements be incremental to any improvements predicated on ZEV technology. The commenter notes that under the proposal, large percentages of ICE vehicles would remain and that cost-effective and feasible improvements to these vehicles fuel efficiency are possible, such as, lightweighting, tire improvements, stop start, advanced aerodynamics. Sources of data cited in the comment are ICCT's 2023 White Paper, the DOE Super Truck 2 program, and the NACFE fleet study. These improvements would also benefit if included on BEVs, since they would increase BEV efficiency and hence increase battery range.   The cumulative GHG benefit of maintaining the emissions reduction trajectory of ICE vehicles is substantial.

ACEEE maintains that potential to reduce ICEV carbon dioxide (CO_2) emissions below the level of current MY 2027 standards, together with the expectation that ICEV sales will continue to MY 2039 (based on the US National Blueprint for Transportation Decarbonization,25) imply that EPA could substantially increase emissions reductions out to 2050 by steadily increasing ICEV efficiency through the Phase 3 standards. For long-haul tractors, for example, the potential for 23% cost-effective efficiency improvements, as estimated by ICCT, could translate to an annual reduction in long-haul ICEV emissions of more than 5% per year in MY 2028-2032. Using Argonne National Laboratory's VISION model, the commenter estimated that this would reduce cumulative emissions out to 2050 from MY 2027 and beyond sleeper cab tractors by 154 million metric tons (MMT) of CO_2. This would add 11% to the emissions reductions achieved through an electrification-only strategy in which BEV share reached 100% in 2040 per the National Blueprint. If sleeper cab BEV market share were instead to max out at 80% in 2040 or alternatively to reach 100% only in 2050, the ICEV efficiency improvements would add 18% or 24%, respectively, to cumulative emissions reductions from electrification alone. (See Comment Figure 1.) Otherwise viewed, these results show that raising ICEV efficiency by 5% per year in MY 2028-2032 would nearly (97%) make up for the shortfall in cumulative emissions reduction resulting from a maximum BEV sales share for sleepers of 80%, instead of 100%, in 2040. Cumulative emission reductions from electrification of long-haul tractors,

CARB, CALSTART, and CATF et al. also give examples of ICE vehicle technologies that could provide reductions beyond those realized with the Phase 2 standards, including not only technologies mentioned by ICCT, but hybrids of all types, 48V energy recovery and management systems, and predictive cruise control. SELC requested that EPA ensure ZEVs do not erode requirements for ICE vehicles, and suggested that EPA could set “minimum ZEV production requirements” to separately regulate ICE vehicles and ZEVs. USW requested that EPA reassess the Phase 3 standards to include ICE vehicles because the proposal would “will eliminate the ICE vehicle all together, and is not an economically or socially viable rule.” Neste and others suggested that EPA should enhance its consideration renewable fuels in ICE vehicles (see section 9.1 of this RTC document for our summary of and responses to comments regarding fuels for ICE vehicles).

With respect to further improvements to ICE vehicles and engines, DTNA noted that some of the technologies on which the Phase 2 rule was predicated had proved unmarketable, others (like the Rankine engine and certain advanced aerodynamic features) had never been commercialized, some had proved less efficient than projected, and as a result, some manufacturers had included ZEVs within their offerings as a Phase 2 compliance strategy. Non-utilization of various engine and vehicle technologies thus should not be viewed as either showing opportunity for further ICEV improvements or as demand for BEV vehicles. Volvo noted their need to focus their investments on ZEVs while supporting the industry’s continued need for ICE technologies during the transition to ZEVs and that any additional emission reductions from engine or ICE vehicle improvements would be minor compared to zero and near-zero technologies. Volvo also indicated that any reassessment of ICE vehicle stringency for MY 2027 would necessarily need to include an assessment of the impact on NOx emissions, considering new NOx standards are effective starting in MY 2027 as well.

Response to Comment Theme: EPA’s consideration of ICE vehicles

Our modeled potential compliance pathway includes a mix of ZEV and certain vehicles with ICE technologies; however, we also assess multiple additional example potential compliance pathways using vehicle with ICE technologies, including technical feasibility, costs, and lead time, that illustrate it is feasible to comply with the additional stringency of the final standards without producing additional ZEVs to comply with this rule. See Preamble section II.F.4 and RIA Chapter 2.11 (which also includes assessment of additional example potential compliance pathways relative to a no ZEV baseline). While it is appropriate for EPA to consider ZEV technologies as we explain in preamble Section I and elsewhere in this RTC Section 2, manufacturers may utilize whatever technology or mix of technologies they choose that meets the standards. We disagree with commenters that we should finalize more stringent standards beyond those in this final rule, which in their view would be complied with through manufacturers including additional improvements to vehicles with ICE and ICE beyond those included for vehicles with ICE in the modeled potential compliance pathway in addition to ZEVs in that technology package. Doing so would be inconsistent with the balanced and measured approach to setting Phase 3 standards under CAA section 202(a)(1)-(2) we are taking in this final rule. Specifically, manufacturers have limited resources, and generally deploy those resources into one type of compliance strategy.

Speaking broadly, for Phase 3, our understanding is that OEMs’ potential strategies are including ZEV technologies versus not including ZEV technologies in their technology mixes for compliance (that is, our modeled potential compliance pathway vs our additional example compliance pathways). As explained in preamble Section II, both of these potential strategies are feasible for meeting the Phase 3 standards. However, pursuing both at once, as these commenters suggest, raises concerns that such an approach would unreasonably strain limited resources past the point of available compliance time, particularly for earlier Phase 3 MYs and given the balancing of factors for this final rule EPA describes in preamble Section II.G. We also note the comments received from manufacturers indicating that they have done their own evaluations of Phase 2 ICE vehicle-based technologies and, in some cases, have chosen other pathways for meeting the existing Phase 2 standards, including to shift resources from ICE vehicle technologies to ZEV technologies. Shifting back to pursue the type of dual mix of advanced technologies strategy advocated by these commenters raises and supports the same concerns we just identified. In Section II.G of the preamble to this final rule, we discuss the balancing of the many relevant factors we considered in setting the stringency of the final standards, and our conclusion that this approach is reasonable and appropriate.

EPA acknowledges commenters' concerns regarding the possibility of existing ICE vehicle backsliding, but we think that is very unlikely. Manufacturers have invested significant resources and time into the development and application of emissions reduction technologies for ICE vehicles for compliance with the existing standards. Removing those technologies could entail additional costs and lead-time associated with vehicle redesign. In addition, any backsliding of ICE vehicles would result in emissions deficits that would need to be made up through even greater penetrations of ZEV technologies than the penetrations presented in the modeled potential compliance pathway, resulting in additional costs associated with the additional ZEV deployments. Finally, purchasers of ZEVs are typically profit-maximizing businesses that significantly value the operational costs of the vehicle. Just as EPA finds that ZEVs produce operational savings support willingness to purchase, a manufacturer that removes emissions reduction technology from ICE vehicles and produces vehicles with poorer fuel economy is likely to encounter purchasers that are less willing to purchase their less efficient and more operationally costly vehicles. Many fleets also have environmental goals for their operations; even if these fleets purchase ICE vehicles, they are especially unlikely to purchase ICE vehicles with emissions backsliding.

We disagree with commenters suggesting the rule mandates ZEVs or eliminates ICE vehicles. See section 2.1 of this RTC document where we address similar comments. Our approach of setting performance-based standards continues to allow manufacturers the flexibility to decide the ultimate mix of vehicle technologies to offer, including advanced ICE and vehicle with ICE technologies as well as ZEVs for the duration of these standards and beyond. We note that in the final rule, we have updated our consideration of vehicles with ICE technologies and we have assessed several additional example potential compliance pathways that demonstrate the feasibility of the standards without producing additional ZEVs to comply with this rule. See section II.F.4 of the preamble for further discussion.

Regarding Volvo's comment that conventional vehicle stringencies should not be increased beyond the current model year 2027 levels set in the Phase 2 rulemaking, EPA notes that the vehicles with ICE in the modeled potential compliance pathway include a mix of technologies that meet the Phase 2 MY 2027 standards. These technologies are feasible and available in the timeframe of the Phase 3 program and at reasonable cost. However, manufacturers may use whatever technology or mix of technologies they choose that meets the standards.

Summary of Comment Theme: Federal standards themselves will provide regulatory certainty for investment in ZEVs, critical materials, and infrastructure

Many commenters noted the role of federal standards as a means to bolster the EV the market and encourage investment in infrastructure (ACEEE, AESI, CARB et al., Ceres BICEP, CALSTART, EEI, Lion Electric, NACAA, NPCA, Nuvve, Proterra, TerraWatt, ZETA). These commenters noted that investors and companies are looking for certainty, and that new standards would spur more domestic production and infrastructure buildout and establish the U.S. as a leader for electric HD vehicles.

Other commenters offer a different view in that the lack of certainty relating to infrastructure and consumer demand (both of which are out of control of the regulated entities) impact the rule's feasibility. Navistar conditions its support of the MY 2032 standards on infrastructure availability ("as long as the necessary charging infrastructure is widely available"). EMA compares the rule to a three-legged stool and notes that it will only be successful at accelerating adoption of ZEVs if it includes all three legs: 1) regulation that leads OEMs to design, build, and sell, 2) infrastructure build-out to ensure operation, and 3) purchase incentives to spur consumer demand, and points out that the proposal only impacts leg 1. DTNA's analogy focused on the three main factors influencing consumer demand: (1) vehicle technology development, (2) cost parity between ZEVs and conventional vehicles, and (3) infrastructure development, and DTNA similarly notes that the proposal only addresses factor 1.

Response to Comment Theme: Federal standards themselves will provide regulatory certainty for investment in both ZEVs, critical materials, and infrastructure

We agree with commenters that federal standards serve as a signal for investment in advanced technologies. Federal standards create certainty for the regulated community. They help to spur and support investment and provide some level of assurance for research and development activities and the time and costs associated with those activities. As indicated by the comments, and the supporting materials they cite, federal standards provide some of this needed assurance. We note further that these comments come from all sides of the spectrum, spanning NGOs, state regulators, and manufacturers. Comments in this section center around the "chicken-and-egg conundrum" and the role of federal standards. Similar comments are shared in RTC sections 6 and 7 relating specifically to charging infrastructure and grid reliability, respectively. We address the issue in the "Feasibility of Timing" and "Distribution" responses in section 7 of this RTC document. We note here that these federal standards are a signal not just to the vehicle manufacturing sector, but to the utility sector as well. We agree with CATF's comment that "EPA's standards themselves will send a strong signal to the market to undertake the infrastructure investments needed to accommodate a gradual rise in vehicle electrification," see CATF Comments at n. 189 and sources cited by CATF in support of this proposition, and we agree with the Edison Electric Institute's comment that "EPA's Proposed Rule is of critical importance to EEI members as they continue to lead this clean energy transformation. A HDV Phase 3 rule that supports the continued electrification of the transportation sector and leverages the existing investment in the electric system and the electric sector's ongoing clean energy transformation will provide both environmental benefits and send appropriate signals to support the continued buildout of infrastructure to support increased electrification." See Comments of Edison Electric Institute at 6.

EPA also carefully considered the availability of purchase incentives, see RTC 2.7, as well as the costs of ZEVs, including the costs of ZEVs relative to ICE vehicles for both manufacturers and consumers, see responses below and in RTC 3. In sum, commenters are wrong to claim that the rule only addresses the issue of vehicle technology development; in fact, the rule rests upon EPA's holistic assessment of factors affecting feasibility, costs, lead-time, and other relevant factors, including all "three legs" identified by EMA and the three main factors identified by DTNA.

Summary of Comment Theme: EPA's feasibility analysis

Several commenters had specific recommendations for EPA to inform its Total Cost of Ownership (TCO), cost parity with diesel, battery sizing, and other HDTRUCS inputs for specific applications of vehicles (see section 3 of this RTC document for additional and more detailed comments related to HDTRUCS). Many commenters had specific comments relating to the assumptions in EPA's methodology for determining ZEV adoption rates in the potential compliance pathway. Commenters noted that at proposal EPA used a modified form of a payback equation developed by ACT Research to quantify when payback periods of given duration would support adoption of ZEVs as a reasonable compliance option, and that the equation itself was proprietary and thus did not appear in the DRIA. EPA's approach was heavily criticized by commenters. Some commenters decried the lack of transparency and replicability (ICCT, CALSTART, DTNA, POET), while others, including EMA supported by ACT Research, stated that EPA had applied the equation imperfectly. Some commenters also shared concerns with EPA's assessment of feasibility in light of uncertainties relating to key elements of the program that are out of control of the regulated entities. Regarding EPA's adoption rate assumptions and methodology, Tesla recommended several resources for EPA to consider, including a National Renewable Energy Laboratory study which found that ZEVs in all medium- and heavy-duty vehicle classes could reach cost parity with diesel vehicles by 2035, even without incentives. MFN notes that ZEV adoption rates in recent economic projections in the literature do not reflect current status as much of the literature on ZE MHDV total cost was published pre-IRA, meaning that lifetime cost parity would be reached sooner in many cases. NESCAUM suggested the proposed standard for tractors could be at ACT levels if predicated on reduced battery size and opportunity (public) charging.

ICCT requested EPA implement different assumptions about battery sizing for tractors. They stated that by not considering the possibility of opportunity charging for high-roof sleeper cab, battery size for these applications is overlarge and improperly eliminates these vehicles from feasible emission reductions. They stated that specifically, assuming availability of public chargers of 350 kW could reduce needed battery size by 20%; 1 Mw public chargers would allow 40% reduction in battery size. The comment estimates costs for such charging as part of electricity rate calculations and contains close analysis of grid reliability, availability of distributive electrical infrastructure, and associated actions by utilities to effectuate infrastructure availability. For Class 7 and 8 vehicles, EDF predicted Total Cost of Ownership (TCO) parity with ICE vehicles by either 2030 or 2032 predicated largely on availability of 3,000 amp megawatt chargers, which could recharge a tractor battery in 15 minutes and essentially double its range, allowing for smaller battery sizes and essentially no decrease in cargo capacity.

EDF submitted other detailed comments supporting more stringent standards. Many of these comments concerned the question of price parity between BEVs and their ICE counterparts. EDF stated the following:

- Powertrain costs of most BEVs will be on par or cheaper than diesel vehicles even after conservatively considering a 50% higher battery DMCs (compared to the global average) due to the battery tax credits under the IRA.
- The TCO of BEVs is significantly lower than diesel ICE across all segments. The payback period is less than 3 years for all vehicles.
- The cargo capacity of most BEVs will be on par with ICEVs due to the increase in battery energy density.
- 15 minutes of en route charging from an MCS charger can add more than 80% of the full range of battery electric tractors, enabling them to meet the requirements of more demanding use cases. Battery technology will enable repeated fast charging while meeting lifetime VMT requirements. The extended range provided by fast en route charging could reduce required battery capacity, with the economics being a trade-off between a cheaper, lighter BEV with more load capacity versus higher electricity cost.
- BEVs have a lower TCO per mile, even with significant en route charging. With 30% en route charging (20-80% charge on 50% of days), the payback period of all vehicles is still less than 5 years.
- Higher annual operational VMTs increase annual savings and reduce the payback period for BEVs due to their lower energy and maintenance cost per mile.
- An increase in diesel prices makes the economics of BEVs even more attractive due to the low energy cost per mile. (EDF Comment Attachment Q, plus detailed analysis of same at EDF pp. 31-40)
- A study published by Argonne National Laboratory's Energy System Division in April 2021 estimated that electric Class 4 delivery trucks will reach life-cycle cost parity with diesel trucks in model year 2025, while day-cab tractors will reach cost parity in model year 2027, and sleeper-cab tractors will reach cost parity in model year 2032. Argonne Nat'l Laboratory Energy and Systems Div. (2021) "Comprehensive Total Cost of ownership for Vehicles of Different Size, Class and Powertrains". The analysis included all costs of vehicle ownership including vehicle purchase, fuel, and maintenance costs as well as insurance, financing costs, and depreciation. It did not account for the impacts of the IRA or the BIL.
- Another report developed by M.J. Bradley & Associates for EDF in 2021 showed a large and growing opportunity to expand America's zero-emission freight trucks and buses. The report evaluated four factors in assessing the readiness of zero-emitting medium and heavy-duty vehicles in different applications – the availability of electric models from manufacturers, the requirements for charging, the ability of electric models to meet operating requirements, and the business case for zero-emitting vehicles. It found that a large number of market segments have favorable ratings across at least three of the categories, which indicates strong potential for near term

> zero-emitting vehicle deployment. These market segments, which represent about 66% of the current in-use fleet, include heavy-duty pickups and vans, local delivery and service trucks and vans, transit and school buses, class 3 to 5 box trucks, class 3 to 7 stake trucks, dump trucks and garbage trucks.

EDF also commented that in the study EDF contracted with Roush, they projected that by 2027, battery electric (BE) school buses and transit buses would have lower upfront costs than their diesel counterparts. EDF stated that one difference in cost estimates between the EPA proposal and this study is that the BE school bus examined by Roush had a relatively small 60 kWh battery. EDF stated that EPA's methodology assumes school bus segments have larger batteries, 102-166 kWh. The commenter goes on that using Roush's battery cost estimates, and accounting for these larger batteries, BE school buses would still have lower upfront costs than diesel school buses, again without any tax credits. The commenter stated that even accounting for the cost of the charger and installation leaves the BE school bus cheaper for the 102-kWh battery and only $1000 more expensive with a 166-kWh battery. The commenter stated that the IRA vehicle tax credit would not apply in these cases, but the battery production and charging infrastructure credits could, making it highly likely that the BE school bus would have an immediate payback.

EDF stated that the BE transit bus examined by Roush had a smaller battery (400 kWh) than those evaluated by EPA in this proposal (605-649 kWh). The commenter stated that again, using Roush's cost estimates and accounting for these larger batteries, Roush's BE transit bus would only cost $8,000-$11,000 more than a diesel transit bus, again without any tax credits. The commenter stated that the IRA vehicle tax credit brings the BE transit bus to price parity with the diesel. The commenter stated that the cost of the charger and installation is more substantial for a BE transit bus, $130,000 per bus without the IRA tax credit and $90,000 with the tax credit. The commenter stated that, however, the annual fuel and maintenance savings are substantial, resulting in a 1-2 year payback period with either battery size. Based on these analyses, EDF concludes that a more stringent standard for these applications is justified.

EMA submitted an Exhibit from ACT Research itself maintaining that EPA had misapplied the ACT Research payback equation, omitted consideration of Total Cost of Ownership, applied inappropriately long payback times, among other issues. Moreover, DTNA indicated the ACT Research methodology was based on adoption of technologies significantly less invasive than electrification (such as advanced aerodynamics), and also was geared toward Class 7 and 8 vehicles, which are the least likely candidates for BEVs (DTNA's comment suggested an alternative equation (proprietary) as well.) MFN noted that the projected results based on the modified equation were highly conservative, and inconsistent with the technical literature (citing the ICCT January 2023 White Paper.) Other commenters suggested EPA utilize instead other of the algorhythmic methodologies discussed in the DRIA, notably the TEMPO equation and methodology. (CALSTART, ICCT.)

Commenters maintained that the 80% cap on ZEVs in the proposed compliance pathway was no solution to all of these feasibility uncertainties and issues (e.g., AmFree, noting the irony that the 80% cap applied where payback would suggest a 100% ZEV compliance pathway was available). DTNA questioned why the proposed cap was 80% when even the California ACT sets lower sales mandates —73% for Class 4-7 and 36% for Class 8. Other commenters, however, maintained that the proposed cap was both unnecessary and arbitrary (CALSTART, noting that applications like terminal tractors, transit buses, urban and regional vocational vehicles, and regional class 7/8 vehicles were all candidates for ZEVs), or set too low (ICCT, recommending a cap of 90%).

EMA submitted detailed comments urging that EPA adopt standards roughly 50% less stringent than proposed for each subcategory, and commencing in model year 2030, with standards for HHD vocational vehicle and sleeper cab tractor applications commencing in MY 2033. Their recommended standards would also include three initial years of stability. EMA derived these standards using EPA's HD TRUC tool with different inputs. Reasons EMA provided for the different inputs included omitted costs, underestimated costs, certain errors regarding various of the 101 models included in HD TRUC, misapplication of the ACT payback algorithm, and unrealistic assumptions. In contrast, CARB commented that the costs of compliance were reasonable and even the more stringent alternative are "entirely consistent with the CAA section 202(a)(2) criteria". EMA's comments are summarized below and addressed in other RTC sections, as noted:

- costs for federal excise tax, state sales taxes, and increased insurance were omitted (see RTC section 3.8);
- battery pack and fuel cell costs are higher (see RTC section 3.4);
- the assumption of depot charging exclusively is unfounded; some type of public charging network will be needed in the short term, and those costs should be reflected in the estimated electricity rate. In addition, EPA's estimated cost of electricity was unrealistically low to begin with since it improperly reflected optimized rates to commercial users (see RTC section 6);
- similar to a comment from POET, EMA notes that since HD ZEVs are already being marketed, learning has already commenced, so the estimated learning curve should be flatter during the Phase 3 period (see RTC section 12);
- as noted above, that EPA misapplied the ACT algorithm used to derive payback periods, among other things not including total cost of ownership, and overestimating technology adoption rates for payback periods of greater than 4 years (EMA Exh. 3. from ACT itself) (POET offered a similar critique, including a study from Trinity, cited at n. 45 of the POET comment) (see RTC section 3.11);
- with regard to the payback metric generally, EMA (and DTNA) maintained that payback is not a guarantee of technology adoption, pointing to various cost-effective technologies (like drive wheel fairings) which nonetheless proved unmarketable. These same commenters maintained that a 2-year payback period is more appropriate for HDVs, since initial purchasers typically have a 3-5 year resale schedule. In any case, total cost of ownership is a better metric (see RTC section 3.11);

EMA and others challenged additional assumptions underlying the proposal (we expand on and address each of these topics in other RTC sections, as noted)

- fuel cell efficiency concerns (EMA) (see RTC section 3.2);
- lack of consideration of resale value (EMA) (see RTC section 3.8);
- assumption of 100% pass through of any battery production subsidy in the form of lower battery pack costs (EMA) (see RTC section 3.4);

- unrealistic estimates of cost of hydrogen infrastructure (EMA) (see RTC section 8);
- a cargo penalty of 30% is a significant deterrent (EMA, POET) (see RTC section 3.10);
- over-estimated maintenance and repair savings (AmFree, noting that the single report on which EPA's estimates are based cautioned about the lack of supporting data of HDVs) (see RTC section 3.7);
- failure to consider the need for battery mid-life repairs, the need for which will occur more often than the need for an engine rebuild on an ICE vehicle (AmFree) (see RTC section 3.7);
- need to purchase more ZEVs to compensate for their limited range and maintenance downtime (POET) (see RTC sections 3.7 and 3.10);
- need for more lead time to accommodate the research and development needed for the new technology, which is greater than the lead time needed for ICEV improvements (POET) (see RTC section 2.3.3);

Several comments more generally noted the implausibility of the proposal. AmFree noted that the number of BEV buses would need to increase by a factor of 12, and that thousands of BEV drayage, day-cab tractors, sleeper tractors, and step vans would need to be sold to achieve the proposed standards; POET noted that EPA's projections of ZEV sales differed drastically from those of the Energy Information Agency's AEO 2022 report; AFPM scoffed that the proposal was predicated on a ZEV sale growth rate of 63,000% from 2021-2032. Delek noted that a predicated introduction of more than two orders of magnitude (0.2% to approximately 40%) in a few model years was inherently implausible.

Certain commenters argue that, in any case, the proposed rule was arbitrary and capricious. They maintain that the proposal overstated potential benefits, ignored implications related to depending on foreign entities for critical material, underestimated costs, and underestimated adverse environmental implications when considering emissions on a lifecycle basis. (Delek.) For response on critical minerals see Preamble section II.D.2.ii.c and RTC 17.2; for response on lifecycle emissions see RTC 17.1. Several other commenters maintained that EPA had not demonstrated a need for a standard because it had not shown any nexus to NAAQS non-attainment (AFPM, API). Another commenter claimed the proposal infeasible because it ignored consumer acceptability: consumers simply will not gravitate to ZEVs (Bradbury). Arizona State legislature maintains that EPA's incorrect estimates relating to grid reliability make the proposal arbitrary (see RTC 7.1 and 7.2 for response).

The basis of many comments questioning the feasibility of the program includes the following uncertainties relating to key elements of the program that are out of control of the regulated entities (we expand on and address each in other RTC sections as noted):

- Comments on availability of distributive electrical infrastructure necessary to support BEVs (these comments are addressed, and summarized in more detail, in RTC sections 6 and 7);
    - Comments on chicken-egg dynamic of ZEV purchasers needing assurance of supporting infrastructure before committing to purchases, but electric utilities

needing (and, in many cases, legally requiring), assurance of demand before building out. (e.g., AmFree, UAW, POET, Valero.), the need to get pro-active involvement of electric utilities, and EPA's seeming lack of effort in encouraging such actions (see RTC section 7 (Distribution);

  - Comments on magnitude of infrastructure buildout needed to support the levels of BEVs on which the proposal was predicated (stating the need for 15,000 new chargers each week for the next 8 years, per EMA Exh. 1 (Ricardo report)) (see RTC section 6);
  - Comments on issue of timing: it can take 40 weeks for utilities to acquire transformer parts, 70 to acquire switchgear parts. Installation delays can be 1-3 years for smaller installations (cable, conductor systems), 3-5 for medium (feeders and substation capacity), and 4-6 for large installations (subtransmission requiring licensing). (DTNA.); buildout schedules rarely correlate with purchasers' resale schedules, or with BIL/IRA subsidy timings (DTNA) (see RTC sections 6 and 7).

- Comments on availability of critical minerals and associated supply chain issues (e.g., AFPM, UAW, POET), especially in light of overlapping demands from the LDV sector (EMA), the assumption of domestic battery production, given the absence of any domestic lithium mining (EMA) (these comments are addressed in RTC section 17.2 and Preamble Section II.D.2.ii);
- Comments on purchasers' decisions, noting customer reluctance to utilize an unfamiliar technology (DTNA), unsuitability given limited range and cargo penalty due to need for large batteries (e.g. CFDC et al.), the inherent improbability of increasing percentages of BEVs from the current 0.2% by orders of magnitude in a few model years from now (CFDC et al., Delek) (see RIA 2 and RTC section 3);
- Comments on lack of grid reliability, given competing demands of the light duty vehicle program, other EPA regulations affecting the grid, and general issues of grid reliability (AFPM) (addressed in RTC section 7 (Distribution));
- Comments on estimating availability of hydrogen infrastructure is well-nigh futile at present because this technology is barely commercialized (DTNA); stating EPA has also mistakenly assumed availability of clean hydrogen, failed to consider costs of hydrogen infrastructure, ignored potential issues of permitting and interfaces with electric utilities with regard to hydrogen infrastructure, and failed to discuss physical requirements of hydrogen charging stations (EMA); and stating EPA also did not consider issues relating to hydrogen handling or high initial costs of hydrogen infrastructure (POET) (comments relating to hydrogen availability and infrastructure are addressed in RTC section 8).

AmFree addressed the issue of these uncertainties as a legal matter. AmFree alleges that EPA is obliged, under the decision template set out by the court in *NRDC v. EPA*, to identify the steps necessary to resolve technical issues within the lead time afforded, must offer reasoned solutions to any technical difficulties that could emerge, and do so without engaging in crystal ball speculation. The commenter considers EPA's consideration of all of these issues to be merely speculative given the acknowledged absence of data on which to base projections stating that EPA has presented no information to justify its determinations that there would be sufficient supportive distributive buildout infrastructure in the rule's time frame, and that there would be sufficient critical minerals and supply chains to support the battery production needed for the standards. Commenters further allege that EPA had ignored issues of dependence on unreliable or hostile sources of critical minerals, and assumed without basis that consumers would accept HD ZEVs. In a similar comment, Valero maintained that EPA's statement that it was using "engineering judgment" to make projections on these uncertain issues was insufficient and maintains that EPA failed to follow the directives of OMB Circular A-4 to "set out basic assumptions, methods, and data underlying the analysis, and discuss the uncertainties associated with the estimate." Both of these commenters maintain that EPA is failing to engage in "reasoned decisionmaking" within the meaning of the *State Farm* opinion.

Given the alleged uncertainties, some commenters questioned the disproportionate weight EPA gave to payback in constructing a ZEV-based compliance pathway. AmFree indicated that EPA should accord equal analytical weight to purchase price, limited range, excess weight, lack of electrification infrastructure, durability concerns, and unpromising state support (all concerns mentioned by EPA itself in the DRIA). POET maintained that there was an inherent flaw in the approach, because it held supply and demand constant, whereas greater demand would lead to a corresponding increase in cost (citing Trinity study referenced in n. 45 of the comment). Commenters also noted the reality of the energy efficiency gap noted by EPA, whereby purchasers refrain from making seemingly economically rational decisions for various understandable reasons. (POET, DTNA.) However, many commenters stated that this is precisely the value of federal standards, to push beyond what the market would otherwise provide by adopting standards predicated on feasible emission reductions at reasonable cost (see, e.g., ACEEE (federal standards "close the gap between market-driven and technically and economically feasible") and CALSTART (maintaining, however, further that the payback metric alone was insufficient to achieve this purpose).

EMA further maintained that its suggested standards be adjusted automatically downwards, if any of the assumptions on which a standard is predicated prove unfounded. They specifically suggest that these triggers include a linkage to infrastructure availability, with the standard be automatically reduced based on the percentage of infrastructure less than predicted. EMA further suggested this linkage trigger could be based on infrastructure buildout in counties known to be freight corridors. In further discussions with the agency, EMA suggested a further trigger based on monitoring ZEV sales both within states which have adopted the California ACT program, and states which have not done so. Similarly, DTNA suggested discounting standards to reflect post-promulgation developments, the discount factor reflecting ratios of supportive infrastructure in existence and amount of infrastructure actually needed, EVSE (charging) infrastructure installed versus charging infrastructure needed, and hydrogen infrastructure deployed versus amount of such infrastructure needed.

DTNA suggested specific updates to the analysis. First, they suggested three-year stability for 2027-2029, then in MY 2030:

- Use EMA's revised HD TRUCS, because of the uncertainties, inaccuracies, and demonstrated sensitivity informing EPA's proposed ZEV adoption rates—including TCO calculations, application suitability, customer adoption rates, and availability of infrastructure—DTNA submits that the more realistic technology adoption rates in Table 1 [redacted; sent to EPA separately as CBI], reflecting:

  - No ZEV adoption for the HHD vocational vehicle category until 2033 (diverse applications and vehicle configurations, need additional R&D time for body builders to produce EVs)
  - Same ZEV adoption for HHD and MHD vocational categories (HHD vocational applications are more challenging to electrify than MHD).
  - No ZEV adoption for Long-Haul Sleeper Cab Tractors until 2033 when FCEV or hydrogen combustion may be viable products (this category needs nationwide HD-accessible infrastructure, likely ten years out

- 3-year CO2 Standard Tiers vs annual increments to align with product cycles, consistent with Phase 2 and in line with CAA section 202 principle of stability
- Add an infrastructure scaling factor set as a ratio of the total installed HD-accessible ZEV charging and fueling capacity vs amount needed to support EPA's project vehicle adoption rates.
  - BEV charging capacity estimated for each vehicle proposed in HD TRUCS; DTNA estimates total installed charging capacity for EPA's projected BEV volumes for 2027 – 2032 to be approximately 45 gigawatts (denominator); the numerator for this scalar should correspond to total currently installed HD-accessible charging capacity in the United States. There is no centralized data source for determining this number, but our research reveals that it is a very small number (regularly review and update as charging infrastructure develops).
  - Hydrogen fueling capacity by working with DOE to capture accessibility and hydrogen state (gas or liquid) criteria in the AFDC data for purposes of this infrastructure scalar, and to make fleets aware of where HD-accessible ZEV infrastructure can be located. [EPA-HQ-OAR-2022-0985-1555-A1, p. 64]
- Revised Standard-Setting Methodology to determine payback period and corresponding adoption rates shared by DTNA (CBI), then multiply the output of its 'ideal' ZEV adoption rates by an infrastructure scalar, which better accounts for fleet concerns such as whether 1) a ZEV is suitable for the fleet's application; 2) the ZEV TCO is better than the ICE TCO within the fleet's trade cycle; 3) there is infrastructure available to use the ZEV.

<u>Response to Comment Theme: EPA's feasibility analysis- Response to Comments that the Standards Should be More Stringent</u>

As further noted in the summaries above, we address many of the comments with specific suggestions for updating our analyses in the preamble, RIA, and/or RTC sections where we describe those analyses.

In response to commenters requesting the "strongest possible" and "most stringent" standards, including the thorough comments from EDF, CARB, CATF, ICCT, and MFN, we note that the final standards reflect a balancing of the statutory and other relevant factors which require that the Agency give appropriate consideration to cost and lead time necessary to allow for the development and application of technology. EPA's assessment of the statutory and other factors in selecting the final GHG standards through this balanced and measured approach is found in Section II.G of this preamble and RTC section 2.1. We have explained above that the standards demonstrably achieve reductions of GHG emissions nationwide, including beyond those attributable to the current market (including reductions beyond those attributable to the ACT standards). We have further indicated that the various caps on consideration of percentages of ZEV technologies in our modeled compliance pathway reflect reasonable consideration of the availability and timing of the distributive infrastructure necessary to support that technology pathway, issues of purchaser acceptance plus our determination that some specific and extreme cases for HDV applications are unsuitable for ZEVs in the Phase 3 rule's time frame (for which our modeled potential compliance pathway includes vehicles with ICE technologies). That is, these caps are neither arbitrary values nor assessments that ZEV technologies will necessarily reach that penetration in a given year, but rather quantitative representations of relevant factors, like electrification infrastructure development and suitability, determined by the Administrator after evaluating the relevant evidence and in the exercise of his technical and policy judgment. See, e.g., RIA Chapter 2.7.2. stating that "[t]his limit was developed after consideration of the actual needs of the purchasers related to two primary areas of our analysis. First, this volume limit takes into account that we sized the batteries, power electronics, e-motors, and infrastructure for each vehicle type based on the 90th percentile of the average VMT. We utilize this technical assessment approach because we do not expect heavy-duty manufacturers to design ZEV models for the 100th percentile VMT daily use case for vehicle applications, as this could significantly increase the ZEV powertrain size, weight, and costs for a ZEV application for all users, when only a relatively small part of the market will need such specifications. Therefore, the ZEVs we analyzed and have used for the feasibility and cost projections for the proposal and final rule in this timeframe are likely not appropriate for 100 percent of the vehicle applications in the real-world. Our second consideration for including a limit for BEVs and FCEVs is that we recognize there is a wide variety of real-world operation even for the same type of vehicle. For example, some owners may not have the ability to install charging infrastructure at their facility, or some vehicles may need to be operational 24 hours a day." Under the technology pathway projected for these final standards, ICE vehicles continue to be available in volumes to address these specific vehicle applications.

With regard to our decision to exercise caution in considering the extent and timing of distribution buildout, we note that we considered that successful deployment is not completely in the control of the regulated entities and requires coordination with electric utilities and other stakeholders.,. We have carefully examined the steps needed for this to occur to support the final standards under the modeled potential compliance pathway and projected that these steps can occur as needed, as discussed in RTC 7 (Distribution). We have correspondingly structured both the timing and stringency of the standards to take a measured approach in order to reasonably accommodate the time needed for successful buildout deployment. This is one of the reasons that the standards are carefully phased in so that the standards for the initial years of the Phase 3 program have a lower increase in stringency than proposed, that Phase 3 standards for various subcategories commence in post-2027 model years (compared to starting in MY 2027 under the proposal), and that the increase in stringency of the standards where public charging is part of the modeled potential compliance pathway are for later Phase 3 model years (to provide additional lead time). In short, we assessed, and find, that the standards are appropriate under CAA section 202(a)(1)-(2), and are not persuaded to adopt a different weighing of the statutory considerations to yield more stringent standards.

We respond to EDF's specific comments as follows. In response to EDF's comment that powertrain costs of most BEVs will be on par or cheaper than diesel vehicles even after conservatively considering a 50% higher battery DMCs, we note that we updated our battery cost and other component costs for the final rule. Similar to EDF's findings, we do see BEV upfront costs to be on par with comparable ICE vehicles for many applications, especially in the MY 2032 timeframe, as shown in RIA Chapter 2.9.2 and 2.10.

Regarding EDF's comment that the TCO of BEVs is significantly lower than diesel ICE vehicles across all segments, we note that similar to EDF's findings, we do see many BEVs have payback periods of less than 3 years, especially in the MY 2032 timeframe, as shown in RIA Chapter 2.9.2.

In response to EDF's comment that cargo capacity of most BEVs will be on par with ICEVs due to the increase in battery energy density, we have reassessed the projected battery energy density for the two primary battery chemistries, including an assessment of the data shared in comments, as described in RIA Chapter 2.4.2. We found that BEVs have similar payload capacity as comparable ICE vehicles for many applications, and some BEV payloads are lower than may be acceptable for certain applications. We expect that the remaining ICE vehicles in our modeled potential compliance pathway can address those applications for which payload capacity is needed beyond what we project would be served by a BEV, as shown in RIA Chapter 2.9.1.

In response to EDF's comment regarding MCS chargers, we agree that some HD ZEVs would be likely to utilize en route charging, and that such vehicles would not need the size of battery which we assessed at proposal (see RIA Chapter 2.2.1.2). We have therefore revised our analysis for the modeled potential compliance pathway accordingly.

Concerning EDF's comment that BEVs have a lower TCO per mile, even with significant en route charging, we note that as shown in the payback analysis for the final standards noted above, we project that many HD ZEV applications can achieve payback within the years of first ownership. Total cost of ownership (TCO) is likewise favorable for many vehicles. See RIA Chapter 2.12 showing TCO analyses for the 101 vehicle types in HD TRUCS. There are certain vehicle type for which we regard ZEVs as either too costly or otherwise unsuitable. See, e.g. HD TRUCS vehicles 18B (coach bus), 38-44 (recreation vehicles), 45, 54, 78, and 79 (tractors), and 61S (snow plow) in RIA Chapter 2.9.2 and our discussion of payload or operational constraints for certain applications like coach buses and concrete mixers in RIA Chapter 2.9.1).

We agree with EDF that lower annual operational VMT increases the payback period, and we have conducted our analysis using the 50th percentile VMT for each application, as described in RIA Chapter 2.2.1.2.

In response to EDF's comment concerning increasing diesel prices making the economics of BEVs even more attractive due to the low energy cost per mile, we note that we updated our diesel fuel prices to reflect the latest projections based on AEO 2023, as described in RIA Chapter 2.3.4.

Regarding EDF's comment concerning the study they referenced that was published by Argonne National Laboratory's Energy System Division in April 2021, we note that although this study accounts for the federal excise tax and increased insurance, it likewise appears to assume all charging will be en route (only manufacturer's suggested retail price is given for a vehicle purchase price, see e.g. Study at 15, 29), and no consideration is given to whether there would be an adequate private charging network to accommodate all HDV ZEVs within the rule's timeframe.

In response to EDF's comment about the report they referenced that was developed by M.J. Bradley & Associates for EDF in 2021, we note that although the study states that depot charging is the likely norm for HDV BEVs, there is no indication that EVSE costs were considered. Study at 23-24. Nor is there indication that federal excise tax, insurance, or maintenance costs were considered. Id. The study also uses a somewhat lower estimate of battery pack costs than EPA considers appropriate ($86 kWh in 2030 v. EPA's estimate of $97 kWh in 2032). See RIA Chapter 2.4.3.

Additionally, notwithstanding our agreement with EDF on a number of issues relating to payback period and TCO, we continue to believe that it is appropriate to apply conservative maximum penetration constraints within HD TRUCS, and somewhat more than at proposal. As further explained in RIA Chapter 2.7, after consideration of comments, including concerns raised by manufacturers, we re-evaluated the maximum penetration constraints in HD TRUCS for the final rule. The constraints discussed in the proposal, such as the methodology to size the batteries and the recognition of the variety of real-world applications of heavy-duty trucks, still apply to the final rule analysis. Furthermore, we continued to take a phased-in approach to the constraints to recognize that the development of the ZEV market will take time to develop. We broadly considered the lead time necessary to increase heavy-duty battery production, as discussed in preamble Section II.D.2.ii.b, which shows a growth in the planned battery production capacity from now through 2031. We also have generally accounted for the time required for the potential distributive grid buildout through 2032 as informed by the DOE's TEIS and discussed in RIA Chapter 2.6.4. We see a similar trend in the growth of the infrastructure to support H_2 refueling for FCEVs, as discussed in RIA Chapter 1.8.3.6. In recognition of these considerations, for the final rule we applied more conservative maximum penetration constraints within HD TRUCS than at proposal. We limited the maximum penetration of the ZEV technologies in HD TRUCS for the final rule to 20 percent in MY 2027 and 70 percent in MY 2032 for any given vehicle type.

<u>Response to Comment Theme: EPA's feasibility analysis- Standards Should be less Stringent or Remain at Phase 2 Levels</u>

EPA's predictions here are rooted in facts and data, and the agency's fact-based judgments are not 'crystal ball speculation', as the commenters would have it. Nor has EPA failed to address critical issues. Instead, the agency acted consistent with the statute and the *NRDC* decision (655 F. 2d at 333)—identifying the major steps necessary to reach a successful conclusion, indicating what problems may remain, and identifying reasonable solutions to those potential problems—in considering and addressing all of the issues raised by the commenters. With regard to standard stringency, EPA has explained through its detailed technology assessment and analysis of program costs that the standards are technically feasible at reasonable cost. In doing so, EPA hewed to *NRDC*, developing a modeled potential compliance pathway—as well as assessing several additional example potential compliance pathways—to demonstrate how manufacturers *may* choose to comply with the standards. EPA then assessed the cost of the standards under the modeled potential compliance pathway, assessing those costs as reasonable, and showed how the standards are feasible within the lead time afforded by the rule (as discussed further immediately below). See preamble Section II and RIA 2; see also EPA's assessment that the additional example potential compliance pathways support the feasibility of the final standards as discussed in preamble Section II.F.4 (without producing additional ZEVs to comply with this rule) and RIA Chapter 2.11. We also note that manufacturers do not need to follow the modeled potential compliance pathway nor any of the other example potential compliance pathways that EPA assessed; rather, manufacturers may choose whichever technology or mix of technologies meets the standards and best suits their business.

Consistent with *NRDC*, EPA has carefully analyzed potential difficulties in achieving the standards, and provided reasonable predictions of how those difficulties can be surmounted in the lead time afforded by the standards. See 665 F. 2d at 333. With regard to infrastructure availability (in particular availability of "back of the meter" EVSE (i.e. chargers and ports) and "front of the meter" infrastructure (i.e. distributive grid buildout or, put another way, sufficiency of time for aligning needs of potential HD ZEVs with those of utilities), EPA has demonstrated, based on the most recent available information, that there will be sufficient infrastructure available to support the modeled potential compliance pathway as needed for each model year of the relevant Phase 3 standards (although we again note that manufacturers are not required to follow this pathway). See RTC 7 (Distribution). In brief, we show that demand on the grid from the Phase 3 rule is low both nationally, in the key freight corridors where potential need for buildout could be highest, and at the individual parcel level both in representative states and extrapolated nationally. We have further structured the stringency of the final standards to minimize the need for distributive grid buildout, both through careful gradations of standard stringency (see response to comment urging more stringent standards, above) and showing how the standards could be achieved with types of chargers and port sharing that minimize load. We further show that this analysis is conservative in that it does not consider various available further measures by which electrification demand can be minimized. In making these determinations, EPA has relied on its own technical and policy expertise, consulted with numerous expert entities including the Department of Energy, carefully considered the work of respected technical analysts, and weighed the entirety of the voluminous evidence in the record.

With respect to issues relating to critical mineral availability, EPA again has acted on the basis of data, not uninformed speculation as the commenters would have it. We have supplemented the record from the proposal with additional information and data, and we reasonably predict that there will be sufficient critical minerals availability, reliable supply chains, and adequate North American battery production to support the feasibility of the standards. See Preamble section II.D.2.ii and RTC 17.2. We have further shown that the necessary critical minerals under the modeled potential compliance pathway can be obtained within the rule's timeframe either from North American sources, or imported from foreign countries without raising issues of mineral security. Id. Again, in making these determinations, EPA has relied on its own technical and policy expertise, consulted with numerous expert organizations including the Department of Energy, carefully considered the work of respected technical analysts, and weighed the entirety of the voluminous evidence in the record.

We have also analyzed willingness to purchase ZEVs under the modeled compliance pathway, using the same approach identified above from *NRDC*. See Preamble Section VI.E. In addition to the discussion there, we note that the manufacturing industry has itself invested billions of dollars into developing and marketing HD BEVs. See RIA 1. While some of this effort may reflect compliance with California ACT standards, EPA reasonably believes that it also reflects more general market forces across the nation. Manufacturers are not likely to develop, produce, and market products which they believe to be unsaleable, or to use such technologies rather than other available potential compliance pathways as part of their compliance strategies with Phase 2 standards (which several manufacturers indicated they are doing in their submitted comments). Rather, as highly sophisticated and profit-maximizing corporations, manufacturers are generally making investments that they believe—based on their own research and technical and strategic judgments—will yield optimal return on investments for their shareholders.

EPA has also reasonably addressed the comments alleging that its modeled potential compliance pathway is inherently implausible because of the level of ZEV adoption projected in the timeframe of the standards. In RIA Chapters 2 and 3, we document step by step precisely how such compliance could be achieved. We reiterate that manufacturers are not required to follow the modeled potential compliance pathway and may choose to instead follow one of the other example potential compliance pathways EPA assessed— including without producing additional ZEVs to comply with this rule—or may choose to come up with their own technology or mix of technologies to meet the standards. In response to the comment of POET (at p. 6 of Attachment A to their comments) that EPA's estimates of ZEVs in its modeled potential compliance pathway is inconsistent with the projections of the 2022 Annual Energy Outlook report of Energy Information Administration, we explained at proposal that that report did not include any assumptions for new regulations or laws beyond those in place as of November 2021. DRIA at 12. Consequently, its ZEV sales projections do not consider (among other things) the California ACT requirements, or account for BIL, IRA, and other financial incentives. EPA consequently reasonably did not use these projections in estimating the volume of ZEVs in the reference case (baseline), or in the modeled potential compliance pathway.

Some commenters claimed that EPA attached too much weight to payback, and ignored other relevant metrics, including total cost of ownership, consumer acceptance, and alleged uncertainties regarding adequacy of supporting infrastructure and critical minerals. As discussed above and in the earlier response on why EPA is not adopting more stringent standards or giving different weight to balancing the statutory and other relevant factors that commenters would prefer, EPA has in fact (and given appropriate weight to) considering issues relating to uncertainties of supporting infrastructure, willingness to purchase, and critical minerals availability in determining the appropriate level of stringency for the standards. See also our discussion of purchaser acceptance in our discussion of economic impacts of the final rule in preamble Section VI and RTC 19. We evaluate total cost of ownership, see RIA 2.12, but note further that it is a metric closely related to payback. That is, once there is payback, savings continue to accrue and thus further reduce the total cost of ownership. Accordingly, in every instance where EPA has found there to be payback within a reasonable timeframe under the modeled potential compliance pathway, total cost of ownership will be positive. See RIA 2.7 for discussion of development of the payback analysis utilized in the final rule.

EPA has carefully considered the alternative standards set out in the comments of the Engine Manufacturers Association (EMA) which EMA developed using the HD TRUCS model with different inputs. EMA's projected standards are considerably less stringent than EPA proposed, and are less stringent (although less dramatically) than the final standards. EMA and DTNA also suggested that the Agency should establish mechanisms to automatically adjust the CO_2

standards to the same extent that the annual deployment of ZEV truck recharging/refueling stations falls short of the previously calculated infrastructure-deployment benchmark. This adjustment operates as a fraction to reduce whatever level of stringency is otherwise developed. EPA agrees with EMA and DTNA that the availability of infrastructure is a relevant consideration, but we disagree that a scalar is the best way to reflect that availability. Although we acknowledge uncertainties regarding infrastructure availability, EPA has structured the standards to address those concerns and provided a thorough analysis to support how the final standards do so. In coordination with DOE, we have closely analyzed projections of infrastructure availability in the timeframe of the Phase 3 program and reasonably predict there will be adequate infrastructure to support the Phase 3 standards. We disagree with the scalar that was suggested by DTNA in setting the standards, but have adopted an approach that appropriately take our assessments and projections into account for the considerations they identified (including infrastructure). See further discussion in RIA Chapter 2.7. In addition, as discussed in Preamble section II.B.2.iii and RTC section 2.9, EPA will closely monitor infrastructure development progress, and intends to continue to engage with stakeholders post-promulgation and to monitor implementation of the Phase 3 program. The final standards reflect careful consideration of, and accounting for, the uncertainties regarding infrastructure buildout. We respond throughout RIA Chapter 3 and in section 3 of this RTC to the various suggestions of EMA regarding different inputs and costs which they utilized to come up with their alternative standard scenario.

API's and AFPM's comments that EPA has shown no need for a Phase 3 rule because it is not linked to achieving a National Ambient Air Quality Standard ignores the statutory authority under which EPA is promulgating the standards and the factors that EPA must consider in so doing. CAA section 202(a)(1) is a technology-based provision aimed at preventing or controlling emissions of air pollution that cause or contributes to endangerment; it does not direct EPA to set health-based standards. As explained in preamble Section II, the Phase 3 standards are necessary to address the HD motor vehicle GHG emissions which contribute to endangerment. See *Coal. for Resp. Regulation*, 684 F. 3d at 127 (such standards are mandatory) and 128 (those GHG standards are not required to achieve a particular level of mitigation). We note further that the level of GHG emission reductions attributable to the Phase 3 rule is greater than the level in Coalition for Responsible Regulation referred to as "meaningful mitigation". 684 F. 3d at 128.

We thank commenters for their thoughtful input to HD TRUCS. As noted in preamble section 2, RIA chapter 2, and RTC section 3, the HD TRUCS tool used for the final rule has been updated from the proposal based on consideration of the many comments received. As discussed in the final rule preamble, the final rule RIA, and this RTC, EPA has utilized the HD TRUCS model to inform our assessment of certain technologies in supporting the stringency of the final rule standards, and the Agency believes this is a reasonable and appropriate modeling tool to inform the Agency's decision making.

We disagree with commenters that this rulemaking is arbitrary and capricious merely because there are certain factors influencing the implementation of the final standards that are not within the complete control of the regulated entities. After considering comments, we have taken steps to update our consideration of willingness to purchase (including payback) (RIA Chapter 2 and RTC 2 and 3), charging and hydrogen refueling infrastructure availability (RTC sections 6 and 8, respectively), grid reliability and adequacy and timing of distributive grid buildout (RTC section 7), critical minerals and supply chain concerns (Preamble Section II.D.2.ii and RTC 17.2), and discussion of purchaser acceptance (RTC section 19). Our assessments and projections reflect careful consideration of potential obstacles, and means of resolving them.

We note further that there can be no absolute certainty in making predictive judgments. See *NRDC*, 665 F. 2d at 335. And so it is here, including with regard to issues such as extent and timing of vehicle technology development and supportive infrastructure. We have carefully weighed these predictive uncertainties as reflected in the final standards. Specifically, the final rule delays setting new standards for certain vehicle categories consistent with our assessment and addressing those for which commenters have expressed the most concern, thereby increasing the lead time for deploying emission reducing technologies and infrastructure deployment, as well as time for purchasers to become more accustomed to the new technology. The final rule also retains advanced technology credit multipliers for PHEV and BEVs through MY 2027 (as finalized in the Phase 2 program) to ensure manufacturers continue to have access to any incentives that are currently in their Phase 2 MY 2027 compliance plans (see RTC section 10.3.1).

We disagree with commenters who claimed that EPA failed to follow OMB Circular A-4. EPA followed OMB Circular A-4, and we also submitted the rule to OMB for interagency review pursuant to EO 12866.

Summary of Comment Theme: EPA’s consideration of CARB’s ACT regulation

Many commenters requested EPA set standards that align with CARB’s ACT regulation. Allergy & Asthma Network et al, ACEEE, ATS, CARB, CARB et al., Ceres BICEP, CATF et al., CO DOT, DC DOEE, EDF, MFN, NACAA, NPCA, NESCAUM/OTC, Our Children’s Trust), South Coast AQMD, SELC, State of CA et al., Tesla, WRI, ZETA. NESCAUM/OTC specifically requested that EPA update the reference case to include VT and CO as states adopting ACT. NESCAUM/OTC and South Coast AQMD requested EPA account for CARB’s ACF regulation in the final standards.

Other commenters strongly opposed the California program(s) as a basis for national standards. (See e.g., ATA, Ford, Roush, TRALA, Valero.) This group of commenters (excluding Ford) questioned the feasibility of the standards EPA proposed, much less standards more stringent still (see below). Ford and Roush noted assumptions and circumstances reflected in the ACT program which would not be replicated nationally, including assumptions of high diesel prices, high ACT vehicle availability, and high ACF demand, plus local climate conditions which did not require BEVs designed for more extreme weather conditions. DTNA, AmFree, and Delek stated that manufacturers’ aspirational goals did not translate to actual production, especially given uncertainties regarding supporting electric infrastructure, customer reactions to a new, unfamiliar product, and critical material potential shortages. Valero noted further that a number of these aspirational announcements were qualified, and that EPA had not always noted or otherwise accounted for those qualifications. Valero also questioned the legality of the ACT standards, maintaining that they are preempted by the Energy Policy and Conservation Act.

DTNA summarized its views of whether the ACT program can be viewed as evidence of feasibility as follows: “California’s ACT rulemaking processes both intend to model customer purchasing behavior, but regulate manufacturer sales. California’s ACT regulation cannot force customers to buy Zero Emission MHDVs, and customers will not buy products which do not meet their operational needs, cannot reliably be refueled, or do not lead to a positive return on investment. Additionally, while other states have opted into California's ACT provisions, not all other states have the same complete ecosystem of supporting regulations, and it is not clear how many ZEVs will be sold in each state. Since the ACT cannot force customer sales of ZEVs, and it is unclear how many nationwide ZEVs will be sold as a result of the ACT, EPA should not increase the proposed emission standard stringency levels to account for ACT requirements."

CATF et al. indicated that the baseline should account for both California programs, their adoption by the section 177 states and their putative adoption by the NESCAUM MOU states. ICCT argued sales of ZEVs required by California and by the section 177 states adopting the California ACT standards should not be counted toward compliance with the standard unless the standard is made more stringent to account for those compelled sales. Otherwise, these sales have the potential to account for compliance with the rule without any further emission reductions elsewhere (particularly when considered in combination with the credit multiplier feature of the rule).

Response to Comment Theme: EPA's consideration of CARB's ACT regulation

The final standards are based on our feasibility assessment as explained in preamble Section II and supported by our modeled potential compliance pathway which reflects our HD TRUCS assessment of ZEV technologies feasibility, independent of CARB's ACT. In other words, the final standards reflect the Administrator's judgment of the standards based on the statutory criteria and other relevant factors, not based on EPA adopting the ACT program, or stringency levels that correspond to the ACT program, or otherwise deferring to any judgments made by CARB in promulgating the ACT program.

We have included ACT adoption as part of our baseline (i.e., reference case) as described in Chapter 4.2.2 of the RIA to this rulemaking, including the addition of Vermont and Colorado as states adopting ACT.[262] This is consistent with EPA's general practice of considering existing laws and regulations as part of the regulatory baseline. This approach is also consistent with OMB Circular A-4. As further support for the reasonableness of including ACT adoption as part of our baseline, in summer 2023, major manufacturers signed an agreement committing to meet the Advanced Clean Trucks regulation in California, subject to certain conditions.[263]

In response to some commenters' assertions questioning the volume of ZEVs that will be sold as a result of ACT and thus questioning the reasonableness of the reference case and the feasibility of the final standards, EPA finds that the final standards are reasonable and appropriate even in the absence of the ACT program. In determining this, we conducted a reference case ZEV adoption sensitivity analysis with meaningfully lower ZEV adoption than

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[262] At the time we performed the inventory modeling analysis, seven states had adopted ACT in addition to California. Oregon, Washington, New York, New Jersey, and Massachusetts adopted ACT beginning in MY 2025 while Vermont adopted ACT beginning in MY 2026 and Colorado in MY 2027. Three other states, New Mexico, Maryland, and Rhode Island adopted ACT (beginning in MY 2027) in November and December of 2023, but there was not sufficient time for us to incorporate them as ACT states in our modeling. That these additional States have decided to enact ACT's stringent ZEV sales mandates further corroborates the feasibility of EPA's final standards.

[263] See CARB-EMA Agreement i-ii ("The OEMs Commit to Meet CARB Truck Regulations *** The OEMs commit to meet, in California, the requirements of the relevant regulations as specified below and any agreed upon modifications per this Agreement, regardless of the outcome of any litigation challenging the waivers/authorizations for those regulations, or CARB's overall authority to implement those regulations. *** The ACT regulation, as it existed on March 15, 2021, and the 100 percent ZEV sales requirement set forth in Cal. Code Regs title 13, section 2016, as it existed on April 28, 2023.")

our final rule reference case. As further detailed in RIA Chapter 4.10, we calculated the lower national ZEV sales percentages in the sensitivity reference case using the approach we used in the NPRM (that was conducted prior to EPA granting the ACT waiver) and that we updated. In other words, the level of ZEV adoption in the sensitivity reference case reflects the ZEV adoption that will occur as a result of the existence of the various considerations we discuss in preamble Section V, including the IRA and BIL, but in response to these comments the sensitivity looks at lower ZEV adoption than we project in the final rule reference case that will occur through compliance with CARB's ACT within ACT states (e.g., a future no action scenario in the absence of an enforceable ACT program). Our sensitivity analysis (which included the sensitivity reference case and a corresponding sensitivity control case with the same numeric values of the final standards) showed greater downstream emission reductions than our main modeling of the final standards. Meanwhile, manufacturer costs are greater in magnitude than those in the main analysis of the final standards. Importantly, consistent with our discussion in preamble Section II.G.2 for the main analysis, the fleet-average per-vehicle manufacturer costs in this reference case sensitivity analysis are lower than those we projected for the HD GHG Phase 2 rule that we considered to be reasonable. Our assessment is that this sensitivity analysis demonstrates that, even in the absence of enforceability of CARB's ACT, the final standards are feasible and appropriate. In addition, our infrastructure analysis and battery production levels evaluate the total ZEVs projected in the modeled potential compliance pathway. Therefore, the results of these analyses are the same regardless of how many ZEVs are in the reference case. Correspondingly, while ACT's existence supports the final standards, the final standards' feasibility does not depend on ACT.

The final standards are not a national version of the California standards. In the final rule analysis, we also considered standards consistent with levels of stringency that would be achieved from the California ACT rule extrapolated to the national level (see also Section II.H of the preamble to this rule). We are not adopting standards consistent with this more stringent alternative because we consider the final standards' stringency to reflect the appropriate balancing of the factors, as discussed in preamble Section II.G. We are not including CARB's ACF regulation in the analysis of this final rule; at the time of this rulemaking, EPA is still reviewing the waiver request for the ACF regulation.

Regarding the comments of EDF and others that given the Phase 2 flexibilities and the ACT requirements, manufacturers will necessarily comply with the Phase 3 standards by virtue of complying with ACT, please see our discussion and response in preamble Section III.A.

In response to comments regarding the legality of ACT or related actions (such as Section 177 States adopting ACT or EPA granting a waiver for ACT), those comments are beyond the scope of this proceeding.

<u>Other Comments Related to Stringency or Feasibility:</u>

<u>Summary of comment related to BEV and FCEV efficiency:</u>

ACEEE commented that the Phase 3 standards should promote BEV and FCEV efficiency and noted that the real-world efficiency gains will not be observed if EPA deems BEV and FCEV to be zero CO2 and they are not required to test. EPA has assumed constant battery efficiency through MY 2032, but efficiency is likely to increase due to learning, in which case batteries will be both less expensive and have greater range, all of which should be reflected in the out-year standard stringency.

Response to comment related to BEV and FCEV efficiency:

EPA disagrees with ACEEE that the Phase 3 standards should promote BEV and FCEV efficiency. As EPA explains in RTC 17, compliance with the Phase 3 standards, like its predecessors, is determined based on vehicular emissions. Because BEV and FCEV produce no tailpipe emissions, any efficiency improvements to BEV and FCEV would not reduce their tailpipe emissions. While such efficiency improvements could reduce upstream emissions associated with generating and delivering electricity, EPA's longstanding approach to assessing compliance at the tailpipe is consistent with section 202(a)'s focus on addressing emissions from classes of motor vehicles. We did not reopen this approach in this rulemaking. EPA notes that NHTSA's standards do promote energy efficiency.[264]

EPA, however, has considered the efficiency of BEV and FCEV in modeling the impacts of the rule. In the final rule, we updated our approach to accounting for efficiency gains and we refer readers to section 3.2 of this RTC document and Chapters 2.4 and 2.5 of the RIA for this rule. Further, while the final battery durability and warranty requirements for BEVs and PHEVs are justified based on vehicular emissions reductions as explained in preamble Section III.B and not based on energy efficiency, those requirements may incidentally support the efficiency improvements noted by the commenter. See section 11 of this RTC document and section III.B of the preamble to this rule.

Summary of comment related to cross-subsidization:

Manufacturers have control over the marketing of ZEV vehicles by means of cross-subsidization, as EPA noted in the DRIA. (MFN)

Response to comment related to cross-subsidization:

EPA is not predicating any part of the final Phase 3 rule on cross-subsidization strategies. We recognize that manufacturers have discretion in their pricing strategies, and the final rule does not preclude manufacturers from using any specific pricing strategies, including cross-subsidization.

Summary of comment related to stringency benefits to disadvantaged communities:

Some commenters stressed especially the benefits to disadvantaged communities that would be afforded by more stringent standards and the complementary improvements in criteria pollutant emissions. (State of California et al., CleanAirNow, RMI, Tesla.) MFN expanded on the need for stronger standards to address disproportionate impacts: "Had EPA considered the potential disproportionate and cumulative impacts of vehicle emissions in developing this proposal, the Agency would have structured the rule so that only the cleanest vehicles would be incentivized and so that reductions of other health-harming pollutants (like the non-GHG criteria

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[264] *See Massachusetts v. EPA*, 549 U.S. 497, 532 (2007) ("that DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public's "health" and "welfare," 42 U.S.C. § 7521(a)(1), a statutory obligation wholly independent of DOT's mandate to promote energy efficiency. See Energy Policy and Conservation Act, § 2(5), 89 Stat. 874, 42 U.S.C. § 6201(5). The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency").

pollutants and air toxics the rule indirectly affects) are guaranteed. See also Comments of Evergreen Action: "The transition to zero emissions medium and heavy-duty vehicles is feasible and necessary to address long standing public health disparities. …. Now that there is viable technology available that would eliminate tailpipe pollution from trucks, it would be even more irresponsible and unjust not to compel the most expansive application of this technology to rectify the pollution impacts imposed on people of color and low-income communities."

Our Children's Trust commented in support of strengthened federal emission standards on behalf of the nation's youth. Our Children's Trust recommended a documentary film and requested that EPA "incorporates the protection of children's fundamental rights to a safe climate system, defined by the best available science, into future rulemaking, policies, and initiatives."

<u>Response to comment related to stringency benefits to disadvantaged communities:</u>

We address comments related to environmental justice in Section 18 of this RTC document. In response to Our Children's Trust, see our response in RTC 14. We also note that this action is subject to Executive Order 13045 and we have evaluated the environmental health or safety effects of air pollutants affected by the final rule on children. The results of this evaluation are described in Section VI of the preamble, Chapter 5 of the RIA, and section 14 of this RTC document.

<u>Summary of comment related to the need for EPA to perform post-promulgation monitoring:</u>

EMA, and other commenters, generally recommended the need for post-promulgation monitoring of infrastructure developments and critical material availability, and that this be done on a transparent, government-wide basis.

<u>Response to comment related to the need for EPA to perform post-promulgation monitoring:</u>

Additional comments related to the topic of post-promulgation assessments can be found in section 2.9 of this RTC document. See preamble section II.B.2.iii for a description of EPA's commitment to engage with stakeholders and monitor implementation of the HD GHG programs.

<u>Summary of comment related to scrapping:</u>

CleanAirNow and MFN requested EPA implement a scrapping program. MFN noted such a program is necessary to prevent "the re-sale, migration, and increased density of dirty diesel heavy-duty vehicles" in EJ communities, especially port-adjacent communities.

<u>Response to comment related to scrapping:</u>

A scrapping program is out of scope for this rulemaking.

<u>Summary of comments related to biofuels:</u>

A group of commenters urged EPA to predicate standards based on use of biofuels. They noted that such fuels, including varying degrees of biodiesel, not only provide emission reduction benefits, but can do so immediately, can do so at less cost, and are the subject of various federal incentive programs, including those administered by the Dept. of Agriculture. (Clean Fuels Alliance America, NACS, NESTE, POET).

Response to comments related to biofuels:

We are not finalizing standards predicated on the use of biofuels. Manufacturers will continue to have the option to use biofuels in their compliance strategies to meet the performance-based standards. Other comments relating to our consideration of fuels, including biofuels, are summarized and addressed in RTC section 9.1 and 17.

Summary of comment related to EPA's assessment of GHG reductions:

POET stated that EPA's proposal is flawed due to overestimation of GHG reductions, citing a study by Trinity commissioned by the commenter (n. 45 of comment))

Response to comment related to EPA's assessment of GHG reductions:

Comments relating to emission reductions are addressed in section 13 of this RTC document.

Summary of comments related to EPA's consideration of lifecycle emissions:

AFPM and others maintained that the standards should be constructed on a lifecycle basis and that without doing so, EPA's benefit estimates are flawed

Response to comments related to EPA's consideration of lifecycle emissions:

Comments related to lifecycle are addressed in RTC sections 13 and 17.

Summary of comment related to EPA's consideration of electricity charges:

Valero maintains that by suggesting various ways ZEV purchasers can mitigate electricity charges, EPA is acting beyond its delegated section 202(a) authority in "dictat[ing] vehicle charging behavior" or telling grid operators to manage electricity loads in particular manners. EPA must account for grid costs and impacts, as well as issues of grid availability and reliability.

Response to comment related to EPA's consideration of electricity charges:

In supporting the feasibility of the standards under the modeled potential compliance pathway, EPA considered the costs of the final standards for both manufacturers (i.e. cost of compliance) and purchasers (considering willingness to purchase, including payback, as an appropriate relevant factor), and also considered grid availability and reliability in determining the appropriate lead time for the standards. In examining ways ZEV users can reduce costs (such as through time of use charging and other measures), EPA is reasonably considering how best to assess those overall costs, again within the authority delegated in section 202(a)(1)-(2). Consideration of these cost and feasibility issues is not "dictating charging behavior" or grid management, as the commenter would have it, but instead represents a reasonable and thorough assessment of these considerations.

Comment:

DTNA requests that EPA consider extending the timeframe for manufacturers to remedy end-of-year CO_2 credit deficits in 40 CFR 1037.745(a) from 3 to 5 MYs for all regulatory subcategories of vehicles. By extending the timeframe for manufacturers to balance out credit deficits, EPA could alleviate some of the impacts of ZEV market uncertainty on manufacturer compliance plans.

Response:

We did not reopen the existing 3-year period for manufacturers to remedy CO_2 credit deficits, and are not taking final action on a revision to extend that period as requested by DTNA. This revision is out of scope for this final rule. We note that we are finalizing certain other flexibilities while taking into consideration limiting impacts of uncertainty on manufacturer compliance plans. See section 10 of this RTC document and section III.A of the preamble for this rule for further discussion.

Comment:

As part of their comment on this rule, Evergreen Action indicated that delayed action on emission standards from other elements of the mobile source sector (locomotives, off-road equipment, and marine vessels), the California waivers for many sectors, and IRA incentive programs is allowing emissions to rise in several regions of the country.

Response:

These comments are outside the scope of this final rule. In this rulemaking, we did not propose or request comment and are not taking final action in this rule related to standards for sectors other than heavy-duty highway vehicles (e.g., locomotives, off-road equipment and marine vessels). EPA action on California waiver requests and incentive availability through the IRA are also out-of-scope for this rulemaking. We discuss our consideration of California's ACT program and the IRA/BIL incentives in responses of this section 2.4 and section 2.7 of this RTC document and in section II of the preamble to this final rule.

2.5 Calculating the standards

Comments by Organizations

Organization: Allison Transmission Inc.

2. Mathematical errors in computed LHD stringency thresholds

In Table II-29 Calculations of the Proposed MY2032 CO2 Emissions Standards for Light Heavy-Duty (LHD) Vocational Vehicles, Allison has identified five mathematical errors in the creation of the six "Proposed CO2 Emissions Standard" values. Specifically, the value for the CI LHD Multi-Purpose vehicle is the only correctly computed value in that table. The other values were not calculated correctly based on the appropriate current value and percentage adoption rate per equation II-2. Please see Appendix A attached hereto for additional details. Allison requests that EPA correct these errors prior to finalization of the Phase 3 rule. [EPA-HQ-OAR-2022-0985-1657-A2, p. 2.] [See Docket Number EPA-HQ-OAR-2022-0985-1657-A2, pages 4-5, for Appendix A.]

Organization: California Air Resources Board (CARB)

b. HDVs with no installed propulsion engine

Affected page: 26122 (1037.101(b)) and (1037.102(b))

The NPRM proposes the following language:

"Heavy-duty vehicles with no installed propulsion engine, such as battery electric vehicles, are subject to compression-ignition emission standards for the purpose of calculating emission credits." [EPA-HQ-OAR-2022-0985-1591-A1, p.37]

The credit calculation (40 CFR 1037.705(b)) requires manufacturers of those HDVs to use the compression-ignition multi-purpose standard for the purpose of Average, Banking, and Trading (ABT) credit calculation. CARB staff suggests adding language in 40 CFR 1037.101(b) or 1037.105 that those HDVs are subject to the compression-ignition multi-purpose emission standards. CARB staff believes that it does not make sense to allow those manufacturers to certify to the compression-ignition urban or regional standards. [EPA-HQ-OAR-2022-0985-1591-A1, p.37]

Organization: China WTO/TBT National Notification & Enquiry Center

3. It is suggested to clarify the calculation method and source of emission standard values for carbon dioxide emissions from heavy-duty vehicles in the table “TABLE II-19 PROPOSED MY 2027 THROUGH 2032+VOCATIONAL VEHICLE CO2 EMISSION STANDARDS”. [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

The reasonable emission values of carbon dioxide in 2027-2032 are calculated and set according to internationally recognized standards such as ISO 14064 and Euro 6d. In addition, there are some differences between different methods of calculation. Please explain whether the differences between the calculation values of international standard methods such as ISO and Euro and the simulation calculation methods in Chimerica in this regulation are within the valid and reasonable range. [EPA-HQ-OAR-2022-0985-1658-A2, pp.3-4]

Organization: Cummins Inc.

10. Cummins requests clarification that 40 CFR §1037.705(b) applies to both vocational vehicles and tractors.

For vehicles with tailpipe CO2 emissions deemed to be zero, 40 CFR §1037.705 (b) references section §1037.105 (vocational vehicles) for generating CO2 vehicle credits and does not include a reference to section §1037.106 (tractors). We would like clarification that both vocational vehicles and tractors are eligible to generate vehicle CO2 credits. [EPA-HQ-OAR-2022-0985-1598-A1, pp. 9 - 10]

Organization: Daimler Truck North America LLC (DTNA)

Common Reference Standard for ZEV Credit Calculations.

DTNA supports EPA’s proposal to establish a common reference standard for ZEV credit calculations under 40 C.F.R. 1037.705 by requiring use of the applicable Compression-Ignition Multi-Purpose (CI MP) standard for the vehicle’s corresponding weight class beginning in MY 2027. However, the Company requests that EPA provide additional flexibility with respect to which regulatory subcategory standard is appropriate to use for ZEVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 76]

As proposed, EPA’s ‘common reference standard’ approach could create inappropriate calculation of credits for certain ZEV vehicle types. For example, a manufacturer might, using the provisions of 40 C.F.R. 1037.140(h), declare an ICE vehicle as an Urban or Regional vehicle, based on good engineering judgment, or subject to the restrictions listed in 40 C.F.R. 1037.150(z), based on transmission type. The same vehicle, when equipped with a zero-emission powertrain, would generate credits under the assumption it was a Multi-Purpose vehicle, regardless of the vehicle's operational characteristics. [EPA-HQ-OAR-2022-0985-1555-A1, p. 76]

To alleviate this discrepancy, EPA should allow ZEV manufacturers to use good engineering judgment to determine the appropriate regulatory subcategory for calculation of emission credits generated by a ZEV, based on the vehicle it is intended to replace. [EPA-HQ-OAR-2022-0985-1555-A1, p. 76]

EPA Request for Comment, Request #54: The calculations for the other model years and vocational vehicle subcategories are shown in DRIA Chapter 2.9. We welcome comment on this approach to taking the proposed change to the ZEV ABT credit calculation into account in setting vocational vehicle standards. We also request comment alternatively on using the same approach for vocational vehicles as we are proposing for tractors (see Section II.F.2).

- DTNA Response: DTNA provides recommendations and comments on EPA's proposed revisions to the ABT program in Section III.B. of these comments.

EPA Request for Comment, Request #53: First, prior to the effective date of this proposed change, there is a potential for manufacturers producing BEVs, FCEVs, and certain H2-ICE vehicles to generate larger credits than they would after this change, depending on the vocational vehicle subcategory to which a vehicle is certified. Second, we recognize that manufacturers develop their emissions compliance plans several years in advance to manage their R&D and manufacturing investments. After taking these into account, we propose that this regulation revision become effective beginning in MY 2027 to provide manufacturers with sufficient time to adjust their production plans, if necessary. We request comment on this proposed revision.

- DTNA Response: To facilitate credit generation for ZEVs, DTNA recommends that EPA allow manufacturers to determine the most appropriate ZEV service class based on good engineering judgment and that it revise its regulations to provide that the averaging set limitations in 40 CFR 1037.740 do not apply to ABT credits generated by ZEVs. DTNA provides detailed comments on these issues in Sections III.A.4 and III.B.1 of its comments on the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 167-168]

EPA Request for Comment, Request #55: We request comment on possible alternative vocational vehicle regulatory subcategory structures, such as reducing the number of vocational vehicle subcategories to only include the Multi-Purpose standards in each weight class, and/or maintaining Urban, Multipurpose, and Regional but combining SI and CI into a standard for each weight class.

- DTNA Response: See DTNA Response to Request # 53, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 168]

Organization: PACCAR, Inc.

D. EPA Should Revise its Proposed Approach to Calculating CO2 Emissions Credits for Vocational Vehicles

EPA's Proposed Rule would require OEMs to use the emissions standard codified at 40 C.F.R. § 1037.105 to calculate credits generated on all MY2027 and later zero emission vocational vehicles. As a result, some vocational vehicles would be newly classified as "multi-purpose" for credit calculation purposes. [EPA-HQ-OAR-2022-0985-1607-A1, p. 11]

PACCAR strongly disagrees with this approach. OEMs should be allowed to classify ZEV vehicles according to their intended use, and ZEV vehicles should not be limited to multi-purpose categorization. Current EPA regulations allow manufacturers to select a vocational duty cycle using any applicable vocational regulatory subcategory.6 Now, however, EPA is proposing to limit manufacturers to using the Multi-Purpose standard when calculating credits for zero emission vehicles. This change would result in an unexpected reduction in credits earned for ZEVs, with insufficient lead-time for manufacturers to adjust their product portfolios and production planning. EPA should continue to allow zero-emission vehicles to score in any applicable Phase 3 regulatory subcategory to further encourage increased zero emission vehicle adoption rates and prevent unexpected disruptions in product planning. If EPA were to nonetheless require using the Multi-Purpose subcategory, the Agency should not implement the change before MY2030 to allow OEMs sufficient lead-time. [EPA-HQ-OAR-2022-0985-1607-A1, pp. 11 - 12]

6 See 40 C.F.R. § 1037.140(h).

Organization: Volvo Group

Vocational Vehicle Stringency Setting Process

The Agency has proposed determining the Vocational Vehicle stringencies by taking the expected stringency increases for each model year, calculating the absolute grams per ton-mile reduction in the Multi-Purpose subcategory for each service class, and applying this absolute gCO2/ton-mile reduction to the Urban and Regional subcategories. For Heavy-Heavy-Duty (HHD), the proposed stringency increase results in a model year 2027 standard of 193 gCO2/ton-mile in the HHD Compression Ignition (CI) Multi-Purpose subcategory, an absolute reduction of 37 g/CO2/ton. This absolute 37 gCO2/ton-mile reduction is then applied to both the HHD CI Urban and Regional Vocational Vehicle subcategories to determine the new standard for each. The result is an actual stringency increase of 14% in the Urban subcategory, and 20% in the Regional. (Refer to Table 1 on page 18 of docket number EPA-HQ-OAR-2022-0985-1606-A1). [EPA-HQ-OAR-2022-0985-1606-A1, p. 17-18]

Although this might seem advantageous for OEMs producing more vehicles in the Urban subcategory, this actually results in lost credits for the OEM since EPA is proposing that all zero-emission vocational vehicles are be placed in the Compression Ignition Multi-Purpose subcategories in their service class regardless of the conventional vehicle they displace. From Table 2 below, if a zero-emission vehicle that replaces a HHD CI Urban Vocational Vehicle must be classified in the HHD CI Multi-Purpose subcategory, the resultant loss of credit for that ZEV is 127 Mg of CO2 from what it would receive if it were classified as Urban. The reverse is true for the HHD CI Regional subcategory. Even though a HHD CI Regional Vocational Vehicle sees a 20% stringency increase from baseline in MY 2027, a HHD CI Regional ZEV gains 134 Mg when classified against the Multi-Purpose standard. (Refer to Table 2 on page 18 of docket number EPA-HQ-OAR-2022-0985-1606-A1). [EPA-HQ-OAR-2022-0985-1606-A1, p. 18]

A cursory review of absolute credits gained or lost with this stringency setting process might appear beneficial; however, the impact depends upon an OEM's mix of vehicles classified as

Urban, Multi-Purpose, or Regional. If a manufacturer has a significantly higher penetration of vehicles classified as Urban than it does as Regional, they would be at a disadvantage. The OEM's product mix of ZEVs also has significant implications. If an OEM has greater Urban ZEV product offerings or sales than for Regional vocational vehicles, the disadvantage could be substantial. This is most apparent for Mack's distribution of MHD product, where an overwhelming percentage are classified in the Urban subcategories. [EPA-HQ-OAR-2022-0985-1606-A1, p. 19]

Lastly, all conventional Regional Vocational Vehicles would be required to meet this increased stringency without consideration for the actual expected ZEV penetration in the Regional subcategories, or the technology packages that EPA deemed appropriate for those subcategories in the Phase 2 rule making. [EPA-HQ-OAR-2022-0985-1606-A1, p. 19]

Because of the unintended disadvantages created by this stringency setting process, as well as the proposed modifications to 1037.705(b) that would require all ZEVs to meet the standard of the CI Multi-Purpose subcategories in their respect service classes, Volvo Group suggests EPA re-evaluate the stringency setting procedure and ZEV categorization for vocational vehicles. [EPA-HQ-OAR-2022-0985-1606-A1, p. 20]

EPA Summary and Response:

Summary:

Allison identified a purported error in the calculation of the proposed standards. Cummins requested EPA to clarify whether the CO_2 credit equation of 40 CFR 1037.705(b) continued to apply for tractors in light of the proposed update to the equation that noted a reference standard for the vocational vehicles, but did not note anything for tractors. DTNA proposes that EPA continue to use the Phase 2 approach that allows manufacturers to use good engineering judgement to determine the appropriate vocational vehicle subcategory (urban, rural, multi-purpose) for ZEVs as they do for ICEVs. PACCAR also requested that OEMs be allowed to classify their vocational vehicle ZEVs "according to their intended use" noting that the proposal would reduce credits earned for certain vocational vehicle ZEVs and thereby not provide enough lead time for manufacturers to plan unless implementation was delayed until MY 2030. Volvo also raised concerns with the vocational vehicle standard setting process used by EPA in the NPRM and suggested that EPA re-evaluate the approach for the final rule considering the potential impacts on each of the vocational vehicle subcategories. China WTO requests that EPA explain the differences in the numerical CO2 emission standards relative to Euro 6 or other ISO values.

Response:

After considering comments, we are not finalizing the proposed approach of setting the CI vocational vehicle standards relative to the CI Multipurpose regulatory subcategory. We agree with those commenters that asserted this would adversely affect manufacturers whose vehicles would otherwise be appropriately assigned to a higher credit-generating vocational vehicle subcategory, and that this could also adversely affect some manufacturers' existing Phase 2 plans for compliance strategies. Therefore, we are utilizing an approach to setting the vocational vehicle standards in the final rule using the same method we used for tractors in the NPRM. We continue to be concerned about the possibility of manufacturers assigning vocational vehicle ZEVs to an inappropriate subcategory. To minimize the potential for incorrect identification of vocational subcategories, we added provisions in 40 CFR 1037 to more clearly define how to assign a ZEV to a vocational vehicle subcategory (see revised 40 CFR 1037.140(g) that defines how manufacturers classify their vehicles as Light HDV, Medium HDV, and Heavy HDV, existing 40 CFR 1037.140(h) allowing manufacturers to use good engineering judgment to identify vocational regulatory subcategories (i.e., Urban, Multi-Purpose, or Regional), and the revised 1037.101(b)(2) clarifying that heavy-duty vehicles wih no installed propulsion engine are subject to CI emission standards).

As described in RIA Chapter 2.10.2.4.1, the standards for the vocational SI vehicles are set such that the technology package for modeled potential compliance pathway has the same fraction of ICE and ZEV vehicles regardless of whether a manufacturer is certifying SI or CI vocational vehicles; this is similar to the proposed approach but is more targeted at addressing manufacturers' concerns, and it will appropriately reflect the urban, multi-purpose and regional categories. This approach will continue to allow manufactures to certify ZEVs to the most appropriate urban, regional, or multi-purpose subcategory, using good engineering judgement, so the commenters' concern about potential inequities for certifying categories other than multi-purpose is addressed. This resolution also has the benefit of maintaining the existing, clear approach for certifying ZEVs to the CI standard. Lastly, this approach has the benefit of ensuring that manufacturer compliance strategies that include utilization of ZEV technologies will be able to comply with the same fraction of ZEVs regardless of whether the manufacturer also produces SI or CI vehicles.

With respect to Allison's comment, we believe they misunderstood the method we used to calculate the vocational vehicle standards and we disagree that there was an error in the NPRM. Furthermore, this is no longer a relevant comment because as previously mentioned, we are using a similar approach to what we proposed for tractors to setting standards for vocational vehicles and tractors in the final rule.

In response to Cummins, we clarify that manufacturers can continue to use the equation of 40 CFR 1037.705(b) to calculate CO_2 credits for tractors. Our proposed update to the "Std" variable was intended to establish a common reference standard for vocational vehicles deemed to have zero CO_2 emissions. It was not intended to exclude tractors; rather, the tractors would continue to use the applicable standard "associated with the specific regulatory subcategory" as specified in the retained text of the variable definition.

China WTO requests information regarding the differences between other CO_2 emissions reported in other countries. We note that the grams of CO_2 emitted per ton-mile standards are challenging to compare because they are specific to the test procedures specified for determining compliance. Parameters such as the defined payload, the tested weight of the vehicle, the assumed aerodynamic performance of vocational vehicles, and the drive cycles all have significant impact on the numerical value of the emissions.

2.6 Costs

Comments by Organizations

Organization: Clean Fuels Development Coalition et al.

VII. The Proposed Rule Fails to Adequately Consider Costs.

A. The proposed rule ignores many of the direct compliance costs of the rule.

As detailed above, Section I, supra, the proposed rule neglects to account for many of the direct costs of the rule. Among these are:

- The costs to build new factories capable of manufacturing heavy-duty electric and fuel cell vehicles.
  The cost to build DC fast-charging stations across the country.
- The cost of new electric infrastructure, including generation, transmission, distribution, and transformers.
  Added costs for maintenance on electrified heavy-duty vehicles.
- Battery replacement costs.
  Battery recycling or disposal costs.
- Increased road and tire wear because of increased vehicle weight, and associated disbenefits and environmental justice impacts from the resulting higher particulate matter emissions.
  Increased insurance costs.
- Loss of jobs in the American automotive industry and other related industries. [EPA-HQ-OAR-2022-0985-1585-A1, p. 32]

H. The proposal manipulates timelines and vehicle categories to inflate the benefits of the rule.

Perhaps the greatest failure of the proposal's attempt to hide the costs of the rule by spreading them across multiple classes of truck buyers. The proposal does not conduct a marginal cost analysis of the rule across each sub-category of vehicles but instead uses averaging, exceeding the agency's statutory authority as discussed above, to blend these costs together and thus hide the infeasibility of electrifying larger and heavier classes of vehicles. As vehicles become heavier, electrification becomes less and less economically feasible. By failing to perform these calculations in its proposal and instead hiding this infeasibility by averaging over a large pool of numbers, the proposal has made its cost-benefit analysis unreasonable and inadequate to justify the proposed rule. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 37 - 38]

Organization: Daimler Truck North America LLC (DTNA)

Aggregated Incremental Costs

Based on today's BEV prices and future anticipated FCEV prices, EPA's estimated aggregated incremental ZEV cost estimates appear to be significantly below the actual costs of ZEV adoption for fleets. For example, in HD TRUCS, EPA projects an approximately $80,000 incremental cost increase for Class 8 day cab tractors, reduced to $40,000 after application of the Section 45W commercial clean vehicle tax credit.61 DTNA's current aggregated incremental cost estimates for Class 8 ZEVs are shown in Table 12 below. These estimates account for both the Section 45W tax credit and payment of the FET but do not include the cost of charging infrastructure installation. DTNA is optimistic that incremental costs will decrease over time, but believes EPA should revisit its assumptions as the market develops. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 33-34] [Refer to Table 12 on p. 34 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

61 See Heavy-Duty Technology Resource Use Case Scenario Tool (HD TRUCS), 'Payback' Worksheet, https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-0830.

Organization: Delek US Holdings, Inc.

V. The Proposed Rule Severely Underestimates the Costs of BEVs

EPA claims that the Proposed Rule will somehow result in $180 billion to $230 billion in net benefits, which represents a five-fold increase over the cost in vehicle technology and associated electric vehicle supply equipment ("ESVE") required to meet the associated standards.25 As industry experts have asserted, "the derivation of these cost estimates is murky and fundamentally not credible," especially as EPA's estimate of the no-action alternative from which all other proposals are compared to deceptively ignores the regulatory costs of the Administration's current efforts to rapidly escalate electrification and automatically assumes that "American car buyers will suddenly drop their resistance to EVs."26 [EPA-HQ-OAR-2022-0985-1561-A1, p. 6]

25 Proposed Rule at 25,937.

26 Steven G. Bradbury, THE HERITAGE FOUNDATION, Prepared Statement for the hearing entitled "Driving Bad Policy: Examining EPA's Tailpipe Emissions Rules and the Realities of a Rapid Electric Vehicle Transition," before the Subcommittee on Economic Grown, Energy Policy, and Regulatory Affairs of the U.S. House of Representatives Committee on Oversight and Accountability, at 10 (May 17, 2023) available at https://oversight.house.gov/wp-content/uploads/2023/05/Bradbury-Prepared-Statement-for-17-May-2023-Oversight-Hearing.pdf.

Despite the substantial price differences between HD ZEV and ICE vehicles, EPA's cost analysis concludes—with little to no concrete support—that the "incremental cost" difference will be "eliminated," leaving only the added upfront cost of EVSE.27 EPA also underestimates the costs of EVSEs as ZEV HD charging infrastructure is expected to take significantly more time to deploy and require increased demand on the electricity grid to a greater extent than light duty charging infrastructure.28 Instead of fully accounting for these obvious costs, EPA relies heavily on incentives under the IRA,29 which apply to a limited number and type of vehicles and taxpayers, and ignores the fact that incentives from the IRA are still a "cost" to tax-paying consumers.30 Notably, the cost to consumer also fails to account for the decreased range and loads for ZEV HDs in the payback occurring between three and seven years for long-haul tractors. Beyond the direct costs to the consumer, EPA fails to account for costs associated with infrastructure impacts from increased operation of heavier ZEVs on the road, including road and bridge deterioration and commensurate reduced funding for infrastructure from fuel tax collections. EPA's failure to quantitatively analyze these costs——is fatal to its analysis. [EPA-HQ-OAR-2022-0985-1561-A1, pp. 6 - 7]

27 DRIA at 9, 67–68.

28 Peter Slowik, et al., THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION, "Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States" (Jan. 2023), available at https://energyinnovation.org/wp-content/uploads/2023/01/Analyzing-the-Impact-of-the-Inflation-Reduction-Act-on-EV-Uptake-in-the-U.S..pdf.

29 See, e.g., DRIA at 67 – 68.

30 See, e.g., IRS, "Credits for New Clean Vehicles Purchased in 2023 or After" (Apr. 17, 2023), available at https://www.irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after (citing IRA, § 30D).

And as discussed above, EPA hardly pays any mind to the volatile pricing of critical minerals and how that can greatly affect battery costs. The price of lithium, for example, has consistently risen in recent years. Between January 2021 and March 2022, the cost of lithium increased by 738% and continues to rise today.31 Despite these very public findings, EPA asserts that "the cost to manufacture lithium-ion batteries (the single most expensive component of a BEV) has dropped significantly in the past eight years, and that cost is projected to continue to fall during this decade, all while the performance of the batteries (in terms of energy density) improves."32 Yet future lithium-ion battery production will be heavily subsidized if the BIL and IRA remain in place, which likely serves as an impediment to actually reducing the cost of the battery. [EPA-HQ-OAR-2022-0985-1561-A1, p. 7]

31 See CANADA ENERGY REGULATOR, Market Snapshot: Critical Minerals are Key to the Global Transition (Jan. 18, 2023), available here.

32 Proposed Rule at 25,930.

Organization: National Federation of Independent Business (NFIB)

NFIB requests that EPA withdraw the proposed rule. [EPA-HQ-OAR-2022-0985-1472-A1, p. 1]

First, EPA should bear in mind that its continual turning of the regulatory screw on truck and truck engine manufacturers, with tighter and tighter GHG emissions standards, imposes substantial and growing costs not only on the manufacturers, sellers, and purchasers of trucks, but on the American economy as a whole. EPA's GHG emissions regulations, including the proposed Phase 3, make trucks more expensive to produce, more expensive for dealers to buy from manufacturers, and more expensive for trucking companies and independent owner-operators to buy from dealers. The trucking companies and independent owner-operators must then, in turn, charge more to the customers who hire them to move freight. Recalling that 10,930,000,000 tons of freight, representing 72.2% of total domestic freight tonnage, moves annually by truck in America,2 it is clear that EPA's GHG Phase 3 regulations will cost American businesses, including small and independent businesses,3 and consumers a fortune. [EPA-HQ-OAR-2022-0985-1472-A1, p. 1]

2 American Trucking Associations, Economics and Industry Data, available at https://www.trucking.org/economics-and-industry-data (data for 2021) (visited May 10, 2023).

3 EPA stated with respect to small businesses: 'EPA is proposing to make no changes to (i.e., maintain the existing) MY 2027 and later GHG vehicle emission standards for any heavy-duty manufacturers that meet the 'small business' size criteria set by the Small Business Administration. In other words, these manufacturers would not be subject to the proposed revised MY 2027 and new MYs 2028 through 2032 and later HD vehicle CO2 emission standards but would remain subject to the HD vehicle CO2 emission

standards previous [sic] set in HD GHG Phase 2' (citations omitted). 88 Fed. Reg. at 26008, col. 1. While NFIB appreciates this crumb of freedom that has fallen from EPA's table, it will not benefit most small and independent businesses. And it would not protect any small and independent businesses from the loss of profits and jobs due to shipping inflation caused by the proposed rule.

Secondly, EPA failed to conduct a comprehensive benefit-cost analysis to determine whether the benefit of its proposed GHG Phase Ill regulations outweighs the damage the regulations inflict on the American economy. EPA says: 'EPA's consistent practice has been to set standards to achieve improved air quality consistent with CAA [Clean Air Act] section 202, and not to rely on cost-benefit calculations, with their uncertainties and limitations, in identifying the appropriate standards.'4 EPA's blithe dismissal of the importance of weighing the costs and benefits of its proposed regulation runs flatly contrary to Presidential directives. Executive Order 12866 states that (1) 'In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating'5 and (2) 'Each agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.'6 EPA admits that it has not conducted the required benefit-cost analysis, without which it cannot have reached a reasoned determination that the benefits of the proposed GHG Phase 3 regulations justify its cost. [EPA-HQ-OAR-2022-0985-1472-A1, p. 2]

4 88 Fed. Reg. at 25935, col. 1. EPA's compliance with the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., also is in question, as EPA did not consider the effect of shipping inflation caused by the proposed rule that all small businesses (like other businesses) would face. See 88 Fed. Reg. at 26097, col. 2.

5 Section 1(a) of Executive Order 12866, 'Regulatory Planning and Review,' as amended, 5 U.S.C. 601 note. Note that Executive Order 14037, 'Strengthening American Leadership in Clean Cars and Trucks,' 42 U.S.C. 7521 note, calling for EPA to consider the proposed regulation, did not override the requirements of Executive Order 12866.

6 Section 1(b)(6) of Executive Order 12866. Also, section 202 of the Clean Air Act (42 U.S.C. 7521) contains no provision prohibiting consideration of costs, and section 202(a)(2) of the Act (42 U.S.C. 7521(a)(2) explicitly calls for the EPA Administrator to make effective the regulations on emissions of new trucks and engines 'after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.' Thus, section 202 of the Clean Air Act clearly allows EPA to follow the Presidential directives in Executive Order 12866 to analyze and weigh benefits and costs.

Finally, EPA has not properly assessed the practical impact of its proposed regulation. As ABF Freight System, Inc., told EPA about the proposed regulation: It picks winners and losers for emissions technology and sets a de facto mandate on the adoption of electric vehicle technology that is at an early stage of development in the trucking industry. Currently there is very limited quantities for battery electric trucks on the road today and hydrogen fuel cell trucks are an even smaller number.7 [EPA-HQ-OAR-2022-0985-1472-A1, p. 2]

7 EPA Comment I.D. EPA-HQ-OAR-2022-0985-1442.

ABF also stated, with respect to the six electric trucks currently in its fleet: Our experience with these EVs [electric vehicles] is that our range and usable application is greatly diminished in comparison with clean diesel technology. In addition, all locations have experienced both financial and physical constraints regarding supporting infrastructure.8 [EPA-HQ-OAR-2022-0985-1472-A1, pp. 2-3]

8 EPA Comment 1.D. EPA-HQ-OAR-2022-0985-1442.

The American Truck Dealers Division of the National Automobile Dealers Association (ATDD/NADA) told9 EPA that alternative-fueled trucks, including those powered by plug-in electrics and hybrids, hydrogen and hydrogen fuel cells, and natural gas, ‘are too costly for most customers and unsuitable for most applications’ and that ‘[i]n addition to price, the greater obstacles to adoption are range and weight.’ The ATDD/NADA also noted that a Class 8 truck (gross vehicle weight rating in excess of 33,000 pounds) compared unfavorably across a range of factors to an equivalent diesel-fueled truck: (1) range of 150 miles without refueling compared to 1,000 to 1,500 miles for the diesel-fueled truck, (2) servicing costs double the cost of servicing the diesel-fueled truck, and (3) purchase price of nearly $500,000 compared to $180,000 for the diesel-fueled truck. The ATDD/NADA summed up the case: ‘Trucking is a for-profit business, and commercial viability is crucial for acceptance.’ EPA’s proposed rule fails the commercial viability test. And EPA should remain ever mindful that profits are essential to the generation of jobs. [EPA-HQ-OAR-2022-0985-1472-A1, p. 3]

9 Testimony by the American Truck Dealers Division of National Automobile Dealers Association before the Environmental Protection Agency, Washington, DC (May 3, 2023). EPA Comment I.D. EPA-HQ-OAR-20220985-1445.

The administrative record in this proposed rulemaking makes clear that EPA’s proposed rule would force the American transportation industry to use trucks that are nearly three times as expensive as current trucks, with ten percent of the range, double the servicing costs, and little supporting infrastructure to plug into for electric refueling. EPA’s rule would force substantial new costs on the trucking industry and thereby damage the economic viability of trucking companies, shippers, and consumers. While EPA can ignore the higher costs it imposes on truck-shipped goods, American families who pay for those goods cannot. [EPA-HQ-OAR-2022-0985-1472-A1, p. 3]

Organization: Valero Energy Corporation

D. EPA fails to adequately consider economic impacts of the proposed rule.

EPA has not prepared a comprehensive costs model with respect to its proposal. Without doing so, EPA cannot adequately consider alternatives that emphasize affordability alongside emissions reductions. EPA’s analysis also fails to convey the consequences and difficulties associated with the major technology transformation required under the rule. For example, EPA should quantify risks and potential impacts to American stakeholders. This includes accurately disclosing the total costs of compliance and quantifying impacts to America’s job market. Without doing so, EPA’s analysis of the proposed rule is inconsistent and incomplete. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 35 - 36]

1. EPA’s consideration of program costs is limited to HDV manufacturers and purchasers.

Section 3 of the DRIA represents the costs that EPA estimates “would be incurred by manufacturers and purchasers of HD vehicles impacted by the proposed standards. We also present the social costs of the proposed standards.”175 EPA has not quantified the following program costs:

- Costs to utilities for upgrades of local electrical distribution systems to accommodate increased PEV charging, despite EPA's expectation that "distribution system upgrades may be borne by utilities rather than directly incurred by BEV or fleet owners."176
- Costs to utilities for actively managing charging behavior to mitigate potential risks to the electrical grid;177
- Costs to ratepayers, especially economically-disadvantaged communities, who lack the flexibility to charge off-hours and may incur higher electricity costs;
- Costs to states and communities relating to road wear by heavier vehicles, which especially for regional and long-haul heavy-duty vehicles, cannot be recouped via EV registration fees;
- Lost state revenue due to loss of gas tax, which especially for regional and long-haul heavy-duty vehicles, cannot be recouped via EV registration fees;
- Full impacts to fleet owners and independent operators, including:
  - Loss of revenue and efficiency due to charging "dwell time;"
  - Accounting for impacts to fleets operating in remote areas, where higher daily VMT are needed;
  - Accounting for impacts to fleets operating in areas with higher electricity rates;
  - Loss of value in the secondary HDV market; and
  - Costs associated with battery replacements; and
- Impacts to taxpayers footing the bill for BIL and IRA tax credits. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 36 - 37]

175 DRIA at 272

176 DRIA at 201

177 DRIA at 70

EPA claims it is required to consider the costs only to the motor vehicle industry to come into compliance with the new emissions standards. That is incorrect, at least with regard to these rules that transform the vehicle market and are designed to address social policy. The cases EPA relies upon—Motor & Equipment Manufacturers Association Inc. v. EPA, 627 F.2d 1095, 1118 (D.C. Cir. 1979) and Coalition for Responsible Regulation v. EPA, 684 F.3d 120, 128 (D.C. Cir. 2012)—are inapposite because they were not addressing "social cost" and were not creating transformative changes to force a change from traditional combustion vehicles to ZEVs that require wholly different manufacturing and fueling sources, consumer choices, and changes to vehicle infrastructure. EPA must consider all the costs of compliance that are substantially affected by its new standards, including costs on the manufacturers of the vehicles, manufacturers of the batteries (including miners, refiners, and manufacturers of the battery source materials) and other component parts of traditional combustion engines, manufacturers and sellers of the fuels (whether electric or liquid fuels), consumers who must change their types of vehicles and fuels, and any others who will be substantially impacted by these new mandates. [EPA-HQ-OAR-2022-0985-1566-A2, p. 37]

G. EPA fails to adequately consider the environmental justice impacts of the proposed rule.

EPA's assessment of environmental justice (EJ) in the proposed rulemaking is inappropriately limited to tailpipe emissions. Other lifecycle emissions like power generation and proximity to battery production and recycling facilities lack an equivalent EJ analysis. EPA implicitly defends this decision in its rulemaking analysis by estimating that that “[t]he [electricity generating unit] EGU impacts decrease over time because of projected changes in the power generation mix.” Additionally, EPA’s EJ analysis fails to address impacts to electricity rates when utilities seek to pass costs incurred under the proposal onto consumers and/or balance load requirements during peak hours. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 47 - 48.]

For these reasons, the EJ analysis in the proposal is incomplete per EPA’s own EJ assessment criteria. Specifically, when assessing the potential for disproportionately high and adverse health or environmental impacts of regulatory actions on minority populations, low-income populations, tribes, and/or indigenous peoples, EPA should answer three broad question

1. Is there evidence of potential EJ concerns in the baseline (the state of the world absent the regulatory action)?

2. Is there evidence of potential EJ concerns for the regulatory option(s) under consideration?

3. Do the regulatory option(s) under consideration exacerbate or mitigate EJ concerns relative to the baseline?

EPA fails to perform this full assessment for its proposal. Consequently, EPA ignores EJ concerns both inherent to the baseline and exacerbated by the proposal. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

Moreover, EPA’s proposed rule exposes EJ communities to greater direct emissions associated with increased local electricity generation. This is because EPA’s proposal disassociates and discounts environmental attributes from emissions-intensive electricity generation. Supporting electricity generation is predominantly located in more remote, rural regions that are geographically isolated from urban centers. EPA ignores the fact that increased electrical demand, such as demand from electric vehicles, will be satisfied by increasing ready, local, and on-demand power generation in response to demand spikes, and thus increased emissions associated with the same. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

Further, EPA has previously acknowledged the environmental impacts of electricity delivery, but has failed to mention them in its analysis. These impacts include: line loss (“the longer the distance the electricity must travel from generation to consumer, the larger the line loss”); the loss of trees and other plants near power lines to keep vegetation from touching the wires; the placement of powerlines and their access roads in undeveloped areas, which “can disturb forests, wetlands, and other natural areas”; and sulfur hexafluoride (“[m]any high-voltage circuit breakers, switches, and other pieces of equipment used in the transmission and distribution system are insulated with sulfur hexafluoride, which is a potent greenhouse gas. This gas can leak into the atmosphere from aging equipment or during maintenance and servicing.”) The environmental impacts of electricity delivery should be disclosed in the proposed rulemaking and further evaluated as related to EJ concerns. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

By incentivizing electricity generation through an unsynchronized deployment of HD ZEVs, EPA’s proposal directly impacts EJ communities by contributing to additional, local emissions to meet HD electric vehicle charging demand. Consequently, EJ communities might incur an incremental burden in exchange for the subsidization of HD ZEVs for commercial trucking companies. And EPA’s EV policy occurs at expense of our most vulnerable communities burdened by emissions as a direct result of the proposal, with no corresponding benefit. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 48 - 49.]

Similarly, EPA overlooks the EJ impacts of increased production, recycling, and disposal associated with lithium-ion batteries. On May 24, 2023, EPA issued a memo clarifying that used vehicle batteries are to be regulated under EPA's Universal Waste standards and are subject to RCRA requirements for recycling.231 As EPA maintains, hazardous waste management facilities are disproportionately located near EJ communities. Yet EPA has not considered the volume of hazardous waste that will be generated under the proposed rule, nor has it identified the location of facilities currently permitted to handle these materials, much less performed a siting analysis to identify the locations of facilities most likely to be expanded to handle the increased volume of battery waste, a necessary precursor to analyzing likely impacts on overburdened communities. [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

231 https://insideepa.com/sites/insideepa.com/files/documents/2023/jun/epa2023_1003.pdf

EPA's EJ analysis must be thorough and inclusive of factors that may impact the price of freight goods, such as HD ZEV affordability, the availability of public and depot charging as well as refueling infrastructure, reasonable charging practices, and a lifecycle analysis of electric vehicles and power generation emissions. Without doing so, EPA runs the risk of intensifying price disparities relative to the baseline for EJ communities. [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

Executive Order (EO) 12898 establishes federal executive policy on EJ. It directs federal agencies, "to the greatest extent practicable and permitted by law," to make "achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on communities with environmental justice concerns in the United States."232 If EJ is truly a commitment for EPA, it should carefully consider criticisms like those leveled by The Two Hundred for Housing Equity, who point out the disproportionate impacts to working and minority communities as a result of both California's and EPA's climate approach regarding electrified transport; those impacts and concerns remain true, and indeed are magnified under the proposed HD rule.233 [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

232 59 FR 7629, February 16, 1994.

233 See, e.g., Brief of Amicus Curiae, The Two Hundred for Housing Equity in State of Texas et al. v. EPA, Case No. 22-1031, D.C. Circuit.

Accordingly, EPA should provide for a transparent and reasoned impact analysis. The Agency falls short in communicating challenges associated with electrified HD transport with the absence of any substantive EJ assessment regarding its proposal. EJ stakeholders should have an opportunity to evaluate the data, costs, and assumptions underlying the proposal and any alternative analysis before EPA finalizes its proposed rulemaking. It is critical from the outset to minimize the potential for price shocks and supply disruptions. As written, EPA's proposal is not fit for the purposes of EJ communities. At minimum, EPA should perform a thorough EJ assessment specific to its HD proposal that is comprehensive of both transport challenges and impacts faced by EJ stakeholders and the government-wide Justice40 Initiative.234 [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

234 https://www.whitehouse.gov/environmentaljustice/justice40/.

Summary and Response:

Summary:

Clean Fuels Development Corp. submitted comments regarding which costs to consider and methodology for doing so.

Response:

Regarding CFDC stating that EPA failed to consider the costs to build new factories capable of manufacturing heavy-duty electric and fuel cell vehicles, see discussion of RPE in RIA Chapter 3 and RTC section 12.1. Regarding the cost to build DC fast-charging stations across the country, EPA has fully assessed this cost under the modeled potential compliance pathway supporting the feasibility of the final standards. See preamble Section II.D.2.iii and II.E.5 and RTC sections 6 and 7. Regarding the cost of new electric infrastructure, including generation, transmission, distribution, and transformers, EPA has fully assessed these costs under the modeled potential compliance pathway supporting the feasibility of the final standards. See RTC sections 6 and 7, including the discussion of the Multi-State Transportation Electrification Impact Study. Regarding costs for maintenance on BEV and FCEV heavy-duty vehicles, EPA has fully assessed these costs under the modeled potential compliance pathway supporting the feasibility of the final standards. See RIA Chapter 2.4.4.1. Regarding battery replacement costs, see RIA Chapter 2.4.1.1.4 addressing issues of battery deterioration in our final HD TRUCS analysis. See also RIA Chapter 3.4.7.6 addressing operating costs associated with battery replacement and ICE engine rebuilding in the final rule program costs analysis. Regarding battery recycling or disposal costs, see RTC sections 4.7 and 17.1 responding to comments relating to battery recycling and disposal. Regarding increased road and tire wear because of increased vehicle weight, and associated disbenefits and environmental justice impacts from the resulting higher particulate matter emissions, see RTC section 4.6 and 13 and RIA Chapter 4.1 (discussion of accounting for tire wear in emission inventories) and 4.2.4.2 (particulate matter inventory). Note that commenters Delek and Valero made the identical comment, and our response to their comments are therefore the same. Regarding increased insurance costs, see RIA Chapter 2.8.8.3 accounting for insurance costs under the modeled potential compliance pathway supporting the feasibility of the final standards. Regarding loss of jobs in the American automotive industry and other related industries, see RTC section 19 discussing issues relating to employment impacts.

Summary:

CFDC further maintains that EPA "attempt[s] to hide the costs of the rule by spreading them across multiple classes of truck buyers. The proposal does not conduct a marginal cost analysis of the rule across each sub-category of vehicles but instead uses averaging, exceeding the agency's statutory authority as discussed above, to blend these costs together and thus hide the infeasibility of electrifying larger and heavier classes of vehicles."

Response:

The commenter is mistaken. Both at proposal and in the final rule preamble and RIA, EPA has presented manufacturer costs and purchaser costs by regulatory group (light heavy-duty vocational vehicles, medium heavy-duty vocational vehicles, heavy heavy-duty vocational vehicles, day cab tractors, and sleeper tractors) for clarity and digestibility. See, e.g., RIA Chapter 2.10. From many stakeholders, including the regulated entities' (manufacturers') perspective, understanding the costs of the standards at this grouping is informative. Additionally, we have clarified in the final rule that while the vocational vehicle costs are presented in some tables at the regulatory group level (e.g., LHDV), if they were instead presented at the regulatory subcategory level (e.g. CI LHDV MP, CI, LHDV R, and CI LHDV U) the costs for each regulatory subcategory would be the same as the respective regulatory group costs. We also note that these groupings are less aggregated than the averaging set level. See 40 CFR 1037.740. Importantly, to determine the costs presented in these groupings, both at proposal and in the final rule preamble and RIA, EPA both examined and presented the manufacturer and purchaser costs of the final standards (including relevant aspects of those costs like DMC, RPE, operating costs, and infrastructure costs and tax credits as applicable) for each of the 101 vehicle types in HD TRUCS. Furthermore, each vehicle ID for each vehicle type clearly identifies the vehicle's regulatory subcategory through indication of class and intended vehicle duty cycle, and each regulatory group is also presented for each of the 101 vehicle types. See DRIA Chapters 2.3.2, 2.4.3.4, 2.5.2, 2.8.2; RIA Chapters 2.3.2.1, 2.4.3.4, 2.5.2, 2.9.2, 2.9.3, 2.10.6.1. Thus, EPA's cost estimates were thoroughly explained and transparently presented (and even more transparently presented than commenter advocated for, including from the purchaser's perspective, given presentation by vehicle type), and were not "blended" to hide costs of larger and heavier classes of vehicles. EPA in fact included in those tables all the results of our HD TRUCS analysis for transparency, including even cost estimates for those vehicle types that EPA did not include in the technology packages for the modeled potential compliance pathway based on consideration of relevant factors like payback. Also, EPA's analysis does in fact find that certain categories of heavier vehicles are in fact more difficult and costly to electrify, and we have established the standards accordingly, for example, by providing greater lead-time for some regulatory groups (e.g., HHD and sleeper cabs) and by considering the availability of FCEV in addition to BEV technologies for certain applications.

<u>Summary:</u>

Daimler Truck North America LLC (DTNA) states that the EPA underestimated incremental costs for ZEVs. DTNA would like EPA to revisit cost assumptions as the market develops.

<u>Response:</u>

EPA's costs analysis has been updated from proposal as explained in RIA Chapter 2 and RTC Sections 2.4 and 3. DTNA's cost estimates are for BEV vehicle prices in 2023, which mirror current vehicles and not vehicles during the timeframe of the Phase 3 standards reflecting increased learning and higher production levels. EPA is committing to monitor the industry's compliance with the standards, their development of new technologies including ZEVs, the growth and barriers associated with public & depot charging infrastructure, and the development of the hydrogen fueling infrastructure leading up to and through the early years of Phase 3. We will be issuing annual reports of what we find.

<u>Summary:</u>

Delek states that present costs to purchasers of BEVs are higher than for a comparable ICE vehicle, and questions EPA's findings relating to payback or other predictions of price parity. The commenter also notes that there are associated charging costs which must be considered. Delek also maintains that EPA has failed to account for critical mineral price volatility.

Response:

We note that Delek's comment is short of specifics. In the proposed rule, EPA provided detailed cost analysis in DRIA Chapters 2 and 3. As explained in RIA Chapter 2 and RTC Sections 2.4 and 3, EPA's costs analysis has been updated from proposal and EPA's payback analysis is found at RIA Chapter 2.9.2 and reflects both the back-of-the-meter (EVSE purchase and installation) and front-of-meter (distributive grid buildout) costs. See RIA Chapter 2.8.7 and RTC section 7 (Distribution). Moreover, the commenter focuses on current BEV vehicle prices, which reflect current vehicles and not vehicles during the timeframe of the Phase 3 standards reflecting increased learning and higher production levels. See also the comment from DTNA excerpted above stating that incremental costs of HD BEV production will fall over time. See Preamble section II.D.2.ii and RTC section 17.2 where issues relating to price volatility of critical minerals are addressed in detail.

Summary:

Valero states that EPA failed to consider the following costs at proposal, and that EPA should take these costs into account in promulgating Phase 3 standards:

- Costs to utilities for upgrades of local electrical distribution systems to accommodate increased PEV charging, despite EPA's expectation that "distribution system upgrades may be borne by utilities rather than directly incurred by BEV or fleet owners."
- Costs to utilities for actively managing charging behavior to mitigate potential risks to the electrical grid;
- Costs to ratepayers, especially economically-disadvantaged communities, who lack the flexibility to charge off-hours and may incur higher electricity costs;
- Lost state revenue due to loss of gas tax, which especially for regional and long-haul heavy-duty vehicles, cannot be recouped via EV registration fees;
- Full impacts to fleet owners and independent operators, including:
    - Loss of revenue and efficiency due to charging "dwell time;"
    - Accounting for impacts to fleets operating in remote areas, where higher daily VMT are needed
    - Accounting for impacts to fleets operating in areas with higher electricity rates;
    - Loss of value in the secondary HDV market;
    - Costs associated with battery replacements;

Impacts to taxpayers footing the bill for BIL and IRA tax credits.

Response:

Regarding the first bullet of the comment summary, EPA has considered the costs to utilities of distributive grid buildout with respect to both depot and public charging as part of its cost analysis for the final rule. See Preamble section II.D.2.ii.c and RTC section 7 (Distribution).

Regarding the second bullet in the comment summary, this comment does not articulate with reasonable specificity the risks the commenter is concerned about. See preamble Section II and RTC section 7 discussion of EPA's thorough analysis regarding the grid. As we note in section 7, we find that managed charging can significantly reduce the costs of charging BEVs, provide services back to the grid, and potentially generate revenue for fleets, relative to not implementing managed charging. As such, further deployment of managed charging practices would likely create additional savings, as opposed to additional costs, for fleets, as well as for society.

Regarding the third bullet of the comment summary, EPA considers the costs to BEV purchasers, including those associated with distributive grid buildout as part of the cost of charging. See RIA Chapter 2.4.4.2. That analysis includes differential rates depending on whether depot charging or en route charging is involved. See also RTC Sections 6 and 7.

Regarding the fourth bullet in the comment summary, we acknowledge the comment and note that we have been fully transparent in showing associated fuel reductions. See RIA Chapter 3. In addition, EPA does not regard state tax revenues as social costs because they are transfers.

Regarding the fifth bullet in the comment summary:

- The issue of depot dwell time, and how it can be accommodated to fit commercial schedules, is addressed fully at RIA Chapter 2.6.2.1.4.
- We have taken into account in the HD TRUCS analysis availability of ICE vehicles to accommodate extreme conditions such as those posited in this comment. Our modeled potential compliance pathway includes ICEVs in the technology packages, in all of the regulatory subcategories, for such purposes.
- See earlier portion of this response concerning EPA's methodology for assessing cost of electricity.
- As noted in RTC section 3.8.1, there is a dearth of experience on resale value of HD BEVs. However, for the final rule, we conducted a supplemental TCO analysis that includes the impact of residual value as a proxy for resale value. The results from our TCO analysis (RIA Chapter 2.12) show that the costs for owning and operating a ZEV will be lower than a comparable ICE vehicle for all MY 2032 BEVs and FCEVs in our technology packages to support the modeled compliance pathway when evaluated over a five-year time horizon including the impact of residual value. Moreover, we note that our payback analysis does not assume resale value; that is, we find that vehicles pay back regardless of what the resale value is, including if the resale value were hypothetically to be zero.
- See RIA Chapter 2.4.1.1.4 for our analysis of issues associated with battery deterioration and RIA Chapter 3 regarding inclusion in our program cost analysis.

Regarding the sixth bullet in the comment summary, all of our assumptions regarding utilization of incentives under the IRA are transparent and reasonable. See RTC Section 2.7; preamble Sections II.E.2 and II.E.4; and RIA Chapters 2.4.3.1, 2.4.3.5, and 2.6.2.1. Regarding that these are a 'cost' to tax payers, our approach of reducing the cost for vehicle purchasers is proper because these costs are meant to estimate the costs purchasers will incur upon purchasing a new vehicle. Therefore, those tax credits should be included, i.e., they should reduce the price paid by the purchaser. As we did in the NPRM, we have omitted the tax credits and taxes in our calculation of costs to society (see Section IV.E of the preamble) as these are transfers from taxpayers to purchasers and we present those transfers for full transparency in Section VIII.B of the preamble. Moreover, Congress, not EPA, made the decision to enact the IRA. (Note that commenter Delek submitted a virtually identical comment, and the response is the same.)

<u>Summary:</u>

Valero disputes that EPA is required to consider the costs only to the motor vehicle industry to come into compliance with the new emissions standards. Valero states that EPA's approach is incorrect, at least with regard to these rules that transform the vehicle market and are designed to address social policy.

Response:

As the commenter admits, EPA's stated position is consistent with applicable law. See e.g., Coalition for Responsible Regulation, 684 F. 3d at 128. Valero seeks to distinguish these cases on the grounds that they did not consider 'social costs' and were not considering rules which create "transformational changes". There is no language in the opinions to support these statements. Nor is the Phase 3 rule transformational or undertaking a different approach under our same CAA section 202(a)(1)-(2) authority to setting standards than previous HD standards rulemaking. See preamble Section I and II and RTC section 2.1, noting among other things that costs to manufacturers and emission reductions associated with the Phase 3 rule are generally similar to or smaller than those of the past CAA section 202(a)(1)-(2) standards addressing GHG emissions. Indeed, the emission reductions associated with the Phase 3 rule are essentially identical to those in the rule upheld by the D.C. Circuit in Coalition for Responsible Regulation. 684 F. 3d at 128. Finally, EPA notes that we did not limit our costs considerations to only costs of compliance. Consistent with our prior HD GHG rules, EPA also considered costs to purchasers. EPA also performed a broader analysis of the impacts of the rulemaking, including net benefits to society, as reflected in preamble Sections VII-VIII.

Summary and Response:

Valero also raises a number of issues concerning EPA's Environmental Justice analysis. These comments are addressed in RTC section 18.

Summary:

NFIB indicates that the proposed rule would have significant impacts on small businesses notwithstanding that such businesses are not directly regulated under the rule. They also incorrectly state that EPA did not conduct a benefit-cost analysis for the rule. They point to testimony from public hearings regarding the limited range of current HDV ZEVs, challenges associated with infrastructure, and higher purchase prices for current technologies.

Response:

See RIA Chapter 9 for our assessment of small business impacts, and Section 26 of this RTC for our response to other commenters indicating EPA should consider the impacts of businesses not directly regulated under the rule. NFIB's series of comments relating to EPA's cost benefit analysis are without merit, as explained in the responses in RTC section 23. EPA conducted a benefits-cost analysis for both the proposed and final rule, as discussed in preamble Section VIII. In both cases, the net benefits of the proposed rule and final rule exceed the costs. For the final rule, after considering comments, EPA made a number of updates to our technical analyses that support the final standards, as described in preamble Section II and RIA Chapter 2. These updates include upfront technology costs, operating costs, an updated evaluation of infrastructure development and a commitment to monitor infrastructure after the rulemaking. The commenter also says that the proposed rule was a mandate, picking winners and losers. Neither the proposal nor the final rule mandates any specific compliance pathway. The standards are performance based, and manufacturers may choose any compliance strategy that meets the standards, including without producing additional ZEVs to comply with this rule. See, e.g., RTC section 2.1 and preamble section II.F.4. The commenter also notes that one of its member companies has had disappointing experiences with current BEVs due to limited range. Our analysis includes consideration of and addresses issues of range such that operational functionality is not impeded under the modeled potential compliance pathway. See generally RIA Chapter 2.4.1 and 2.9.1.3.

2.7 Accounting for federal and state measures

<u>Comments by Organizations</u>

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Moreover, as explained above, EPA has not provided any basis for its assumption that manufacturers will be able to take full advantage of the IRA's Section 13502 tax credit within the compliance period to reduce their direct manufacturing costs. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 53 - 54]

Organization: American Trucking Associations (ATA)

Higher cost for transportation

As noted above, the IRA provides a commercial clean vehicle tax credit of up to $40,000 per vehicle through 2032 to offset the higher incremental cost of commercial ZEVs. In addition, an alternative fuel refueling property tax credit of up to $100,000 is available for projects located in low-income or rural census tracts. While the availability of these tax credits helps offset a portion of the vehicle and infrastructure expense, ensuring the credits are structured for fleet use will help incentivize higher utilization rates. Currently, the IRA credit covers less than the $48,000 in federal excise tax when fleets purchase a $400,000 BEV day cab. Also, the Alternative Fuel Refueling Infrastructure Tax Credit has limiting factors where fleets will be unable to qualify due to their depot locations or tax liability. These additional costs must be passed on to consumers for businesses to stay profitable. [EPA-HQ-OAR-2022-0985-1535-A1, p. 14]

Organization: Arizona State Legislature

EPA's analysis includes a tax credit from the Inflation Reduction Act to those who purchase or lease a qualifying vehicle. 88 Fed. Reg. 25,945. EPA calculates 'the purchaser's incremental cost of [battery electric vehicles] and [fuel-cell electric vehicles] compared to [internal combustion engine] vehicles and not the full cost of vehicles in our analysis.' Id. EPA projects 'that the impact of the IRA vehicle tax credit will be significant.' Id. at 25,946. EPA believes that the Inflation Reduction Act provisions 'reduce or eliminate the cost difference between [internal combustion engine] vehicles and [zero-emission vehicles].' Id. at 25,954. EPA relies on this analysis to conclude that it expects the Inflation Reduction Act 'will incentivize the demand and purchaser acceptance for [heavy-duty zero-emission vehicles].' Id. at 25,998. EPA calculates that the proposed rule will save $1.4 billion in vehicle costs. Id. at 26,082. [EPA-HQ-OAR-2022-0985-1621-A1, p. 22]

EPA's analysis already has proven inaccurate. Contrary to EPA's assumptions, the price for electric vehicles has not remained static with the passage of the Inflation Reduction Act. Instead, days before passage of the Inflation Reduction Act, 'Ford and General Motors announced price increases at similar rates' as the Act's tax credits.17 Inflation and supply-chain issues have caused electric car prices to 'surge' and mean fewer buyers can use the Inflation Reduction Act tax credits.18 [EPA-HQ-OAR-2022-0985-1621-A1, p. 22]

17 Ryan King, Inflation Reduction Act promises $7,500 electric vehicle credits after Ford and GM raised prices, WASHINGTON EXAMINER, Aug. 16, 2022, available at https://www.washingtonexaminer.com/news/democratsextended-credits-evs-ford-gm-prices.

18 Keith Laing, Electric Cars' Surging Prices Mean Fewer Buyers Can Use Tax Credit, BLOOMBERG, Aug. 4, 2022, available at https://www.bloomberg.com/news/articles/2022-08-04/electric-cars-rising-prices-mean-fewer-buyerseligible-for-senate-tax-credit.

Vehicles also have been eliminated from receiving the full tax credit. Ford and Chrysler parent Stellantis reported in April that 'most of its electric and plug-in electric hybrid models will see tax credits halved to $3,750 on April 18 after new U.S. Treasury rules take effect.'19 In fact, just 11 electric cars from four automakers qualify for the full tax credit.20 And this limited availability comes before any changes made in response to Senator Joe Manchin, the critical vote to passing the Inflation Reduction Act, who threatened to repeal the bill or sue the Treasury Department because the tax credit standards are too liberal.21 [EPA-HQ-OAR-2022-0985-1621-A1, p. 22]

19 David Shepardson and Nathan Gomes, Ford, Stellantis says new rules will cut EV tax credits for most models, REUTERS, Apr. 5, 2023, available at https://www.reuters.com/business/autos-transportation/ford-confirms-all-threeevs-plug-in-hybrids-eligible-ira-subsidies-2023-04-05/.

20 Lawrence Ulrich, Electric Vehicle Tax Credit Rules Create 'Chaos for Consumers,' The New York Times, Apr. 20, 2023, available at https://www.nytimes.com/2023/04/20/business/electric-vehicle-tax-credits-consumers.html.

21 Ramsey Touchberry, Sen. Manchin threatens to repeal his own climate law if Biden continues to 'liberalize' it, WASHINGTON TIMES, Apr. 25, 2023, available at https://www.washingtontimes.com/news/2023/apr/25/sen-joemanchin-threatens-repeal-his-own-climate-l/; David Shepardson, Manchin threatens to sue US Treasury over EV tax credit rules, REUTERS, Mar. 30, 2023, available at https://www.reuters.com/world/us/democratic-sen-manchinthreatens-legal-action-over-treasury-ev-battery-guidance-2023-03-29/.

EPA also does not grapple with the economic reality that the Inflation Reduction Act's 'net impact is likely to be negative on electric vehicle sales in the immediate future.'22 Other economic analysis concluded the strings attached to the Inflation Reduction Act tax credits 'are likely to make [electric vehicles] even more expensive.'23 [EPA-HQ-OAR-2022-0985-1621-A1, p. 23]

22 Anderson Economic Group, 'An estimated 3/4 of recent EV purchases would no longer qualify for tax credits under the proposed 'Inflation Reduction Act',' Aug. 9, 2022, available at https://www.andersoneconomicgroup.com/atleast-four-ira-provisions-will-negatively-affect-sales-of-electric-vehicles/.

23 Tori Smith, 'Proposed Tax Credits Would Make Electric Vehicles More Expensive,' AMERICAN ACTION FORUM, Aug. 4, 2022, available at https://www.americanactionforum.org/insight/proposed-tax-credits-would-make-electricvehicles-more-expensive/.

This all significantly affects EPA's analysis. Vehicles that EPA's analysis includes as eligible for the credit are now ineligible due to price increases or Treasury Department regulations. The resulting higher prices for electric vehicles, and reduced amount and availability of subsidies, will affect consumer demand. EPA's conclusions that there is no cost difference between gas-powered and electric-powered vehicles, and that there will be a corresponding increase in purchaser demand, are thus erroneous. [EPA-HQ-OAR-2022-0985-1621-A1, p. 23]

Organization: BlueGreen Alliance (BGA)

At the same time, EPA must consider that the manufacturing investments from the Inflation Reduction Act and Bipartisan Infrastructure Law will take time to achieve their full production capacity. EPA should coordinate with DOE, the U.S. Department of Transportation (DOT), and the U.S. Department of Commerce (DOC) to ensure that the manufacturing investments from the Inflation Reduction Act and Bipartisan Infrastructure Law will be fully leveraged to support regulatory compliance. Programs like the Battery Manufacturing and Recycling Grants (DOE), the Battery Material Processing Grants (DOE), the Domestic Manufacturing Conversion Grants (DOE), the 48C Advanced Manufacturing Tax Credit (DOE/DOC), the Advanced Technology Vehicle Manufacturing Loan Program (DOE), the Clean Heavy-Duty Vehicle Program (EPA), the Clean School Bus Program (EPA), the National Electric Vehicle Infrastructure (NEVI) Program (DOT), and the Charging and Fueling Infrastructure Grant Program (DOT) all provide unprecedented federal resources that manufacturers and fleet owners can leverage to support both supply and demand for low- and zero-emission heavy-duty vehicles. However, these programs take time to bear fruit—whether that means a complete heavy-duty vehicle-enabled EV charging network, or a robust supply chain for Buy America-compliant transit and school buses. [EPA-HQ-OAR-2022-0985-1605-A1, pp. 6 - 7]

It is essential to workers and communities that these programs be carefully designed and implemented, with robust stakeholder engagement. This helps ensure that they adhere to Justice40 requirements as well as the new Build America, Buy America provisions that are critical to ensuring that federal programs support domestic manufacturing investment. [EPA-HQ-OAR-2022-0985-1605-A1, p. 7]

With that, EPA must account for the time it takes to convert federal awards and allocations into actual domestic production capacity and critical on-the-ground infrastructure. EPA should coordinate with DOT and DOE to fully assess the availability of charging and fueling infrastructure for heavy-duty vehicles, and related grants and loans. [EPA-HQ-OAR-2022-0985-1605-A1, p. 7]

Research from the International Council on Clean Transportation (ICCT) suggests that 85% of long haul trucking charging needs in 2030 would be met by zero emission fueling infrastructure buildout of the National Highway Freight Network as designated by the Federal Highways Administration—that is, the construction of medium- and heavy-duty fueling infrastructure every 50 miles. Additionally, the energy needs assumed by a fully-electric medium and heavy-duty fleet are not expected to be limited by power generation capacity in most areas across the country. ICCT has identified priority counties representing the most highly industrialized parts of the country, which will require significant and targeted investment to meet energy demand and fueling infrastructure needs in the near term.11 [EPA-HQ-OAR-2022-0985-1605-A1, p. 7]

11 International Council on Clean Transportation, Near term infrastructure deployment to support zero-emission medium- and heavy-duty vehicles in the United States, May 2023. Available Online: https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf.

Organization: Bradbury, Steven G.

(Text giving the following bullet points context: Some of the most consequential burdens and negative ramifications of the proposed rules that EPA hides, disregards, or minimizes include the following:)

- Putting the Highway Trust Fund at risk. The Highway Trust Fund, which covers a large percentage of the costs of state and local highway improvements and maintenance in the U.S., is currently funded through a gas tax. The gas tax is relatively easy to administer because it is paid at the level of wholesale gasoline and diesel fuel distribution by a small number of large distributors. If more than half of new vehicles sold in the U.S. were EVs, as contemplated in the EPA's proposals, the gas-tax revenues for the Fund would drop dramatically, and the solvency and utility of the Fund would collapse. That would threaten the viability of the national highway system and the capacity of states to maintain highways in good repair. [EPA-HQ-OAR-2022-0985-2427-A2, p. 19]

  If the Fund were to be retained in some form, it would require a new source of revenue, such as a tax on all vehicle miles traveled, or VMT. The idea behind a VMT tax is that it would equitably capture the VMT of EVs, just as well as ICE vehicles. However, a VMT tax is likely to be more complicated and costly to administer than the gas tax. There are significant questions about the design and administrability of a VMT tax that would need to be worked out and proven—for example, through one or more state-wide pilot programs—before implementation. Since EPA is proposing to adopt rules that would cause a national shift to EVs, which in turn would undermine the revenue basis for the Highway Trust Fund, EPA should recognize and consider as part of these rulemakings the upfront costs and dislocations that would be involved in transitioning to a new revenue basis for the Highway Trust Fund, as well as the ongoing higher costs of administering such an alternative tax. [EPA-HQ-OAR-2022-0985-2427-A2, p. 19]

Organization: California Air Resources Board (CARB)

The transportation sector remains the largest source of GHG emissions, both in the U.S. and in California, with HDVs2 constituting an important source of transportation emissions.3 HDVs contribute about eight percent of total California GHG emissions. Further, GHG emission reductions from HDVs are needed to avoid the worst effects of climate change and warmer temperature driven increases in ozone.4 [EPA-HQ-OAR-2022-0985-1591-A1, p.11]

2 The HDV terminology based on weight class differs in federal and CARB regulations. In California, vehicles with 8,501 to 14,000 pounds gross vehicle weight rating (GVWR) are considered medium-duty vehicles (MDV). Vehicles with greater than 14,000 pounds GVWR are considered HDVs. In these comments, HDV is used to refer to vehicles greater than 14,000 pounds GVWR.

3 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, Proposed Rules, 88 Fed. Reg., April 27, 2023, page 25928. https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

4 U.S. EPA's How Climate Change May Impart Ozone Pollution and Public Health through the 21st Century, February 15, 2022. https://www.epa.gov/sciencematters/how-climate-change-may-impact-ozone-pollution-and-publichealth-through-

21stcentury#:~:text=Higher%20levels%20of%20GHG%20emissions,other%20respiratory%20and%20cardiovascular%20conditions.

As a leader in climate action, California has ambitious goals to combat climate change:

- 40 percent below 1990 GHG emissions by 20305
- More aggressive target of 80 percent below 1990 emissions by 20506
- Decarbonization by 2045 with Governor Newsom ordered targets for a zero emission (ZE) heavy-duty (HD) fleet by 2035 for drayage trucks and by 2045 for all HD trucks7 [EPA-HQ-OAR-2022-0985-1591-A1, pp.11-12]

5 Executive Order B-30-15 signed by Governor Brown in 2015.

6 Executive Order S-3-05 signed by Governor Schwarzenegger in 2005.

7 Executive Order N-79-20 signed by Governor Newsom in 2020.

The California Air Resources Board (CARB) has already taken several important steps to help California reach these targets and to accelerate the use of HD zero-emission vehicles (ZEV), including Advanced Clean Trucks (ACT) ZE sales requirements approved in June 20208 and Advanced Clean Fleets (ACF) further driving fleet purchases and turnover to ZEVs approved in April 2023.9 Eight states10 have exercised their options under the Clean Air Act (CAA) to join California HD programs with every fourth U.S. truck today registered in an ACT state. [EPA-HQ-OAR-2022-0985-1591-A1, p.12]

8 ACT regulation is part of a holistic approach to accelerate a large-scale transition of ZE MDVs and HDVs from class 2b to class 8. The regulation has a manufacturer sales requirement and a reporting requirement. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

9 ACF regulation is part of CARB's overall approach to accelerate a large-scale transition to ZE MDVs and HDVs. This regulation works in conjunction with the ACT regulation. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets

10 Joined by eight (8) ACT-adopted states (MA, NJ, NY, OR, VT, WA, MD, and CO).

As discussed further in Part I. Sections A., C.1., G.1., and I.1., on April 28, 2023, CARB approved the adoption of the ACF regulation, which accelerates the widespread adoption of ZEVs in California's MD and HD truck sector beyond the ZEV adoption rates required by the ACT regulation. CARB staff projects that the ACF regulation will significantly increase the number of MD and HD ZEVs in California beyond the ZEV sales attributable to the ACT regulation, by approximately 190,000 ZEVs in 2035, 450,000 ZEVs in 2045, and 640,000 ZEVs in 2050,23 and determined that the technology needed to comply with the ACF requirements sufficiently exists. More specifically, CARB staff found that ZEVs are currently available in every weight class of trucks, and each weight class includes a wide range of vehicle configurations. Staff also found that currently there are 148 models in North America where manufacturers are accepting orders or pre-orders, and there are 135 models that are actively being produced and are being delivered to customers.24 Moreover, the recent announcements by manufacturers (described above) also support CARB staff's projections that there will be a sufficient supply of ZEVs available for fleets to purchase. [EPA-HQ-OAR-2022-0985-1591-A1, pp.15-16]

23 CARB, Staff Report: Initial Statement of Reasons, Public Hearing to Consider the Proposed Advanced Clean Fleets Regulation (2022), Executive Summary, Section C. Staff Report available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf

24 Id. at Section I.F; see also Appendix J to the Staff Report (listing makes and models of commercially available ZEVs); Appendix J available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appj.xlsm

Moreover, on August 16, 2022, President Joe Biden signed the IRA. This landmark piece of federal legislation establishes several provisions which will reduce costs of MD and HD ZEVs and will accelerate the ZEV market. Some of the most significant provisions include tax credits of up to $40,000 per ZEV or 30 percent of each BEV charger, three billion dollars to convert the United States Postal Service (USPS) fleet to ZE, up to $45/kilowatt hour (kWh) to produce batteries in the U.S., $3 billion in grants and $20 billion in loans to support ZE manufacturing in the U.S. These and other provisions will encourage significant investments in ZEV manufacturing and accelerate ZEVs into the market. The fleet-focused provisions of the IRA will decrease the TCO of ZEVs and lower the upfront acquisition costs for vehicles as well as the associated infrastructure. Several studies have been recently released which discuss the positive impact the IRA will have on the HD ZEV market.40,41,42,43 [EPA-HQ-OAR-2022-0985-1591-A1, p.19]

40 Environmental Defense Fund, Inflation Reduction Act gives truck electrification a dose of adrenaline, 2022 (web link: https://blogs.edf.org/energyexchange/2022/09/12/inflation-reduction-act-gives-truck-electrification-adose-of-adrenaline/ last accessed January 2023).

41 The International Council on Clean Transportation, Analysing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States, 2023 (web link: https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23.pdf last accessed February 2023).

42 Rocky Mountain Institute, The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, 2022 (web link: https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/ last accessed January 2023).

43 Roush, Inflation Reduction Act 2022 Impact Study, 2022 (web link: https://blogs.edf.org/climate411/files/2022/09/2022-09-EDF-Rouch-IRA-MHD-Final-1.pdf last accessed January 2023).

In summary, CARB staff has acquired information during its promulgation of the ACF regulation that informed its determination that the projected costs of compliance of that regulation, which requires rates of ZEV adoption exceeding those projected in response to the Proposed Standards, are reasonable within the proposed time frame. That same information supports the adoption of standards more stringent than U.S. EPA's preferred alternative and at least as stringent as U.S. EPA's most stringent alternative. [EPA-HQ-OAR-2022-0985-1591-A1, p. 19]

As CARB staff explains in greater detail throughout these comments, alternative standards that reflect higher rates of ZEV adoption than the Proposed Standards are indisputably more protective of the public health and welfare than the Proposed Standards and are therefore more consistent with U.S. EPA's obligations to prescribe and revise emissions standards to address the harms that GHGs and other pollutants present to the public health and welfare. [EPA-HQ-OAR-2022-0985-1591-A1, p.20]

Organization: California Air Resources Board et al.

This timing is critical to act strongly now because the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA) are bringing unprecedented levels of funding for infrastructure and vehicles over the next decade. The integrated magnitude of the commercial vehicle tax credits in particular is dependent on purchaser choices to employ them—a situation where strong immediate EPA leadership can materially increase the total financial sum at play and attract the kinds of innovative business models and financial instruments making those increased benefits accessible across the most fleets and end users. As noted in our March 2023 letter5, climate change is an urgent problem demanding immediate action. With increasing examples of how climate change is already harming human health and the environment, and progressively sobering reports on how the harm will increase over time, additional actions are paramount if we are to limit the most severe impacts – much of which will be disproportionately borne by those least equipped to adapt. We are at a unique point in history—rapid technological innovation with hundreds of US commercialized zero emission truck models currently available provides a generational opportunity to catalyze the transition of the heavy-duty transportation sector to zero emission vehicles. This is one of the most significant opportunities you will have as EPA's Administrator to improve public health in the United States and abroad, delivering benefits for generations. [EPA-HQ-OAR-2022-0985-1594-A1, p. 1]

5 Submitted March 7, 2023.

Throughout the country, mobile sources and the fossil fuels that power them are the largest contributors to the formation of ozone, greenhouse gas emissions, fine particulate matter (PM2.5), and toxic diesel particulate matter. Without transforming the heavy-duty sector to zero emission everywhere possible, we cannot fully protect communities, meet our greenhouse gas reduction commitments, or achieve (or maintain) our health-based air quality standards. [EPA-HQ-OAR-2022-0985-1594-A1, p. 2]

The stage has been set for transforming the heavy-duty truck sector. To date, 17 states, the District of Columbia and the Province of Quebec have entered into a Medium-and Heavy-Duty (MHD) ZEV Memorandum of Understanding6 with the goal to make at least 30 percent of all new MHD vehicle sales zero emissions by no later 2030. In July 2022, the signatories released a Medium and Heavy-duty ZEV Action plan7 including policy options to foster a self-sustaining market for zero-emission MHD vehicles with a focus on near-term strategies. [EPA-HQ-OAR-2022-0985-1594-A1, p. 2]

6 https://www.nescaum.org/documents/multistate-truck-zev-mou-media-release-20200714.pdf

7 https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf

As states who have adopted or are anticipating the adoption of ACT, we recognize the importance and need for parallel progress as it relates to ZEV infrastructure readiness. While infrastructure remains a real near-term challenge – it does not need to be a long-term barrier. A recent ICCT study8 shows that infrastructure can scale for zero emission vehicles at a pace that meets and exceeds a national ACT-aligned standard. Consistent with the MHD ZEV Action plan, several programs are currently being administered by local and state agencies to catalyze the deployment of zero-emission transportation technologies that include Make Ready investments, point-of-sale ZEV truck purchase rebates9, and charging infrastructure incentives. [EPA-HQ-OAR-2022-0985-1594-A1, p. 2]

8 https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/

9 https://calstart.org/voucher-incentive-programs-2023/

Organization: Clean Fuels Development Coalition et al.

And, as will be discussed later in this comment, the proposal's listed costs grossly underestimate the rule's true costs. The proper metric is aggregate cost because the major-questions doctrine asks about the rule's significance to the "national economy." West Virginia v. EPA, 142 S. Ct. at 2609 (2022). These aggregate costs include: [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

Taxpayer subsidies: Taxpayers will inevitably subsidize the sales of electric vehicles, charging infrastructure, roads, and the electricity generation, transmission, and distribution required to power these vehicles. The proposal currently discounts these costs from the rule, which is unreasonable. See 88 Fed. Reg. 26,039 ("neither the battery tax credit nor the vehicle tax credit is included in the social costs analysis."). [EPA-HQ-OAR-2022-0985-1585-A1, pp. 6 - 7]

G. The proposal's purchaser acceptance calculations are based on the availability of tax credits that themselves require domestic manufacturing.

The proposal also repeatedly relies on the tax credits from the IRA to justify the proposed rule. These tax credits are split into two types: 30D credits for "clean vehicles" and 45W credits for "commercial clean vehicles." To qualify for the credit, the former contains a requirement for critical minerals and battery components to be sourced domestically or in a country with which the United States has a free trade agreement. Most—but not all—heavy-duty vehicles fall into the latter category. The proposed rule ignores the effect of domestic sourcing requirements on vehicles in the former category. [EPA-HQ-OAR-2022-0985-1585-A1, p. 29]

As amended by the IRA, the 30D tax credits require an increasing share of minerals to be produced domestically and explicitly exclude vehicles whose components are minerals are sourced from foreign entities of concern—any foreign entity that is "owned by, controlled by, or subject to the jurisdiction or direction of a government of a covered nation (as defined in section 2533c(d) of title 10)"—currently China, Russia, North Korea, and Iran.12 In its proposal, EPA makes no mention of what fraction of minerals are mined domestically and glosses over the fact that China is a key supplier of some 85% of the global stock of critical minerals (including rare earths, copper, cobalt, etc.), Robert Bryce, The Electric-Vehicle Push Empowers China, Wall St. J. (Dec. 23, 2021), and that almost no vehicles will be able to qualify for this credit in the near future. And indeed, as of April 17, 2023, only 16 vehicles qualify for the light duty tax credit and some only qualify for half of the tax credit because they only meet the critical mineral or battery components standards. Hannah Northey, Biden's EV bet is a gamble on critical minerals, E&E News (Apr. 18, 2023), https://www.eenews.net/articles/bidens-ev-bet-is-also-a-gamble-on-criticalminerals/. This list will be further narrowed as the thresholds for domestic sourcing increase and when the foreign entity of concern requirements take effect. [EPA-HQ-OAR-2022-0985-1585-A1, p. 29]

12 The Department of the Treasury and the IRS's proposed regulation interpreting these rules is unlawful. Commentors here have submitted separate comments on that docket to that effect. See Comments of American Free Enterprise Chamber of Commerce on "Section 30D New Clean Vehicle Credit," RIN 1545-BQ52. For all of the reasons stated in that comment, most of this tax benefit will be largely unavailable here.

Neglecting that many vehicles will be excluded from these tax credits further undermines EPA's assertions of feasibility. [EPA-HQ-OAR-2022-0985-1585-A1, p. 29]

Organization: Daimler Truck North America LLC (DTNA)

The timing of new standard implementation must be technologically feasible, giving appropriate consideration to costs.

Clean Air Act (CAA or the Act) Section 202 directs the Agency to prescribe vehicle emission standards that take effect after the time period found by EPA to be 'necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.'3 As EPA notes in the Proposed Rule, emission standards established under CAA Section 202(a) must be premised on a finding of technological feasibility, and compliance costs are a key consideration.4 The 'cost of compliance' considerations embedded in CAA Section 202(a) reflect Congress's desire to 'avoid undue economic disruption in the automotive manufacturing industry' and the 'doubling or tripling the cost of motor vehicles to purchasers' through the imposition of new emission standards in an overly aggressive timeframe.5 [EPA-HQ-OAR-2022-0985-1555-A1, p. 8]

3 42 U.S.C.A. 7521(a)(2). As the U.S. Court of Appeals for the D.C. Circuit has explained, where the feasibility of EPA's vehicle emission standards depends upon future technological developments, the Agency's predictions about such developments—including the pace at which they will occur—must be reasonable. National Resources Defense Council, Inc. v. U.S. EPA, 655 F.2d 318, 331-32 (D.C. Cir. 1981) ('NRDC'). Reasonableness will be found where the Agency answers any 'theoretical objections' to the technology in question, identifies the major steps necessary in the refinement of the technology, and offers plausible reasons for believing that each of these steps can be completed in the time available. Id. at 332.

4 Proposed Rule, 88 Fed. Reg. at 25,948.

5 See Motor and Equipment Mfrs. Ass'n, Inc. v. EPA, 627 F.2d 1095, 1118 (D.C. Cir. 1979).

EPA's statutory obligation to consider costs in setting emission standards—and in particular the appropriate timeframe for such standards to take effect—is germane here. If the Phase 3 GHG standards finalized in this rulemaking are based upon an over-estimation of the pace of HD ZEV adoption (due to an under-estimation of costs and associated impacts on purchasing behavior), they will not be achievable, resulting in a reduction of product offerings in the commercial transportation sector. This result would be contrary to congressional intent to ensure that EPA emission regulations do not cause economic disruptions in the manufacturing industry and significant price increases for purchasers. It would also undermine EPA's stated goal of encouraging proliferation of low- and zero-emission engine and vehicle technology in the HD sector. [EPA-HQ-OAR-2022-0985-1555-A1, p. 8]

Funding for ZEV Applications That Are Ineligible for Current State and Federal Support Programs. As EPA is aware, there are a number of ZEV funding and financing support opportunities available for fleets that have the resources to pursue them. For example, EPA's 2022 Clean School Bus Rebate Program, which in 2022 made up to $375,000 in rebates available for Class 7+ zero-emission (ZE) bus purchases in priority districts, has demonstrated success in spurring ZE bus adoption.10 With the enactment of the IRA, Section 45W was added to the Internal Revenue Code, making a tax credit available for purchasers of qualified commercial clean vehicles.11 With a per-vehicle credit of up to $40,000, Section 45W provides a pathway for fleets with tax obligations to claim a credit for ZEV purchases. [EPA-HQ-OAR-2022-0985-1555-A1, p. 11]

10 See EPA, 2022 Clean School Bus (CSB) Rebates Program Guide (May 2022) at 6, https://nepis.epa.gov/Exe/ZyPDF.cgi/P1014WNH.PDF?Dockey=P1014WNH.PDF.

11 See 26 U.S.C. 45W.

Some states have also developed funding support programs to support ZEV uptake. California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), for example, is an important complement to the CARB Advanced Clean Trucks (ACT) and Advanced Clean Fleets (ACF) regulations, and the program directly funded more than 60% of the ZE trucks on the road in California as of January 2022.12 HVIP voucher amounts for FY22-23 are shown in Table 2 below:13 [EPA-HQ-OAR-2022-0985-1555-A1, p. 11] [Refer to Table 2 on p. 11 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

12 See California HVIP, 'Impact,' https://californiahvip.org/impact/.

13 See id., 'Funding Updates,' https://californiahvip.org/funding/.

HVIP voucher amounts facilitate lower ZEV purchase costs for fleets, helping to achieve payback in a similar timeframe as a conventional vehicle for some applications. However, like other state incentive programs, HVIP has specific geographic operational requirements, limiting a fleet's opportunity to pursue funding for vehicles with multi-state operations. [EPA-HQ-OAR-2022-0985-1555-A1, p. 11]

EPA should therefore consider supporting advocacy for federal funding of regional and long-haul applications that are ineligible under current federal and state incentive programs, either by expansion of the Section 45W tax credit, or a new per-mile tax credit for ZEVs to help spur adoption in applications that travel longer distances and offset more carbon emissions. [EPA-HQ-OAR-2022-0985-1555-A1, p. 11]

Policies to Encourage Turnover of Legacy Fleets

- Cash for Clunkers. According to an analysis of in-use vehicles performed by the Diesel Technology Forum, as of the end of 2021, 47% of the nationwide commercial truck fleet is still utilizing technology that is pre-2011 EPA MY, and these older vehicles emit significantly more GHG and criteria pollutants compared to current-technology diesel engines.20 As most of the nation's larger fleets operate on regular trade cycles, most of these vehicles are likely owned by small businesses and independent owner-operators. There are a number of small businesses with local delivery routes operating older technology that could be highly suitable for ZEV operation, but these businesses lack the capital to purchase new technology diesel engines, much less ZEVs and their infrastructure. EPA should thus consider supporting and advocating for a Cash-for-Clunkers style program designed to enable smaller fleets operating legacy technology to replace their high-emitting vehicles with new technology diesel engines or ZEVs, where suitable. [EPA-HQ-OAR-2022-0985-1555-A1, p. 15]

20 See Testimony of the Diesel Technology Forum Before the U.S. Environmental Protection Agency (April 12, 2022), available at https://www.globenewswire.com/en/news-release/2022/04/12/2420741/0/en/Testimony-of-the-Diesel-Technology-Forum-Before-the-U-S-Environmental-Protection-Agency-April-12-2022.html

IRA and BIL incentives may not have as significant an impact as EPA projects.

EPA seeks comment on how incentives enacted with passing of the IRA and BIL should factor into its TCO and market uptake projections, and asserts that these recent congressional actions will reduce uncertainty related to infrastructure.64 While DTNA appreciates the positive effects that these ambitious pieces of legislation will likely have on the HD ZEV market and believes they are directionally correct, the Company is concerned they may not have the magnitude of impact EPA is projecting. [EPA-HQ-OAR-2022-0985-1555-A1, p. 36]

64 See Proposed Rule, 88 Fed. Reg. at 26,069.

IRA Incentives

There are certain limitations on fleets' ability to claim IRA tax credits, which are not reflected in EPA's analysis in the Proposed Rule. For example, a taxpayer claiming the Alternative Fuel Refueling Property (AFRP) credit, must have a tax obligation of equal or greater value than the credit (up to $100,000).65 DTNA does not have any data on fleet tax obligations, but suspects that not all businesses will have tax obligations this sizable, especially small business fleets, which make up over 95% of fleets today.66 [EPA-HQ-OAR-2022-0985-1555-A1, p. 36]

65 See 26 U.S.C. 30C(d)(2).

66 See American Trucking Associations, Economics and Industry Data, https://www.trucking.org/economics-and-industry-data (reflecting that 95.7% of for-hire US motor carriers operate 10 or fewer trucks). Further, qualifying properties will be limited to those sited in low-income or non-urban census tracts and businesses claiming the AFRP credit must meet prevailing wage and registered apprenticeship requirements. DTNA does not have data to determine how many fleets will be eligible for this tax credit but believes that its impact may be limited in scope based on these and other qualifying criteria. Even where fleets are eligible to claim this tax credit, it is likely that the credit will not substantially offset EVSE costs for depot sites requiring multiple chargers.

In addition, there is a lack of alignment between EPA's treatment of the Section 45W clean vehicle tax credit and the Congressional Budget Office's (CBO) cost estimates in its analysis of the budgetary effects of the IRA.67 As reflected below in Table 13, CBO estimates that the Section 45W commercial clean vehicle tax credit will have a budgetary impact of approximately $2.7 billion total during the years 2027-2031.68. Conservatively assuming that the maximum credit of $40,000 was claimed for each eligible Class 4 - Class 8 vehicle purchased during those years, this budgetary estimate would reflect 67,250 new vehicle purchases. This figure is significantly less than EPA's target of 550,000 new MHD and HDD ZEVs on the road by 2032. Even if EPA's vehicle target turns out to be realistic, DTNA is concerned that the Section 45W program could be curtailed if ZEV penetration rates are much higher than CBO's budgeted amounts. [EPA-HQ-OAR-2022-0985-1555-A1, p. 36] [Refer to Table 13 on p. 37 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

67 See Congressional Budget Office, Cost Estimate, 'Estimated Budgetary Effects of H.R. 5376, the Inflation Reduction Act of 2022' (rev. Aug. 5, 2022), https://www.cbo.gov/system/files/2022-08/hr5376_IR_Act_8-3-22.pdf.

68 Id. at Table 1.

Similarly, as reflected in Table 14 below, the CBO estimates that the budgetary effects of the AFRP tax credit will be a total of $1.16 billion from 2027-2031.70 Conservatively estimating that each taxpayer claiming the credit is entitled to the maximum credit of $100,000, this amount reflects 11,630 property sites, without considering funding for residential sites. If the actual budgetary impact of the AFRP tax credit is significantly greater than this amount, this could potentially impact future availability of the credit. [EPA-HQ-OAR-2022-0985-1555-A1, p. 37] [Refer to Table 14 on p. 37 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

70 Id.

DTNA projects that such an exceedance is likely, estimating that approximately $30 billion will be needed for EVSE charging equipment and installation between 2027 and 2032 to support Class 3-8 BEVs. Assuming CBO's estimated amounts were invested exclusively in commercial vehicle infrastructure, it would represent only about 5% of the total EVSE funding needed for the ZEV transition. EPA should thus revise its estimation of the impacts that the IRA will have on TCO and fleet adoption rates. [EPA-HQ-OAR-2022-0985-1555-A1, p. 37]

EPA states there are other provisions of the IRA that will support electrification that EPA has not modeled and therefore asserts that the Agency's projected impacts of the IRA are somewhat conservative.72 While DTNA believes the IRA will provide valuable benefits for targeted applications, like the U.S. Postal Service Clean Vehicle Fleet and Facility Management, and spur some manufacturing and research and development growth, DTNA does not believe there are other provisions under the IRA that will significantly alter the TCO calculation or address needed ZEV infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 37-38]

72 See Proposed Rule, 88 Fed. Reg. at 25,946.

BIL Incentives

EPA also appears to over-estimate the impacts that BIL incentives will have on TCO and infrastructure buildout during the timeframe covered by the Proposed Rule. For example, the NEVI Formula Program, widely touted for encouraging buildout of public charging along AFCs, does not require stations to accommodate HDVs. DTNA has reviewed the NEVI plans submitted by all 50 states, the District of Colombia, and Puerto Rico, and from this review it appears that most states believe HD public charging infrastructure is out of scope for the NEVI program.73 Other states make no mention at all of HD infrastructure.74 DTNA has also met with a number of state transportation agencies to discuss the importance of including HDV charging infrastructure in the NEVI program, and most have provided feedback that they would require additional federal guidance to do so. Like the IRA, DTNA believes the BIL will help move industry toward a ZEV future, but the scope of the legislation does not alter the TCO calculation beyond what EPA has accounted for, and is unlikely to lead to significant HDV infrastructure buildout. [EPA-HQ-OAR-2022-0985-1555-A1, p. 38]

73 See Appendix B, 'DTNA Summary and Excerpts of State Infrastructure Deployment Plans for National Electric Vehicle Infrastructure (NEVI) Formula Program.'

74 See id.

State HD ZEV incentives are not uniform and have been adopted only by a minority of states.

EPA's market analysis turns in part on the proliferation of state incentives to accelerate HD ZEV adoption in recent years.75 However, this analysis overlooks the fact that state incentives have not been uniformly adopted. Indeed, there are wide variations in terms of state-level engagement on incentivizing HD ZEVs and supporting infrastructure. While seventeen (17) states have signed on to a Memorandum of Understanding (MOU) committing to take certain measures to promote ZEV adoption in the HD vehicle market (including considering ACT adoption),76 the majority of states have declined to mandate or incentivize HD ZEVs, nor adopted policies supporting development of ZEV infrastructure or requiring utilities to make-ready for new demands on the grid for ZEV charging. [EPA-HQ-OAR-2022-0985-1555-A1, p. 38]

75 See, e.g., 88 Fed. Reg. at 25,939 (noting, among other developments since the Phase 2 GHG final rule that have led to increased application of ZEV technologies, that ‘there have been multiple actions by states to accelerate the adoption of HD ZEVs,’including ACT adoption in California and elsewhere, and the execution of the multi-state MD ZEV Memorandum of Understanding (MOU) establishing goals to support widespread electrification of the HD vehicle market).

76 See Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding (July 2020), available at https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf/.

Even in jurisdictions that have adopted HD ZEV-supportive laws and policies, these programs are generally designed to ensure regional benefits and often contain in-state or intrajurisdiction operational requirements. As an example, the California HVIP program requires voucher recipients to commit to operate HVIP-funded vehicles within the State of California for at least three years after the voucher redemption date.77 As another example, the South Coast Air Quality Management District (SCAQMD) Mobile Source Offset Program (MSOP) provides a crediting mechanism for the operation of low- or zero-emission on-road vehicles that result in emission reductions beyond those required by local, state and federal regulations, but credits accrue only for the operation of such vehicles ‘within the boundaries of the District.’78 Washington State provides significant incentives for purchases of clean commercial vehicles through its Commercial Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Tax Credit, but this credit may only be claimed by Washington taxpayers who operate qualifying vehicles that are registered in Washington and display a Washington license plate.79 Further, some states have even adopted policies to discourage ZEV adoption, as discussed below in Section II.B.3.e. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 38-39]

77 See Implementation Manual for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) (March 15, 2022) at 36, available at https://californiahvip.org/wp-content/uploads/2022/03/HVIP-FY21-22-Implementation-Manual-03.15.22.pdf. There are some allowances for vehicles registered in a California county that borders another state or Mexico, emergency response vehicles, Class 8 freight trucks, and vehicles that are registered via the California DMV’s International Registration Plan. Otherwise, HVIP-funded vehicles must operate 100 percent within California for at least three years, and mileage is verified via telematics reporting by the manufacturer. Id.

78 SCAQMD Rule 1612(a).

79 See RCWA 82.04.4496.

Given that state incentive programs have not been uniformly adopted across the United States—and that the programs that have been adopted generally do not provide credit and support mechanisms for ZEV adoption in long-haul, interstate commercial operations—EPA should reevaluate the extent to which state incentives for HD ZEV adoption can be factored in to its cost and market penetration analyses. [EPA-HQ-OAR-2022-0985-1555-A1, p. 39]

EPA should conduct a sensitivity analysis of all cost inputs used in the HD TRUCS analysis to understand the range of alternative ZEV uptake rates under different scenarios.

As discussed above, there is significant uncertainty in a number of EPA's cost projections, which have major implications for the calculated ZEV adoption rates and proposed CO2 standard stringency levels. DTNA strongly recommends that EPA conduct a sensitivity analysis of all costs used in the HD TRUCS tool, especially component costs and fuel costs, and calculate what the impact on ZEV uptake would be in those alternate scenarios. EPA should use this sensitivity analysis when conducting the periodic reviews of the appropriateness of the Phase 3 CO2 standards, as discussed in Section II.C.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 39]

EPA Request for Comment, Request #10: As described in Section II of the proposed rule, EPA has considered the potential impacts of the BIL and the IRA in our assessment of the appropriate proposed GHG standards both quantitatively and qualitatively, and we request comment on our approach.

- DTNA Response: While DTNA appreciates the positive effects that these ambitious pieces of legislation will likely have on the HD ZEV market and believes they are directionally correct, the Company is concerned they may not have the magnitude of impact EPA is projecting, as discussed in Section II.B.3.a of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 160]

EPA Request for Comment, Request #40: We welcome comment on our assessment of how the IRA will impact the heavy-duty industry, and how EPA could consider reflecting those impacts in our assessment for establishing the HD GHG standards under this proposal, including comment on methods to appropriately account for these provisions in our assessment.

- DTNA Response: See DTNA Response to Request # 10, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 164]

EPA Request for Comment, Request #41: We welcome comment on how we included the IRA tax credits for HD vehicles in our assessment.

- DTNA Response: DTNA believes it is appropriate to model the cost impacts of IRA tax credits but has several concerns with EPA's overall treatment of the cost of HD vehicles, as detailed in Section II.B.3 of these comments. The Company also believes that EPA should consider the effects of the IRA expiring in 2032 and the potential risks that the IRA tax credits could be modified or eliminated, also discussed in Section II.B.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 165]

EPA Request for Comment, Request #71: We request comment, including data, on all aspects of the cost analysis. In particular, we request comment on our assessment of the IRA tax credits (see Sections IV.C.2 and IV.D.2) and operating costs (see Section IV.D.5). We also request comment, including data, on alternative approaches to estimating cost that may help inform our cost estimates for the final rulemaking.

- DTNA Response: See DTNA Response to Request # 10, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172] [Refer to section 2 of this comment summary]

EPA Request for Comment, Request #72: We request comment on our assessment of the impact of the IRA tax credits.

DTNA Response: See DTNA Response to Request # 10, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172] [Refer to section 2 of this comment summary]

Organization: Electrification Coalition (EC)

In addition to the economics of HD EVs and the current adoption rates, incentive programs at the state level are driving fleets to transition their fleet to electric. For example, the PA MHD incentive program recently closed the application period with an oversubscription of projects. In Q1 2023, Pennsylvania's Department of Environmental Protection (DEP) released $13 million from the Volkswagen (VW) Settlement for a Medium- and Heavy-Duty Zero-Emission Fleet Vehicle Pilot Grant program.18 The pilot offered up to 100% of funding for Class 4-8 vehicles and supporting fueling infrastructure. A cost-share depended on applicant type, with non-government applicants eligible for up to 75% of reimbursement costs, and government applicants eligible for up to 90% of reimbursement costs. Act 47 financially distressed municipalities in PA could receive up to 100% of eligible costs.19 The PA DEP reported that 34 pre-application meetings were held, with an estimated 25 final applications submitted from that pool. Applications closed March 31, 2023, and a final announcement of awardees is pending. The PA DEP staff estimate they can fund anywhere from 2-6 applicants depending on applicant type and project scope; the PA DEP has stated that this program shows the great depth of interest from Pennsylvania businesses to electrify their fleets. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 6-7]

18 https://files.dep.state.pa.us/Air/Volkswagen/MHDZEV_ProgramGuidelines.pdf

19 https://dced.pa.gov/local-government/act-47-financial-distress/

Another example of a state level HD EV incentive program that is driving adoption of EVs is the NJ Zero Emission Incentive Program (NJ ZIP), which is showing high interest even with micro and small businesses. NJ ZIP is a $90 million pilot administered by the New Jersey Economic Development Authority (NJEDA) to provide vouchers for the purchase of zero-emission MHD vehicles. Of the $43.3 million in voucher applications received for Phase 1, NJEDA approved $39 million. In Phase 1, vouchers under this program were eligible for the purchase of Class 2B to Class 6 vehicles. Phase 2 of the program is currently accepting applications. However, due to the high interest in NJ ZIP, NJEDA has received applications exceeding the amount of funding available for this program. It should be noted that phase 2 of the program increased eligibility of the program to include Class 7 and 8 vehicles. While vouchers are capped at 100% of the vehicle cost, bonuses are provided to applicants that meet certain requirements. For example, small businesses and minority-, women-, and veteran-owned businesses and applicants purchasing a school bus are eligible to receive bonuses. Additionally, applicants that commit to operating the vehicle at a given percentage in environmental justice communities will receive a bonus. [EPA-HQ-OAR-2022-0985-1558-A1, p. 7]

Other states currently have HD EV incentive programs or are considering ones. For example, legislation in NV this past year (AB 184) considered a MHD EV incentive program. Florida also considered an MHD EV incentive program in 2023. As states develop their Carbon Reduction Program plans, some are considering setting aside a portion of funds to create MHD EV incentives as well. While not all of these policies and programs passed or were adopted this year, this shows significant interest from policymakers to promote adoption of HD vehicles in this sector. [EPA-HQ-OAR-2022-0985-1558-A1, p. 7]

Organization: Energy Innovation

The latest Intergovernmental Panel on Climate Change report makes clear that this is the decade of action if we are to reverse course on untenable and dangerous climate change: "In this decade, accelerated action to adapt to climate change is essential to close the gap between existing adaptation and what is needed. Meanwhile, keeping warming to 1.5°C above pre-industrial levels requires deep, rapid and sustained [GHG] emissions reductions in all sectors. Emissions should be decreasing by now and will need to be cut by almost half by 2030, if warming is to be limited to 1.5°C."5 [EPA-HQ-OAR-2022-0985-1604-A1, p. 3]

5 Intergovernmental Panel on Climate Change, "Press Release: Urgent Climate Action Can Secure a Liveable Future for All," March 20, 2023, https://www.ipcc.ch/report/ar6/syr/downloads/press/IPCC_AR6_SYR_PressRelease_en.pdf.

Fortunately, the Inflation Reduction Act (IRA) and the Bipartisan Infrastructure Law (BIL) helped tip the scale in favor of climate-oriented investments and the adoption of ZEVs, namely battery electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEVs). [EPA-HQ-OAR-2022-0985-1604-A1, p. 3]

Energy Innovation's modeling reveals that the IRA's transportation electrification incentives (combined with infrastructure investments in the BIL) can jump-start transportation decarbonization this decade. However, these federal policies are insufficient to cut the sector's GHG emissions at the pace needed to achieve the U.S. Nationally Determined Contribution (NDC) and to be aligned with the Paris Agreement to limit global warming and achieve net zero by 2050. Mitigating the transportation sector's (especially HDVs') impact on the climate and public health will require additional policy and regulatory action in the next decade, including stronger federal tailpipe emissions standards. Our modeling shows that widespread deployment of ZEVs, powered by a clean grid, can help reduce GHG emissions to meet the U.S. NDC.6 See Figures 1 and 2. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 3 - 4.] [See Figure 1, Economy-Wide GHG Emissions, and Figure 2, Transportation Sector GHG Emissions and Reductions, on page 4 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

6 Robbie Orvis et al., "Closing the Emissions Gap Between The IRA And 2030 NDC: Policies To Meet The Moment" (Energy Innovation Policy and Technology LLC, December 2022), https://energyinnovation.org/publication/closing-the-emissions-gap-between-the-ira-and-ndcpolicies-to-meet-the-moment/.

Organization: Environmental Defense Fund (EDF)

ii. Impacts of Historic IRA Investment Further Support Feasibility and Accelerating Cost Declines.

Substantial investments in the IRA only further confirm the feasibility and cost-effectiveness of EPA standards that help ensure nationwide ZEV levels consistent with the ACT rule. In particular, the IRA included "Credit for Qualified Commercial Clean Vehicles" which provides a tax credit for those who purchase qualified M/HDVs between 2023 and 2032 of up to $40,000.37 In particular, the IRA included "Credit for Qualified Commercial Clean Vehicles" which provides a tax credit for those who purchase qualified M/HDVs between 2023 and 2032 of up to $40,000.38 ERM estimates that these and other IRA provisions will provide almost $3 billion in incentives for MHD ZEV purchases.39 This funding has already catalyzed significant investments in EV manufacturing and associated jobs. For example, EDF and WSP found that over $120 billion in private EV supply ecosystem investments and 143,000 new jobs have been announced in the last eight years.40 Nearly $90 billion in EV manufacturing announcements has occurred since the IRA and BIL laws passed and almost $50 billion of that, representing 42 percent of all announced EV investments, has occurred in just the last 6 months since the passage of the IRA. [EPA-HQ-OAR-2022-0985-1644-A1, p. 19] [See Table 2 on p. 19 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

37 Inflation Reduction Act of 2022, P.L. 117-169, § 13404.

38 Inflation Reduction Act of 2022, P.L. 117-169, § 13404.

39 Ellen Robo and Dave Seamonds. 2022. Inflation Reduction Act Supplemental Assessment: Analysis of Alternative Medium- and Heavy-duty Zero-Emission Vehicle Business-as-Usual Scenarios, ERM for EDF, Table 2. (Attachment L).

40 See infra n 195. (Attachment AA)

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

Short of including safeguards in the proposed standards to support the domestic auto manufacturing base, the EPA expects minimal incentive for manufacturers to shift to foreign production as a result of the rule.10 However, in its analysis, we are concerned the EPA overvalues the incentives available to domestic manufacturers to produce vehicles and components domestically.11 The new 45W Commercial Clean Vehicle tax credits for the purchase of medium- and heavy-duty EVs do not include domestic assembly or domestic content requirements.12 Since November 2022, the import of goods generally, and of automotive vehicles and parts in particular, has increased as more goods arrive from Mexico and Canada.13 For this reason, these federal investments should not prima facie be expected to support the domestic build-out of the EV supply chain. Targeted safeguards are necessary to ensure the proposed standards support the domestic production of vehicles and components, instead of encouraging a shift to foreign production. We encourage the EPA to implement standards that strengthen the domestic auto manufacturing supply chain and require the EV transition to provide the same level of investment and quality jobs as the current ICE footprint. [EPA-HQ-OAR-2022-0985-1596-A1, p. 4-5]

10 See id. at 26071 (“The proposed emission standards are not expected to provide incentives for manufacturers to shift between domestic and foreign production. This is because the emission standards apply to vehicles sold in the United States regardless of where such vehicles are produced. If foreign manufacturers already have increased expertise in satisfying the requirements of the emission standards, there may be some initial incentive for foreign production”).

11 See id. at 26073 (“This investment includes the BIL, the CHIPS Act, and the IRA, which are expected to create domestic employment opportunities along the full automotive sector supply chain, from components and equipment manufacturing and processing to final assembly, as well as incentivize the development of reliable EV battery supply chains. For example, the IRA is expected to impact domestic employment through conditions on eligibility for purchase incentives and battery manufacturing incentives. These conditions include contingencies for domestic assembly, domestic critical materials production, and domestic battery manufacturing”).

12 See, e.g., 26 U.S.C. § 45W.

13 Austen Hufford and Anthony DeBarros, “China’s Share of U.S. Goods Imports Falls to Lowest Since 2006”, (The Wall Street Journal, June 7, 2023), https://www.wsj.com/articles/u-s-imported-more-cars-phones-supplies-from-abroad-9157aca6

Organization: Lion Electric, Co. USA

Driving BEV school bus demand over the next five years will dramatically increase due to support from the EPA’s Clean School Bus Program (CSBP) created under President Biden¡¦s Bipartisan Infrastructure Law. This program has already begun to help deploy zero-emission buses and replace their polluting diesel predecessors. Over $900 million was awarded during the 2022 CSBP to replace close to 2,500 diesel-powered school buses. This speaks volumes to school districts being eager to move toward clean energy, zero-emission school buses. [EPA-HQ-OAR-2022-0985-1506-A1, p. 3]

The continued success of California’s longstanding HVIP program, the second installment of the New Jersey ZIP program, and thousands of zero-emission trucks funded via the statewide Volkswagen Settlement funding programs, has led for a greater demand for zero-emission trucks across many industries. Behind the increase in near-term demand for zero-emission equipment are government regulations and subsidies aimed at reducing carbon emissions and improving air quality. [EPA-HQ-OAR-2022-0985-1506-A1, p. 3]

Additionally, incentive programs such as the Clean Heavy-Duty Vehicles and Port’s program and the 45W tax credits in the Inflation Reduction Act, will continue to support these goals, help achieve cost parity, and encourage fleet owners to transition to electric trucks. [EPA-HQ-OAR-2022-0985-1506-A1, p. 3]

Organization: National Waste & Recycling Association (NWRA)

With the projected adoption of ZEVs in the waste industry, we ask that EPA work with U.S. Department of Transportation (USDOT) to resolve the issue of heavier battery vehicles needing to reduce the amount of mass they can haul to comply with truck weight restrictions. EPA and USDOT should work together to minimize pollution without sacrificing cargo carrying capacity of vehicles. This potential reduction of cargo capacity should also be included in EPA’s economic analysis of the rule. [EPA-HQ-OAR-2022-0985-1616-A1, p. 2.]

Organization: Natural Gas Vehicles for America (NGVAmerica)

(7) The Administration should work with Congress to amend the federal excise tax on new trucks to reduce the impediment to fleets and businesses purchasing cleaner new trucks by either eliminating the tax altogether since it discourages new purchases or amend the tax so that it does not penalize more costly, lower polluting technologies (i.e., eliminate the excise tax on the incremental cost). [EPA-HQ-OAR-2022-0985-1522-A1, p. 13]

Organization: RMI

Inflation Reduction Act Transforms Total Cost of Ownership

The Inflation Reduction Act’s (IRA) incentives for heavy-duty trucks are market transforming and RMI was thrilled to see the EPA took these incentives into account in their market analysis.

With the IRA in place, the industry can dramatically decarbonize by making electric trucks cheaper than diesel trucks in most use cases, with urban and regional trucks becoming cost-superior to diesel as soon as 2023. RMI analysis found due to the EV market acceleration from IRA could result in reducing heavy-duty sector GHG emissions by 59 percent in 2035, nearly double what would happen without the IRA. [EPA-HQ-OAR-2022-0985-1529-A1, p. 5]

Two tax credits are key to making heavy-duty trucks more affordable, and were analyzed in the following RMI analysis:

- Qualified Commercial Clean Vehicles Credit: Vehicles greater than 14,000 lbs. that operate on batteries alone receive a tax credit of $40,000 or 30 percent of the vehicle cost, whichever is lower.
- Alternative Fuel Refueling Infrastructure Credit: Charger infrastructure tax credits are 30 percent of the cost of installing chargers, up to a lifetime benefit of $100,000 per site. [EPA-HQ-OAR-2022-0985-1529-A1, p. 5]

Through the global Mission Possible Partnership, RMI analyzed trucking economics and how that drives zero-emissions truck adoption. Once zero-emissions trucks become cheaper than their diesel counterparts, adoption follows based predominately on vehicle and infrastructure availability. And with the IRA, the total cost of ownership of electric trucks will be lower than diesel ones approximately five years sooner than without the law. This is true for urban trucks that travel locally in cities an average of 50–100 miles a day; regional trucks that move 100–250 miles per day and return to the same depot; and long-haul trucks that travel 250 or more miles between cities and need to recharge en route.11 [EPA-HQ-OAR-2022-0985-1529-A1, p. 5] [Refer to Figure on p. 5 of docket number EPA-HQ-OAR-2022-0985-1529-A1]

11 Kahn et Al, The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, RMI, 2022, https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

Organization: Tesla, Inc. (Tesla)

Federal and State Medium- & Heavy- Duty Incentives

Finally, the agency should be prepared to consider the role new state and federal incentives may play in deployment of heavy-duty electric vehicles. Federally, numerous heavy-duty electrification grants, demonstration programs, incentives, and infrastructure incentives were included in the Infrastructure Investment and Jobs Act of 2021.113 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 16-17]

113 See, DOE, Alternative Fuel Data Center, Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act of 2021) available at. https://afdc.energy.gov/laws/infrastructure-investment-jobs-act

State incentives will create additional uptake of BEVs in the medium- and heavy-duty sector. These incentives already exist in California,114 Colorado,115 Connecticut,116 Massachusetts,117 New York,118 Utah,119 and Washington.120 Recent sales suggest this is already occurring.121 In California, the rapid expansion of participation in the Clean Truck and Bus Voucher Incentive Project (HVIP) since 2017 exemplifies the increasing readiness of commercial purchaser uptake of NOX and GHG reducing medium and heavy-duty BEV technologies.122 This rapid transition will have significant public health and welfare health benefits, not only in California but also globally.123 [EPA-HQ-OAR-2022-0985-1505-A1, p. 17]

114 California, HVIP, Carl Moyer, LCFS, and additional CARB programs not listed.

115 Colorado, Colorado Department of Revenue Innovative Truck Credits available at https://www.colorado.gov/pacific/sites/default/files/Income69.pdf

116 Connecticut, Public Act No. 22-25 (May 10, 2022) available at https://www.cga.ct.gov/2022/ACT/PA/PDF/2022PA-00025-R00SB-00004-PA.PDF

117 Massachusetts, MOR-EV Trucks Program available at https://mor-ev.org/

118 New York, New York Truck Voucher Incentive Program available at https://www.nyserda.ny.gov/All-Programs/Truck-Voucher-Program?utm_source=NYTVIP+Newsletter&utm_campaign=c8407b1d6e-EMAIL_CAMPAIGN_2020_06_04_10_38_COPY_01&utm_medium=email&utm_term=0_a4f89bc0f7-c8407b1d6e-89607338; New York City Clean Truck Program available at https://www.nycctp.com/

119 Utah, Utah Code 59-7-618.1. Tax credit related to alternative fuel heavy duty vehicles available at https://le.utah.gov/xcode/Title59/Chapter7/59-7-S618.1.html?v=C59-7-S618.1_2021050520210505

120 Washington, Clean Alternative Commercial Vehicle and Infrastructure Tax Credit available at https://dor.wa.gov/content/clean-alternative-fuel-commercial-vehicle-and-vehicle-infrastructure-bo-or-put-tax-credit

121 Fleet Owner, Pace of heavy EV sales quickens with two recent deals (Mar. 22, 2022) available at https://www.fleetowner.com/emissions-efficiency/electric-vehicles/article/21237583/pace-of-heavy-ev-sales-quickenswith-two-recent-deals

122 CARB, Second Public Work Group to Discuss the Clean Truck and Bus Voucher Incentive Project (HVIP) for Fiscal Year 2022-23 (June 28, 2022) at Slide 9 available at https://ww2.arb.ca.gov/sites/default/files/2022- 06/June_28_HVIP_WG_Slides.pdf (showing rapid uptake starting in 2017).

123 ICCT, Heavy-Duty Zero-Emission Vehicles: Pace and Opportunities for a Rapid Global Transition (May 18, 2022) available at https://theicct.org/publication/hdv-zevtc-global-may22/ (finding that actions among G20 economies to ensure that all new HDVs are either ultra-low or zero-emission could avoid 3 million premature deaths through 2050, equivalent to 5 trillion USD in health benefits. The magnitude of these benefits would be greater with an accelerated transition to HD ZEVs.)

Finally, the IRA has established programs, such as the Clean Heavy-Duty Vehicles Program, to address climate change by reducing GHG emissions and improve the air quality through the acquisition and use of zero-emission vehicles.124 The program directs EPA to award a total of $1 billion through grants and rebates to eligible recipients (e.g., states and municipalities) to replace existing heavy-duty vehicles with clean zero-emission vehicles and develop zero-emission vehicle infrastructure. The funding can be applied to up to 100% of the incremental costs of replacing an eligible heavy-duty vehicle with a zero-emission vehicle. It can also be used for other activities such as purchasing, installing, operating, and maintaining infrastructure needed to fuel or maintain zero-emission vehicles. [EPA-HQ-OAR-2022-0985-1505-A1, p. 17]

124 Inflation Reduction Act of 2022, P.L. 117-169 (Aug. 16, 2022), Section 60101.

Accordingly, as supported by this growing base of data and incentives, Tesla recommends that the agency's final rule do a far better job of recognizing the expected pace and deployment of BEVs, accurately reflect the state of the existing record of technology and market conditions, and thus finalize a standard that maximizes and accelerates this transition. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 17-18]

Organization: Transportation Departments of Idaho, Montana, North Dakota, South Dakota and Wyoming

The proposed rule in this docket seeks to accelerate a shift from the use of internal combustion engine vehicles to electric vehicles (EVs). An erosion of revenue into the Highway Trust Fund (HTF) would result.1 This would place significant downward pressure on highway and bridge investment, which already faces an investment backlog of $786 billion per U.S. Department of Transportation's latest 'Conditions and Performance Report' for highways, bridges and transit. [EPA-HQ-OAR-2022-0985-1487-A1, p.1]

1 The draft Regulatory Impact Statement for the proposal includes a brief reference (page 429) that, under the proposed rule, fuel consumption would be "reduced." Most fuel sales are subject to a Federal excise tax and generate the largest share of HTF revenue.

Moreover, that backlog estimate was developed before recent inflation of approximately 50% from Q1 2021 to Q3 2022 in the Federal Highway Administration's (FHWA's) highway construction cost index.2 [EPA-HQ-OAR-2022-0985-1487-A1, p.1]

2 For the NHCCI see – https://explore.dot.gov/views/NHIInflationDashboard/NHCCI?%3Aiid=1&%3Aembed=y&%3AisGuestRedirectFromVizportal=y&%3Adisplay_count=n&%3AshowVizHome=n&%3Aorigin=viz_share_link

Significantly, at the same time that EPA has issued this NPRM, it has also issued a separate proposed rule calling for reduced tailpipe emissions of CO2, other GHGs, and other substances from passenger cars and other light-duty and medium-duty vehicles. See 88 Fed. Reg. 29184 (May 5, 2023). That proposal would accelerate growth in EVs as a percentage of new light-duty and medium-duty vehicles and erode revenue into the HTF. [EPA-HQ-OAR-2022-0985-1487-A1, p.1]

However, even though these proposed tailpipe emission rules are high profile initiatives, and the HTF and the programs it supports are high profile programs, the lengthy NPRM in this docket and its lengthy draft Regulatory Impact Analysis (RIA) do not appear to include any consideration of the adverse impacts of the proposal on revenues flowing to the Highway Trust Fund (HTF) and on highway investment – even as the new EVs encouraged by the proposed rule would generate wear and tear on the highways without paying fuel taxes into the HTF. As the HTF has been, for decades, the Federal Government's largest source of funds for highway investment, proposed policies that would erode revenue into the HTF raise important concerns that must be seriously considered by regulatory agencies. [EPA-HQ-OAR-2022-0985-1487-A1, pp.1-2]

Organization: Truck Renting and Leasing Association (TRALA)

Several Cost and Payback Estimations Remain Questionable

Significant costs under Phase 3 appear to be overlooked or underestimated. For instance, it is not uncommon for federal and state sales taxes collected on new EV trucks to be more than 10% of the base retail price of the power unit. (See Table 1 below). [EPA-HQ-OAR-2022-0985-1577-A1, p. 9] [Refer to Table 1 on p. 10 of docket number EPA-HQ-OAR-2022-0985-1577-A1]

Of critical importance in this example is that the $40,000 tax credit afforded under the IRA for the purchase of a new ZEV would not even cover the additional tax bill for a purchaser of this BEV (not to mention the additional $225,000 cost of the vehicle itself along with associated charging infrastructure costs). [EPA-HQ-OAR-2022-0985-1577-A1, p. 10]

Increasing Sale of ZEVs Will Significantly Impact Road Infrastructure Funding

Federal and state fuel taxes revenues will plunge when federal and/or state ZEV regulations are implemented across all vehicle classes. Construction and maintenance of transportation infrastructure in the U.S. is funded primarily with revenues derived from federal and state excise taxes on gasoline and diesel fuel. When ZEVs replace vehicles with internal combustion engines, the demand for gasoline and diesel dissipates and federal and state fuel tax revenues disappear. [EPA-HQ-OAR-2022-0985-1577-A1, p. 16]

The federal Highway Trust Fund (HTF) is the primary source of federal funding used by state governments to maintain and improve U.S. surface transportation infrastructure. About 84% of HTF revenues (which annually total around $42 billion) are derived from transportation gasoline and diesel fuel taxes. In 2020, trucks used for business purposes consumed 9 billion gallons of gasoline and 35.8 billion gallons of diesel fuel generating $8.7 billion and $1.7 billion in federal fuel tax revenues respectively (i.e., 24.7% of total HTF dollars).24 [EPA-HQ-OAR-2022-0985-1577-A1, p. 16]

24 Id.

Fuel taxes operate as a road user fee with trucks typically having low fuel efficiency paying substantially more per mile for road use than automobiles having far better fuel economy. Potential loss of state and federal surface transportation funding is real and will become an unintended consequence of ZEV rulemakings. The HTF and maintenance of our nation's highways remains an under-funded and uphill struggle. TRALA requests EPA to address this concern in the final rule. Trucking deserves consideration for any accelerated degradation of what we characterize as our workplace – the nation's highways and byways.[EPA-HQ-OAR-2022-0985-1577-A1, pp. 16-17]

Incentive Use Overestimates ZEV Market Penetration Rates for Trucks

The Bipartisan Infrastructure Law (BIL)25 included a total of $7.5 billion for EV chargers and other alternative fueling facilities. Five billion of that was assigned to the National Electric Vehicle Infrastructure (NEVI) Formula Program. Under the NEVI program, states can receive funding from the Federal Highway Administration (FHWA) for up to 80% of eligible project costs. NEVI requires charging stations receiving assistance be publicly available or available to commercial drivers from more than one company and be installed along designated FHWA Alternative Fuel Corridors (AFCs). [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

5 Infrastructure Investment and Jobs Act (P.L. 117-58).

The freight industry needs dedicated charging capabilities for both Medium-Duty (MD) and Heavy-Duty (HD) trucks near or within the properties of major warehouses, ports, rail yards, and industrial facilities. These sites can serve multiple companies through an agreement with the site operator but won't necessarily allow 'public' access. In comments filed on behalf of the trucking industry to FHWA on its National Electric Vehicle Infrastructure Formula Program Notice of Proposed Rulemaking (Federal Register, June 22, 2022), FHWA was asked to direct states to dedicate specific funding levels towards the build-out charging infrastructure for the trucking sector. [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

In its final rule, the FHWA addressed this request as follows:

‘FHWA understands that the MD/HD charging industry is very nascent and rapidly evolving; as such, FHWA has not modified the language in this final rule to specifically accommodate MD/HD needs so as not to preempt the pace of the technological innovation. The rule does not preclude MD/HD charging infrastructure and FHWA strongly encourages project sponsors to consider future MD/HD needs. The FHWA will continue to monitor the technological advancements in the MD/HD industry for consideration as to whether further regulation is needed to provide applicable minimum standards and requirements at a future date.’ 26 [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

26 Federal Register, Vol. 88, No. 39, Page 12731 (February 28, 2023).

Given the fact that truck charging infrastructure under NEVI was and remains an afterthought, TRALA is less optimistic than EPA in assuming the BIL will address the tremendous financial needs for powering truck ZEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

The uncertainty within FHWA’s guidance for public charging infrastructure for medium heavy-duty vehicles undermines end-user confidence that there will be sufficient public infrastructure to support ZEV technologies. Therefore, it will benefit EPA, and all stakeholders impacted under Phase 3, to define medium heavy-duty charging requirements for 1:1 productivity now so that HD TRUCS has correct Electric Vehicle Supply Equipment (EVSE) costs modeled and FHWA has clear requirements for NEVI planning early in the program to ensure public funding efficiently enables ZEV deployment across all targeted vehicle applications. [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Turning to the IRA, the $40,000 tax credit per qualified ZEV over 14,000 pounds does not even cover the additional Federal Excise Tax and State Sales Tax paid when compared to the price of a comparable Class 8 ICE truck, let alone the $225,000 up-front increased retail price tag (See Table 1 above). Additionally, TRALA members purchasing ZEVs to lease are the eligible recipients of the ZEV tax credits, not the lessees. Since lessors cannot pass their tax credits onto lessees – most of which are small businesses – many small businesses will not be able to take full advantage of such tax credits. [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

The maximum 30% tax credit, up to $100,000 per EV charger, also has qualifying conditions including that charging stations must be located in an eligible census tract which by definition requires:

- A poverty rate of at least 20%; OR
- Location in a census tract that is not in a metropolitan area and the medium family income for the tract does not exceed 80% of the applicable statewide median family income; AND
- Laborers employed in the construction of EV charging stations must meet the new prevailing wage and apprenticeship requirements [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Many TRALA customers (i.e.., lessees) will not likely be able to maximize this tax credit either since they may not meet the preceding criteria or they will not have permission to install charging ports on leased property under their lease terms. [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Finally, TRALA hopes that the manufacturing tax credits for the production and sales of battery cells and modules (up to $45/kWh) will over time help drive down the cost of battery production. The question that arises is how much of this tax credit will realistically be passed through to the ultimate purchaser of ZEVs? [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

State financial incentives, such as those available in California and other states used to offset the cost of transitioning to ZEVs, may experience a short shelf-life. The reason for this is that fleets generally cannot receive public financial assistance for matters that they are legally required to comply with when regulatory implementation commences. [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Political shifts – whether at the federal or state level – can also impact financial assistance for ZEVs along with charging and fueling infrastructure. This reality should not be overlooked. While TRALA appreciates efforts to help offset the high costs of ZEVs along with charging and fueling infrastructure at both the state and federal levels, we are not as enthusiastic as EPA in projecting the rapid ascent of ZEVs and infrastructure support for the trucking sector. [EPA-HQ-OAR-2022-0985-1577-A1, p. 21]

Organization: United Steelworkers Union (USW)

While the proposed rule is not wrong that the investments made by IRA and IIJA should spur investments in new technologies to lower emissions of vehicles, it does fail to consider the timeline and effectiveness of program implementation. Undoubtably, these manufacturing investments will take time to achieve their full production capacity. Also, small and medium manufacturers in the auto supply chain must be informed, encouraged, and assisted in utilizing these investment opportunities to prevent job loss. At this time, outreach to these companies is limited. EPA should coordinate with the Department of Energy, the Department of Transportation, and the Department of Commerce to better understand how its regulatory timelines correspond with the investments that will support regulatory compliance. [EPA-HQ-OAR-2022-0985-1514-A1, p. 4]

Organization: Volvo Group

Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) impacts

At many points throughout the NPRM, EPA asserts that Inflation Reduction Act (IRA)+ credits will significantly reduce vehicle costs, potentially enabling them to reach parity with equivalent diesel vehicles in as little as one to three years of operational use. The impacts of these provisions are unproven, and we remain skeptical that the value of the incentives and credits offered in this federal program will drive the same behavior change as more financially significant state incentive programs like the HVIP voucher in California. [EPA-HQ-OAR-2022-0985-1606-A1, p. 9]

The primary credit intended to reduce the cost of commercial vehicles is the Qualified Commercial Clean Vehicle Credit (Section 45W). The credit was initially designed to cover the lesser of the incremental cost of the vehicle to its diesel comparison or 30% of the purchase. Unfortunately, a $40,000 cap was placed on all vehicles greater than 14,000 pounds, thereby greatly limiting its value and impact on purchases of both Class 7 and Class 8 zero emission vehicles. IRS guidance recognized early in the process that there was no situation where a Class

7 or 8 vehicle's incremental cost or 30 percent price threshold would be less than the cap. In fact, for many Class 8 vehicles, the $40,000 credit will not even fully cover the 12 percent federal excise tax that is levied on all Class 8 motor vehicles. This is especially true for vocational vehicles like refuse trucks where significant cost is added by the custom body designed for the customer. For any Class 8 truck costing more than $333,333, the 12 percent federal excise tax would be more than the full value of the 45W credit. Additionally, this credit does not include any transferability, so customers with limited tax liabilities will not be able to leverage this tax credit. Many trucking companies have low profit margins and therefore may not have enough taxable income to utilize the 45W credit. [EPA-HQ-OAR-2022-0985-1606-A1, p. 9]

The NPRM asserts that the Advanced Energy Production Credit (Section 45X) is the second primary program to deliver meaningful price reductions for medium and heavy-duty zero emission vehicles. The intent of the credit is to incentivize local production of battery cells and modules, electrode active materials and critical minerals in the U.S. The upfront investment to begin manufacturing these products is overwhelmingly high, in some cases over $4 billion6. As a result, regardless of whether a truck or battery manufacturer is making the investment in new domestic battery supply chains, the high upfront costs of building and equipping these facilities makes it unlikely that the credit benefits will be passed on to end-consumers, especially as the end consumer may be more than five steps or tiers away from the supplier directly receiving the 45X credit. [EPA-HQ-OAR-2022-0985-1606-A1, p. 9]

6 https://www.cnbc.com/2022/10/11/hondas-new-4point4-billion-ev-battery-plant-will-be-built-in-ohio.html

It is true that other IRA programs like the $1 billion Clean Heavy-Duty Vehicle Program support the purchase of zero-emission vehicles, necessary infrastructure, and workforce training for certain governmental and tribal customers. Yet this deceptively named program is limited to Class 6 and 7 vehicles and excludes Class 8 vehicles, thereby preventing fleet owners of vehicles accounting for the greatest volume of emissions from accessing the program. [EPA-HQ-OAR-2022-0985-1606-A1, p. 10]

Federal programs to reduce the cost of charging infrastructure

As discussed throughout the NPRM and our comments, customers are now investing in both a more expensive vehicle and a fuel source to support that vehicle. While the IRA has tools designed to support the investments in charging infrastructure, many of these tools are still being developed and have not yet proven their ability to reduce costs for the end customer. The chief tool to reduce the cost of charging infrastructure for private charging depots is the Section 30C tax credit for Alternative Fueling Infrastructure. This credit includes a new geographic limitation for low-income and non-urban locations. Unfortunately, many operators of battery electric trucks will not have the flexibility to move their charging stations to one of these targeted neighborhoods or modify their operations to access the full 30% investment tax credit. [EPA-HQ-OAR-2022-0985-1606-A1, p. 10]

Additionally, there is $7.5 billion available for public charging infrastructure from the Bipartisan Infrastructure Law (BIL). Of this funding, $5 billion will be obligated to states by formula through the National Electric Vehicle Infrastructure (NEVI). Despite the urging of the Heavy-Duty vehicle industry and the specific inclusion of flexibility for commercial use of public charging as well as consideration for semi-trailers in the statute, this program has been geared towards light duty charging. Not one state—including states opting into California's Advanced Clean Trucks rule—proposed a charging station in their plan that would accommodate heavy duty vehicles. The Federal Highway Administration (FHWA), however, released guidance on June 8th of this year clarifying the eligibility of Medium- and Heavy-Duty charging infrastructure for NEVI funding. [EPA-HQ-OAR-2022-0985-1606-A1, p. 10]

An additional $2.5 billion in BIL funding is found in the Department of Transportation's (DOT) Charging and Fueling Infrastructure competitive grant program. We are optimistic that medium and heavy-duty projects will be prioritized in these programs given the light duty emphasis that has dominated the NEVI program. The initial application window has just opened so it is too early to determine if medium and heavy-duty vehicles will receive the priority signaled by U.S. DOT. [EPA-HQ-OAR-2022-0985-1606-A1, p. 10]

Federal barriers to adoption of ZEVs and Hydrogen powered Vehicles

While the Volvo Group was proud to support the Inflation Reduction Act and Bipartisan Infrastructure Law's zero emission vehicles program incentives and funding, there are still many federal policies in place that will make it either operationally more difficult or more expensive to adopt battery electric and hydrogen-powered vehicles. Below are a few examples:

1. The 12 percent federal excise tax (FET) on Class 8 trucks creates an increased disincentive on the purchase of higher purchase price battery electric and hydrogen-powered trucks.7
2. Battery electric trucks and hydrogen-powered trucks do not have payload parity with their diesel counterparts. Early adopters lose payload as they take on additional battery weight. This either limits the amount of freight that can be carried or reclassifies a Class 7 truck as a Class 8 truck forcing the carrier to pay the 12 percent FET.
3. The U.S.-Mexico-Canada trade agreement (USMCA) regional value content requirements raise the possibility that steep tariffs could be imposed on battery electric vehicles made in the U.S. and exported to Canada (6%) and Mexico (20%) because of nascent domestic battery supply chains. Similarly, battery electric vehicles made in Canada and Mexico that do not meet USMCA content requirements will pay duties coming into the U.S. market. [EPA-HQ-OAR-2022-0985-1606-A1, p. 10]

7 Perrotta, L., President, American Truck Dealers, Spear, C. President and CEO, American Trucking Associations, Gore, A., Executive Director, Zero Emission Transportation Association (2023. February 22). Federal Excise Tax for Heavy-Duty Trucks and Trailers. Letter to Senate Majority Leader Charles Schumer, Senate Minority Leader Mitch McConnell, House Speaker Keving McCarthy, and House Minority Leader Hakeem Jeffries, Accessed 14 June 2023 at https://ata.msgfocus.com/files/amf_highroad_solution/project_2358/FET_Repeal_Coalition_Letter_2.22.pdf.

Organization: Zero Emission Transportation Association (ZETA)

ii. Impact of the Inflation Reduction Act and Bipartisan Infrastructure Law

Despite the TCO savings, reaching near upfront cost parity to ICEVs is a preference for fleet owners. Once cost parity is reached, EV demand can be expected to rise rapidly. Purchase subsidies for HDEV acquisition offers one way to address the upfront cost differential, though the lower operating expenses still makes them attractive to fleet operators—even without incentives. [EPA-HQ-OAR-2022-0985-2429-A1, p. 12]

BloombergNEF projects electric delivery vehicles will reach price parity with diesel trucks around 2025.50 Due to the IRA's 45W commercial clean vehicle tax credit of up to $40,000 and battery production incentives of $45/kWh, McKinsey analysts expect electric HDVs with a range of 400 miles to achieve parity by 2027.51 Prior to the passage of the IRA, cost parity was not anticipated until much later.52 [EPA-HQ-OAR-2022-0985-2429-A1, p. 13]

50 Owen MacDonnell and Cristiano Façanha, "How Zero-Emission Heavy-Duty Trucks Can Be Part of the Climate Solution," CALSTART, (May 2021) https://calstart.org/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-ClimateSolution.pdf

51 "Why the economics of electrification make this decarbonization transition different," McKinsey &

52 "Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis," NREL, (March 2022) https://www.nrel.gov/docs/fy22osti/82081.pdf

Beyond the tax credits created or modified by the IRA, the law's funding programs, coupled with those in the Bipartisan Infrastructure Law (BIL) of 2021, will help drive adoption of heavy-duty vehicle technologies in all sectors, including transit, school bus, and freight. EPA's Clean Heavy-Duty Vehicles program and Clean Ports program will incentivize a buildout of manufacturing capacity to meet the increased demand for these products. EPA's Clean School Bus program is already having a similar effect on the school bus sector. The Department of Transportation's Low or No Emission Vehicle Program is also supporting the transition to electric HDVs with millions of dollars already awarded to transit projects in recent years. The BIL provided an additional $5.5 billion over five years for the Low-No Program—more than six times greater than the previous five years of funding.53 [EPA-HQ-OAR-2022-0985-2429-A1, p. 13]

53 "Biden-Harris Administration Announces Over $1.6 Billion in Bipartisan Infrastructure Law Funding to Nearly Double the Number of Clean Transit Buses on America's Roads," U.S. Department of Transportation, (August 16, 2022) accessed June 4, 2023 https://www.transportation.gov/briefing-room/biden-harris-administration-announces-over-16-billion-bipartisan-infrastructure-law

EPA Summary and Response:

Summary:

Many commenters acknowledged the likely positive effect of federal, state, and local funding efforts, but a number were skeptical of the extent of those benefits, stating:

- The $40,000 section 45W qualified commercial clean vehicle credit is offset virtually dollar for dollar by the federal excise tax, which was unaccounted for in EPA's analysis, and in any case, does not cover the increased purchase price of a HD BEV by a wide margin. (Clean Fuels Dvl., TRALA, ATA);
- The IRA section 30D clean vehicle credit, which applies to a small fraction of the heavy-duty vehicle market, is of limited use due to the requirement that increasing shares of minerals be sourced domestically when presently China is the source of roughly 85% of critical materials (Clean Fuels Dvl.);

- The alternative fuel refueling property 30C tax credit is so limited by geographic scope (low income and rural area – non-optimal locales for charging stations) and sufficiency of taxable income as to be of minimum utility (TRALA, Volvo, DTNA);

- Startup costs for battery production are so high that the 45X advanced manufacturing production credit will be subsumed by those costs. EPA's assumption that this credit will be passed through to battery purchasers in the form of lower battery costs is thus unrealistic (Volvo, TRALA);

- The Clean HD Vehicle program is for class 6-7 vehicles only (Volvo);

- With respect to NEVI funding for charging networks authorized by the BIL, commenters were adamant that this funding is being dedicated almost exclusively to light duty vehicle charging networks, which will not be suitable for heavy duty on grounds of space and charging capacity among other factors. (DTNA, TRALA.) DTNA included an appendix to its comments of a state-by-state survey to see if any had specific plans for HDV in their NEVI implementation efforts. Almost none did. TRALA, in public comments to the Federal Highway Administration—the agency issuing guidance regarding NEVI implementation— requested guidance that would direct HDV charging networks to be located near warehouses, ports, and large factories. The FHWA pointedly declined to issue such guidance.

- These commenters thus believe that these incentives, while welcome, are not likely to appreciably affect such metrics as vehicle price, total cost of ownership, or electric infrastructure availability. Moreover, DTNA notes that EPA's estimates of IRA effects differ considerably from those of the Congressional Budget Office and they expressed concern that the Section 45W program could be curtailed if ZEV penetration rates are much higher than CBO's budgeted amounts.

• Other commenters were more sanguine. These commenters pointed to the BIL and IRA, plus state and local initiatives, as confirming feasibility of standards more stringent than those proposed. Pointing to the $40,000 credit in the IRA for Qualified Commercial Clean Vehicles, although not to the federal excise tax, EDF quoted estimates that these and other IRA provisions have already catalyzed significant investments in EV manufacturing and associated jobs. For example, EDF, through its contractor WSP, documented announcements between 2015–2023 of over $120 billion in private EV "supply ecosystem investments" (EV, battery, and battery component production) and 143,000 new jobs (EDF Comment Attachment AA.)

• RMI likewise pointed to the $40,000 tax credit as accelerating cost parity between ICE and BEVs. They further pointed to studies indicating that the IRA would accelerate such price parity by 5 years, including for vehicles needing to recharge en route, noting TCO price parity for long haul vehicles by 2027, and price parity for urban and regional vocational vehicles already.

• These commenters also pointed to State initiatives, both legislative and financial. CARB noted the ACT and ACF regulations. They, and other commenters, also mentioned the promising California voucher program for HD vehicles. (Tesla). Tesla also cited the Clean Heavy Duty program providing $1 billion to States and municipalities for replacement of diesel HD vehicles as especially valuable in transitioning. The Electrification Coalition noted programs in both Pennsylvania and New Jersey directed at promoting MHD BEV transitioning. DTNA noted that State programs, though helpful, tended to be limited to within-state scope, and thus were of limited utility, giving as examples the California HVIP voucher program, and the Washington State Commercial Alternative Vehicle tax credit. DTNA's ultimate conclusion is that these programs will not have significant effect on total cost of ownership or other cost metrics.

Response:

EPA agrees with commenters who stated that federal, state, and local funding efforts, in particular the Inflation Reduction Act, will be beneficial to the deployment of heavy-duty ZEVs. We anticipate that the IRA programs with the largest impact in the timeframe of this rule will be the three IRA tax credits described in Section II.E.4 of the preamble: the 45W Qualified Commercial Clean Vehicles credit, the 45X Advanced Manufacturing Production Credit, and the 30C Alternative Fuel Refueling Property Credit. We have quantitatively included these tax credits in our analyses as shown in preamble Sections II.E.2, II.E.4, and IV and RIA Chapters 2.4.3, 2.6.2, and 3. These sections detail how we have considered these incentives and the extent to which we anticipate they will affect the market.

We have made some changes from our NPRM analysis for these three tax credits in this final rulemaking after consideration of the comments summarized above.

For the 30C Alternative Fuel Refueling Property Credit, we agree that the geographic requirements under the statute could limit the use of the tax credit. However, a map developed by DOE to show eligible census tracts supports that stations installed in a large majority of the U.S. may qualify.[265] Additionally, as detailed in a report analyzing Inflation Reduction Act tax credits for plug-in electric vehicles, DOE projects that the weighted-average 30C tax credit on all recharging investment for medium- and heavy-duty vehicles will be 18 percent of the installed cost for depot-based charging.[266] This reflects their assessment of the impact of geographic eligibility requirements in addition to other requirements listed in the statute. We have updated our EVSE cost analysis to quantitatively include the 30C credit supported by this work. See preamble Section II.E.2 and RIA Chapter 2.6.2.1.2 for further discussion.

We agree with RMI's assessment that the 45W tax credit will accelerate cost parity between ICE vehicles and BEVs. We show our anticipated impacts of this tax credit on the relative retail price equivalents (RPE) of ICE vehicles and BEVs in RIA Chapter 2.9.2. We note that RPE is not the same as price, but RIA Chapter 2.9.2 does indicate which vehicle types we anticipate will reach RPE parity between ICE vehicles and BEVs. For the reasons explained in preamble Section II and RTC section 2.4, our final standards are sufficiently stringent in consideration of this tax credit among other factors.

[265] Internal Revenue Service. "Alternative Fuel Vehicle Refueling Property Credit." February 2, 2024. Last accessed on March 19, 2024. Available at: https://www.irs.gov/credits-deductions/alternative-fuel-vehicle-refueling-property-credit. See also the Department of Energy's map of eligible locations titled "30C Tax Credit Eligibility Locator" linked from this IRS site, with a direct link here (last accessed on March 20, 2024): https://experience.arcgis.com/experience/3f67d5e82dc64d1589714d5499196d4f/page/Page/.

[266] U.S. Department of Energy. "Estimating Federal Tax Incentives for Heavy Duty Electric Vehicle Infrastructure and for Acquiring Electric Vehicles Weighing Less Than 14,000 Pounds." March 11, 2024.

For the matter of sufficiency of taxable income and HD ZEV purchasers' ability to use the 45W tax credits, we note in preamble Section II.E.4 that the Internal Revenue Service allows the 45W tax credits to be treated as general business credits, which greatly expands the time in which they can be used to 21 tax years. This treatment of tax credits as general business credits also applies to 30C.[267] It is thus reasonable that businesses would have sufficient taxable income to use the 45W and 30C credits.

DTNA noted that our estimates of the impact of the 45W and 30C tax credits in the NPRM differ from the CBO's. However, CBO's estimates could not have aligned with our projections of the market under the proposed standards because CBO did not know what the standards would be. If anything, their estimate may be a better representation of the regulatory baseline, i.e. the world without this rule, at the time they calculated their estimate. We note that, if one were to consider CBO's estimate to be a baseline, this CBO baseline would be different than the baseline we use in this final rule (FRM reference case) because the regulatory landscape has changed since CBO's cost estimates. Importantly, as discussed in preamble Section V.A.1 and RIA Chapter 4.2.2, in March of 2023 we granted CARB a waiver of preemption to enforce the State's Advanced Clean Trucks rule, which would not (and could not) have been reflected in CBO's cost estimates for the IRA which was signed in August of 2022. Whether or not the realized budgetary impacts after this rule is finalized differ from CBO's estimates and whether or not they lead to modification of the 45W and 30C tax credit programs by the U.S. Department of the Treasury or by Congress is out of scope of the analysis of this rule.

We have included upfront costs for battery production in the RPE (prior to consideration of the 45X Advanced Manufacturing Production Credit) we use in our modeling, and then appropriately reduce the costs by the 45X Advanced Manufacturing Production Credit. For further discussion of direct manufacturing costs, indirect costs, and RPE, see the beginnings of preamble Section IV and RIA Chapter 3.

Regarding the extent to which battery costs are reduced, the DOE has conducted an analysis of public announcements that shows that in 2027–2032, there will be sufficient domestic battery manufacturing capacity for the HD industry to produce cells and modules that meet the requirements of this tax credit and to supply the volumes we project in this final rulemaking.[268] The study includes a bounding analysis of full- and low-end responses for utilization of the IRA section 45X tax credit. With respect to utilization of the credit for battery cells and modules, the analysis shows that full- and low-end responses "are nearly identical because the smallest low-end response is 97%."[269] These estimates reflect "announced production capacities" as of November 2023.[270]

As noted in preamble Section II.E.4, we have considered a) comments expressing skepticism over how much of the credit would be passed through to consumers, b) the DOE report described

[267] Internal Revenue Service. "Alternative Fuel Vehicle Refueling Property Credit." February 2, 2024. Last accessed on March 19, 2024. Available at: https://www.irs.gov/credits-deductions/alternative-fuel-vehicle-refueling-property-credit.
[268] Kevin Knehr, Joseph Kubal, Shabbir Ahmed, "Cost Analysis and Projections for U.S.-Manufactured Automotive Lithium-ion Batteries", Argonne National Laboratory report ANL/CSE-24/1 for US Department of Energy. January 2024. Available online: https://www.osti.gov/biblio/2280913. See pp.16–19 and Appendix A6.
[269] Ibid. See pp. 19 and Tables 39, 41, and 42 (low-end market response, showing 100 percent utilization from MYs 2027–2031 and 97 percent for MY 2032).
[270] Ibid. See pp. 47 and 16.

in the previous paragraph, and c) Cummins' statement that the 45X tax credit "is expected to benefit customers by lowering the price of batteries."[271] While we expect that the full HDV battery supply chain, including but not limited to cell manufacturers and vehicle manufacturers, will be able to receive at a minimum nearly all of the available module and cell credits and a significant amount of credits for electrode active materials and critical minerals as detailed in the DOE report, we conservatively maintain our NPRM approach to modeling this tax credit as described in preamble Section II.E.4 and RIA Chapter 2.4.3.1. We model the vehicle manufacturers as fully utilizing the value of the battery module tax credit and gradually increasing their utilization of the value of the cell tax credit for MYs 2027–2029 until MY 2030 and beyond, when they use 100 percent of the value of the available cell and module tax credits. We model vehicle manufacturers as fully passing through the value of these credits to the purchasers, consistent with Cummins' stated intention of using the credit to lower the price of batteries, in order to remain competitive in the market. We also note that our RPE-based approach to modeling costs should not be considered an actual price since we cannot predict how vehicle manufacturers will set actual prices. In the same way, we cannot predict exactly how they will pass the credits through to their customers. However, we note that our RPE (prior to consideration of the 45X credit) fully accounts for the costs that manufacturers are expected to attempt to recapture via new vehicle sales, including production costs of batteries and profits. Since all their costs are accounted for by the RPE (prior to consideration of the 45X credit), further reductions in cost due to the 45X credit would allow manufacturers to reduce prices to improve their market power. For further discussion, see RIA Chapter 2.4.3.1.

We note that, should the full HDV battery supply chain (including vehicle manufacturers) receive as much tax credit as projected by DOE, there would be significantly more 45X tax credit available than we conservatively project. For example, in 2027, DOE estimates between $47.60 and $53.90 per kWh of tax credits available (Cost of Automotive Batteries at Tables 41 and 42), whereas our modeling for the same year is only $18.75 per kWh (preamble Section II.E.4), yielding a difference of $28.85 to $35.15 per kWh. For battery production levels on the order of tens of gigawatt-hours per year for the HDV market alone (see RIA Chapter 2.10.2 for further details), the difference between our conservative estimate of the 45X credit and the amounts likely to be realized per DOE's estimates amounts to hundreds of millions of dollars in tax credits per year (i.e., that we have conservatively not included in our analysis). To the extent that our projections for these 45X tax credits are conservative, our cost projections for vehicle manufacturers and purchasers in preamble Sections II.F.2 and IV and RIA Chapters 2.10.6 and 3 are overestimated.

The Clean Fuels Development Coalition anticipates limited use of the 30D Clean Vehicle Credit for the heavy-duty vehicle market. We agree that the 30D credit applies to a small fraction of the heavy-duty market at issue in this Phase 3 rulemaking, and we did not include this credit in our Phase 3 analysis. Thus, any consideration of the domestic sourcing requirements in estimating the impact of 30D is outside the scope of this rulemaking. See RTC Section 17.2 for our consideration of other comments relating to critical materials and the supply chain.

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[271] Geman, Ben. "How Biden's climate law is fueling the U.S. battery boom." *Axios*. September 7, 2023. Last accessed on November 2, 2023 at: ***https://www.axios.com/2023/09/07/battery-boom-daimler-blackrock***

We agree that the federal excise tax should be included in our cost analysis and included it in the cost analysis for the final rule as discussed in RTC Section 3.8.1.

We did not quantitatively include other incentives and programs such as the Clean Heavy Duty Vehicles program under the IRA, the NEVI program under the BIL, and California's HVIP in our analysis. Consequently, our analysis supporting this rule (see preamble Section II and RIA Chapter 2) is not based on these programs appreciably affecting such metrics as vehicle price, total cost of ownership, or electric infrastructure availability. However, we do expect them to affect the market (i.e., the ZEV adoption rate) even in the absence of this rule as discussed in preamble Section V.A.1 and RIA Chapters 1 and 4.2.2. To the extent that these incentives and programs do affect vehicle price and other metrics, our estimates may be conservative. For example, if the $10 billion of tax credits under the 48C Advanced Energy Project Credit program extended by the IRA, which is available to facilities that manufacture batteries for HD BEVs and other advanced energy technologies, appreciably reduces battery costs below our projections, then our battery cost estimates would be greater than the realized costs and the costs of compliance in our projected technology pathway would also be overestimated. Further discussion of some of the relevant programs can be found in RIA Chapter 1.3.

Employment impacts are addressed in RTC Section 19.6.

2.8 Intentionally Left Blank

2.9 Post-rule actions

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

Under the proposed rule, auto manufacturers and suppliers are being asked to assume sizable risk to transition manufacturing operations to meet future standards. To reduce these risks, EPA should evaluate the ZEV marketplace prior to the Proposal's effective date and review the state of the ZEV market. [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

EPA is predicting a significant conversion of the U.S. heavy-duty fleet in under four years. Meanwhile in 2021, BEVs comprised 0.1% of all heavy-duty vehicles on U.S. roads.5 EPA's assessment for manufacturer compliance relies heavily on the need for immense infrastructure and supply chain overhauls. [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

5 https://www.iea.org/reports/global-ev-outlook-2022/trends-in-electric-heavy-duty-vehicles

Current manufacturing costs for BEV trucks pose a sizable barrier for most fleet owners. Even with federal subsidies, the cost to manufacture and purchase a BEV will be significant for many years. The Inflation Reduction Act (IRA), cited by EPA as an accelerant to market penetration, will offset only 10% of the estimated purchase price of a Class 8 vehicle and will still result in a purchase price nearly twice the average cost of a diesel vehicle.6 [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

6 https://www.envasetechnologies.com/comparing-total-cost-of-ownership-electric-vs-diesel-trucks

Review of the ZEV marketplace

For the reasons stated above, we urge EPA to commit to an evaluation of the Proposal's feasibility similar to the Agency's midterm evaluation in 2017. The Agency can re-evaluate the ZEV marketplace including the cost of manufacturing and consumer acceptance. The basis for doing so is as relevant as it was when EPA committed to the process in 2012.11 [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

11 Federal Register / Vol. 77, No. 199 / October 15, 2012 / at 62628

Organization: American Petroleum Institute (API)

f. Program Review

i. Assessment of both vehicle and infrastructure development/deployment progress

The design of a program with such significant unknowns and heavy reliance on technology and infrastructure that will "hopefully" or is "anticipated/expected to" be available is optimistic at best. The proposal appears premature on the stated timeline, and essentially in conjunction with the LD/MD program, which would be competing for the same resources. If EPA is not willing to adjust the timeline and/or standards of the Phase 3 program, API requests that the agency consider incorporating a pre-program assessment as well as a program progress assessment. It is imperative that EPA provide a real-world evaluation, with an honest assessment provided to the public, regarding progress on infrastructure readiness and ZEV technology deployment. The opportunity for stranded investments by all stakeholders impacted by this program is just too great not to incorporate pre- and mid-program reviews. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 15 - 16]

For a mid-program assessment, EPA could consider something akin to the Midterm Evaluation that was finalized in its 2012 rulemaking establishing the MY 2017-2025 LD GHG standards.28 Further, we recommend that EPA engage a broad stakeholder community to identify necessary elements to incorporate into such an assessment. [EPA-HQ-OAR-2022-0985-1617-A1, p. 16]

28 https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas

ii. Future program incentives and program adjustment of standards

In the development of the Phase 3 program, EPA needs to consider future program incentives such as adoption of a lifecycle approach, combined with fuel carbon intensity reductions. Such an approach would provide a broad spectrum of industries that power the transportation system (e.g., OEMs, petroleum refiners, power generators, and renewable fuel manufacturers) with incentives to reduce GHGs. [EPA-HQ-OAR-2022-0985-1617-A1, p. 16]

In addition, we also request that the agency report out on the findings following review with enough time to adjust the standards if needed. Adequate leadtime must be provided to the regulated community to allow for necessary adjustments to regulatory compliance strategies, and to avoid stranded investments as much as possible. A proposal based on stretch goals must incorporate an "offramp" or some opportunity to pivot if the essential elements of the program, such as charging/fueling infrastructure, do not materialize. [EPA-HQ-OAR-2022-0985-1617-A1, p. 16]

Organization: Chevron

5. Feasibility and implementation

EPA requested comment on announcements made by vehicle manufacturers about plans to produce heavy-duty ZEVs prior to 2030. Some of the examples cited by EPA are aspirational targets provided by manufacturers rather than production or sales commitments. Other comments are not specific to the U.S. market. Examples of this nature add to the uncertainty about whether the optimistic BEV forecasts may be overstated. [EPA-HQ-OAR-2022-0985-1552-A1, p.7]

BEV sales forecasts may rely on optimistic expectations for increased electricity generation and charging infrastructure. EPA should conduct an assessment to account for the costs and timing associated with upgrades to the nation's grid infrastructure, including new and upgraded generation, transmission, and distribution, and the costs associated with the installation of public and private electric vehicle chargers. If it is not feasible to complete expansion and improvements for the current grid, it may not be possible to meet the additional demand created by the proposed regulation. [EPA-HQ-OAR-2022-0985-1552-A1, p.7]

Stakeholders have expressed concern about the supply and availability of critical minerals and supply chains for battery manufacturing, many of which are sourced from China. EPA should quantitatively assess the impact this regulation will have on the nation/worldwide demand of lithium and other rare earth metals, and the emissions that will be produced as a result of mining and shipping these materials. EPA should consider environmental impacts from mining of semi-precious metals and potential mitigations. The proposal does not address the potential hazards, construction, noise, or other impacts and potential mitigations for these impacts. [EPA-HQ-OAR-2022-0985-1552-A1, p.7]

It is important for EPA to plan for uncertainty in the feasibility and timing of meeting the standards proposed in the phase 3 heavy-duty rule. We endorse the recommendation from API in their written comments to implement an interim program review, with provisions for adjustment of the standards if adequate progress is not being demonstrated. These important program elements should be incorporated into any final regulatory action. [EPA-HQ-OAR-2022-0985-1552-A1, p.7]

The new standards must be based upon accurate market and technology assumptions that are subject to periodic review and reevaluation.

EPA's predictions of future HD ZEV adoption depends entirely upon a complex set of circumstances that may or may not materialize in accordance with the Agency's projections. These circumstances include, but are not limited to, the buildout of HD ZEV supporting infrastructure, customer acceptance of new technologies, costs of these new technologies relative to comparable ICE vehicles, payback periods, and suitability of HD ZEVs for certain drive cycles. None of these considerations are within EPA's ability to control, meaning that there is no assurance whatsoever that the proposed standards will be achievable within the timeframes given. [EPA-HQ-OAR-2022-0985-1555-A1, p. 9]

Under these circumstances, it is critical that EPA start with reasonable CO_2 standard stringency levels that are supported by more conservative projections of ZEV adoption rates. EPA should also incorporate into the Phase 3 final rule a mechanism for performing periodic reviews of these standards, including the assumptions and projections upon which they are based, and for adjusting the standards where it is found that these projections have not materialized. Such a review-and-adjustment process is necessary to ensure that the Phase 3 standards remain feasible and cost-effective, and that EPA's future projections are supported by reasoned analysis.7 [EPA-HQ-OAR-2022-0985-1555-A1, p. 9]

7 As courts have observed, EPA's latitude to project future technological developments relevant to emission standard achievability is 'subject to the restraints of reasonableness and does not open the door to 'crystal ball' inquiry.' International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 629 (D.C. Cir. 1973). In other words, while the CAA requires EPA to look to the future in setting emission standards, it must 'provide a reasoned explanation of its basis for believing that its projection [of future technological advances] is reliable. This includes a defense of its methodology for arriving at numerical estimates.' NRDC, 655 F. 2d at 328.

Organization: Cummins Inc.

To ensure that technology investments like ours continue toward success, EPA's Phase 3 final rule also must be durable, in that it must be robust against uncertainties that are largely outside the control of EPA and the companies that must certify to EPA's Phase 3 standards. EPA has proposed the most ambitious heavy-duty GHG standards ever considered, and EPA arrived at its proposed stringencies by projecting almost exclusively a rapid increase in the market adoption of fully electric heavy-duty vehicles in the 2027-2032 timeframe. Cummins and several other stakeholders, such as the Truck and Engine Manufacturers Association (EMA) and its members, share concerns about the readiness of the U.S. heavy-duty electric vehicle recharging infrastructure to support EPA's projections in that timeframe. While Cummins supports EMA's comments recommending that EPA closely monitor infrastructure readiness and adjust Phase 3 stringencies as needed in the future, we also recognize that the prospect of those adjustments would call into question the durability of Phase 3 altogether. That regulatory uncertainty, in turn, would have a chilling effect on future technology investments, which would only delay progress even further. [EPA-HQ-OAR-2022-0985-1598-A1, p. 5]

To help avoid that kind of regulatory uncertainty after Phase 3 is finalized, we believe that EPA can and should do more than just monitor infrastructure and delay the Phase 3 standards, should recharging infrastructure be deemed not ready. Hybrids are a technology that OEM's and customers can rely on if infrastructure is deemed not ready. Specifically, we request that EPA formally commits to propose a technical amendments rulemaking in the first quarter of 2024 and to finalize that rulemaking no later than the fourth quarter of 2024. We request that the technical amendments rulemaking address any of our comments that EPA is unable to address in the Phase 3 final rule. [EPA-HQ-OAR-2022-0985-1598-A1, pp. 5 - 6]

Organization: Daimler Truck North America LLC (DTNA)

DTNA is heavily invested in the transition of the commercial transportation sector to emission-free technologies. Manufacturers cannot make this transition happen by themselves, however. Rather, the development of high quality zero-emission vehicles (ZEVs) is only one part of a three-part 'transformation equation,' which also requires ZEVs to achieve cost parity with conventional vehicles and for there to be adequate charging and fueling infrastructure available to support widespread ZEV deployment. Because the latter two factors will significantly impact the achievability of the Phase 3 standards but are outside of EPA's regulatory authority and ability to control, the Agency should build in to this rule a mechanism for adjusting its standards if these factors preclude or significantly delay ZEV adoption in the United States. [EPA-HQ-OAR-2022-0985-1555-A1, p. 1]

EPA's battery cost estimates rely on assumptions about raw materials and critical minerals, the development of complex supply chains, projected future domestic mining and production, and global trade and geopolitics. EPA does not, however, account for the possibility that mineral costs could rise in the future, as global demand for BEVs increases. It is only appropriate that EPA periodically reassess the battery costs used in the HD TRUCS model to inform the payback period analysis. [EPA-HQ-OAR-2022-0985-1555-A1, p. 29]

Given the uncertainties and discrepancies in EPA's projections, a mechanism for periodic review and standard adjustment is necessary.

In addition to finalizing standards that align with DTNA's proposed and more realistic technology adoption rates, as discussed above, the Company requests that EPA incorporate the following procedures for periodic review and possible adjustment of CO2 standard stringency levels:

- Biennial Reviews. Starting in 2024, the final rule must provide a process for EPA to engage with stakeholders—including vehicle manufacturers, utilities, fleet owners, and infrastructure providers—to conduct a biennial review and evaluation of the market and technological assumptions underlying the CO2 emission standards that take effect three years from the review date. This review would encompass review of the standards in two-year increments (e.g., the 2024 review would reassess MY 2027-2028 standards, the 2026 review would reassess MY 2029-2030 standards, the 2028 review would reassess MY 2031-2032 standards, etc.). EPA should only consider promulgating standards beyond 2032 if the Agency adopts this proposed review process.
- Re-Evaluate HD TRUCS Inputs In Light of Market and Technological Developments. The biennial review must be focused on assessing whether the market and technological assumptions that originally supported the Phase 3 CO2 emission standard stringencies have materialized or are reasonably likely to do so within the timeframe that the standards under review will apply. Based upon the Proposed Rule, key assumptions to be reviewed would include but are not limited to: (1) all cost inputs, including technology and fueling costs, as well as continued availability of vehicle and battery tax credits; (2) payback periods; and (3) projected adoption rates.
- Apply Updated Infrastructure Scalar. DTNA proposes that EPA re-calculate the infrastructure scalar described in Section II.C.2 at the time of the biennial review. This updated scalar should then be applied to the revised projected ZEV adoption rates generated through the HD TRUCS analytical process described immediately above, to ensure more accurate consideration of the status of ZEV support infrastructure development at the time of the review.
- Re-Calculate Appropriate Standard Stringency Based Upon HD TRUCS With New Inputs. After EPA has evaluated and adjusted its technological and market assumptions as needed, the Agency would apply its HD TRUCS analytical tool using the updated inputs. Subject to the technical assessment discussed below, this process may result in a re-calibration of appropriate CO2 standard stringency for the years under review.
- Technical Assessment Report and Determination of Standard Appropriateness. The review and evaluation process described herein must provide an opportunity for public

comment and preparation of a technical assessment report on the issues relevant to emission standard stringency for the MYs under review.136 After public comment on the draft technical assessment report, the biennial review would conclude with a determination by EPA either that (1) the underlying projections for upcoming MY standards remain accurate and that the standards are appropriate; or (2) the underlying projections in the Phase 3 final rule have not materialized and the Agency must initiate a rulemaking to revise the upcoming MY standards, to be either more or less stringent as appropriate.137 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 64-65]

136 See, e.g., 40 C.F.R. 86.1818–12(h) (describing the mid-term evaluation process for EPA's CO2 standards for MY 2022-2025 passenger automobiles and light-duty trucks).

137 See, e.g., id. at 86.1818–12(h)(2), (3) (outlining the draft Technical Assessment Report requirement for EPA's mid-term review of MY 2022-2025 passenger automobile and light-duty truck CO2 standards and a deadline for the report to be issued in advance of EPA's determination of whether these standards are appropriate).

EPA Request for Comment, Request #9: We request comment on our assessment of the HD ZEV market and any additional data sources we should consider.

- DTNA Response: Throughout its comments on the Proposed Rule, DTNA provides significant comment on EPA's assessment of the HD ZEV market and provides additional data sources that it requests EPA consider. EPA should revisit its data periodically to evaluate the feasibility of the Phase 3 standards as new data becomes available, as discussed in more detail in Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 160]

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #21: We request additional data that could be considered in our assessment of PTO loads in our final rulemaking assessment.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

In light of these projections, we urge the EPA to continue to draw upon technical feedback from the industry responsible for implementing this transition and calibrate the standards as explained above. We also encourage the EPA to factor the cost of a disruption to the heavy-duty vehicle market caused by the proposed standards into its economic impact analysis. This contingency planning is necessary because heavy-duty vehicles are integral to the functioning of the U.S. economy as they carry 70% of all freight moved in the country and are "expected to move freight at an even greater rate in the future."17 The domestic economy and heavy-duty vehicle market depend on a reliable supply chain. The proposed standards should be better aligned with these concerns. [EPA-HQ-OAR-2022-0985-1596-A1, p. 6-7]

17 Id. at 1.

Organization: National Automobile Dealers Association (NADA)

II. EPA's failure to provide for an adequate rulemaking process necessitates that its Phase 3 GHG program be subject to periodic review.

Today, less than 1% of new HDV sales are ZEVs. Yet, the Phase 3 proposal projects a near transformation of the new HDV sales from ICE to ZEV HDVs. Such a transformation would require massive changes to the design and manufacturer of HDVs and to their refueling infrastructure (e.g., from the nation's electrical grids or a new facility designed to deliver highly-compressed or liquified hydrogen). Such a transformation will require thoughtful changes in business and transportation logistics and related human behavior, and even changes in traffic patterns and land use for charging infrastructure and ZEV HDV parking. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 2 - 3]

Despite the transformational nature of the Phase 3 GHG proposal, EPA appears to have based nearly all its major assumptions and predictions on a "literature review,"8 in contrast with prior rulemakings that involved data generated and provided by key stakeholders and agency engine tests and simulations. For example, instead of allowing HDV manufacturers to provide welldefined costs related to batteries, technology packages, and charging equipment, the EPA is relying on third-party research. As a result, EPA's payback periods and adoption rates are missing important inputs and are rife with inaccuracies. [EPA-HQ-OAR-2022-0985-1592-A1, p. 3]

8 The review appears to have included research, surveys, and models developed by International Council on Clean Transportation (ICCT) and Argonne National Laboratory (ANL), including ANL's BEnefit ANalysis ("BEAN") model.

A. Recommendations

Consequently, ATD requests that the Phase 3 GHG program provide for a biennial review and evaluation of the market and technological assumptions underlying the GHG emission standards that take effect three years from the review date. This biennial review process will enable EPA to engage with stakeholders, including HDV manufacturers, dealers, fleet and truck owners, and infrastructure providers, to review based on objective and rational criteria aimed at ensuring the effective and efficient rollout of ZEV HDV technologies and infrastructure. As detailed below, EPA's biennial review should in part rely on an updated version of its Heavy- Duty Technology Resource Use Case Scenario (HD TRUCS) tool, with revisions to key analyses and assumptions involving, but not limited to: (1) all cost inputs; (2) payback periods; (3) projected adoption rates; and (4) updated infrastructure monitoring and benchmarks. This process should result in an appropriate revision of Phase 3 standard stringency based on the updated HD TRUCS analysis. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 3 - 4]

Organization: Navistar, Inc.

EPA should commit to conducting a Midterm Evaluation (MTE) of the Phase 3 GHG standards.

In addition to the inclusion of a regulatory mechanism discussed above, the proposed rule should also be revised to include a specific regulatory requirement for EPA to conduct a Midterm Evaluation ('MTE') of the GHG standards established for MY 2028-2032. The MTE process should include the establishment of an advisory board made up of representatives of the various stakeholders, including for example, state, regional and local governments, regional and local transportation agencies, EMA, ZEV manufacturers, utilities, and NGOs. The MTE process should involve the preparation of a comprehensive assessment regarding the pace and feasibility of the deployment of the necessary infrastructure. Following public comment, EPA should issue recommendations regarding whether to reopen the Phase 3 standards for proposed revisions consistent with the findings in the comprehensive infrastructure report. [EPA-HQ-OAR-2022-0985-1527-A1, p. 6]

Organization: Truck and Engine Manufacturers Association (EMA)

Because the development of this requisite ZEV-truck infrastructure is, in essence, the linchpin to the feasibility of the Phase 3 program, EPA should initiate steps now to gauge, monitor and respond to the pace of deployment of the necessary infrastructures for HDOH BEVs and FCEVs. As one option for doing so, EPA could work with ICCT, Ricardo and other federal agencies and departments to identify the top 100 counties in the country where the greatest numbers of ZEV-trucks likely will need to be deployed under the final Phase 3 (and ACT) regulations. The number and types of ZEV-trucks that likely will need to be deployed in each of the 100 top counties during the 2028-2032 time period could be assessed, and from that assessment a determination could be made of the benchmark number and types of ZEV-truck-battery recharging and H2-refueling stations that will need to be constructed and made operational in each of the top 100 counties on an annual basis over the next 8-9 years. EPA could then monitor the progress of the development of the necessary ZEV-truck infrastructure in the top 100 counties against the annual benchmarks. Based on that annual monitoring, beginning in 2024, if it is determined by EPA, in consultation with other stakeholders and federal agencies, that sufficient infrastructure development has not occurred across the top 100 counties – perhaps, for example, if the pace of infrastructure development falls 20% or more below the calculated benchmark rates of deployment – the three-year increments of the phase-in schedule could be shifted forward by one or more model years. Providing that sort of direct linkage between the phase-in of the final Phase 3 standards and the phase-in of the necessary underlying ZEV-truck infrastructures will be vital to the success of the Phase 3 program. Without that direct and objective linkage, the likelihood of the Phase 3 program's collapse and failure will exceed the likelihood of its successful implementation. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 58 - 59]

To facilitate the necessary monitoring of the requisite infrastructure development, EPA should specify in any final rule that the Agency will engage with all key stakeholders in a biennial review process starting as soon as practicable (i.e., the beginning of 2025) to assess whether any infrastructure-scaled adjustments are required to the final Phase 3 CO_2 standards or to the three-year phase-in periods, or both. [EPA-HQ-OAR-2022-0985-2668-A1, p. 59]

Organization: Truck Renting and Leasing Association (TRALA)

Need for Periodic Status Reviews

TRALA strongly recommends EPA consider building 'off-ramps' into the final Phase 3 rule to include, but not be limited to, the state of electric charging and hydrogen fueling infrastructure in all states; supply chain shortages including rare earth mineral and precious metal availability; the state of the nation's economy; and the availability and readiness of low carbon technologies for every truck family in each compliance year. Such reviews not only make for sound policy development but are also necessary to better gauge whether ZEV technologies and the marketplace are aligning as projected. [EPA-HQ-OAR-2022-0985-1577-A1, p. 21]

TRALA also recommends EPA conduct and complete a special study and analysis regarding Class 8 BEV and FCEV technology pathways prior to the 2030 Class 8 implementation schedule to assess the feasibility and availability of both technologies. If such study concludes that either technology has not advanced to the levels predicted six years prior by EPA, the Phase 3 rule should be revised accordingly. [EPA-HQ-OAR-2022-0985-1577-A1, p. 22]

Organization: Valero Energy Corporation

EPA should account for additional risks and challenges to EV infrastructure implementation goals, such as equipment supply chain delays, energy security risks, grid capacity and constraints, and availability of site hosts and matching funds. [EPA-HQ-OAR-2022-0985-1566-A2, p. 36]

Organization: Volvo Group

Safety Valves

The stringencies proposed by the agency rely heavily on many assumptions and factors outside of either the agency's, or manufacturers' ability to control. As such, Volvo Group believes that safety valves must be placed in the regulation such that industry compliance is not dependent on the actions of other stakeholders or beyond EPA's authority to regulate. These include such items as the availability and price of battery raw materials or sufficient charging and refueling capacity located where it can support the proposed adoption rates, plus some additional level of capacity (margin) so as not to disadvantage any single OEM based on their product portfolio, regional strengths, etc. [EPA-HQ-OAR-2022-0985-1606-A1, p. 15]

With respect to infrastructure, Volvo Group proposes that the agency link either the vehicle stringencies or manufacturer compliance determination for each model year of the Phase 3 regulatory period to the actual infrastructure capacity, accessibility, and density within geographic areas and along freight corridors. That infrastructure must be able to support the agency's adoption rates in each vehicle subcategory such that, regardless of geographic area or freight corridor in which the infrastructure is installed, it can support the previous years' fleet plus the total number of zero-emission vehicles determined by the agency's annual adoption rates. [EPA-HQ-OAR-2022-0985-1606-A1, p. 15]

For example, if a city had enough chargers to charge 1,000 HD EVs daily, but the total fleet (regardless of fuel/energy source) operating in or transiting to and from this city was only 500

HD vehicles daily, then the additional capacity would not be included in the capacity assessment. Of course, it is not realistic that there would be this much excess capacity; the numbers are exaggerated to make the point. [EPA-HQ-OAR-2022-0985-1606-A1, p. 15-16]

If 50 of those vehicles were locally domiciled Class 8 vocational vehicles that returned to base every night and had available infrastructure to charge batteries that met their range 100% of the time, then that capacity would be counted toward the required Class 8 adoption rate. However, if the chargers were private, but had additional capacity beyond this fleet’s needs, this additional capacity should not be counted. [EPA-HQ-OAR-2022-0985-1606-A1, p. 16]

Thus, this determination, is not a one-to-one equivalence when it comes to number of chargers, making the assessment more complicated. As noted, the chargers must be accessible, which means a mix of public and private chargers. Additionally, they must be available for a sufficient amount of time for charging when and where vehicles need them. In some cases, this will require opportunity charging, which is not included in the agency’s analysis. [EPA-HQ-OAR-2022-0985-1606-A1, p. 16]

There should also be some consideration given to an individual OEM’s ability to comply based on its product portfolio and market share by region and segment. If the infrastructure is sufficient to meet the adoption rate for Class 8 high roof day cab tractors based only on infrastructure on the West Coast, but a manufacturer has no sales in that region, they will be at risk of noncompliance. Thus, there must be some margin applied so that a manufacturer is not deemed non-compliant due to such factors. [EPA-HQ-OAR-2022-0985-1606-A1, p. 16]

Because of the myriad complicating factors that go into assessing the sufficiency of infrastructure, we suggest the agency reach out to the broadest possible group of stakeholders. At a minimum, we think the agency should enlist utilities and public utility commissions; hydrogen, alternative fuel, and diesel fuel producers and distributors; charging service providers and EVSE manufacturers; vehicle manufacturers; dealers; public and private fleets; expert industry consultants in clean transportation; trucking industry service providers; and additional state and federal agencies such as CARB and DOE. [EPA-HQ-OAR-2022-0985-1606-A1, p. 16]

We also suggest EPA undertake a data collection effort as soon as possible to determine how to assess sufficiency. One good source of data will be available through the Electric Power Research Institute’s (EPRI) EVs2Scale 2030 project.11 This project will include a three-year comprehensive study to model grid impacts (load profiles/clusters) for 50% EV market share by 2030 for light, medium and heavy-duty vehicles. This study will provide critical information to utilities to determine the pace of year-over-year action and investment required to prepare the grid in advance of this load. The goal is to help support rapid deployment of millions of electric vehicles and trucks – while minimizing grid impacts and ensuring regulators/utilities are in lockstep with OEMs and vehicle regulations. The result will be a 50-state roadmap to 2030 outlining EV loads, grid impacts, lead times, workforce, and costs, assuming 50% EV adoption across all weight classes. [EPA-HQ-OAR-2022-0985-1606-A1, p. 16]

11 Walton, R (2023, April 19). EPRI launches 3-year initiative to address grid constraints, develop tools to serve coming EV loads. UtilityDive.com. Accessed on 14 June 2023 at https://www.utilitydive.com/news/epri-initiative-electric-vehicle-loads-power-grid-constraints-interconnection/648024/

Of course, this need does not only apply to infrastructure. It is important to remember that this is a nascent industry, and many of the assumptions being made may or may not come to fruition. With such high stringency increases above the Phase 2 2027 model year vehicle standards, the only pathway to meeting the NPRM's proposed improvements will be through zero, or near-zero emissions technologies. [EPA-HQ-OAR-2022-0985-1606-A1, p. 16]

Thus, it is absolutely critical that the agency work with all stakeholders during the rulemaking period to assure the best possible assumptions and inputs are utilized in the stringency setting, and that there be some included safety valves in acknowledgement of the uncertainty and volatility around this emerging technology. [EPA-HQ-OAR-2022-0985-1606-A1, p. 17]

Organization: Zero Emission Transportation Association (ZETA)

Other commenters may recommend EPA adopt so-called regulatory "off-ramps" in an effort to undermine the stringency of the proposed standards. ZETA urges EPA not to adopt any regulatory changes that would create unnecessary and avoidable uncertainty in the HDEV supply chain. The private sector investments being made today will be critical in meeting the target EPA has created with these proposed standards and arbitrarily undermining them with counterproductive regulatory changes will only add additional risk to such investments. [EPA-HQ-OAR-2022-0985-2429-A1, p. 16]

<u>EPA Summary and Response:</u>

<u>Summary:</u>

Many commenters coalesced on the point that there must be extensive post-promulgation oversight and potential action by EPA if the Phase 3 program is to be successfully implemented. A number of commenters stressed the need for a government-wide approach including at a minimum, EPA, DOE, and the Joint Office of Energy and Transportation. (DTNA, UAW). The linked uncertainties cited by commenters as necessitating some type of post-promulgation monitoring include:

- distributive infrastructure (e.g. Cummins, Chevron, EMA, DTNA)
- customer acceptance of ZEVs (e.g. Chevron, DTNA)
- critical mineral supply and availability (e.g. Chevron)
- ZEV sales (e.g. Chevron)
- other critical assumptions in HD TRUCS relating to cost (e.g. DTNA, NADA)

Commenters had various suggestions as to the type of post-promulgation activity needed, ranging from monitoring and reporting, to automatic adjustment of the standards:

- Monitoring and reporting of, in particular, distributive infrastructure, BEV sales, and critical material availability (Chevron)
- a midterm review analogous to that conducted by EPA for the second LDV GHG standard (which would include a regulatory requirement binding EPA to conduct such a review) (API, Navistar)

- a commitment to a technical amendment by the end of calendar year 2024 if important projections appear not to be occurring (Cummins)
- an automatic adjustment factor ('scalar') built into the standards themselves whereby the standards would be proportionately adjusted downward depending on the percentages of infrastructure (and potentially other parameters as well) which deviate from those projected (EMA, DTNA) (this type of off- ramp was actively opposed by various other commenters including EDF and ZETA)
- careful monitoring, and potential pre-adjustment of standards for MY 2030 for Class 8 vehicles (TRALA)

In public comments, and in subsequent meetings with agency staff, EMA put forward other ideas of what could be monitored as a type of warning signal. These suggestions included evaluating potential charging infrastructure needs for the 100 counties considered to be the most likely areas for ZEV adoption (based, for example, on the ICCT April 2023 White Paper) and from that assessment determine the benchmark number and types of ZEV-truck-battery recharging (and H2-refueling stations) that will need to be constructed and made operational in each these counties on an annual basis over the next 8-9 years. Commenters also suggested that EPA could then monitor the progress of the development of the necessary ZEV-truck infrastructure in these top 100 counties against the annual benchmarks. (This suggested methodology is similar to that utilized by EMA consultant Ricardo in their exhibit to the EMA public comments). Another suggestion from commenters was to monitor the extent of compliance with ACT requirements in California and the section 177 States to see what lessons can be drawn, and to adjust the federal program if needed.

Response:

In response to several commenters raising concerns related in particular to the readiness of the infrastructure to support ZEVs, we have carefully assessed infrastructure needed for the modeled potential compliance pathway that supports the feasibility of the final standards. See preamble Section II.F. As described in preamble Section II.G, we conclude that the Phase 3 standards are feasible and appropriate, which includes findings that there will be adequate supporting infrastructure. See also RTC section 7.1. However, EPA also commits in this final rule to actively engage with stakeholders and monitor both manufacturer compliance and the major elements of the HD ZEV infrastructure and issue periodic reports in consultation with other agencies, as discussed in preamble section II.B.2.iii. Based on these reports, as appropriate and consistent with CAA section 202(a) authority, EPA may decide to issue guidance documents, initiate a rulemaking to consider modifications to the Phase 3 standards (if the agency determines that the standards may no longer reflect the appropriate balancing of statutory and other relevant factors), or make no changes to the Phase 3 rule program. However, EPA is declining to include in the final rule a self-adjusting linkage between the standards and ZEV infrastructure. First, as discussed in preamble section II.B.2.iii, our approach here is consistent with similar actions EPA has taken in the past to monitor implementation successfully post-rulemaking. Second, as explained in preamble Section II and RTC section 2, the Phase 3 standards are performance-based standards and the modeled potential compliance pathway is not the only way that manufacturers may comply with the standards, and thus these reports will include but not be limited to assessing only HD ZEV infrastructure (the metric suggested by commenters for a self-adjusting linkage). A self-adjusting mechanism based solely on HD ZEV-related developments would inappropriately suggest that the final standards are a ZEV mandate or can only be achieved by ZEV technologies, which is both legally and factually erroneous; such a mechanism, moreover, could improperly reduce regulatory certainty and undermine the development and application of non-ZEV technologies for achieving GHG emissions reductions. Finally, we believe our active engagement with stakeholders and our monitoring and reporting activities will provide sufficient information from which to assess whether any changes to the Phase 3 rule program are warranted. For discussion of payback and adoption rates, please see RTC section 3. For discussion of critical minerals, please see RTC section 17.

2.10 Coordination for Implementation of the Program

Comments by Organizations

Organization: American Petroleum Institute (API)

iv. Stakeholders missing from the discussion – utilities

EPA requested comment on stakeholders that may be missing from the discussion. As noted during the public hearing testimony, of the various stakeholders who testified, representation from the utilities was lacking. We implore the agency to fully engage the utilities in discussion prior to finalizing the Phase 3 rule. Because infrastructure is such an important piece of the program, the main stakeholder group needs to be included in the design of the program to provide EPA guidance. For example, a set of truck chargers of sufficient size to charge a fleet of fully electric trucks requires power enough for a small town.10 If there are National Electric Vehicle Infrastructure (NEVI) charging facilities (i.e., four direct current fast chargers (DCFCs) with the capability to deliver 150 kW simultaneously) located on the same grid, there could be significant challenges to delivering the power without impacting other residential, commercial, and industrial customers. Further, a guidance report by the North American Council for Freight Efficiency (NACFE) and RMI highlights that “[c]harging infrastructure includes not only the chargers themselves, but the interrelated system of vehicles, duty cycles, chargers, and electric utilities.”11 [EPA-HQ-OAR-2022-0985-1617-A1, p. 9]

10 “Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet,” American Trucking Research Institute, December 2022.

11 “Charging Forward with Electric Trucks,” North American Council for Freight Efficiency (NACFE) and RMI, June 2023.

Organization: California Air Resources Board (CARB)

The NPRM states that U.S. EPA believes there is sufficient lead time for the charging and refueling infrastructure to develop to support the Proposed Standards and that such infrastructure for BEVs and FCEVs is important for the success of the increasing development and adoption of these vehicle technologies. CARB staff agrees with both statements. In California, staff have recognized the critical role that infrastructure plays in supporting the adoption of ZE truck technologies. As such the state has found it useful to bring together environmental, energy, transportation, and business development agencies to focus on planning, communication, funding, permit streamlining and workforce development to support development of fueling infrastructure for BEV and FCEV HDVs. An example of this effort is the Zero Emission Infrastructure Joint Agency Statement of Intent. [EPA-HQ-OAR-2022-0985-1591-A1, p.49]

The NPRM states that U.S. EPA has heard from some representatives from the HDV manufacturing industry both optimism regarding the HD industry's ability to produce ZEV technologies in future years at high volume, but also concern that a slow growth in ZEV refueling infrastructure can slow the growth of HD ZEV adoption, and that this may present challenges for vehicle manufacturers' ability to comply with future U.S. EPA GHG standards. This fails to recognize that the standards finalized by U.S. EPA can be, and should be, the catalyst for any needed planning, investment and fueling infrastructure development (both Electric Vehicle Supply Equipment (EVSE)/Hydrogen stations and the upstream infrastructure for electricity and hydrogen production and delivery). CARB and U.S. EPA have both seen how standards, of diverse types, can accelerate these kind of developments—whether in low-sulfur gasoline, biofuels, or ZEV charging. [EPA-HQ-OAR-2022-0985-1591-A1, p.49]

U.S. EPA requests comment on stakeholders they should work with in the assessment of implementation of the Phase 3 rulemaking, including with respect to important issues of refueling and charging infrastructure. California has been conducting stakeholder engagement with the following parties: fleets, fleet depot providers, infrastructure providers, vehicle manufacturers, utilities, cities and counties, infrastructure consultants, state energy, transportation, workforce development, and business development agencies, port authorities, community environmental justice (EJ) organizations, truck stop operators, warehouse operators and agricultural industry representatives. These engagements have been fruitful in identifying stakeholder concerns and opportunities for data sharing, as well as for connecting stakeholders with solution providers. [EPA-HQ-OAR-2022-0985-1591-A1, p.50]

Organization: Daimler Truck North America LLC (DTNA)

Successful implementation of the new standards will depend upon coordinated regulatory and policy support for the HD ZEV transition.

DTNA devotes significant resources to developing an array of ZEV product offerings for its customers and invests heavily in the technological advancements needed to support expansion of the Company's ZEV portfolio. Solving TCO and infrastructure barriers to widespread ZEV adoption cannot be accomplished by manufacturers alone, however. Rather, these obstacles will be overcome only by coordinated regulatory, legislative, and private sector efforts. As the driver of national clean transportation regulatory programs, EPA has the unique role of promoting the clean transportation policies needed to ensure that its emission standards are achievable, including the following:

- Policies to Promote TCO Parity Between ZEVs and Conventional Vehicles
    - Federal Excise Tax Cap or Repeal. The Federal Excise Tax (FET) adds 12% to the first retail sale of new HD trucks, truck trailers, semitrailers, and tractors.8 Because HD ZEVs currently retail for two to three times the price of their conventional vehicle equivalents, the FET applied to a HD ZEV sale is two to three times the tax applied to the sale of a comparable conventional vehicle. Given the hefty FET passed on by retailers to ZEV purchasers, the up-to-$40,000 commercial clean vehicle tax credit enacted by the Inflation Reduction Act (IRA) may only be enough to offset the additional FET applied to a ZEV purchase, instead of reducing actual technology costs. DTNA thus recommends that EPA support advocacy for a legislative change to repeal the FET as applied to HD ZEV

sales, or to adopt a cap so that the tax applied to such sales is no more than the FET collected on a comparable conventional vehicle sale. [EPA-HQ-OAR-2022-0985-1555-A1, p. 10]

- Vehicle Weight Adjustments. Due to additional battery weight, commercial ZEVs weigh significantly more than comparable conventional vehicles. This additional weight impacts the cargo capacity of the vehicle and ultimately the fleet's profitability and TCO. In 2019, federal highway laws were amended to allow a 2,000-pound maximum exceedance of the established weight limits for HD BEVs operating on federal interstates.9 Few states have enacted a similar weight increase for HD BEVs to operate on state roads, however, despite the fact that such an increase is needed for BEVs to serve in weight-sensitive applications. BEV weights also impact Federal Motor Carrier Safety Administration (FMCSA) and state-equivalent vehicle weight classification and licensing requirements. For instance, under FMCSA and state motor carrier safety programs, a number of vehicle applications that are under the 26,001-pound threshold for conventional medium-duty vehicles (MDVs) would be classified in a higher weight class as a BEV, requiring fleets to hire additional drivers with commercial drivers' licenses (CDLs) where they would not otherwise be required. DTNA recognizes that adjusting weight limits and classifications have potential implications for road wear and safety and must be further studied. In the meantime, however, EPA should consider fully accounting for these weight penalty issues in the TCO calculations for this rulemaking, or limiting its ZEV uptake projections to only specific applications that are less sensitive to payload capacity restrictions. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 10-11]

9 See 23 U.S.C. 127(s).

Organization: Electrification Coalition (EC)

We suggest the EPA work collaboratively with the Joint Office, National Association of Regulatory Utility Commissioners (NARUC), and additional stakeholders to ensure a successful implementation of the final rule, particularly for the timely deployment of EV charging infrastructure. [EPA-HQ-OAR-2022-0985-1558-A1, p. 12]

The EPA specifically requests comments on request comment on whether there are additional stakeholders EPA should work with during implementation of the Phase 3 standards, particularly with respect to the important issue of HD EV charging infrastructure.35 The EC comments that the EPA should work collaboratively with the Joint Office of Energy and Transportation (JO) to begin with, as some of the lessons learned and best practices from deployment of EV charging infrastructure on the light-duty side under the National EV Infrastructure (NEVI) Program and Charging and Fueling Infrastructure Grant Program (CFI) will be applicable to the HD EV charging sector. The EPA should also work with NARUC, the American Public Power Association (APPA) and the National Rural Electric Cooperative Association (NRECA), as utility Commissioners, staff, muni and coop boards and staff need to be aware of the impact the EPA proposed rule will have on their utilities. A HD EV charging consortium could be created consisting of the aforementioned stakeholders, Edison Electric Institute (EEI), regional utility commission associations, and select additional partners to discuss challenges and solutions. In particular, this consortium should discuss best practices for commercial utility EV rates and rate design for the HD sector, and encourage adoption of these rates and rate design across all utilities. [EPA-HQ-OAR-2022-0985-1558-A1, p. 12]

35 See page 25934 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

In addition, the EC suggests the EPA could work with the FHWA to expeditiously announce the designated national EV charging corridors to support freight and goods movements along national highways, National Highway Freight Network, and other goods movement locations as required by the BIL. [EPA-HQ-OAR-2022-0985-1558-A1, p. 13]

Organization: International Council on Clean Transportation (ICCT)

The EPA rule can go further than we have outlined here by making use of the significant research and investment the U.S. Department of Energy is making in truck efficiency. The DOE SuperTruck program continues to deliver cutting edge innovations in partnership with private industry. The failure to incorporate commercially viable efficiency packages with short payback periods is a significant missed opportunity. We encourage EPA in preparing its final rule to consult with DOE and its industry partners to identify additional efficiency technologies we have not identified here. Their inclusion will further strengthen and increase the benefits of the proposed standards. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 18-19]

Organization: MEMA

It is imperative that EPA aligns with the Joint Office of Energy and Transportation through the implementation period of this rule to identify shared concerns and solutions for the many moving parts of the rule. Failure in one key sector, lithium sourcing as one example, could result in significant cost or schedule impacts, stunting availability or adoption of these new vehicles. Positive regulatory certainty bolsters consumer confidence in new technologies and decreased use of gasoline- and diesel-fueled vehicles. EPA should adopt an "all hands on deck" approach with regards to emissions-lowering technologies and encourage greater acceptance of and investment in renewable fuels, which can positively impact the net emissions of the entire U.S. Internal Combustion Engine (ICE) vehicle fleet. [EPA-HQ-OAR-2022-0985-1570-A1, p. 4]

The aggressive pace and scope of the proposed rule obliges EPA to work to ensure success throughout the course of this rule's implementation. EPA must follow through on all assumptions, and act accordingly to help make them a reality and reassure manufacturers and consumers along the way. [EPA-HQ-OAR-2022-0985-1570-A1, p. 4]

Recommendation: EPA align regulations and priorities in concert with the Joint Office of Energy and Transportation throughout the implementation period of this rule to identify shared concerns and solutions for the many moving parts of the rule. EPA must follow through on all assumptions regarding critical materials, infrastructure needs and timing of milestones identified in the rule's analyses, and take action to make them a reality as this rule is implemented. [EPA-HQ-OAR-2022-0985-1570-A1, p. 4]

The federal government is well-suited to deploy infrastructure along interstates and should allocate targets in funding for hydrogen and DC fast charging to support opportunity charging needs for MHDV. [EPA-HQ-OAR-2022-0985-1570-A1, p. 9.]

Recommendation: EPA to work with other agencies in the Joint Office of Energy and Transportation to deploy even more infrastructure than currently planned along interstates and allocate increased targets in funding for hydrogen and DC fast charging to support opportunity charging needs for MHDV. [EPA-HQ-OAR-2022-0985-1570-A1, p. 9.]

Organization: Truck and Engine Manufacturers Association (EMA)

Thus, as a practical matter, the NPRM at issue amounts to a one-legged stool, which as currently designed will fracture and frustrate all stakeholders. The Agency will need to address that fundament defect upfront in concrete ways. More specifically, and at the very least, the Agency should work with all of the necessary stakeholders (e.g., the national laboratories, EPRI, the Joint Office of Energy and Transportation, DOT, FHWA, CRC, OEMs, and others) to establish benchmarks and timelines for the necessary build-out of the requisite infrastructure, and should link potential adjustments to the implementation of the Phase 3 standards to those benchmarks. To not do so is, in essence, to ignore the elephant in the room, an elephant that is certainly large enough to cause the collapse of what needs to be a three-legged stool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 6]

EPA Summary and Response

Summary:

In the preamble for the proposal, EPA requested comment on "whether there are additional stakeholders EPA should work with during implementation of the Phase 3 standards, if finalized, and what measures EPA should consider to help ensure the success of the Phase 3 program" (Preamble, Section I.C.). The above commenters provided several suggestions. DTNA stated that a coordinated regulatory and policy support structure is needed, and that implementation cannot be solved by manufacturers alone. Other commenters recommended that EPA include a wide variety of groups, including utilities, fleets, fleet depot providers, infrastructure providers, vehicle manufacturers, utilities, cities and counties, infrastructure consultants, state energy, transportation, workforce development, and business development agencies, port authorities, community environmental justice (EJ) organizations, truck stop operators, warehouse operators and agricultural industry representatives. Several commenters also suggested involving the Joint Office of Energy and Transportation, regarding lessons learned and best practices from deployment of EV charging infrastructure on the light-duty side under the National EV Infrastructure (NEVI) Program and Charging and Fueling Infrastructure Grant Program (CFI); the National Association of Regulatory Utility Commissioners (NARUC), the American Public Power Association (APPA); and the National Rural Electric Cooperative Association (NRECA).

CARB recommended, based on their experience, involving people from the environmental, energy, and transportation sectors, and business development agencies to focus on planning, communication, funding, permit streamlining, and workforce development to support fuel infrastructure for BEC and FCEV HDVs. CARB also noted that EPA's rule should be a catalyst for infrastructure development. DTNA noted that coordinated regulatory, legislative, and private sector efforts are needed. The Electrification Coalition recommended creating a heavy-duty EV charging consortium, including Edison Electric Institute, regional utility commission associations as well as other selected partners. ICCT said EPA should take advantage of the

SuperTruck program and consult with DoE and its industry partners. DTNA called for action to repeal the federal excise tax cap and to modify vehicle weight requirements.

Response:

Regarding coordination and engagement during the course of the Phase 3 rulemaking process, see preamble Sections ES.E and F for a summary of the extensive coordination and engagement EPA undertook, as reflected throughout the record of this rulemaking. As noted in Section 2.9 of this document, and in Preamble Section II.B.2.iii, EPA, in conjunction with its Federal partners, is committing to continuing this engagement with stakeholders and to monitoring both manufacturer compliance and the build-out of major elements of the HD ZEV infrastructure. EPA, and its federal partners, intend to engage with other interested stakeholders as part of these efforts. See RTC Section 7 for our consideration of comments relating to infrastructure and our engagement with utilities, as recommended by API. In response to CARB's "catalyst" comment, we direct readers to RTC Section 2.4 for our responses to comments suggesting that federal standards will provide needed certainty for investment in ZEVs, critical materials, and infrastructure. In response to DTNA, we have revised our HD TRUCS analysis as described in RIA Chapter 2 and RTC Section 3, including specific revisions to our assessment of payload capacity. DTNA's suggestions that EPA address the federal excise tax cap and vehicle weight requirements are outside the scope of this rulemaking.

2.11 Other Legal Issues

Comments by Organizations

Organization: Texas Public Policy Foundation (TPPF)

Both Tailpipe Rules Violate The Administrative Procedure Act ('APA')

The Tailpipe Rules also violate the Administrative Procedure Act's prohibition against agency action that is 'arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law . . . .' 5 U.S.C. 706. [EPA-HQ-OAR-2022-0985-1488-A1, p. 3]

The statute defines 'air pollutant' as 'any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air.' 42 U.S.C. 7602. Because the statute fails to define the meaning of the term 'air pollution agent,' this definition is facially circular and therefore void for vagueness. Antonin Scalia & Bryan Garner, READING LAW 134 (Thomson/West 2012) ('An unintelligible text is inoperative.'); see also Sackett v. EPA, 598 U.S. ____ (2023), slip op. at 24 (stating that a 'broad and unqualified' interpretation of the Clean Water Act 'gives rise to serious vagueness concerns'). [EPA-HQ-OAR-2022-0985-1488-A1, p. 3]

Furthermore, carbon dioxide, the most plentiful greenhouse gas, is a natural substance essential to life on Earth. It is everywhere and in everything, yet EPA claims the power to regulate it. Congress could not possibly have intended to grant the EPA such wide-ranging regulatory power when it passed the Clean Air Act. Courts analyzing grants of authority to executive agencies must consider 'whether Congress in fact meant to confer the power the agency has asserted.' West Virginia v. EPA, 142 S. Ct. 2587, 2608 (2022). In West Virginia, the

Supreme Court affirmed that when ‘the history and breadth of the authority that the agency has asserted, and the economic and political significance of that assertion’ are large and weighty, courts have ‘reason to hesitate’ before concluding Congress meant to delegate such power. Id. (cleaned up). At the very least, the Court ‘expect[s] Congress to speak clearly if it wishes to assign to an agency decisions of vast economic and political significance.’ Util. Air Regulatory Grp. v. EPA, 573 U.S. 302, 324 (2014) (cleaned up). Because EPA’s interpretation of the CAA to regulate CO2 ‘would bring about an enormous and transformative expansion in EPA’s regulatory authority without clear congressional authorization,’ it is ‘patently unreasonable’ for EPA to seize such authority. Id. [EPA-HQ-OAR-2022-0985-1488-A1, p. 3]

EPA points to their Greenhouse Gas Endangerment Finding, see 74 Fed. Reg. 66496 (Dec. 15, 2009), as the source of their conclusion that it may regulate greenhouse gases. EPA made this Endangerment Finding without seeking peer review from the Science Advisory Board (‘SAB’), a blue-ribbon panel of experts established by Congress to ensure that EPA regulations are based on accurate data and credible scientific analyses. In enacting the peer review requirement, Congress was concerned that EPA not impose unnecessary restrictions on economic and personal freedom by unintelligently pursuing its regulatory goals. By ignoring the peer review requirement, EPA violated 42 U.S.C. 4365(c)(1), which states that EPA ‘shall’ make its regulatory proposals available to the SAB for peer review. That fundamental error stemmed from a desire to impress the community of nations by being among the first to regulate greenhouse gas emissions timed to coincide with the 2009 Copenhagen international climate conference. [EPA-HQ-OAR-2022-0985-1488-A1, pp. 3-4]

The Endangerment Finding has other flaws. In making it, EPA made no showing that the Finding or any of its related greenhouse gas rules will remove any dangers to human health or welfare. Indeed, EPA disclaimed any obligation to define its ultimate regulatory objectives or its chosen means of achieving them and even refused to articulate how the Endangerment Finding could lead to successfully combating anthropogenic climate change. Furthermore, EPA claimed it was 90-99% certain that human-caused climate change threatened public health and welfare, see 74 Fed. Reg. at 66518 n.22, while failing to state what constitutes a safe climate, acceptable global temperature ranges, how levels of greenhouse gases in the atmosphere (whether natural or man-made) may affect those ranges, or even whether its regulatory actions would ameliorate any risk. Because of these substantial gaps in its analysis, no one could accurately judge whether EPA achieved any discernable public benefit or congressionally-authorized goal when it made the Endangerment Finding. Section 202(a)(1) of the CAA requires the EPA to exercise its own independent judgment to determine how its regulatory response to a perceived risk will reduce or eliminate that risk. Instead, the EPA left evidentiary analysis and risk assessment almost entirely to international non-governmental organizations (‘NGOs’) when making the Endangerment Finding. Congress did not clearly delegate the significant power to make regulatory determinations affecting public policy to NGOs. See Util. Air Regulatory Grp., 573 U.S. at 324. [EPA-HQ-OAR-2022-0985-1488-A1, p. 4]

For all these reasons, the Endangerment Finding was itself arbitrary, capricious, and ultra vires, and any regulation based on its authority suffers the same problems. [EPA-HQ-OAR-2022-0985-1488-A1, p. 4]

The HD Tailpipe Rule Will Devastate Trucking

Former Supreme Court Justice Breyer stated in Whitman v. Am. Trucking, 531 U.S. 457 (2001), that the Clean Air Act ‘does not require the EPA to eliminate every health risk, however slight, at any economic cost, however great, to the point of ‘hurtling’ industry over ‘the brink of ruin.’’ Id. at 494. In the Whitman case the Supreme Court vacated the 1997 NAAQS because of the poor science and lack of discernable criteria underlying them. Likewise here, no scientific data requires the EPA to enact the most stringent tailpipe emission limits conceivable. [EPA-HQ-OAR-2022-0985-1488-A1, pp. 4-5]

EPA Summary and Response:

Comment Summary:

TPPF raises various challenges to EPA’s authority to regulate CO2 emissions from motor vehicles. TPPF commented that the Clean Air Act provisions at issue here are void for vagueness because the statutory definition of “air pollutant” is circular. The statute defines ‘air pollutant’ as ‘any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air.’ 42 U.S.C. 7602. Because the statute fails to define the meaning of the term ‘air pollution agent,’ this definition is facially circular and therefore void for vagueness.

TPPF also commented that Congress couldn’t have meant for EPA to regulate CO2, which they state is a ubiquitous substance essential for life on earth. TPPF asserts that EPA’s claimed authority to do so comes from its Endangerment Finding, which they further assert is flawed. TPPF commented that the proposal is inherently unlawful because the Endangerment Finding, its predicate, was issued without following proper procedures, referring to review by the Science Advisory Board. TPFF added that, in their view, the Endangerment Finding is fatally flawed because it does not state what level of ambient GHGs is “unsafe” or “safe”, and in addition, the agency made no independent findings, relying instead on NGO reports, and so did not exercise its independent judgment.

TPPF also cites Justice Breyer’s concurring opinion in *Whitman v. ATA* (without identifying it as a concurrence), and states that the Court vacated EPA’s 1997 NAAQS as being scientifically unsupported and without discernible criteria, flaws the commenter perceives in the HD proposed rule.

Response:

A commenter raises various challenges to the EPA’s authority to regulate CO2 from motor vehicles and the 2009 Endangerment Finding and claim that the statutory definition of “air pollutant” is circular. EPA disagrees with these comments.

In the 2009 Endangerment Finding, the Administrator determined that emissions of GHGs by classes of new motor vehicles contribute to air pollution. This finding was upheld by the D.C. Circuit in *Coalition for Responsible Regulation v. EPA*, 684 F.3d 102, 117 (D.C. Cir. 2012) (“We ultimately conclude that the Endangerment Finding is consistent with Massachusetts v. EPA and the text and structure of the CAA, and is adequately supported by the administrative record.”). Based on the 2009 Endangerment Finding, EPA subsequently issued numerous rules to regulate GHGs from classes of motor vehicles. TPPF’s comments questioning the 2009 Endangerment Finding and EPA’s authority to regulate GHG emissions from motor vehicles are therefore untimely. EPA did not reopen the 2009 Endangerment Finding in this action. Nonetheless, we provide a further response to TPPF's arguments.

With respect to the 2009 Endangerment Finding, as noted above, we are not reopening the Endangerment Finding in this rulemaking, so TPPF's comments are out of scope. We also refer TPFF to the Supreme Court's *Massachusetts v. EPA* case, holding that greenhouse gases, including CO2, are air pollutants under the CAA's "capacious" definition, and therefore that the command in CAA section 202(a)(1) to regulate "any air pollutant" includes CO2. 549 U.S. at 529, 533. Further, the Endangerment Finding was sustained in all respects in litigation. *Coal. for Resp. Regulation*, 684 F. 3d at 116-125, including rejecting the very argument the commenter belatedly offers here. 684 F. 3d at 124. In addition to being 14 years out of time and out of scope for this rulemaking, the commenter fails to note that the arguments relating to the safe level of ambient GHGs and no independent judgment were likewise rejected by the court in *Coal. For Responsible Regulation v. EPA*. See 684 F. 3d at 326-27, 323-24.

The commenter's argument that the definition of "air pollutant" is circular or void for vagueness is also beyond the scope of this rulemaking. EPA also addressed the definition of "air pollutant" in the 2009 Endangerment Finding including as it applies to GHGs. See 74 FR 66536. In any event, EPA disagrees with this comment. The statutory definition explains the characteristics that may give rise to an air pollution agent or combination of agents being considered an "air pollutant." EPA properly considers GHGs to be air pollutants under the CAA. In *Massachusetts v. EPA*, the Supreme Court upheld EPA's authority to regulate GHG emissions from new motor vehicles and in doing so explained that "greenhouse gases fit well within the Clean Air Act's capacious definition of 'air pollutant.'" 549 U.S. 497, 532 (2007). The Court explained that the definition of "air pollutant," "which includes '*any* air pollution agent . . . , including *any* physical, chemical, . . . substance . . . emitted into . . . the ambient air . . . ,' embraces all airborne compounds of whatever stripe. Moreover, carbon dioxide and other greenhouse gases are undoubtedly "physical [and] chemical ... substance[s]." *Id.* (emphases in original) (bracket alterations in original) (internal citation omitted). This makes clear that GHGs are properly considered air pollutants under the CAA.

The commenter's reliance on *Whitman v. ATA* is also misplaced. The Court in *Whitman* vacated the D.C. Circuit's opinion holding that the 1997 NAAQS effected an impermissible delegation of authority, holding that CAA section 109(d) in fact contains an intelligible principle and so constitutes a permissible delegation of authority to EPA. *Whitman v. ATA*, 531 U.S. at 474. On remand, the D.C. Circuit upheld the 1997 NAAQS in all remaining respects. *ATA v. EPA*. 283 F. 3d 355, 380 (D.C. Cir. 2002).

3 HD TRUCS Tool

Comments by Organizations

Organization: CALSTART

Stringency and Penetration Rate Considerations

CALSTART believes that EPA staff has generally taken a thoughtful and serious approach to set assumptions about ZE-MHDV sales penetration rates. The HD TRUCS tool is a solid framework, and we do not believe EPA needs to make wholesale changes to its basic model. That said, we do believe there are some important modifications and adjustments to the assumptions that would better support the rule and set the penetration rate based on additional researched sources, given how important this rate is to set the ultimate stringency in the rule. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 11 - 12]

We start with our understanding of the Phase 3 framework. In our observations and discussions with multiple stakeholders, we believe EPA has set stringency based on:

- No additional improvements in ICE technology;
- Incorporating ZE-MHDV sales in ACT states as part of compliance with EPA stringency; and
- Setting assumptions based on expected market-driven ZE-MHDV sales in the remaining states as the limit of GHG stringency. [EPA-HQ-OAR-2022-0985-1656-A1, p. 12]

Organization: Truck and Engine Manufacturers Association (EMA)

The specifics of EPA's Phase 3 proposal are largely based on the Agency's HD TRUCS spreadsheet and the various inputs and assumptions that the Agency used to derive the underlying estimates of ZEV-truck adoption rates. In this section of our comments, EMA assesses the reasonableness (or not) of the Agency's inputs and assumptions, and then develops an alternative HD TRUCS analysis to derive alternative and more reasonable estimates of potentially achievable ZEV-truck adoption rates. Using those revised data-based adoption rates, we then derive, for illustrative purposes, alternative GEM-based GHG standards for the 2027 through 2032 model years. [EPA-HQ-OAR-2022-0985-2668-A1, p. 19]

There are a number of ways that EPA could have set about developing a ZEV-based Phase 3 rulemaking. For example, EPA might have undertaken a comprehensive study of the "best case" ZEV-truck infrastructure build-out that could be achieved on a nationwide basis over the next ten years, taking the BIL, IRA and multiple state initiatives into account. Based on that "best case" analysis, EPA could have derived the optimal ZEV-based program that could be supported by the achievable ZEV infrastructure, and then could have derived GEM-based GHG standards from that optimized ZEV-based program. [EPA-HQ-OAR-2022-0985-2668-A1, p. 19]

Alternatively, EPA could have engaged in extensive outreach with ZEV-truck OEMs (and ZEV-truck component manufacturers) to assess OEMs' maximum capacities to source, produce and sell ZEV-trucks over the next ten years, again taking the BIL, IRA and multiple state initiatives into account. Using those OEM-informed data-based projections, EPA could have developed corresponding aspirational ZEV-truck adoption rates to serve as the basis for calculating future GEM-based GHG standards. [EPA-HQ-OAR-2022-0985-2668-A1, p. 20]

As another approach, one that EMA espoused, EPA could have carefully assessed which types and applications of trucks and trucking fleets are best suited to wholesale conversions to ZEVs over the next 10 years. Those applications would include trucks that return daily to a central refueling depot (for overnight charging) and that have daily ranges of less than 150 miles. EPA could have based its Phase 3 standards on the numbers and types of ZEV trucks that reasonably could be deployed among the optimized "beachhead" ZEV-truck applications over the next ten years. [EPA-HQ-OAR-2022-0985-2668-A1, p. 20]

But EPA did not do any of that. Instead, as the basis for the proposed Phase 3 standards, EPA simply conducted a literature review in order to construct a spreadsheet-based tool (HD TRUCS) that it created to estimate the potential future TCOs for 101 different types and applications of ZEV-trucks. Using that same literature-based spreadsheet tool, EPA next compared the estimated TCOs of the corresponding conventionally-fueled trucks to determine the respective "payback periods" (i.e., the number of years it takes for the TCOs to become equivalent) for each of the 101 truck types and applications. As a final step, the Agency then ascribed predetermined (and overstated) "adoption-rate" percentages for each of the payback periods for the 101 truck types and applications. The shorter the ZEV-truck payback periods, the higher the ascribed adoption rate percentages. EPA then developed a truncated adoption-rate table (see Table ES-4) for the years 2027 through 2032, and used those ZEV-truck adoption rates (and their zero-emission profiles for GHGs) to determine what the corresponding GEM-based GHG standards should be. EPA's final table does not take into account the number of years that the initial purchaser will own the vehicle and the impact of a potentially negative TCO may have on the willingness to adopt a ZEV at a loss to the business. [EPA-HQ-OAR-2022-0985-2668-A1, p. 20]

EMA would not have gone about assessing potential Phase 3 GHG standards in the manner that EPA chose, since, as discussed above, that methodology is premised on overestimated (and underestimated) literature-based assumptions and predictions. Nevertheless, for the purpose of these comments, and as a means to highlight and illustrate the magnitude of EPA's overestimations of adoption rates, EMA has undertaken a thorough assessment of EPA's HD TRUCS model, including an evaluation of the key inputs that EPA used to generate the model outputs. EMA has replaced several of those inputs where better, more data-driven inputs are available, and has, in turn, developed updated and revised ZEV-truck adoption rates through the HD TRUCS model. As detailed below, those adoption rates are much reduced from EPA's and demonstrate that the Agency's proposal will need to be revised very substantially before the Agency issues any final Phase 3 rule. [EPA-HQ-OAR-2022-0985-2668-A1, p. 20]

i. EPA's HD TRUCS Tool

EPA created HD TRUCS to serve as a tool for assessing the commercial viability of zero-emission truck technologies, which assessment is, in essence, the basis of the Phase 3 NPRM. The HD TRUCS tool, created as an Excel spreadsheet, is capable of performing a comprehensive analysis of a vast number of parameters related to battery-electric and fuel cell-electric technologies in a wide range of vehicle types and duty cycles. The tool incorporates 101 different HDOH vehicles, covering Classes 2b though 8, across a variety of truck and tractor applications. The applications include delivery, vocational, school bus, coach bus, and transit bus operations. The tractors include day-cab, sleeper-cab and heavy-haul applications. Specialty market applications were not included in HD TRUCS, since those volumes are very small and most of those applications are not suitable as BEVs or FCEVs. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 20 - 21]

HD TRUCS uses a physics-based approach to determine the energy needed for an average vehicle in each truck type to perform its daily work. Battery performance and future enhancements to the other key components utilized in BEV and FCEV powertrain are modeled. Batteries are sized in HD TRUCS based on real-world factors that impact battery energy and life, including degradation over time and limitations of depth of discharge that are used to extend the life of the battery. [EPA-HQ-OAR-2022-0985-2668-A1, p. 21]

EPA relied on literature searches to determine the cost of the components that make up the ICE, BEV and FCEV powertrains, which costs are then assessed through a series of total cost of ownership (TCO) calculations that were run through HD TRUCS. ICE powertrains are existing products but will be subject to cost increases due to the upcoming increased stringencies in recently revised NOX regulations. The BEV costs and especially the FCEV powertrain costs that EPA calculated are based more on assumptions and estimations than on actual data, since those are technologies that just started commercial production last year or are still in the prototype stage, as is the case for the FCEV powertrains. [EPA-HQ-OAR-2022-0985-2668-A1, p. 21]

HD TRUCS estimates ZEV component performance based both on EPA's literature search and on the presumptions that technologies and components from the light duty (LD) passenger car market will translate directly into the medium-heavy duty (MHD) market. Additional assumptions regarding future improvements to MHD ZEV components are based on national lab, expert consultant, environmental group, and LD industry projections. [EPA-HQ-OAR-2022-0985-2668-A1, p. 21]

While HD TRUCS is a comprehensive tool for the assessment of BEV and FCEV technologies in the MHD market, EMA believes that there are several aspects of a full assessment of BEV and FCEV costs that are not currently included in HD TRUCS. Those missing items can be critical to the decision-making process of a potential ZEV-truck buyer, as they increase both the initial purchasing cost of a ZEV and potentially the capital needed to fund the purchase, as well as the ongoing expenses of owning and operating a ZEV-truck versus an ICE vehicle. Specifically, HD TRUCS fails to account for federal excise taxes (FET), state vehicle sales taxes, insurance cost differentials, electrical grid upgrade costs for EVSE installations, EVSE annual maintenance, and electricity peak charges and demand charges. EMA will go into more detail regarding these important omissions later in this section of our comments. [EPA-HQ-OAR-2022-0985-2668-A1, p. 22]

ii. HD TRUCS – The EMA Version

EMA has completed an extensive study of the HD TRUCS tool. That effort has yielded a high-level understanding of EPA's approach for estimating adoption rates for BEVS and FCEVs for the 101 truck types. EMA's study also revealed how EPA translated those adoption rates into the existing stringency structure of the current GHG regulations, and how the Agency made its payback determinations and adoption rate selections. EMA's review looked at all the inputs that EPA incorporated into the HD TRUCS tool. EMA and its members then assessed whether the various inputs are actually appropriate for use in setting the regulatory standards and if not, what inputs would be more appropriate based on OEM data, cost and performance projections based on ZEV production and/or development data, or, where warranted, literature-based values that are directionally consistent with the available OEM data. Significantly, EMA has identified numerous input values that are suspect and warrant revision. Details are provided below on the more significant necessary input revisions. [EPA-HQ-OAR-2022-0985-2668-A1, p. 22]

EMA also has identified a number of elements and inputs that are missing from HD TRUCS. Each of those was assessed to determine if it would have a material impact on the payback period calculations and adoption rate determinations, or not. Those that were found to be significant were taken into account through the development of new inputs for the tool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

In addition, EMA's thorough assessment of HD TRUCS uncovered several errors that need to be corrected. Those errors range from formula inconsistencies, factors left out of calculations, incorrect limit values in equations, and formulae that have not properly accounted for the physical space available on the vehicle for batteries. EMA's comments below include a section that provides specifics on those errors as well. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

To fully understand the impact of the necessary corrections and revisions to HD TRUCS and certain of its input values, EMA modified the HD TRUCS tool to create a unique EMA version – "EMA HD TRUCS." The EMA HD TRUCS tool incorporates corrections to all the issues identified during EMA's in-depth analysis. The tool was modified to accept the new inputs, and EMA adjusted the calculations, worksheets and macros to allow the new inputs to properly be evaluated. Inputs were changed iteratively and in groups to determine the impact that each had on the final adoption rates calculated by the revised and updated with EMA HD TRUCS tool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

The specific modifications to create EMA HD TRUCS, and the revised outputs from running the updated tool are detailed below. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23. See Exhibit 2, Relevant Worksheets and Spreadsheets, at docket number EPA-HQ-OAR-2022-0985-2668-A3.]

iii. Modifications Made to Create EMA HD TRUCS

The changes made to create EMA HD TRUCS fall into three categories: corrections, changes to existing inputs, and additions. The EMA HD TRUCS tool has a separate worksheet that documents as many of the EMA "Mods" as possible. Copies of the relevant worksheets and spreadsheets are attached hereto as Exhibit "2." The changes and additions on individual worksheets and spreadsheets are noted by red text, as compared against the black text of EPA's original tool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

iv. Evaluation of the Revised Inputs and Additions to EMA HD TRUCS

EMA has used the revised EMA HD TRUCS tool to determine the impact of the above-described corrections, revisions and additions to the tool's inputs. An assessment of the impact that those warranted modifications can have on the estimated payback periods and the associated ZEV-truck adoption rates is critical to assessing the appropriate level of stringency that should be considered for the final GHG Phase 3 rulemaking. [EPA-HQ-OAR-2022-0985-2668-A1, p. 33]

EMA assessed the various input changes both iteratively and as a group. Ultimately, all the changes and revised inputs were run together, yielding a comprehensive "all-in" assessment of more realistic adoption rates and resultant stringencies. [EPA-HQ-OAR-2022-0985-2668-A1, p. 33]

Set forth below are the results of several scenarios that EMA evaluated using the revised EMA HD TRUCS tool. Although the adoption rates for each of the 101 truck types for each scenario will not be shown in this document, they were calculated in EMA HD TRUCS and were used to create the adoption rate tables by regulatory subcategory, similar to the Draft RIA Table 2-80 (shown below). As noted above, the relevant spreadsheets are attached as Exhibit "2." EMA will make all of the relevant outputs, worksheets and spreadsheets from the revised HD TRUCS tool available to the Agency to facilitate additional discussions going forward. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 33 - 34.] [See Table 2-80 on page 33 of docket number EPA-HQ-OAR-2022-0985-2668-A1 and Exhibit 2, Relevant Worksheets and Spreadsheets, at docket number EPA-HQ-OAR-2022-0985-2668-A3.]

Corrections – The necessary corrections to the tool that EMA identified and discussed above are reflected in the first rerun of the revised HD TRUCS. Corrections aside, the inputs reflect the same values that EPA used. No additional or updated inputs were included. The results for the individual 101 truck types were analyzed by EMA. Because of the use of ranges of payback periods for a single adoption rate, there were changes in adoption rates for only a minimal number of vehicle types. Those corrections are carried forward in other scenarios run using EMA HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 34.]

The new corrected baseline adoption rates at the regulatory subcategory level are shown below: [EPA-HQ-OAR-2022-0985-2668-A1, p. 34.] [See Projected ZEV Adoption Rates for 2027 and 2032 Table on page 34 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Battery Pack Cost, Fuel Cell Stack Cost, and Learning Curve Start Year – All three of these revised inputs were grouped together and run at the same time, using the values discussed above. The revised projected ZEV adoption rates from this scenario of the grouped revised inputs are shown below for 2027 and 2032: [EPA-HQ-OAR-2022-0985-2668-A1, p. 36] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032 Table on page 36 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

All-In – As a final scenario, all of the recommended changes - - including all of the additions and prioritized modifications to inputs - - were run as a batch. The "all-in" revised adoption rates, and an ensuing side-by-side comparison of EPA's and EMA's calculated adoption rates, are shown below: [EPA-HQ-OAR-2022-0985-2668-A1, p. 39] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032, Technology Packages Table on page 39 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

The foregoing "all-in" table reflects markedly reduced adoption rates (reduced by roughly 50% or more) from those that EPA derived and used to calculate the proposed Phase 3 GHG standards, and clearly demonstrates that EPA's proposal will require substantial revision to ensure that realistic and reasonable targets are set. EMA stands ready to share our detailed analyses and results with the Agency in an effort to assess and determine feasible and cost-effective final Phase 3 standards. [EPA-HQ-OAR-2022-0985-2668-A1, p. 40] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032, Technology Packages "all-in" Table on page 40 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

v. Revised GEM-Based GHG Stringency

The adoption rates generated through HD TRUCS drive the calculation of the stringency of the GHG standards for each regulatory subcategory the Phase 3 NPRM using the existing GHG vehicle structure. The revised and more accurate output of EMA HD TRUCS can be used in a similar way to calculate revised and more realistic GEM-based stringencies. Set forth below is a summary of the 2027 and 2032 GHG stringencies that are derived from the EMA HD TRUCS "All-In" scenario. This run in the revised tool brings together all of EMA's recommended inputs, additions and modifications to the HD TRUCS tool. The resulting revised GEM-based GHG stringencies are as follows: [EPA-HQ-OAR-2022-0985-2668-A1, p. 40] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032 Summary of Stringencies Table on pages 40-41 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Importantly, the revised and significantly reduced stringencies shown above should be seen as a starting point (i.e., the ceiling) for additional discussions regarding what the final Phase 3 standards should be. The revised stringencies clearly show, as do the revised adoption rates, the significant impact that one or more of EPA's incorrect assumptions and model inputs can have on an OEM's ability to comply with the next-phase GHG standards. [EPA-HQ-OAR-2022-0985-2668-A1, p. 41]

What also is clear from the foregoing revised model runs is that both EPA's proposed and alternative adoption rates, along with the corollary GHG stringencies, are well beyond what is feasible or reasonable for this rulemaking. The new inputs and the revised output of EMA HD TRUCS, even applying EPA's skewed payback-to-adoption rate table, provide clear evidence that the market simply cannot and will not support the level of ZEV-truck adoptions that EPA has proposed in the NPRM. [EPA-HQ-OAR-2022-0985-2668-A1, p. 41]

To recap, using the methodology that EPA created to apply in its NPRM (HD TRUCS), EMA has identified a number of corrections, additions and revisions that need to be made to the HD TRUCS tool to improve its overall accuracy and suitability for a rulemaking of this significance. The net result is that EMA's updated and more complete version of HD TRUCS can serve as the refined tool to help frame the scope of any final sustainable Phase 3 GHG standards. [EPA-HQ-OAR-2022-0985-2668-A1, p. 41]

As previously noted, however, the improved relative accuracy of the ZEV-truck adoption rates generated through EMA HD TRUCS, and the more reasonable resultant GEM-based GHG standards derived therefrom, are not the end of the necessary analysis. Rather, they are simply the new starting point for follow-on stakeholder discussions. Moreover, any results determined through EMA's HD TRUCS still need to be discounted further by the very real probability that some significant portion of the requisite MHD ZEV-truck recharging and refueling infrastructure will not be in place in time to meet the implicit ZEV-trucks sales mandates that the Phase 3 standards will impose between 2027 and 2032. [EPA-HQ-OAR-2022-0985-2668-A1, p. 41]

6. Additional Potential Modifications and/or Additions to HD TRUCS

EMA members have identified several other elements that are potential modifications and/or additions to HD TRUCS. EPA should consider incorporating these additional elements into the final rulemaking assessment as well. [EPA-HQ-OAR-2022-0985-2668-A1, p.47]

8. Conclusion and Recommendations

EPA's Phase 3 NPRM has missed the mark by a wide margin. EPA has premised the NPRM on significantly overstated predictions of future ZEV-truck adoption rates. Those predictions, in turn, are based on significantly over-estimated and under-estimated inputs into the HD TRUCS model that EPA has created to assess the relative TCO and "payback periods" of ZEV-trucks during the 2027-2032 time period. The net result is an NPRM that is fundamentally flawed and unworkable. Indeed, without very substantial revision, EPA's Phase 3 proposal will amount to an arbitrary, capricious and wholly unreasonable rulemaking. [EPA-HQ-OAR-2022-0985-2668-A1, p. 58]

EMA has analyzed, corrected and improved a number of prioritized inputs into the HD TRUCS model, and has derived a series of revised adoption rates for ZEV-trucks that are much more in line with technological and commercial realities. Those revised adoption rates – which are roughly half of what EPA has predicted – should serve as the starting point (i.e., the ceiling) for additional collaborative discussions aimed at developing a final cost-effective Phase 3 rule. In that regard, any final rule will need to discount the reduced adoption rates derived through EMA's version of HD TRUCS even more to account for the significant probability that the requisite ZEV-truck infrastructure will not be developed to the full extent required over the next nine years. [EPA-HQ-OAR-2022-0985-2668-A1, p. 58]

With all of the foregoing in mind, EMA offers the following recommendations to help guide the necessary additional assessment of what the final Phase 3 GHG standards should be: [EPA-HQ-OAR-2022-0985-2668-A1, p. 58]

The starting point (i.e., the ceiling) for determining the final Phase 3 standards should be based on the GEM-based GHG standards derived from the substantially reduced ZEV-truck adoption rates generated through EMA's version of HD TRUCS. Those standards will need to be discounted further by some appropriate percentage or "scaler" that corresponds with the probability that the requisite ZEV-truck infrastructure will not be in place where and as needed during the 2027 through 2032 time period. [EPA-HQ-OAR-2022-0985-2668-A1, p. 58]

Organization: Valero Energy Corporation

B. EPA's modeling of technological suitability is based on hypothetical future HD BEVs and FCEVs using unreasonable assumptions.

EPA uses the HD TRUCS model to evaluate hypothetical future HD BEVs and FCEVs and whether they can be designed to meet the energy demands of 101 different types of existing HD ICEVs. If a hypothetical future HD BEV or FCEV is deemed to be within the bounds of thresholds defined by EPA for acceptable gravimetric payload capacity reduction and payback period,13 then EPA considers the hypothetical future HD BEV or FCEV to be a suitable alternative to the comparable ICEV and assumes some percentage of consumer adoption. [EPA-HQ-OAR-2022-0985-1566-A2, p. 3]

13 Defined by EPA as "the number of years that it would take for the annual operational savings of a ZEV to offset the incremental upfront purchase price of a BEV or FCEV (after accounting for the IRA [] battery tax credit and [] vehicle tax credit []) and charging infrastructure costs (for BEVs) when compared to purchasing a comparable ICE vehicle," DRIA at 235.

2. EPA underestimates the costs of ZEVs.

EPA underestimates the upfront and total costs of ownership (TCO) regarding HD ZEVs throughout its proposal, which include costs of a HD ZEV battery and components. Citing in part to a January 2022 ICCT working paper, EPA maintains that "[t]he cost to manufacture lithium-ion batteries (the single most expensive component of a BEV) has dropped significantly in the past eight years, and that cost is projected to continue to fall during this decade, all while the performance of the batteries (in terms of energy density) improves."21 However, the ICCT working paper EPA cites cautions that material market factors will ultimately determine HD ZEV penetration:22

- "[T]he speed of uptake [of electric Class 2b and 3 trucks] is tailored, in part, by the economic viability of the technology relative to conventional vehicles."
- "While cost remains an important factor in determining the uptake of electric vehicles, there are several additional factors influencing consumers' decision-making, including model availability, recharging infrastructure, range anxiety, environmental concerns, brand loyalty, and vehicle comfort. As such, attractive TCO economics and purchase price parity are only a subset of the phenomena impacting the rate at which society transitions to zero-emission vehicles, and should not be relied on as the sole indicator of significant market uptake."
- "Our model results are widely dependent on a series of assumed projections which are key in understanding the total purchase price and total cost of ownership of EVs and ICEs. Most notably, significant doubts remain related to the evolution of battery prices, which comprise a considerable amount of the vehicle purchase price. Our assumptions for battery prices are based off the average of the reported sources from literature and automaker estimates [], yet the actual price of lithium-ion batteries has largely outpaced historic projections discussed previously." [EPA-HQ-OAR-2022-0985-1566-A2, p. 5]

21 EPA's HD Phase 3 GHG Proposal at 25930.

22 Mulholland, Eamonn. "Cost of electric commercial vans and pickup trucks in the United States through 2040." January 2022. https://theicct.org/publication/cost-ev-vans-pickups-us-2040-jan22/.

38 DRIA at 152.

8. EPA arbitrarily excludes viable HDV technologies from its compliance modeling.

In the DRIA, EPA presents data from the U.S. Energy Information Agency's (EIA's) 2022 Annual Energy Outlook (AEO), which projects that an overwhelming majority of non-ICE HDV sales over the next 30 years will be PHEVs.82 See Figures 5 to 7, below. [EPA-HQ-OAR-2022-0985-1566-A2, p. 16.] [See Figures 5-7, EIA Projected Sales of Vehicles, on page 16 and 17 of docket number EPA-HQ-OAR-2022-0986-1566-A2.]

82 DRIA at 13.

While EPA recognizes that PHEVs will play a role in manufacturers' compliance strategies,83 PHEVs are excluded from consideration in EPA's HD TRUCS modeling and regulatory impact analysis. EPA acknowledges in DRIA that it "did not analyze PHEVs because they are not part of our technology packages in this proposal,"84 without any further explanation for the omission. This critical omission is wholly at odds with EPA's obligation to consider reasonable alternatives. [EPA-HQ-OAR-2022-0985-1566-A2, p. 17.]

83 EPA's HD Phase 3 GHG Proposal at 26016.

84 DRIA at 19 and 181.

EPA further fails to consider compliance strategies that involve on-board CO2 capture for subsequent use or sequestration. CO2 removal devices that fit behind the cab of Class 8 trucks are available to the U.S. market today.85 Given the magnitude of carbon capture and sequestration (CCS) deployment proposed by EPA in the "New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule" rulemaking,86 EPA clearly has significant confidence in the technology. Congress recently provided significant financial incentives in the IRA to encourage development of carbon sequestration facilities. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 17 - 18.]

85 https://remoracarbon.com/

86 88 FR 33240 (May 23, 2023).

It is arbitrary for EPA to overlook reasonable vehicle technology packages that are fit for purpose and which may meet the objectives of reducing greenhouse gas emissions at a lower cost and with fewer adverse consequences for consumers and the U.S. economy. [EPA-HQ-OAR-2022-0985-1566-A2, p. 18.]

EPA Summary and Response:

Summary:

CALSTART complimented the EPA on the development of HD TRUCS. Other commenters generally had critiques on individual elements of, or inputs to, HD TRUCS in their comments; these comments are discussed by topic in the sections that follow. EMA stated that they would have chosen a different means of developing Phase 3 standards, but used HD TRUCS with different inputs to devise a set of alternative standards- these comments are also addressed in the sections that follow. Both DTNA and NADA suggested continuing to use HD TRUCS for post-rule evaluation (see Section 2 of the RTC).

Valero commented that EPA arbitrarily excludes technology such as PHEVs from its compliance modeling and that EPA failed to consider onboard CO_2 capture. In addition, Valero commented that EPA underestimates the costs of ZEVs, pointing to the inherent uncertainty of projecting future costs and future market responses.

Response:

We thank all commenters for their thoughtful input to HD TRUCS. While, as EMA as suggested, there could be other approaches to developing Phase 3 standards, HD TRUCS provides a comprehensive approach, has undergone an external peer review, has been reviewed by commenters including EMA, and has been updated based on consideration of the many comments described in the remainder of this RTC Section 3 and other RTC sections as described below. As discussed in the final rule preamble, the final rule RIA, and this RTC, EPA has utilized the HD TRUCS model to inform the stringency of the final rule standards, and the Agency believes this is a reasonable and appropriate modeling tool to inform the Agency's decision making.[272] EPA responds to the specific comments on HD TRUCS in the remainder of this RTC section.

In response to the comment that EPA excluded certain technologies from its assessment, EPA disagrees as we assessed a wide range of technologies as described in preamble Section II and RIA Chapters 1 and 2. As further explain there, within HD TRUCS EPA analyzed the technologies that are most likely to yield the largest vehicle emission benefits. Manufacturers, however, may use other technologies for vehicles with ICE, such as PHEVs, in their compliance strategies. In fact, we also assess multiple additional example potential compliance pathways using such technologies, including technical feasibility, costs, and lead time, that illustrate it is feasible to comply with the final standards including without producing additional ZEVs to comply with this rule. See Preamble Section II.F.4 and RIA Chapter 2.11 (which also includes assessment of additional example potential compliance pathways relative to a no ZEV baseline). Furthermore, the existing HD GHG regulations allow for manufacturers to seek approval for off-cycle technologies that reduce GHG emissions as prescribed in 40 CFR 1037.610.

In response to Valero's comments about EPA underestimating the costs due to the uncertainty of future projections, EPA is relying on the best available data as inputs to the HD TRUCS model. See RIA Chapter 2. We have received many comments on the inputs to HD TRUCS in this section (RTC Section 3) and throughout multiple sections of this RTC. These include comments on costs, factors affecting costs and HD TRUCS inputs that recommend both lower and higher costs than what were in the NPRM. We have carefully considered all comments, and we have incorporated many suggested changes to the inputs and modeling that are used to estimate the cost of future ZEVs.

3.1 Sales Distribution

<u>Comments by Organizations</u>

Organization: Alliance for Vehicle Efficiency (AVE)

It is assumed by many stakeholders that lower weight classes within the heavy-duty truck category will likely see greater, and faster, levels of electrification than the Class 8 category. These estimates seemingly support EPA's projected compliance pathways. These estimates, however, may underrepresent the sales picture of the heavy-duty market. As shown in the chart below, the Class 8 category comprises an overwhelming percentage of trucks. [EPA-HQ-OAR-2022-0985-1571-A1, p. 2.] [See Docket Number EPA-HQ-OAR-2022-0985-1571-A1, page 2, for the referenced chart.]

[272] See Midwest Ozone Grp. v. Env't Prot. Agency, 61 F.4th 187, 192–93 (D.C. Cir. 2023) ("the Court has never required EPA to use a particular modeling method to generate its data or adhere to past practice, but rather that EPA 'consider[s] all of the relevant factors, and demonstrate[s] a reasonable connection between the facts on the record and its decision.' Id. (quoting Ethyl Corp. v. EPA, 51 F.3d 1053, 1064 (D.C. Cir. 1995)). Thus, when an agency has not otherwise acted contrary to law, we will conclude that its choice of model is arbitrary and capricious if "the model is so oversimplified that the agency's conclusions from it are unreasonable." Appalachian Power, 249 F.3d at 1052 (quoting Small Refiner Lead Phase–Down Task Force v. EPA, 705 F.2d 506, 535 (D.C. Cir. 1983))."

Organization: Moving Forward Network (MFN) et al.

8.4. Over-Inclusion of Medium-Duty EVs in EPA's Benefit Cost Analysis

MFN believes that Class 2b-3 vehicles (a majority of which are regulated under the agency's light- and medium-duty rulemaking) 109 are overrepresented in EPA's HD TRUCS model. The benefits attributed to such EV adoption levels are, therefore, likely overstated in the agency's preferred proposal. ERM's benefit-cost analyses accounted for this by adjusting Class 2b-3 vehicle populations, as they are interpreted to be covered by the scope of EPA's heavy-duty rulemaking. [EPA-HQ-OAR-2022-0985-1608-A1, p. 53]

109 U.S. EPA. Proposed Rule: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles. (2023). https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-multi-pollutant-emissions-standards-model

As noted in more detail in Figure 7, Class 2b-3 vocational vehicles included in the heavy-duty Phase 3 standards correspond only with "incomplete" Class 2b-3 HD vehicles that are relevant to HD vocational vehicle standards. These "incomplete vehicles" represent approximately 5 percent 110 of all Class 2b-3 vehicle sales. The remaining ~95 percent of Class 2b-3 vehicles are covered by EPA's Light- and Medium-Duty Vehicle rules. Consequently, ERM isolated relevant Class 2b-3 vehicles within MOVES3.R3 for all subsequent EV adoption analyses, sales and in-use calculations, and VMT and emissions assessments. 111 [EPA-HQ-OAR-2022-0985-1608-A1, p. 53] [Refer to Figure 7, National Heavy-Duty Vehicle Fleet: 2026 Forecast on p. 54 of docket number EPA-HQ-OAR-202-1608-A1.]

110 Table 3-1 of Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles Draft Regulatory Impact Analysis. (2023). https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-multi-pollutant-emissions-standards-model

111 MOVES3.R3 class 2b-3 vehicles covered by HD vocational standards calculated using assumption that 4.6% of total annual class 2b-3 vehicle sales (MOVES regulatory class 41) are of MOVES source categories 52 (single unit short-haul truck) and 53 (single unit long-haul truck); annual in-use vehicle populations estimated using MOVES source/regulatory class-specific survival rates.

EPA Summary and Response:

Summary:

EPA has received two comments relating to sales distribution within HD TRUCS. AVE was concerned that the percentage of Class 8 vehicles was underrepresented in HD TRUCS and provided a chart showing how Class 8 trucks represent an overwhelming percentage of HD fleet. MFN was concerned that Class 2b-3 vehicles were overrepresented in HD TRUCS. They asserted that only incomplete vehicles in the 2b-3 weight class should be included in this rulemaking.

Response:

In the proposal, EPA used the 2019 Production Volume Reports into Engine and Vehicle Compliance Information System to weight the MOVES MY 2019 new vehicle sales from MOVES 3.Ra into the 101 vehicle applications in HD TRUCS. This data included sales of chassis certified class 2b-3 vehicles which are not included in this rulemaking. Including such Class 2b-3 vehicles caused the percentage of HHD vehicles in the NPRM analysis to be underrepresented as a percentage of the fleet analyzed and the LHD vehicles in the NPRM analysis to be overrepresented. For the final rule, we have updated our sales distribution to more accurately represent the HD fleet which is the subject of the Phase 3 final rule, both by vehicle number and percentage. The source we used for the final rule is the MOVES 4.0 new vehicle sales for Model Year 2021. This change from proposal removed the Class 2b-3 chassis certified vehicles from our sales and our combined Class 2b-5 vehicle sales went from 55% in the proposal to 33% in the final rule and increased the percentage of Class 8 vehicles represented in HD TRUCS from 28% in the proposal to 42% in the final rule.

3.2 Component Performance

3.2.1 BEV Component Efficiencies

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

Assumptions in EPA's analysis of ZEV adoption rates are too limiting

Fully incorporating the results of state actions as recommended above would not be sufficient to bring EPA's projections of ZEV adoption to highest feasible levels. Certain key elements of EPA's ZEV analysis tool, HD TRUCS, are overly conservative, leading to low projections of ZEV adoption. These include battery and payback period requirements. [EPA-HQ-OAR-2022-0985-1560-A1, p. 5]

Another factor that may lead to prolonged, excessive battery requirements is EPA's low expectations regarding BEV efficiency improvement. Battery efficiency remains constant in MY 2027-2032, and inverter and motor efficiencies are assumed to improve by only a half percentage point over this period (Table II-6 FR 25977). Charging efficiency improves by a single percentage point (HD TRUCS). This issue is discussed further in the section below on upstream emissions. [EPA-HQ-OAR-2022-0985-1560-A1, p. 6]

There is significant potential for BEV and FCEV efficiency improvement.

Table II-6 (FR 25977) shows EPA's assumed BEV component (battery, inverter, e-motor) efficiency improvements from MY 2027 to 2032. Their combined efficiency improves only 1% over the life of the standards, from 87% to 88%. This de minimus improvement does not represent the full potential for efficiency gains, however. The NAS Phase 3 light-duty vehicle report assumed that EV efficiency would improve by 1% per year through a combination of vehicle and powertrain improvements discussed in the report.29 The report found, for example, that "[wide bandgap devices] could result in boosting inverter and converter efficiencies to 99% (from 96%)."30 Similar improvements should be available for heavy-duty BEVs. [EPA-HQ-OAR-2022-0985-1560-A1, p. 16.]

29 https://nap.nationalacademies.org/catalog/26092/assessment-of-technologies-for-improving-light-duty-vehicle-fuel-economy-2025-2035

30 https://nap.nationalacademies.org/catalog/26092/assessment-of-technologies-for-improving-light-duty-vehicle-fuel-economy-2025-2035

Organization: Daimler Trucks North America

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #26: We request comment, including data, on our approach [battery sizing and daily energy consumption] and the results for our assessment of system efficiencies for HD BEV components.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

EPA Request for Comment, Request #28: We request comment on our approach using these performance targets [for eMotors].

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

Organization: Dana Incorporated

Dana has reviewed the component efficiencies for battery, invertor and e-motor and find the number appropriate for its purpose. In fact, Dana feels that some of the noted efficiencies are conservative if EPA is referring to the maximum efficiency of the components. [EPA-HQ-OAR-2022-0985-1610-A1, p. 5]

EPA Summary and Response:

Summary:

ACEEE recommends using higher efficiency improvement over time for batteries, inverters and motors, as improvements in efficiencies use in HD TRUCS will reduce size and weight of the battery and thus increase projected technology adoption rate. Dana commented that the efficiencies used in HD TRUCS for the battery, invertor, and e-motor were all conservative, but appropriate. DTNA commented that EPA should consider all available data including that which can be provided by manufacturers in confidential settings, and asserted that, given data available today is limited, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data.

Response:

For the final rule, EPA took a comprehensive approach to estimating cycle average efficiency values for BEV components (see Chapter 2.4.1.1.3 of the RIA for more information). In response to comments that efficiency values may improve over time, we generally agree that efficiency improvements are likely to occur in the future (see comments in Section 3.4.2 of the RTC);

however, during the MY 2027-2032 timeframe, we have decided to keep the efficiency values constant as a conservative approach while noting that the cost of these components in HD TRUCS improves over time due to the learning curve that is applied to BEV technologies. See Chapter 2.4.3 of the RIA for e-drive costs.

EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

3.2.2 Fuel Cell System Efficiency

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

FCEVs would benefit from any inverter or battery efficiency gains for BEVs. For the fuel cell stack, EPA assumes that efficiency increases from 64.5% to 66% in MY 2027-2032, stopping short of DOE’s 2030 efficiency target of 68% and long-term target of 72% (FR 25979-25980). A more efficient fuel cell stack may require less cooling and a smaller radiator, compounding efficiency gains.31 [EPA-HQ-OAR-2022-0985-1560-A1, p. 16.]

H31 https://nap.nationalacademies.org/catalog/26092/assessment-of-technologies-for-improving-light-duty-vehicle-fuel-economy-2025-2035

Organization: China WTO/TBT National Notification & Enquiry Center

2. It is suggested to moderately reduce the numerical limits in the tables “TABLE II-8 BATTERY PACK LEVEL SPECIFIC ENERGY IN HD TRUCS (WH/KG)”, “TABLE II-9 BATTERY PACK LEVEL ENERGY DENSITY IN HD TRUCS (WH/L)”, and “TABLE II-10 FCEV FUEL CELL EFFICIENCIES FOR MY 2027-2032”. [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

Organization: PACCAR

D. EPA OVERESTIMATES FUEL CELL EFFICIENCY

TRUCS includes an inflated fuel cell efficiency value, which directly affects fuel cell electric vehicle energy requirements, hydrogen usage, and overall operating cost. TRUCS assumes a 65% value for MY2027 that increases to 67.5% in MY2032. These values do not accurately represent any current or planned medium- or heavy-duty fuel cell system, particularly when accounting for the high power levels required in commercial vehicles compared to automotive applications. In fact, peak efficiency typically occurs at very low power levels, e.g., at 20 kW for a 120 kW fuel cell, and nominal efficiencies are measured at the actual power output levels during service and should be used when making comparisons. The typical nominal efficiencies for the power levels used in commercial vehicles range from 42% to 50%. In addition, fuel cell performance permanently degrades over time – generally due to impurities in the hydrogen fuel – and the efficiencies drop significantly from beginning of life to end of life (EOL). EOL nominal efficiencies can be as low as 40%, which is a major consideration when sizing a fuel cell system for customer requirements and expectations. In sum, EPA erred in using the peak efficiency value to model fuel cell operation, and the Agency should correct this error to reflect operating efficiency values more accurately. [EPA-HQ-OAR-2022-0985-1607-A1, p. 7]

Organization: Truck and Engine Manufacturers Association (EMA)

a) Fuel Cell Efficiency – The evaluation of fuel cell technology in HD TRUCS uses the fuel cell stack peak efficiency in determining the quantity of hydrogen that will be needed to allow the FCEV to complete its daily tasks. However, like diesel engines, fuel cell stacks operate at peak efficiency only for a short period of the vehicle's duty cycle. [EPA-HQ-OAR-2022-0985-2668-A1, p.47]

ANL's October 2022 paper ANL/ESD-22/6 "A Comprehensive Simulation Study to Evaluate Future Vehicle Energy and Cost Reduction Potential" (Islam et al.), includes Figure 2-11, reproduced below, which reflects the operating efficiency curve for medium-duty and heavy-duty fuel cells. This plot demonstrates that the efficiency is a function of the power required to perform the work. If peak efficiency is 65%, as is used in HD TRUCS, then the operating efficiency would be in the range of 56% to 60% when 75% to 50% of the fuel cell's power is needed. [EPA-HQ-OAR-2022-0985-2668-A1, p.47] [See Figure 2-11 on page 48 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

EMA recommends that EPA reconsider using the peak efficiency values for fuel cell stack efficiency in HD TRUCS for the final rulemaking. [EPA-HQ-OAR-2022-0985-2668-A1, p.48]

EPA Summary and Response:

Summary:

We received comments suggesting that the NPRM did not accurately reflect how a fuel cell operates because we relied on peak fuel cell efficiency rather than average operating efficiency. One commenter noted that FCEVs would benefit from BEV component efficiency gains and observed that we did not utilize DOE targets for peak fuel cell efficiency in HD TRUCS, implying that fuel cells could be more efficient than we assumed in the NPRM because a more efficient stack would require less cooling, which could lead to compounded gains over time. Three commenters suggested that the fuel cell efficiency values in HD TRUCS were too high. PACCAR pointed out that we considered peak efficiency estimates in error rather than nominal efficiencies at actual power levels (i.e., average operating efficiencies). PACCAR and EMA offered ranges for operating efficiency at power levels typical for commercial vehicles and suggested that we revise our fuel cell efficiency estimates. PACCAR also noted that fuel cell performance can degrade over time, generally due to impurities in hydrogen fuel that cause efficiencies to drop significantly from beginning of life to end of life.

Response:

We evaluated these comments and find those about considering fuel cell efficiencies at more average rather than peak operating conditions to be persuasive. Accordingly, we have revised our fuel cell efficiency estimates in a manner that we think appropriately addresses the commenters' suggestions. This affected the sizing methodology for onboard storage tanks (to meet the energy demands of a vehicle) in the final rule version of HD TRUCS. Considering the comments, we also revised our sizing methodology for the fuel cell system (to meet power demands of a vehicle).

As described in RIA Chapter 2.5.1.2.1, Figure 1 shows the shape of an efficiency curve for a fuel cell system in a HD FCEV in terms of normalized net power. A typical fuel cell system operates most efficiently at lower or partial power loads. For example, the figure demonstrates a peak efficiency of about 65 percent at roughly 10 percent power load compared to an efficiency of around 55 percent at full poweron a normalized scale.

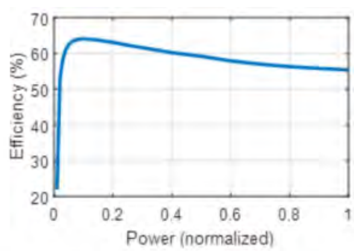

FIGURE 2-11 Operating efficiency of the fuel cell plotted against the normalized net power output

Figure 1. Operating Efficiency of a Fuel Cell[273]

For the final rule, in response to comments, though we agree with ACEEE that efficiency gains are likely over time as the technology matures, we also agree that the fuel cell system efficiency value in the NPRM was too high and should not be based on peak performance at low power, since fuel cells typically do not operate for long in that range. We therefore reduced the energy efficiency value of the fuel cell system by eight percent to reflect a more average operating efficiency instead of peak efficiency. This was based on a review of DOE's 2019 Class 8 Fuel Cell Targets. DOE has an ultimate target for peak efficiency of 72 percent, which corresponds to an ultimate fuel cell drive cycle efficiency of 66 percent. This equates to an 8 percent difference between peak efficiency and drive cycle efficiency at a more typical operating power. Therefore, to reflect system efficiency more accurately at a typical operating power, we applied the 8 percent difference to the peak efficiency estimate in the NPRM. For the final rule, the operational efficiency of the fuel cell system (i.e., represented by drive cycle efficiency) is about 61 percent.

This fuel cell system efficiency value is still somewhat higher than the values suggested by PACCAR (42 to 50 percent) and EMA (56 to 60 percent). It represents a projection of modest improvements in fuel cell efficiency over time. Thus, in combination with other sizing

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[273] Islam, Ehsan Sabri, Ram Vijayagopal, Aymeric Rousseau. "A Comprehensive Simulation Study to Evaluate Future Vehicle Energy and Cost Reduction Potential", *Report to the U.S. Department of Energy, Contract ANL/ESD-22/6,* October 2022. Available online: https://anl.app.box.com/s/an4nx0v2xpudxtpsnkhd5peimzu4j1hk/file/1406494585829.

adjustments to account for fuel cell degradation over time, for example, we believe that we have adequately addressed commenter concerns.

We agree with the ACEEE comment about considering BEV component efficiency gains for FCEVs and did this for the proposal. (As explained in DRIA Chapter 2.5.1.2.1, we used the same component efficiencies from Table 2-38, also called a "FC to Road" or "FCTR" efficiency in the NPRM version of HD TRUCS.[274]) For the final rule, as explained in RIA Chapter 2.5.1.2, we combined the revised fuel cell system efficiency value with the BEV powertrain efficiency (i.e., the combined inverter, gearbox, and e-motor efficiencies) as a total FCEV powertrain efficiency to account for losses that take place before the remaining energy arrives at the axle. The final FCEV powertrain efficiencies, ranging from 51 percent to 57 percent, were used to size the hydrogen storage tank and to determine the hydrogen usage and related costs.

As described in RIA Chapter 2.5.1.1.2, to avoid undersizing the fuel cell system, we also oversized the fuel cell stack by an additional 25 percent to allow for occasional scenarios where the vehicle requires more power (e.g., to accelerate when the battery state of charge is low, to meet unusually long grade requirements, or to meet other infrequent extended high loads like a strong headwind) and so the fuel cell can operate within an efficient region. This size increase we included in the final rule version of HD TRUCS can also improve fuel cell stack durability and ensure the fuel cell stack can meet the power needs throughout the useful life. This is the systems' net peak power, or the amount available to power the wheels.[275] The fuel cell stack generates power, but some power is consumed to operate the fuel cell system before it gets to the e-motor. Therefore, we increased the size of the system by an additional 20 percent[276] to account for operation of balance of plant (BOP) components that ensure that gases entering the system are at the appropriate temperature, pressure, and humidity and remove heat generated by the stack. This is the fuel cell stack gross power.

For example:
190 kW (continuous power from FC) * 1.25% = 237.5 kWnet
237.5 kWnet * 1.2% = 285 kWgross
[or 190 kW * 1.5% = 285 kWgross]

The larger fuel cell can allow the system to operate more efficiently based on its daily needs, which results in less wasted energy and lower fuel consumption. This additional size also adds durability, which is important for commercial vehicles, by allowing for some degradation over time. This should address PACCAR's concern about fuel cell degradation over time. We determined that with this upsizing, there is no need for a fuel cell system replacement within the 10-year period at issue in the HD TRUCS analysis.

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[274] EPA "Draft Regulatory Impact Analysis: Heavy-Duty Greenhouse Gas Emissions: Phase 3." April 2023. EPA-420-D-23-004. Page 23. Available online: https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy or https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-1428.

[275] Net system power is the gross stack power minus balance of plant losses. This value can be called the rated power.

[276] Huya-Kouadio, Jennie and Brian D. James. "Fuel Cell Cost and Performance Analysis: Presentation for the DOE Hydrogen Program; 2023 Annual Merit Review and Peer Evaluation Meeting". Strategic Analysis. June 6, 2023. Available online: https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/review23/fc353_james_2023_o-pdf.pdf.

3.2.3 Battery Specific Energy and Energy Density

Comments by Organizations

Organization: China WTO/TBT National Notification & Enquiry Center

2. It is suggested to moderately reduce the numerical limits in the tables "TABLE II-8 BATTERY PACK LEVEL SPECIFIC ENERGY IN HD TRUCS (WH/KG)", "TABLE II-9 BATTERY PACK LEVEL ENERGY DENSITY IN HD TRUCS (WH/L)", and "TABLE II-10 FCEV FUEL CELL EFFICIENCIES FOR MY 2027-2032". [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

According to the description in the text, the emission limits corresponding to each year from 2027 to 2032 in the above table are quantitative theoretical simulation values for Autonomie vehicle modeling and simulation research, and the simulation values may often differ from the measured data. Please provide evidence to prove the rationality of the limit values in the above table. It is recommended to calculate and deduce the reasonable limit value of vehicle battery according to International Electrotechnical Commission IEC 62133 and SAE 1537 test calculation method. [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

There is a certain difference in the limit values calculated using the quantitative theoretical method for IEC and Autonomie vehicle modeling and simulation research. Please explain the rationality of using the quantitative theoretical method for Autonomie vehicle modeling and simulation research. [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

Organization: Daimler Trucks North America

EPA Request for Comment, Request #29: We request comment on our approach and results as well as comment and data on current and projected levels of battery-specific energy and battery-specific density values for HD vehicles.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

Organization: Environmental Defense Fund (EDF)

Key EPA assumptions related to ZEV costs and deployment are overly conservative and when corrected, support more protective standards

i. EPA's ZEV technology and adoption modeling assumptions are too conservative

EPA's ZEV assumptions are too conservative and more reasonable assumptions would result in higher ZEV deployment projections, especially in key categories. [EPA-HQ-OAR-2022-0985-1644-A1, p. 53]

EPA's battery-related assumptions are too conservative

In the HD TRUCS model, EPA makes a number of assumptions related to EV batteries that result in unnecessarily large, and artificially costly, batteries. First, EPA uses an unrealistically high daily mileage to size the battery. Second, EPA underestimates the average percent from full capacity that a battery will discharge per charge cycle, and overestimates deterioration over a battery's lifetime. Third, EPA does not consider the average decrease in annual mileage over a vehicles' lifetime. Fourth, EPA's values for battery specific energy (Wh/kg) and energy density (Wh/L) are overly conservative. [EPA-HQ-OAR-2022-0985-1644-A1, p. 54]Battery specific energy. Additionally, EPA's values for the battery specific energy (Wh/kg) and energy density (Wh/L) used in the HD TRUCS modeling are overly conservative. In 2027, EPA's modeling assumes batteries will have a specific energy of 199 Wh/kg increasing to 223 Wh/kg in 2032 and a energy density of 496 Wh/L increasing to 557 Wh/L by 2032. In contrast, studies put current batteries at 250 to 300 Wh/kg and energy density at 600 to 700 Wh/L.136 Next generation batteries are expected to be even more energy dense. The Battery500 consortium out of the Pacific Northwest National Laboratory have established a cell design that could achieve up to 500 Wh/kg.137 Battery developer SES has created their Apollo battery cell with an energy density of 417 Wh/kg and 935 Wh/L with plans to start commercialization of the batteries by 2025.138 [EPA-HQ-OAR-2022-0985-1644-A1, p. 56]

136 Shuru Chen, Fang Dai, and Mei Cai, ACS Energy Letters 2020 5 (10), 3140-3151, DOI: 10.1021/acsenergylett.0c01545

137 Liu, J., Bao, Z., Cui, Y. et al. Pathways for practical high-energy long-cycling lithium metal batteries. Nat Energy 4, 180–186 (2019). https://doi.org/10.1038/s41560-019-0338-x

138 Doll, Scooter. SES shares plans for world's largest lithium-metal facility to build 107 amp-hour EV batteries. November 3, 2021. Electrek. https://electrek.co/2021/11/03/ses-shares-plans-for-worlds-largest-lithium-metal-facility-to-build-107-amp-hour-ev-batteries/

Since the eligibility of vehicles to have any BEV adoption in HD TRUCS depends on the batteries being less than 30% of the payload weight and smaller than 12 feet across, the specific energy and energy density of the batteries impacts the stringency of the rule. EPA should use less conservative energy density values in their modeling to better account for the projected improvement in battery science that will occur in the next decade. [EPA-HQ-OAR-2022-0985-1644-A1, p. 56]

Organization: Moving Forward Network (MFN) et al.

11.1.3.3. Specific energy assumed in the model is lower than expected for HDVs

11.1.3.3.1. Specific energy improvements over time

"Specific energy" is the amount of energy a battery can store per unit of its weight, and "energy density" is the amount of energy a battery can store per unit of its volume. As shown in

Figures 26 and 27 below, both of these metrics have increased dramatically over time for lithium-ion batteries. Improving battery-specific energy and energy density increases the amount of energy that can be stored using the same amount of materials, which is important not only for reducing demand for battery minerals but also for improving the range of electric vehicles. These increases are due to battery chemistry and design improvements. Battery chemistries have different specific energies; nickel and cobalt containing chemistries have higher specific energy than the LFP. For example, Tesla Model Y uses an NCA battery with a reported 276-333 Wh/kg. The Model S and X use a battery with slightly less at 250 Wh/kg. 202 While lower, this 250 Wh/kg is still a drastic increase from the beginning of Panasonic's production in 1990 when it was at about 150 Wh/kg. 203 [EPA-HQ-OAR-2022-0985-1608-A1, p. 95.] [See Figure 26 Specific energy and energy density of nickel-based lithium-ion batteries continue to increase located on p. 95 of docket number EPA-HQ-OAR-2022-0985-1608-A1]

202 Aditya Dhage. Cylindrical Cell Comparison 4680 vs 21700 vs 18650. V. I. (2023). https://www.batterydesign.net/cylindrical-cell-comparison-4680-vs-21700-vs-18650/

203 Placke, T., Kloepsch, R., Dühnen, S. et al. Lithium ion, lithium metal, and alternative rechargeable battery technologies: the odyssey for high energy density. J Solid State Electrochem. V. 21. (2017). p. 1939–1964 https://doi.org/10.1007/s10008-017-3610-7

204 Id.

LFP batteries have similarly seen advancements in their specific energy capacity, with below 90 Wh/kg in 2010 to current reports from Proterra of 170 Wh/kg 205 and BYD with 166 Wh/kg. 206 BYD has recently announced the blade LFP battery which is estimated to reach 180 Wh/kg 207 due to the use of "cell to pack" design, therefore not using the "cell to module to pack" design that has been historically seen. 208 [EPA-HQ-OAR-2022-0985-1608-A1, p. 96.] [See Figure 27 Specific energy of LFP lithium-ion batteries continues to increase located on p. 96 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

205 Proterra. Proterra battery pack features and specifications. (2020). https://www.proterra.com/wp-content/uploads/2020/08/Proterra-EV-Battery-Pack-Specs-2020.pdf

206 BYD Blade. Battery Design from Chemistry to Pack. (2022). https://www.batterydesign.net/byd-blade/#:~:text=Weight%203.9%20kg%20%5B3%5D,Energy%20Density%20%3D%20166%20Wh%2Fkg

207 BYD Blade. BYD'S new blade battery set to redefine EV safety Standards. (Nd). https://en.byd.com/news/byds-new-blade-battery-set-to-redefine-ev-safety-standards/

208 International Energy Agency. Global EV Outlook 2022. (2022). https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf

209 BloombergNEF. Electric Vehicle Outlook 2022. BloombergNEF. (2022). Subscription required. https://bnef.turtl.co/story/evo-2022/page/1

About 40% of global commercial vehicle sales are expected to contain LFP batteries in 2023, and LFP batteries are more common in certain vehicle segments like electric buses and in certain countries like China. 210 In the U.S., LFP batteries in heavy-duty BEVs are less common than nickel- and cobalt-based chemistries, and the use of LFP in commercial vehicles globally is expected to continue to decrease over time, reaching around 30% in 2032. 211 The relatively low pack-level specific energy in Table 2-41 of the DRIA shown in Table 10 below appears to only be taking into account the use of LFP, although this assumption cannot be checked because the cathode chemistry breakout/market share forecast was not provided. This is a conservative estimate of energy density considering nickel and cobalt containing cathodes are used in about a third of trucks, and recent advancements, such as the Blade Battery (10 Wh/kg increase), demonstrate density gains faster than historically seen. The EPA forecasts closely align with the lowest limit of specific energy forecasts by Bloomberg in Figure 27, although it would be more accurate to align with a medium forecast scenario considering the share of NMC chemistries used, especially in the U.S. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 96 - 97.] [See Table 10 Battery pack-level specific energy used by EPA in HD TRUCS located on p. 97 of docket number EPA-HQ-OAR-2022-0985-1608-A1 and Figure 28 Historic and Forecasted Specific Energy for Different Battery Chemistries located on p. 98 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

210 Colin McKerracher et al. Electric Vehicle Outlook 2023. BloombergNEF. (June 8, 2023).

211 Id.

212 Phase 3 DRIA at 169.

213 BloombergNEF Electric Vehicle Outlook 2022 (subscription required).

In BloombergNEF's analysis, they used chemistry specific density and forecasted based on linear interpolation demonstrating that in 2027 the 95% confidence lower limit of specific energy is 198 Wh/kg, the same value used in the analysis shown above in Figure 28. 214 BloombergNEF's lower limit values continue to closely align with the forecast used in EPAs analysis. As previously stated, this is likely an underestimation of the average specific energy we will see in the future, considering the share of nickel and cobalt containing chemistries used in the analysis compared to likely real-world scenarios as well as advancements in battery design. In addition, the linear interpretation forecast does not account for material substitution and large specific energy gains expected from quickly advancing technology. For example, the use of silicon in the anode can increase specific energy as shown in Figure 29 below, 215 and while it is not yet used widely, startups are progressing the technology and constructing commercial-scale manufacturing facilities. 216 [EPA-HQ-OAR-2022-0985-1608-A1, p. 98.] [See Figure 29 Specific energy and capacity for different anode and cathode compositions (silicon carbon composite anodes show higher metrics across the board than graphite alone) located on p. 99 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

214 Andy Leach. Lithium-Ion Batteries: State of the Industry. BloombergNEF. (September 9, 2022).This data includes historical and forecasted energy density rates from 2010 - 2035, subscription required for full report.

215 Placke, T., Kloepsch, R., Dühnen, S. et al. Lithium ion, lithium metal, and alternative rechargeable battery technologies: the odyssey for high energy density. J Solid State Electrochem. V. 21. (2017). 1939–1964. https://doi.org/10.1007/s10008-017-3610-7

216 Matt Blois. Silicon anode battery companies get a major boost. Chemical and Engineering News. (2022). https://cen.acs.org/energy/energy-storage-/Silicon-anode-battery-companies-major/100/web/2022/12; Group14. Group14 Begins Construction of World's Largest Commercial Factory for Advanced Silicon Battery Materials. (April 4, 2023). https://group14.technology/en/news/group14-technologies-begins-construction-of-the-worlds-largest-commercial-factory-for-advanced-silicon-battery-materials-

217 Placke et al.

Updating the specific energy forecast would likely lead to lower costs of heavy-duty BEVs, and therefore, increased feasibility of BEV technologies, thus justifying stronger standards even under EPA's current analytical approach. EPA's assumptions must be revised to reflect what is actually occurring in the market. [EPA-HQ-OAR-2022-0985-1608-A1, p. 99]

Table 11 represents the specific energy for HDVs using the linear interpolation approach of the EPA, and including a 30% portion of NMC batteries. [EPA-HQ-OAR-2022-0985-1608-A1, p. 100.] [See Table 11 Estimated Specific Energy for Heavy-duty BEVs located on p. 100 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

218 BloombergNEF Electric Vehicle Outlook 2022 (subscription required)

Table 11 is calculated based on historical energy densities for LFP and cobalt-containing cathodes provided by BloombergNEF. 219 When specific energy for LFP and cobalt-containing cathodes are individually calculated based on linear interpolation, Table 12 are the results. If the ratio of 70% LFP and 30% cobalt-containing is kept, we get the average specific energy in Table 11. [EPA-HQ-OAR-2022-0985-1608-A1, p. 100.] [See Table 12 Estimated Specific Energy for LFP and Cobalt-containing Battery Chemistries located on p. 101 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

219 Colin McKerracher et al. Electric Vehicle Outlook 2022. BloombergNEF. (June 1, 2022).

EPA Summary and Response:

Summary:

We received several comments relating to battery specific energy and energy density; most commenters believe we should use a higher value for the specific energy. EDF states the battery properties including specific energy and energy density are lower than current values of specific energy "at 250 to 300 Wh/kg and energy density at 600 to 700 Wh/L"; they maintain that battery cells will be redesigned to improve the specific energy of the battery. They state that this improvement in battery chemistry and pack design, such as by sodium-ion chemistry or solid-state design, will significantly reduce weight of the battery and hence improve payload capacity. They further cite to specific instances of battery packs having higher specific energy and energy density than EPA considered, referring to Battery500 Consortium (Pacific Northwest National Laboratory) with specific energy of 500 Wh/kg, and the Apollo battery from SES with specific energy of 417 Wh/kg and 935 Wh/L of energy density. They suggest further that EPA's values at proposal reflect a low-end estimate from Bloomberg New Energy Finance (BNEF) and discuss why a midpoint estimate would be more appropriate.

MFN provided a similar comment, noting that the specific energy of batteries has improved over time for both nickel and iron-phosphate based batteries. They use improvements of Tesla Model Y from Models S and X as an example of recent improvements in nickel based batteries. Their Models S and X have batteries with 250 Wh/kg and Model Y has a reported specific energy of 276-333 Wh/kg. MFN states that LFP batteries are more common in China than worldwide, and that the specific energy and energy density used by EPA at proposal only accounts for LFP batteries. They state that the value in the DRIA also aligns with the lowest limit forecast by BNEF, whereas, in the commenter's view, it should align with the medium BNEF forecast which considers the share of NMC chemistries used in the US.

China WTO/TBT National Notification and Enquiry Center believes there is an overall issue with using simulated results from Autonomie for battery specific energy and energy density in that there is inherent difference between simulation compared to measured data. The commenter states that further justification is needed for using simulated data.

DTNA commented that EPA should consider all available data including that which can be provided by manufacturers in confidential settings, and asserted that, given data available today is limited, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data.

Response:

We received comments from EDF and MFN maintaining that EPA had used overly conservative values at proposal for battery energy density and specific energy. EPA recognizes that there have been significant developments in the areas of battery chemistry, battery cell and battery pack design. EDF and MFN provided examples and values for battery specific energy as well as for energy density, however, as explained in RIA Chapter 1, there is a difference between battery cell properties and battery pack properties. For the HD TRUCS analysis, one metric we used is to determine the weight of the BEV powertrain system, which includes the battery pack weight as well as the motor weight and sometimes the gear box weight. Since a battery pack consists of a group of cells (or modules), additional mass from packaging, cooling system and battery management system will only add additional mass without providing additional energy. This will bring down the overall specific energy (and energy density) for the pack level value. For example, the value that MFN provided for the Model Y is 276 Wh/kg; however, this value is for their first generation 4680 cylindrical cell. As documented in a recent report, Munro tore down a Tesla Model Y which used the 4680 cells.[277] This vehicle's battery weight was 543 kg, which means that for a usable battery energy of 67 kWh, the pack level energy density would be 123 Wh/kg or about 45% of the cell level specific energy[278] -- lower than the reported value compared to the proposal. MFN also reported the specific energy of the 2020 Proterra bus battery pack as 170 Wh/kg, but conflates the BYD Blade battery cell specific energy of 166 Wh/kg as a pack level energy (although the same citation from MFN estimates the pack level specific energy of the BYD Blade battery pack to have a specific energy of 150 Wh/kg). Lastly, some commenters compared the NPRM specific energy value to that of the lower bound of BNEF value battery specific energy; however, the values for the specific energy of battery packs with lithium-ion cell chemistries in the proposal are based on the 2021 version of Autonomie (see DRIA Chapter 2.4.2.1 for more information). [279,280]

We generally disagree with the China WTO/TBT National Notification and Enquiry Center perspective about using Autonomie values as input to HD TRUCS. Autonomie is a vehicle

[277] https://insideevs.com/news/595621/munro-4680-tesla-modely-teardown/

[278] We should note the actual specific energy of the Tesla Model Y is higher than the 123 Wh/kg because the likely pack energy is higher than the reported usable energy of the battery pack.

[279] Argonne National Laboratory. VTO HFTO Analysis Reports – 2021. "ANL – ESD-2110 Report – MD HD Truck – Autonomie Assumptions.xlsm". Available online: https://anl.app.box.com/s/an4nx0v2xpudxtpsnkhd5peimzu4j1hk/folder/177858439896.

[280] EPA "Draft Regulatory Impact Analysis: Heavy-Duty Greenhouse Gas Emissions: Phase 3." April 2023. EPA-420-D-23-004. Page 23. Available online: https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy or https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-1428.

simulation model that provides expected physical results based on modeled vehicle parameters. Although we agree that actual physical tests may yield dissimilar results from model results, there are limitations in testing real heavy-duty vehicles. It is generally cost prohibitive and time consuming to build every vehicle variation for physical tests, and results can be inconclusive. See comments of EMA at p. 53] and our response in section 24 of the RTC, amending regulations to no longer require that OEMs conduct corroborative chassis testing of HDVs for MY 2026 and earlier vehicles unless EPA requests it and we are sun-setting the requirement for MY 2027 and later vehicles. Furthermore, Autonomie is a well-established (>15 year old) vehicle simulation model, and many of the results of the model have been validated against component and vehicle test data. Lastly, the two test methods provided by China WTO/TBT International Electrotechnical Commission, IEC 62133 and SAE 1537, do not yield more information about specific energy or energy density. International Electrotechnical Commission IEC 62133 is a safety requirement test, and SAE 1537 are tests associated with fuel pump and fuel injection systems. Even if there is an IEC or SAE test that can be used to determine the specific energy or energy density of batteries, these tests will be unhelpful in projecting future properties of the battery as these batteries do not yet exist and are proprietary information.

For the final rule version of HD TRUCS we have updated both our value for specific energy and for energy density. Instead of relying on the 2021 version of Autonomie as we did at proposal for specific energy, we revised the specific energy of the battery based on an updated ANL DOE study[281] resulting in an input to HD TRUCS of 198 Wh/kg. See RIA Chapter 2.4.2.1 for an in-depth discussion about this value and our decision to apply the conservative assumption that this value does not improve over the MY 2027-MY 2032 time frame. For energy density, we divided the energy density values provided by MFN in their comment by their corresponding specific energy and averaged the results to calculate a factor to change the specific energy in HD TRUCS to energy density. The average of the values was 2.2; however, we used a value of 2.0 to be conservative and in consideration that some of the battery specifications provided were at the battery cell level rather than the battery pack level.

EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

[281] Kevin Knehr, Joseph Kubal, Shabbir Ahmed, "Cost Analysis and Projections for U.S.-Manufactured Automotive Lithium-ion Batteries", Argonne National Laboratory report ANL/CSE-24/1 for US Department of Energy. January 2024. Available online: https://www.osti.gov/biblio/2280913

3.2.4 Other Efficiency Improvements

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

Both BEV and FCEV efficiencies could also be substantially increased from the improvements to tires, aerodynamics, and auxiliary systems referenced earlier as efficiency opportunities for ICEVs. The final rule should promote these efficiency gains both through standards reflecting ICEV improvements beyond MY 2027 targets and through realistic upstream emissions accounting. [EPA-HQ-OAR-2022-0985-1560-A1, p. 16.]

Organization: International Council on Clean Transportation (ICCT)

ENERGY CONSUMPTION OF TRACTOR-TRAILERS EPA assumes there will be no improvement in the energy efficiency of zero-emission trucks over time. This is driven by EPA's assumption that there will be no efficiency improvements for ICE vehicles beyond Phase 2 requirements. Improvement in vehicle aerodynamics, tires, and lightweight chassis technologies can decrease truck energy consumption and result in smaller battery sizes. We think it would be appropriate for EPA to assume manufacturers will deploy vehicle efficiency technologies that reduce the direct manufacturing costs of the vehicle without sacrificing vehicle range. Based on ICCT's analysis, improvements in vehicle technologies can result in energy efficiencies as low as 2.29 kWh/mile by 2032 for battery electric tractor-trailer sleeper cabs reaching 2.12 kWh/mile once the technology reaches its full potential by 2035. (Basma et al., 2023) [EPA-HQ-OAR-2022-0985-1553-A1, pp. 13-14]

Basma, H., Buysse, C., Zhou, Y., & Rodríguez, F. (2023). Total cost of ownership of alternative powertrain technologies for Class 8 long-haul trucks in the United States. International Council on Clean Transportation. https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/

ICCT recommends updating the energy consumption figures for battery-electric tractor-trailer sleeper cabs, considering the vehicle technology improvement and more representative cooling and heating loads, which would result in a truck energy consumption in the range 2.29 kWh/mile by 2032. This energy consumption estimate is almost 18% lower than what EPA assumes. [EPA-HQ-OAR-2022-0985-1553-A1, p. 14]

Organization: Moving Forward Network (MFN) et al.

The fuel economy and efficiency of the trucks are based on EPA's Phase 2 requirements for diesel-powered vehicles, as simulated for representative duty cycles in a modified version of EPA's GEM model designed in MATLAB. Because the model is not designed for electric powertrains, electric efficiency was determined via an observed energy-efficiency relationship between diesel and electric powertrains observed in real-world testing. 99 A comparison between the modeled efficiencies and EPA's assumptions in its HD TRUCS model are shown in Figure 3 to ground this work in the assumptions used in the proposal. [EPA-HQ-OAR-2022-0985-1608-A1, p. 42-43] [Refer to Figure 3, Comparison between EPA truck efficiency and trucks modeled in this analysis, on p. 43 of docket number EPA-HQ-OAR-202-1608-A1.]

99 Liu, X., et al . Well-to-wheels analysis of zero-emission plug-in battery electric vehicle technology for medium and heavy-duty trucks, Environ. Sci. Technol. V. 55. (2021). p. 538-546. https://doi.org/10.1021/acs.est.0c02931; Hunter, C., et al. Spatial and temporal analysis of the total cost of ownership for class 8 tractors and class 4 parcel delivery trucks. Technical Report NREL/TP-5400-71796. (2021). https://www.nrel.gov/docs/fy21osti/71796.pdf; California Air Resources Board. Battery Electric Truck and Bus Energy Efficiency Compared to Conventional Diesel Vehicles. (May 2018). https://ww2.arb.ca.gov/sites/default/files/2018-11/180124hdbevefficiency.pdf.

EPA Summary and Response:

Summary:

EPA received comments raising concerns about the efficiency of the vehicles modeled in HD TRUCS. ACEEE and ICCT commented that ZEVs total efficiency could improve substantially with improvements to tires, aerodynamics, and auxiliary systems, just like ICE vehicles. ACEEE suggested that the final rule should take these efficiencies into account for both ICE vehicles and ZEVs when setting the stringency of the standard. ICCT additionally commented that lightweighting chassis technology should also be considered as reducing vehicle weight and will lead to reduced energy consumption and smaller battery sizes. MFN stated that the efficiency of the modeled BEVs in HD TRUCS was greater than the efficiency they modeled using empirical data. See many additional comments on this issue in section 2.4 of this RTC.

Response:

EPA has considered further ICE vehicle improvements and adoption as part of the additional example compliance pathways that support the stringency of our final standards. See RIA Chapter 2.11 and generally RTC sections 2.1 and 9.2. Please refer to Section 2.4 for response to comments of ICCT and others that EPA should adopt more stringent Phase 3 standards reflecting technology packages of both ZEVs and further improvements to ICE vehicles and engines beyond those projected to meet the MY 2027 Phase 2 standards.

As explained in RIA Chapter 2.4 and 2.5, the efficiency of the vehicles modeled in HD TRUCS are based on the best available data for the efficiency of the different drivetrain systems in ZEVs. In the proposal and for the final rule, we started with the energy demand at the axle calculated in GEM using a suite of technologies that meet the Phase 2 MY 2027 standards over the Phase 2 drive cycles and associated weightings. We then applied appropriate losses for each powertrain system based on data from component suppliers and literature. We agree with ICCT that manufacturers will likely deploy vehicle efficiency technologies (like improving the aerodynamics of the vehicle and lightweighting) that further improve the efficiency of ZEVs if they are cost-effective. After considering their comment, we revised the aerodynamic load for one day cab vehicle type and one sleeper cab vehicle type in HD TRUCS to reflect the aerodynamic performance of today’s day cab tractor produced by Tesla, which is more aerodynamic than today’s ICE tractors. As for lightweighting the chassis, we agree that this will happened as the vehicles continue to be improved; however, our approach for modeling vehicle energy demand includes the weight of the vehicle, powertrain, payload and the trailer (for tractors), so there is not enough certainty that small improvements in vehicle weight will result in a lower gross combined vehicle weight. Because of this we took a conservative approach and modeled the ZEV at the same vehicle weight as the comparable ICE vehicles. We appreciate the comment from MFN that provided information on how the energy efficiency of ICE vehicles and ZEVs compared between their analysis and what was used in HD TRUCS. The energy efficiency of ZEVs and ICE vehicles is a function of the duty cycle and MFN used different duty cycles for their assessment than what was used for HD TRUCS. The efficiency of ZEVs in HD TRUCS is determined from a bottom-up approach using the efficiency of the powertrain and drivetrain components. For further information on the efficiency rates we used for each powertrain system, see Chapter 2 of the RIA.

Please refer to Section 17.1 for our response to ACEEE's comment related to upstream emissions.

3.2.5 PTO

Comments by Organizations

Organization: MEMA

The EPA HD TRUCS Tool Must Be Expanded and Improved

We appreciate the substantial work EPA has invested in framing and inputting to the Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS) tool to date, to create modeling resources for various truck technologies. The model needs to be improved before it can accurately inform and assist EPA in finalizing this rule. Industry and end-users can support EPA with data to improve inputs to the HD TRUCS model. Appendix 1 of this document contains several sections and use-case reviews, along with numerous recommendations on how to improve HD TRUCS. [EPA-HQ-OAR-2022-0985-1570-A1, p. 14.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, pages 16-23, for Appendix 1.]

Appendix 1

The Draft EPA HD TRUCS Model is a Good Framework and Will Benefit from Significant Additional Development

We commend EPA for building and soliciting comments on the HD TRUCS model, which represents an endeavor to build a bottom-up projection of ZEV adoption deemed feasible from MY27 through MY32. We offer several observations on the HD TRUCS model and where it can be improved:

- There is a great level of detailed source data from the National Renewable Energy Lab (NREL) about one vocational application (utility boom trucks) in the TRUCS model and limited detail for other vocational applications. This limited view must be corrected.
- EPA included one source that measures Power Takeoff (PTO) across vocations - the California data on safe-harbor percentages - to estimate PTO usage and energy demands into HD TRUCS. This must be expanded.
- EPA's GHG Phase II inclusion of neutral-idle technology within the GEM model creates a compliance pathway for more OEMs to utilize idle reduction features in vocational trucks as GHG Phase 2 stringencies tighten. This is a positive example of how EPA can integrate efficiency features into the GEM model to incentivize deployment for mature, ready-efficiency technology with low regulatory overhead.

Industry and end-users can support EPA with data to improve inputs to the HD TRUCS model. We recommend EPA plan a second comment period or technical amendment to publicize data collected from this NPRM and to solicit additional data similar to EPA data collections from NREL on boom trucks for vehicle applications within HD TRUCS. Given the time constraints EPA is under to finalize the rule, some MEMA members plan to provide available duty cycle data that has been collected from end-user vehicle applications to answer EPA's question regarding vehicle applications that are expected to be more challenging to electrify and take more time to convert to ZEV. For example, PTO data can be used to estimate energy usage for battery sizing as EPA has, and PTO can also be an indicator of vehicle specialization which has additional timing considerations for end-user ZEV adoption. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 16 - 17]

Section 1: Vehicle applications with additional challenges to implementing ZEV technology

Specialized vehicle bodies - EPA has gathered information on PTO operation time and energy consumption for battery sizing. The presence of a PTO also indicates specialization of the truck body with accessories and other high-powered equipment. [EPA-HQ-OAR-2022-0985-1570-A1, p. 17]

Section 3: Continuous, stationary use and occasional high-performance demands

Similarly, ready-mix concrete applications need to continuously turn the drum to avoid concrete hardening leading to higher fuel burn in the range of 35-49% from PTO usage. This is higher fuel burn from PTO usage than referenced NREL data from utility bucket trucks showing <15% fuel burn from intermittent PTO usage. Likewise, concrete pumpers have extremely high-performance needs for PTO that would require higher performance PTO than utility bucket trucks. [EPA-HQ-OAR-2022-0985-1570-A1, p. 20.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, page. 20, for referenced figures.]

Organization: Daimler Trucks North America LLC (DTNA)

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #21: We request additional data that could be considered in our assessment of PTO loads in our final rulemaking assessment.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

Organization: Odyne Systems LLC

Provide a greater regulatory benefit for the use of electric Power Take-Off (ePTO) systems

Odyne recommends that the EPA consider increasing the regulatory benefit of using ePTO systems. In the past, chassis OEMs have not had a sufficient need to use ePTOs to meet regulations. ePTOs can significantly reduce NOx and GHG emissions. [EPA-HQ-OAR-2022-0985-1623-A1, p. 2]

Trucks operating at worksites often use engines to power truck-mounted equipment, such as cranes, bucket trucks, and other applications. Depending on the application, diesel trucks can be in PTO mode for many hours daily. Some examples of trucks with PTOs are shown below and listed in California Regulation 1432.1 [EPA-HQ-OAR-2022-0985-1623-A1, p. 2]

> 1 PTO examples: "boom truck (block boom), bulk feed truck, car carrier with a hydraulic winch, carpet cleaning van, cement mixer, cement pumper, distribution truck (hot asphalt), dump trailer, dump truck, fire truck, garbage truck (automated side loader, manual side loader, single drive front end loader, dual drive front end loader, single drive rear end loader, dual drive rear end loader, roll-off truck, lugger truck, recycling truck (compaction and non-compaction), one-pass truck, and container delivery truck), leaf truck, lime spreader, line trucks with digger, derrick or aerial lift, log trucks with self-loader, mobile crane, pneumatic tank truck, refrigeration truck, salt spreader (dump with spreader), seeder truck, semi-wrecker, service trucks with a jackhammer or pneumatic drill, sewer cleaning truck (sewer jet, sewer vactor), snow plow, spray truck, super suckers (port-o-let trucks), sweeper truck, tank transport, tank truck, truck with a hydraulic winch, transfer trailer, and wrecker." https://www.cdtfa.ca.gov/lawguides/vol3/dftr/dftr-reg1432.html

Very high unregulated GHG and NOx emissions in the PTO operating mode: GHG and NOx emissions from trucks are often very high when operating Power Take-offs (PTOs). Odyne has worked with the U.S. Department of Energy on various projects that show 50% or more of daily fuel can be consumed in some applications due to PTO operations. DOE studies also show very high NOx emissions since PTO operation does not allow the diesel after-treatment system to work correctly. Very high NOx output results from a low average load on the engine during many PTO applications, causing the exhaust to be too cold to enable the emissions system to work properly. As a result, 90% of full-day NOx emissions in some applications can be attributed to PTO use per DOE studies. [EPA-HQ-OAR-2022-0985-1623-A1, pp. 2 - 3]

California Regulation 1432 may underestimate the percentage of fuel consumed in PTO mode

The EPA relied on California Regulation 1432, in section 2.2.2.1.4 Power Take Off (PTO) and Table 2-28 Annual Diesel Fuel Consumption from Driving and PTO Use (MY 2027-2032) of the EPA phase 3 Draft Regulatory Impact Analysis. Regulation 1432 may underestimate fuel use in PTO mode. Per California regulations, "If the motor vehicle is idling on the highway while auxiliary equipment is in use, a refund will be allowed for the diesel fuel tax paid on that portion of the diesel fuel which is used to operate the auxiliary equipment; however, no refund will be allowed for the diesel fuel tax paid on that portion of the diesel fuel which is used for idling."[2] While regulation 1432 may not attribute fuel consumption in PTO mode to idling, it still occurs when a diesel engine-powered truck is in PTO mode and should be added to EPA's fuel estimates. Work crews turn on the PTO to operate truck-mounted equipment. They may also turn on a PTO function because it enables the vehicle to continue to idle without triggering an automatic engine shutdown. Work crews sometimes keep the engine idling in PTO mode, even if the equipment is not operated because HVAC continues to operate, and the 12V battery is charged, which is helpful if 12V worksite warning lights are activated. For example, Utility vehicle PTO consumption in Regulation 1432 (Line truck with digger, derrick, or aerial lift 20%) appears low based on U.S. DOE estimates. Table 2-28 estimates may also be low depending upon equipment and use variation. Odyne has collected data on wallboard cranes, indicating that up to 1700 gallons + of fuel annually can be consumed in PTO mode. [EPA-HQ-OAR-2022-0985-1623-A1, p. 3]

2 https://www.cdtfa.ca.gov/lawguides/vol3/dftr/dftr-reg1432.html

Odyne encourages the EPA to consider increasing the stringency of regulations impacting PTO emissions because eliminating emissions in power take-off mode reduces large amounts of GHGs and decreases harmful NOx by up to 90%. The GHG reductions/fuel savings in PTO mode may be larger than estimated by the EPA based on regulation 1432 since the California regulation does not count idling that occurs in PTO mode, and other government-funded studies show PTO fuel consumption being higher than shown in the Phase 3 Draft Regulatory Impact Analysis. [EPA-HQ-OAR-2022-0985-1623-A1, p. 3]

EPA Summary and Response

Summary:

MEMA raises concerns with the limited source of PTO data used to develop the PTO energy consumption in HD TRUCS. They recommend that EPA open a second comment period or technical amendment to solicit more detailed PTO data, such as the NREL data source for utility boom trucks which uses 15% fuel burn. MEMA compares the fuel burn for concrete mixers to the 15% fuel burn for utility vehicles in the NREL paper. MEMA states the fuel burn range for the PTO for concrete mixers is 35-49%. DTNA stated that EPA should consider all data made available to EPA in the rulemaking and suggested, because of the limited data available for PTO, EPA should re-evaluate the PTO as more data becomes available.

Odyne raised a concern that the California Regulation 1432 may underrepresent the fuel usage in PTO mode as it does not attribute fuel consumption in PTO mode to idling, but idling still occurs when a diesel-powered truck is in PTO mode. Odyne also raised concerns about NOx emissions during PTO operation.

Commenters also requested that EPA develop procedures, standards, and/or GEM features that encourage more efficient PTO applications, such as ePTOs.

Response:

In the NPRM, EPA requested additional PTO data that could be considered in the assessment of PTO loads in our final rulemaking assessment (88 FR at 25975); the only additional PTO fuel burn data that was submitted in comments was an estimate from MEMA for concrete mixers. We therefore disagree that EPA should open a second comment period, as EPA provided commenters an opportunity to provide any such additional data in the NPRM comment period.

We note that PTO data was used to inform the comparative baseline energy consumption, and thus the comparative upfront cost and cost of operation, between ZEVs and comparable ICE vehicles. An increase in the estimate of fuel burn for PTO increases the required battery size and therefore upfront cost of ZEVs compared to ICE vehicles but leads to lower operating costs due to greater efficiency of ZEVs and the fuel/electricity cost differences among the ZEV and ICE technologies.

As discussed in Chapter 2.2.2 of the RIA, for the final rule EPA increased the PTO fuel burn for concrete mixers/concrete pumpers and has used an average of the estimated range submitted by MEMA to update the PTO fuel burn rate.

MEMA's comment comparing the PTO fuel burn rate of concrete mixers to the 15% fuel burn rate for utility vehicles appears to imply that EPA used a 15% PTO fuel burn rate across all applications; however, that is not the case. As discussed in RIA 2.2.2, EPA relied on a table described in California's Diesel Tax Fuel Regulations, specifically in Regulation 1432, "Other Nontaxable Uses of Diesel Fuel in a Motor Vehicle,"[282] that covers a wider range of vehicles beyond the electric utility vehicles in the referenced NREL studies. In response to Odyne's comment that the California's Diesel Tax Fuel Regulations may underestimate fuel usage due to the exclusion of idle fuel consumption, EPA disagrees because idle fuel consumption is already accounted for in the vocational vehicle duty cycle weightings, which include 25% parked idle.[283] HD TRUCS also increases the energy consumption of each vehicle based on the percent PTO use from California's Diesel Tax Fuel Regulations with powertrain efficiencies applied. See RIA Chapter 2 for further information regarding increase in energy consumption based on percent PTO usage.

In response to Odyne's comments about NOx emissions during PTO operation, this comment is out of scope for the current rulemaking, as we did not reopen our criteria pollutant standards. We note that the existing off-cycle criteria pollutant standards in 40 CFR 1036.104 cover PTO operation, so the current standards ensure that NOx is controlled during PTO operation.

In response to the comment that EPA should develop test procedures for recognizing the benefits of electrified PTO systems, we note that the current 40 CFR 1037.520(k) and 40 CFR 1037.540 already allow for this.

EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

[282] *See* Cal. Code Regs. tit. 18, § 1432, "Other Nontaxable Uses of Diesel Fuel in a Motor Vehicle," *available at https://www.cdtfa.ca.gov/lawguides/vol3/dftr/dftr-reg1432.html*.

[283] Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2 RIA *available at https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NS.PDF?Dockey=P100P7NS.PDF.* See Table 3-19, Page 3-71.

3.3 Battery Sizing

3.3.1 90th Percentile VMT

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

EPA's battery requirements may unnecessarily limit BEV adoption in some applications, as a result of high cost or payload constraints. Examples of onerous requirements include sizing the battery for a given vehicle type to meet the daily needs for vehicle-miles-traveled (VMT) of 90% of all vehicles of that type (88 FR 25977). For long-haul tractors in particular, it is reasonable to expect that OEMs would offer a range of battery sizes so that fleets would not need to over-specify their trucks. However, HD TRUCS requires, for example, that a BEV Class 8 sleeper cab tractor with average daily operational VMT of 200 miles (vehicle type 78) have a battery that serves for 400 miles of daily operation. Consequently its battery is sized at more than 1450 kWh through MY 2032 and reduces the truck's payload capacity by more than EPA's threshold value of 30% until MY 2031. Such requirements result not only in long payback periods but the exclusion of BEVs for all sleeper cab trucks, with ZEVs first appearing in 2030 as fuel cell electric vehicles (FCEVs). [EPA-HQ-OAR-2022-0985-1560-A1, p. 5]

Organization: California Air Resources Board (CARB)

However, CARB staff believes that U.S. EPA's analysis is overly conservative regarding battery sizing for long range HD BEVs. To calculate battery size, the U.S. EPA methodology included multiplying the 90th percentile of daily range by the estimated energy usage per mile including temperature effects and battery conditioning, and then added a 20 percent buffer for battery deterioration and 20 percent for a depth of discharge reserve. This methodology results in overly inflated battery sizes for HDVs which do not reflect fleet purchasing decisions nor what manufacturers are offering on the market today. [EPA-HQ-OAR-2022-0985-1591-A1, p.61]

In particular, the assumption that fleets must purchase ZEVs with range needs which meet the 90th percentile of usage is not in line with typical fleet purchasing decisions. To compare, U.S. EPA's analysis generally finds that the 90th percentile of daily range results in daily mileage 35 to 200 percent above the 50th percentile. For instance, the 50th percentile of a class 8 sleeper cab in a regional duty cycle is 400 miles while the 90th percentile is 550 miles. This means that under U.S. EPA's assumptions, every sleeper cab must be sized for a battery capable of 550 miles, which then results in a battery size of 2,036 kWh. Similarly, a class 8 day cab in a region duty cycle has a daily range of 191 miles at the 50th percentile and 349 miles at the 90th percentile. This range of 349 miles results in a battery size of 1,261 kWh after factoring in the energy usage and additional buffers. [EPA-HQ-OAR-2022-0985-1591-A1, p.61]

These oversized battery capacities have numerous negative impacts on the vehicle's attributes including cost, weight, and space. The battery is the largest component of BEV powertrain costs, and as a result, oversizing batteries results in major increases in expected costs. Larger batteries weigh more and occupy more space, both of which negatively impact the expected performance of BEVs. As a result, the battery sizing assumption ends up being one of the most critical assumptions in the model, and it is imperative to properly model this in line with fleet needs. [EPA-HQ-OAR-2022-0985-1591-A1, pp.61-62]

U.S. EPA's analysis does not appear to be in alignment with fleet purchasing decisions. Fleets generally look for opportunities to minimize costs and will not pay for additional range that is not needed. Many fleets dispatch their vehicles from a centralized control and have flexibility in which vehicles to dispatch on which routes. Fleets can dispatch ZEVs on routes which are within their range needs and leave longer distance routes for the ICE vehicles in the fleet. Given the minimal presence of ZEVs in the trucking fleet overall today, any new ZEV purchase requirement will mean fleets will still have ICE vehicles in their fleet for a significant length of time. Over time, as technology develops and fleets gain familiarity with how BEVs fit into their operations, longer range BEVs can be procured. While these will cost more upfront, the longer range enables more routes and additional operational savings at the same time. [EPA-HQ-OAR-2022-0985-1591-A1, p.62]

Real-world data illustrates how these assumptions are not aligned with actual vehicles being sold as commercial products. Battery-electric class 8 day cab tractors are commercially available today and numerous manufacturers have products targeting the drayage operation or regional applications on fixed routes.209 Based on the range and associated energy capacity, it is clear the battery capacities assumed in the Heavy- Duty Technology Resource Use Case Scenario (known as HD TRUCS) model do not reflect the actual range needs to vehicles produced by manufacturers for the modeled segments. In fact, per U.S. EPA's analysis, regional class 8 day cabs are described as infeasible for BEV operations, in stark contrast to the market today, four years before U.S. EPA's revised and new standards would begin. [EPA-HQ-OAR-2022-0985-1591-A1, p.61] [Table 1 can be found on pp. 62-63 of docket number EPA-HQ-OAR-2022-0985-1591-A1]

2. BEV Technology Costs

Affected pages: NPRM 25977 and DRIA 158-166

CARB staff finds U.S. EPA's assumptions for component costs to be reasonable given available information and literature projections. CARB staff's analysis for the ACF regulation performed a similar analysis which determined the upfront costs of BEVs through a component cost analysis. [EPA-HQ-OAR-2022-0985-1591-A1, p.61]

U.S. EPA's analysis also does not factor in the potential benefits of longer operations, in particular, higher operational savings. BEVs which need to travel longer distances will cost more upfront but can generate higher fuel and maintenance savings on a per mile basis as well. As a result, longer range operations do not inherently lead to worse payback periods; in fact, depending on the operation, higher daily range can increase savings and accelerate the payback period. [EPA-HQ-OAR-2022-0985-1591-A1, p.63]

In summary, U.S. EPA's battery size projections appear to overestimate fleet needs and do not reflect actual models being offered by manufacturers today. CARB staff recommend that U.S. EPA reevaluate the assumptions used in battery sizing and in particular, the assumptions regarding the 90th percentile. While this assumption is necessary for some applications such as recreation vehicles, in other applications such as motorcoaches, day cabs, and sleeper cabs, it is resulting in flawed modelling with negative impacts on the rest of the analysis. [EPA-HQ-OAR-2022-0985-1591-A1, p7.63]

Organization: Daimler Truck North America LLC (DTNA)

DTNA's review of telematics data supports more conservative assumptions about purchaser decisions based upon ZEV suitability. DTNA analyzed an 18-day snapshot from May 1, 2023 to May 18, 2023 of telematics-equipped Class 8 day cab and sleeper cab tractors in operation nationwide and compared this snapshot to EPA's assessment of duty cycle characteristics and ZEV suitability. Based on this data, which is set forth in more detail in Appendix A ('DTNA Telematics Data vs. EPA's GHG Phase 3 Suitability Assessment'), DTNA believes EPA is significantly overestimating current ZEV application suitability with respect to daily VMT, charging dwell times, and return-to-base operations that could rely on depot charging. As shown in Table 4 below, DTNA's 90th percentile daily VMT is significantly higher than EPA's value used for assessing BEV component sizing in HD TRUCS. This data indicates that the Proposed Rule overestimates suitable applications and underestimates the associated battery costs and weight penalty required to size batteries to meet the 90th percentile operational needs. If EPA were to use DTNA's 90th percentile daily VMT to size batteries, all day cab and sleeper cab tractors would exceed EPA's 30% payload capacity penalty threshold. [EPA-HQ-OAR-2022-0985-1555-A1, p. 22] [Refer to Table 4 on p. 22 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Fleets may choose not to adopt new technology if that technology could have a worse payback period in the future. As IRA incentives expire and electricity prices rise, fleets may wait to see if the TCO case will remain positive in the long run without subsidies. [EPA-HQ-OAR-2022-0985-1555-A1, p. 26]

- Vehicle Suitability to Fleet Operations. As EPA acknowledges, commercial vehicles are purchased to perform a variety of operations. Before a calculated payback period is considered, the fleet must decide whether the ZEV will meet required drive cycle and operational requirements. In the HD TRUCS model, EPA sizes BEV and FCEV components to meet 90th percentile VMT needs, stating that the Agency expects manufacturers to design to this condition, as opposed to operational extremes. Unless fleets have exceptionally high confidence their vehicle will see a predictable route and weight that falls within the 90th percentile of operation, they will not purchase a ZEV that can fulfill only the 90th percentile of daily use cases. Furthermore, as discussed above, EPA significantly underestimates the 90th percentile daily VMT for the tractor categories. [EPA-HQ-OAR-2022-0985-1555-A1, p. 26]

EPA Request for Comment, Request #22: We request comment, including comment with data, on our VMT assessments.

- Based upon DTNA's analysis, EPA underestimates the 90th percentile daily VMT for heavy duty vehicles. An accurate estimate is critical to the feasibility of HD ZEVs to replace a conventional vehicle, thus EPA should reevaluate VMT using the best available data, including the data DTNA provides for certain vehicle categories in Section II.B.3 and Appendix A to these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

EPA Request for Comment, Request #50: Our request for comment includes a request for data to inform an assessment of the distribution of daily miles traveled and the distribution of the number of hours available daily to charge for each of the vehicle types that we could use to update a constraint like this in the final rulemaking analysis.

- DTNA Response: Based upon DTNA's analysis, EPA significantly underestimates daily VMT in the tractor categories and over-estimates dwell time available for vehicles to charge, as reflected in Section II.B.3 and Appendix A to these comments. An accurate estimate is critical to the feasibility of HD ZEVs to replace conventional vehicles, thus EPA should reevaluate VMT using the best available data, including the data DTNA provides for certain vehicle categories in Section II.B.3 and Appendix A to these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 167]

Organization: Environmental Defense Fund (EDF)

Daily mileage. EPA uses the 90th percentile daily mileage to set the battery size but only assumes that vehicles will travel the 50th percentile annual miles.132 While battery size impacts the upfront cost of the vehicle, the annual miles dictate how quickly the fuel and maintenance savings from ZEVs will pay back the upfront costs. The stringency of the standards, which is determined in part by the payback period, is directly impacted by these assumptions. In the Draft RIA, EPA alludes to the assumption that vehicle manufacturers will make only one ZEV for each of the 101 categories EPA has identified. This is not the current reality of the market nor is it expected to be in the future. Vehicle manufacturers currently make the same vehicle with multiple battery size options to allow fleet or vehicle owners to select the best vehicle for them. As can be seen in Appendix C of the ERM EV Market Update from April 2023, many of the current BEV HD offerings come in multiple battery sizes.133 For instance, the Kenworth Class 7 box truck can be purchased with a 141 kWh or 282 kWh battery. [EPA-HQ-OAR-2022-0985-1644-A1, p. 54-55]

132 Section 2.2.1.2.1 Sizing VMT and Section 2.2.1.2.2 Operational VMT in Greenhouse Gas Emission Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis

133 Rachel MacIntosh, Harrison Branner, Kayla Escobar, and Sophie Tolomiczenko. 2023. Electric Vehicle Market Update: Manufacturer & Commercial Fleet Electrification Commitments Supporting Electric Mobility in the United States, ERM for EDF, Appendix C.

While it is reasonable to assume that some vehicles will not drive the exact same number of miles per day, many vehicles drive similar numbers of miles per day as they carry out similar duty cycles (e.g., school buses drive the same route every day). EPA's current assumption that vehicle owners would pay for such a large battery when their vehicles do not need it most of the time is inconsistent with good business practices and reality. [EPA-HQ-OAR-2022-0985-1644-A1, p. 55]

ii. Correcting EPA's assumptions that all sleeper cabs will be FCVs and that all heavy-duty vehicles will be charged in depots supports stronger standards.

EPA's modeling assumes all sleeper cab tractors will exclusively be fuel cell electric vehicles (FCEVs). However, as noted above, a number of sleeper cab tractors travel short enough distances every day that it would be very reasonable for EPA to assume those vehicles could be battery electric starting as early as 2027. The two categories of sleeper cabs EPA modeled had a 90th percentile daily mileage of 400 and 550 miles. By only breaking up sleeper cabs into these two categories, EPA is disregarding the share of vehicles that drive fewer daily miles. The 2002 VIUS found 10% of sleeper cabs 5 years or younger drove fewer than 200 miles 90% of the time and CARB found that 14% of sleeper cabs drove fewer than 200 miles on average.98 Additionally, CARB found that 28% of sleeper cabs drive fewer than 300 miles a day.99 [EPA-HQ-OAR-2022-0985-1644-A1, 44-45]

98 Vehicle Inventory and Use Survey 2002. U.S. Department of Transportation, Bureau of Transportation Statistics, 2004, https://rosap.ntl.bts.gov/view/dot/42632

99 California Air Resources Board. 2022. Large Entity Fleet Reporting: Statewide Aggregated Data. https://ww2.arb.ca.gov/sites/default/files/2022-02/Large_Entity_Reporting_Aggregated_Data_ADA.pdf

While this does not represent the majority of the sleeper cabs, failing to incorporate these vehicles into EPA's analysis negatively impacts the stringency of the rule. Tractors account for a significant share of on road tailpipe emissions and early decarbonization of even a small portion of this sector is crucial. [EPA-HQ-OAR-2022-0985-1644-A1, 45]

Organization: MEMA

Section 2: Worksite location unpredictable, away from depot

Any vehicle application that builds and maintains infrastructure, including construction applications and utility trucks that respond in emergencies to restore critical services, represent commercial vehicle missions where the vehicle has a significant probability of not being able to return to the depot to charge overnight. Such vehicles might stay at the job site for days or weeks at a time when its performance demands are highest and most critically needed. This need for geographic flexibility brings added challenges to fleets planning infrastructure. A MEMA member has compiled available duty cycle data to provide real-world examples of these kinds of vehicle's daily variation in miles traveled. This is shown in the figure below: [EPA-HQ-OAR-2022-0985-1570-A1, p. 18.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, page. 18, for referenced figures.]

Organization: POET

Beyond the issues with HD ZEV technology cost and U.S. EPA's payback analysis, there are other issues with the agency's technology assessment that led to overestimation of adoption rates for HD ZEVs. These include the assumption that vehicle purchasers will deem a HD ZEV with a 30% lower cargo carrying capacity as equivalent to a conventional vehicle (Chapter 2.8.1 of the DRIA) and the assumption that purchasers of HD BEVs will accept the relatively low electric ranges upon which the U.S. EPA has based its cost estimates for HD BEVs (Table 2-33) – many of which are considerably less than 100 miles. Further, although U.S. EPA considered gradeability in determining electric motor sizes for HD BEVs (Chapter 2.4.1.2) it is not clear how U.S. EPA accounted for the impact of grade on BEV range which would increase the need for larger more expensive batteries again making a favorable payback analysis more difficult to achieve. [EPA-HQ-OAR-2022-0985-1528-A1, p. 29]

EPA Summary and Response:

Summary:

A number of commenters questioned EPA's choice of a 90th percentile for sizing VMT, and some questioned the value itself as either too high or too low. The main assertions from commenters were that different sets of data have different 90th percentile values, that fleets will not buy vehicles that only meet the 90th percentile operating conditions, that fleets will not buy vehicles sized to the 90th percentile if they were buying a vehicle that operates less than 90th percentile routes, and that using the 50th percentile for calculating daily operational costs (i.e. daily VMT) increases the number of payback years arbitrarily since fleets would not purchase a 90th percentile vehicle and operate it on a 50th percentile duty cycle. There was also a concern raised about the minimum mileage of electric vehicles, saying that fleets would not purchase vehicles that were sized for less than 100 miles of daily VMT, and that EPA had not properly factored gradeability into the sizing of the batteries.

ACEEE commented that the 90th percentile value in HD TRUCS was too high for most fleet needs. They stated that manufacturers will offer multiple battery sizes for their vehicles to meet the needs of a wider range of fleet requirements. They stated that the battery sized in HD TRUCS will be more expensive than required due to its size. They stated that this oversized battery will also be heavier than necessary which negatively impacts the projected payload of the vehicle. They stated that these factors, in combination, unreasonably reduce the adoption rate calculated in HD TRUCS.

EDF went into more depth, disputing the methodology used by EPA for both the sizing VMT and the operation VMT. First, they stated that the 90th percentile VMT is too high and cited several supporting sources of telematics data including the 2002 VIUS survey, data used by CARB for the ACT standards, and a report from Roush Industries. Second, they argued that the combination of the 90th percentile 'sizing' VMT – the VMT used to size the battery – with a 50th percentile 'daily' VMT was not only overly conservative but self-contradictory. That is, they argued these combined assumptions essentially mean that the battery is sized for the 90th percentile when that size battery is almost never needed (as shown by the daily/operational VMT estimate). They argued that the 90th percentile sizing should be reduced since manufacturers will provide multiple battery options for their vehicles - purchasers need not buy vehicles with batteries larger than what they need. Moreover, they argued that the 90th percentile sizing means that vehicles get a large upfront cost due to a large battery and 50th percentile operational range means that the amount of time required for fuel and maintenance savings to pay back the upfront cost is increased.

CARB agreed with the points made by EDF in regard to using the 90th percentile for sizing batteries for HD vehicles. They made their point using fleet purchasing decisions, stating that fleets will only buy vehicles that meet their milage requirements, and generally look for opportunities to minimize costs. CARB also commented that fleets typically operate from a centralized control and have flexibility as to which vehicles to dispatch on which routes, thereby using ZEVs for shorter routes and ICE vehicles for longer routes. CARB also states that the batteries sized using the 90th percentile VMT do not match BEVs that are currently available today and the assumptions used in battery sizing need to be reevaluated.

CARB noted how these sizing and operating assumptions could be at odds with reality. The proposed version of HD TRUCS did not recognize Class 8 BEV day cabs, but CARB notes that such vehicles exist in today's market and are being used in regional applications.

Both DTNA and POET commented that the sizing VMT in HD TRUCS was too low. Their dispute is both with the choice of a 90th percentile, and the mileage estimate of that 90th percentile. DTNA's comments focused on tractors (both day cabs and sleeper cabs). DTNA provided 18 days of telematics data from May of 2023 showing the daily VMT for their vehicles with a much greater 90th percentile VMT than EPA estimated at proposal. They point out that using a higher sizing VMT would increase the upfront costs of the vehicle and that the larger battery required using their 90th percentile VMT would exceed the 30% payload reduction feasibility metric used in HD TRUCS at proposal. DTNA further commented that fleets would not be inclined to purchase vehicles that are sized only to the 90th percentile but would instead purchase vehicles that were designed to operational extremes. Fleets would only purchase 90th percentile trucks if they had exceptionally high confidence that their vehicle will see predictable routes.

POET focused on the vocational vehicles in HD TRUCS that had ranges less than 100 miles. Their comment stated that customers would not purchase vehicles with a range significantly lower than 100 miles. They also commented on how the impact of grade on range was factored into sizing batteries in HD TRUCS. They said that since gradeability was factored into motor sizing, it should be accounted for in the energy consumption and therefore battery sizing.

MEMA raised concerns about jobsite location, especially for vehicles used in applications supporting infrastructure maintenance and development as well as construction and utility vehicles have the potential of remaining at a job site for days at a time and are not always able to return to a depot for charging. They were concerned that these large changes in daily VMT would implement challenges for fleets planning infrastructure to charge these vehicles at different locations.

Response:

Please see Chapter 2.2.1.2.2 and 2.2.1.2.3 of the RIA for an in-depth discussion about the approach to sizing VMT that EPA used in the final rule after consideration of these comments. Among other things, those sections explain how the sizing VMT in the final rule is generally consistent with the telematics data submitted by commenter DTNA, although EPA did not use those data in calculating sizing VMT. The discussion there further explains that taken a different approach, such as sizing batteries to meet shorter daily VMTs through using a lower sizing VMT would mean that these depotcharged BEVs would be unavailable for some market segments in our analysis, and, conversely, that sizing batteries to meet VMTs greater than the 90th percentile would be unnecessarily large for many applications where fleets are using depot charging.

We understand that there are many different datasets available and that the 90th percentile VMT will be different in each dataset. However, the NREL FleetDNA database and MOVES uses data from many different sources across the country giving a homogenized representation of the HD fleet nationwide rather than data from a single source, even if that data was collected on a nationwide basis. In EPA's judgment, the NREL FleetDNA, University of California-Riverside, and MOVES databases are therefore more representative of the nationwide fleet of HD vehicles, compared to data from any individual manufacturer.

DTNA was also concerned that fleets would not purchase vehicles that were designed for only the 90th percentile operating range, and that HD TRUCS should be sizing vehicles to perform at operational extremes. ACEE, EDF, and CARB all commented that fleets would not purchase vehicles sized to the 90th percentile as these vehicles would have larger batteries than required to meet the majority of fleet needs which would increase costs unnecessarily. Their comments suggested reducing the sizing metric from the 90th percentile to an unspecified lower percentile that would cause the vehicles in HD TRUCS to reflect comparable BEVs being offered today. For the final rule, for the reasons fully explained in preamble Section II and RIA Chapter 2, we are continuing to size almost all vocational vehicle batteries to the 90th percentile as this percentile would cover the majority of fleet operations. As reflected in the modeled potential compliance pathway, we expect that ICE vehicles will still be sold in the timeframe of this rule and that those vehicles will be used in applications that see extremes whether they be extreme daily VMT or ambient temperatures. However, we have also addressed the concerns of CARB, EDF, and ACEEE where we agreed it was appropriate to do so, for example by adding tractors to the rule with varying daily VMTs to represent vehicles that are used in applications which can be recharged en route and so do not need to be sized to the 90th percentile. For vehicles that are assumed to be charged en-route, we have accounted for en-route charging costs. For additional discussion on the specifics for these vehicles see Chapters 2.2.1.2.2 and 2.2.1.2.3 of the RIA. For information about en-route charging costs, see RIA Chapter 2.4.4.2.

EDF was concerned about using the 50th percentile daily VMT for operating costs while simultaneously using the 90th percentile daily VMT for sizing the battery. We are retaining this approach for the final rule with the exceptions discussed in the previous paragraph. We are retaining this approach because it is a reasonably conservative analytical approach. Our basic premise was to size most ZEVs so that they could perform the majority of fleet operations where fleets are using daily depot charging (90th percentile VMT), and to use the average amount of work done by a comparable ICE vehicle during a normal workday as a conservative but reasonable means to analyze the payback (50th percentile VMT). This ensures that the vehicles specified in HD TRUCS are capable of doing the work performed by comparable ICE vehicles and keeping payback calculations realistic through use of average daily VMT.

POET was concerned about the low daily VMT to which some of the vehicles in HD TRUCS were sized at proposal, commenting that customers would not purchase vehicles that had less than 100 miles of range. In response to this comment, and as a conservative cost assumption, we are adding an additional constraint for minimum battery sizing, such that no vehicle in HD TRUCS is designed for less than 100 miles of range, i.e., any vehicle with 90th percentile VMT of less than 100 miles in our analysis has been assigned a sizing VMT of 100 miles. For additional discussion about sizing VMT, see Chapters 2.2.1.2.2 and 2.2.1.2.3 of the RIA.

POET also requested clarity on how road grade was factored in for sizing batteries. In our analysis, road grade was factored in with the amount of energy required to move the vehicle. This value was calculate using GEM results. GEM takes road grade into account in the duty cycles that are simulated. The 55 mph and 65 mph cruise cycles include road grades between positive and negative 5%,[284] and the energy consumption rate calculated includes weighted averages of these cycles. See RIA Chapter 2.2.2.1.2.

[284] 81 FR 73633.

MEMA expressed concern about the need to charge vehicles, such as utility trucks, that may need to go longer periods without charging during emergencies to restore critical services. As we just mentioned, for the final rule analysis, we have increased the minimum range to 100 miles for all vehicles, including utility trucks. This change led to larger battery sizes in utility vehicles for the final rule, which will allow BEV utility vehicles to operate for longer periods of time than the vehicles we assessed in the proposal. Based on MEMA's and similar comments, we have made additional changes from the proposal to reflect this consideration. We have included limitations on our consideration of ZEV technology adoption for the regional duty-cycle utility trucks for the final rule to reflect consideration of their use in restoring critical services. It is our understanding that public utility trucks using urban and multi-purpose duty cycles would not be used to restore critical services outside of their typical service area. Under the modeled potential compliance pathway, in MY 2027 all regional duty-cycle utility vehicles are assigned zero adoption of ZEV technologies, and in MY2030 and MY2032 the adoption rate is limited to 14%. The modeled potential compliance pathway correspondingly thus includes a higher adoption rate for ICE vehicles technologies, resulting in a higher number of regional duty-cycle utility trucks remaining as ICE vehicles. We would also like to point out that new charging solutions are being developed for just this purpose. Containerized and mobile charging solutions exist today with large ranging capabilities including DCFC that use their own batteries to store energy from a wide variety of power sources and use it to charge electric vehicles.[285, 286, 287, 288, 289, 290] These systems can be used in a variety of ways and locations to provide temporary power at job sites where it is not possible for ZEVs to return to a depot each day.

Please see Section 3.10.1 of this RTC for comments and responses on payload.

3.3.2 HVAC Loads

Comments by Organizations

Organization: Daimler Trucks North America

EPA Request for Comment, Request #23: We request comment on and data to support other approaches to quantify the HVAC energy demand in BEVs, including the ambient temperature ranges where heating and cooling are utilized.

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[285] Lightning Energy. Lightning Mobile. Available online: https://lightningemotors.com/wp-content/uploads/2023/06/LE_Lightning_Mobile_sheet_Jun2023_v1b_online.pdf

[286] Power Sonic. EVESCO. Off-Grid EV Charging Solutions. Available online: https://www.power-sonic.com/evesco/off-grid-ev-charging/

[287] Pioneer Emobility. E-Boost. Off-Grid EV Charging, Power and Connectivity with Mobility. Available online: https://www.pioneer-emobility.com/

[288] Setec Power. Container EV Charging System. Available online: https://www.setec-power.com/container-ev-charging-system/

[289] Amply Power. Amply Power Launches New Containerized EV Charging Infrastructure Solution, Anaheim Transportation Network Signed on as First Customer. Available online: https://amplypower.com/amply-power-launches-new-containerized-ev-charging-infrastructure-solution-anaheim-transportation-network-signed-on-as-a-first-customer/

[290] Ideanomics. A Scalable Solution: The Benefits of Containerized EV Charging. February 16, 2023. Available online: https://ideanomics.com/a-scalable-solution-the-benefits-of-containerized-ev-charging/

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

EPA Request for Comment, Request #24: We welcome data to support these or other cabin size scaling factors.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

EPA Request for Comment, Request #25: We request additional data on the battery thermal management loads for HD BEVs

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

EPA Request for Comment, Request #25: We request additional data on the battery thermal management loads for HD BEVs

DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

Organization: International Council on Clean Transportation (ICCT)

Another important factor considered by EPA to estimate the vehicle energy needs, and therefore the battery size, is the auxiliary heating and cooling load. The heating and cooling load includes the driver’s cabin and the battery thermal management system. To estimate the energy needed for heating and cooling, EPA uses publicly available data on the heating and cooling needs of a transit bus and then corrects this heating and cooling load to reflect a truck application considering the ratio between the truck cabin surface area and the reference bus surface area. This simplistic approach ignores the impact of surface type on the different heating transfer phenomena that take place between the vehicle cabin and the environment. For example, a significant portion of a transit bus body surface is glazed, which leads to a higher rate of heat transfer with the environment. In addition, the bus passengers are a significant additional heat source that would increase the cooling needs of the bus during hot days, which is not relevant for trucks. ICCT published an analysis in 2022 on the cooling and heating needs of trucks, focusing on long-haul trucks operating in Europe. (Basma & Rodríguez, 2022) Table 1 summarizes the heating and cooling load. ICCT recommends that EPA uses the presented data in Table 1 as the baseline data for the truck cooling and heating needs and adjusts the load accordingly for other truck segments given the ratio of the trucks’ surface areas. [EPA-HQ-OAR-2022-0985-1553-A1, p. 14] [Refer to Table 1, Summary of Truck Cabin Cooling and Heating, on p. 14 of EPA-HQ-OAR-2022-0985-1553-A1.]

Basma, H., & Rodríguez, F. (2022). Fuel cell electric tractor-trailers: Technology overview and fuel economy. International Council on Clean Transportation. https://theicct.org/publication/fuel-cell-tractor-trailer-tech-fueljul22/

Organization: ROUSH CleanTech

Ignoring these considerations, the Basma study cited an average HVAC power demand of 25kW at 14ºF, plus additional 4.9kW for battery heating. Even in a conservative assumption of 4 hours between opportunity charging, this would require an extra 120kW-hr (or more) of battery capacity beyond nominal, solely to run the heating systems—and again, this is at 14ºF, not 0º or -20ºF which is more typical of the minimum ambient temperatures required in most of the US.

EPA Summary and Response:

Summary:

ICCT commented on the methodology for determining the heating and cooling loads in HD TRUCS. They commented that the methodology, which used publicly available data on heating and cooling of transit buses, did not accurately reflect the heating and cooling needs of trucks due to differences in cabin materials. Their concern was that a significant portion of a transit buses surface area is glazed and therefore has a different heat transfer rate than a truck which uses much less glazing in its construction. They were also concerned about the effect of passengers, who are also a heat source, and their effect on cooling the bus on hot days. Their recommendation was to use data collected by a study they published in 2022 that analyzed the heating and cooling needs of long-haul trucks in Europe and use that data to scale for other trucks.

Roush commented that the batteries sized in HD TRUCS are not large enough to accommodate extreme cold temperatures that are commonly seen in most of the United States for buses and other large cabin vehicles.

Response:

We compared the heating and cooling values presented in ICCT's comments for a long-haul tractor with the values we used in HD TRUCS for sleeper cabs, which include a 0.3 cabin scaling factor and represent a heavy-duty VMT-weighted average of the U.S. temperatures to determine heating and cooling loads. The heating and cooling loads in ICCT's work and HD TRUCS are similar; therefore, we view this comment as further supporting the values we used in the NPRM.

We appreciate Roush's comments on the sizing of batteries for use in extreme operation, but we are not sizing batteries to the extremes in our analysis. As we explain in RIA Chapter 2, we sized the batteries, power electronics, e-motors, and infrastructure for each vehicle type based on the 90th percentile of the average VMT. We utilized this technical assessment approach because we do not expect heavy-duty OEMs to design ZEV models for the 100th percentile VMT daily use case for vehicle applications, as this could significantly increase the ZEV powertrain size, weight, and costs for a ZEV application for all users, when only a relatively small part of the market will need such specifications. We know that BEVs today are being sold with reasonably sized batteries, see Chapter 1 of the RIA for a list of BEVs available through MY2024. Therefore, the ZEVs we analyzed and have used for the feasibility and cost projections for the proposal and final rule in this timeframe are likely not appropriate for 100 percent of the vehicle applications in the real-world. However, we have taken into account temperature variations across the country by using a VMT-weighted average of temperature and sized the batteries accordingly. We have taken into account in the HD TRUCS analysis availability of ICE vehicles to accommodate extreme conditions such as those posited in this comment. Our modeled potential compliance pathway includes ICEVs in the technology packages, in all of the regulatory subcategories, for such purposes, and the additional example potential compliance pathways we assessed including without producing additional ZEVs to comply with this rule, so our analyses appropriately contemplate that fleets that operate in extreme weather conditions can use ICE vehicles to meet their specific needs.

Regarding DTNA's comment, DTNA did not provide any specific data related to HVAC or battery thermal loads. EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

3.3.3 Depth of Discharge and Deterioration

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

EV batteries are high-cycle batteries and are made to function for approximately 10 years for a light-duty vehicle, and a shorter time for medium- and heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

EV batteries lose approximately 3 percent of their charging capacity and associated range per year of operation. These percentages likely are higher for higher mileage utilization for typical heavy-duty vehicles. EPA has not made any effort to account for battery degradation, and associated reductions in charging efficiency, charging capacity, customer impacts and accelerated battery replacement and costs. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

Organization: Daimler Trucks North America

EPA Request for Comment, Request #27: We request comment on approach and results for the useable battery range and battery deterioration for HD BEVs that we could consider for our final rule analysis.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 162]

Organization: Environmental Defense Fund (EDF)

Discharge and deterioration percentage. EPA assumes only 80% of the battery will be able to be discharged and over the lifetime of the battery there will be 20% deterioration. Both of these values are conservative. They represent current battery technologies and assume no improvement between now and 2027-2032. Given the fast pace of battery chemistry development it is unreasonable to assume a static industry. In their February 2022 report, Roush found that newer battery technologies are allowing vehicle owners to discharge more of their battery in every charge cycle and increase the battery lifetime.134 In their recent report on the electrification of tractors, Roush sets the discharge limit at 90% and projects 10% degradation over the lifetime of the battery.135 We recommend EPA adopt similar assumptions for the final rulemaking. [EPA-HQ-OAR-2022-0985-1644-A1, p. 55]

134 Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush for Environmental Defense Fund. See http://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf

135 Vishnu Nair, Himanshu Saxena, Sajit Pillai. 2023. Class 7 and Class 8 Tractor–Trailer Electrification for MYs 2030 and 2032, Roush for Environmental Defense Fund

Mileage decreases. In its HD TRUCS model, EPA assumes vehicles will travel between 29% and 35% fewer miles in their 10th year of service compared to their first. This decrease lines up with the assumed deterioration of the battery. Even if the usable battery decreased by 20% over the lifetime of the vehicle, that more than matches the decrease in the mileage traveled by the vehicle. [EPA-HQ-OAR-2022-0985-1644-A1, p. 55]

Organization: International Council on Clean Transportation (ICCT)

In addition, EPA's battery sizing approach considers oversizing the battery by 20% to accommodate capacity fade over time. While battery capacity fade will certainly reduce a truck's driving mileage, it is unclear how EPA decided on the 20% figure given the very scarce battery aging data for heavy-duty vehicle applications. In addition, recent developments in battery technology are resulting in a significantly prolonged battery lifetime, reaching 1.5 million kilometers (ca. 932,000 miles) for long-distance trucking applications. We encourage EPA to adopt a capacity fade assumption based on publicly available information and in consultation with battery suppliers. [EPA-HQ-OAR-2022-0985-1553-A1, p. 13]

Organization: Moving Forward Network (MFN) et al.

11.1.3.1. Modeling oversized batteries results in higher than necessary BEV costs

The battery size calculated by Equation 2-27 in the DRIA includes a 20% deterioration of the battery over its lifetime, and accounts for this by including a 20% larger battery at point of sale than necessary to cover the vehicle miles traveled of the desired route. The rationale stated for this increased battery size is that, at the end of the HDVs lifetime, it should cover the same route and go the same distance as needed when an HDV is new. This is a conservative estimate, considering the fleet owner would likely adjust mileage and routes to adjust for the declining capacity over the 15-year lifespan, as has been the case for diesel-powered trucks for decades via the secondary market, rather than pay for the large amount of unused capacity. This is especially true considering the batteries are also estimated to only use 80% of their capacity in order to increase the lifespan of the battery. It would be more appropriate to model the battery usage and mileage based on capacity fade, which has been demonstrated by Yang et al. 193 and Dunn et al. 194 These lifespan estimations of batteries are modeled as a linear decline over the 10-15 years until capacity reaches 70-80%. [EPA-HQ-OAR-2022-0985-1608-A1, p. 92]

193 Yang, F., Wang, D., Zhao, Y., Tsui, K.-L., & Bae, S. J. A study of the relationship between coulombic efficiency and capacity degradation of commercial lithium-ion batteries. Energy. V. 145. (2018). p. 486–495. https://doi.org/10.1016/j.energy.2017.12.144

194 Jessica Dunn, Kabian Ritter, Jesús M. Velázquez, and Alissa Kendall. Should high-cobalt EV batteries be repurposed? Using LCA to assess the impact of technological innovation on the waste hierarchy. Journal of Industrial Ecology. (2023). https://onlinelibrary.wiley.com/doi/10.1111/jiec.13414?af=R

Equation 2-27 shown in Figure 24 below, overestimates battery capacity, therefore increasing the cost of BEVs. Any material demand analysis that uses similar metrics would overestimate the amount of materials needed for electric truck batteries. [EPA-HQ-OAR-2022-0985-1608-A1, p. 92.] [See Figure 24 EV Battery Pack Sizing Equation. located on p. 93 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

195 EPA Phase 3 DRIA at 216-217.

Organization: Tesla, Inc. (Tesla)

EPA costs projections assume a 20% oversize in battery to provide excess capacity for range.145This assumption harms the projected rate of BEV uptake through imposition of substantial new costs associated with designs utilizing oversized battery capacity. [EPA-HQ-OAR-2022-0985-1505-A1, p. 20]

145 88 Fed. Reg. at 25962.

Utilizing this approach to the BEV manufacturing cost assessment is also fundamentally flawed and not supported by logic or the record. BEV heavy-duty customers will have guarantees of performance from the manufacturer that do not necessitate hidden battery capacity. In addition to cost and range, the hidden capacity approach negatively impacts other product performance metrics (such as range recovered during a fast-charging event). All it does is take away utility, and further emission reductions, at the beginning of life to give customers a manufactured sense of stability. Allowing full access to the battery (with reliable energy estimation) allows for maximum utility of deployed products over the entire life - something that is fundamental to the Tesla customer experience and should be present in good public policy. In short, EPA should not model BEV cost using oversized batteries. [EPA-HQ-OAR-2022-0985-1505-A1, p. 20]

<u>EPA Summary and Response:</u>

<u>Summary:</u>

EPA received comments about battery capacity as well as change in capacity over time. These comments include 20% extra battery capacity to account for battery deterioration over time as well as limiting depth of discharge to 80%. Some of these commenters said we should reduce or remove the additional 20% of extra battery capacity for degradation and the 80% depth of discharge. While others, including AFPM, pointed out batteries degrade over time and will reduce in capacity, up to 3% annual capacity loss.

EDF cited a February 2022 Roush report on the electrification of tractors where Roush had set the depth of discharge to 90% and a 10% battery degradation value and suggested using those values. They also pointed out that the decrease in VMT as a vehicle ages used in HD TRUCS for calculating operating costs meets or exceeds the 20% reduction in battery capacity over that same time. They argue that the decrease in VMT already accounts for 20% battery deterioration and that it should not be included, or that EPA should adopt the 10% value that Roush used in their report. ICCT questioned the source for a 20% battery capacity fade. They agreed that batteries will degrade over time, but stated that data is scarce for HD applications and that recent developments in battery technology have resulted in prolonged battery life with long-distance trucks reaching over 900,000 miles. MFN stated that the additional 20% battery sizing for deterioration was an overly conservative estimate and that fleets would adjust the milage and routes used for a vehicle over time as they currently do with ICEVs by using the secondary market. They stated that fleets would not pay for the additional unused battery capacity to save on costs. MFN also raised concerns about using an 80% depth of discharge value saying that it would be more appropriate to model battery usage and milage based capacity fade, citing a demonstration by Yang et al. and Dunn et al. Tesla stated that oversizing the battery harms the projected rate of BEV adoption due to increased costs attributable to the extra battery capacity. They also raised concerns about the effect of hidden battery capacity on metrics such as range recovered during fast charging and remove utility of the vehicle in the beginning of the vehicle life.

DTNA commented that EPA should consider all available data including that which can be provided by manufacturers in confidential settings, and asserted that, given data available today is limited, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data.

Response:

For the proposal, we assumed that each battery would degrade 20% over the lifetime of the vehicle, and to ensure that the battery for each vehicle would last through the life of the vehicle, we added 20% to the size of the battery. This ensures that each vehicle would still be able to travel the 90^{th} percentile daily VMT at the end of its life. Based on consideration of comments received from EDF, ICCT, MFN, and Tesla, in the final rule we have changed how we calculate battery size to account for battery deterioration. In the final rule, we no longer increase the battery size by 20% for each vehicle; instead, we calculate the number of cycles each battery undergoes during 10 years of operation. If the number of cycles is higher than 2,000, we then increase the size of the battery. In response to EDF's comment about taking into account that VMT declines over time, the energy throughput and battery cycling calculations in HD TRUCS use the operating VMT schedule which appropriately declines over time. See RIA Chapter 2.2.1.2.4. Put another way, the energy consumption (energy throughput) and number of cycles are calculated using the VMT schedule over time, so the two metrics are exactly paired and the issue EDF raised in its comments will not arise. The methodology for estimating the number of battery cycles and a discussion of the selection of 2000 cycles can be found in Chapter 2.4.1.1 of the RIA.

For the proposal, we used an 80% depth of discharge as batteries need an operating window of charge to ensure proper functionality over the lifetime of the vehicle. Over-discharging and charging a battery increase the amount of deterioration experienced by the battery and shorten its life. Based on consideration of comments from EDF, MFN, and Tesla, we revisited this value and changed our depth of discharge to 90% for the final rule. The Roush report cited by EDF provides strong support in favor of increasing the depth of discharge as no significant degradation was experienced in their study for LFP batteries at 90% depth of discharge. After considering these comments, and further supported by the depth of discharge values used in the

2022 Autonomie tool from ANL for this time frame, we revised the battery depth of discharge window to 90 percent in HD TRUCS.[291]

3.3.4 En-Route Charging

Comments by Organizations

Organization: Environmental Defense Fund (EDF)

EPA's analysis also assumes that all heavy-duty vehicles will be charged in depots. While it is reasonable that a large share of vehicles, particularly vocational vehicles, will be charged where they are domiciled in the evenings, this assumption restricts the extent vehicles can be electrified within the rule. [EPA-HQ-OAR-2022-0985-1644-A1, 45]

As demonstrated in Roush's modeling, a 15-minute charge using a 3,000 amp charger will significantly increase the range of a vehicle, taking a battery from 20% to 80% charged.100 Figure 9 below shows the extent of the battery range increase possible with a 15 min charge. [EPA-HQ-OAR-2022-0985-1644-A1, 45] [See Figure 9 on p. 46 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

100 Vishnu Nair, Himanshu Saxena, Sajit Pillai. 2023. Class 7 and Class 8 Tractor–Trailer Electrification for MYs 2030 and 2032, Roush for Environmental Defense Fund.

These types of high-powered chargers would not be required everywhere in the U.S. but instead would need to be located at intervals along major highway routes. Companies such as TeraWatt have already begun development on charging networks to meet this need. TeraWatt has raised $1 billion to place chargers along I-10 spaced 150 miles apart across California, Arizona, and New Mexico.101 [EPA-HQ-OAR-2022-0985-1644-A1, 46]

101 Emma Newburger, TerraWatt Announces First Interstate EV Charging Network for Trucks, CNBC (Oct. 20, 2022), https://www.cnbc.com/2022/10/20/-terawatt-announces-first-interstate-ev-charging-network-for-trucks.html.

By incorporating high speed chargers, vehicles could drive more miles and have smaller batteries. This is particularly relevant for tractors where the daily mileage of the vehicles can exceed 500 miles. By incorporating such assumption, the feasibility of BEV tractors would be greatly expanded past what our recommendation contemplates. [EPA-HQ-OAR-2022-0985-1644-A1, 46]

Given the analyses projecting BEV tractor prices to fall and provide significant savings to fleet owners as well as the high percent of tractor trips that could be easily converted to BEVs, we recommend EPA finalize a tractor standard consistent with at least 50% ZEV sales by 2032. [EPA-HQ-OAR-2022-0985-1644-A1, 47]

[291] Argonne National Laboratory. VTO HFTO Analysis Reports – 2022. "ANL – ESD-2206 Report – MD HD Truck – Autonomie Assumptions.xlsx". Available online: https://anl.app.box.com/s/an4nx0v2xpudxtpsnkhd5peimzu4j1hk/folder/242640145714. In the "Battery" tab, we calculated the difference between the "SOC Max" and "SOC Min" columns for BEVs and chose the lowest depth of discharge as a conservative value.

Organization: International Council on Clean Transportation (ICCT)

The EPA rule would more closely reflect this business case with changes in its battery size assumptions. Excessively large battery sizes of over 1,000 kWh and up to 2,036 kWh for ‘vehicle ID 79’ are driven by EPA’s assumption that opportunity charging for long-distance truck applications will not exist. Opportunity charging can reduce the required battery mileage design point by more than 20% when assuming 350 kW charging capacity and by more than 40% when assuming 1 MW charging capacity. By assuming availability of opportunity charging, ICCT analysis demonstrates lower total-cost-of-ownership and higher forecasted adoption of battery-powered tractors in this decade relative to fuel cell powered tractors. [EPA-HQ-OAR-2022-0985-1553-A1, p. 3]

First, we suggest EPA size batteries based on daily energy needs, taking into account opportunity charging performed during a driver’s mandatory break. Second, we suggest EPA assume per-vehicle charging capacity at publicly accessible charging stations is 350 kW today and will be 1 MW as of 2027. Finally, we suggest EPA assume a maximum battery size of 1 MWh due to payload and volume capacity constraints. Battery size assumptions are critical to the stringency of this proposal since they shape the retail price of battery-electric trucks, their fuel economy, technology payback period, technology adoption rate, the stringency of the proposal, and the benefits of the rule. [EPA-HQ-OAR-2022-0985-1553-A1, p. 3]

BATTERY SIZING FOR TRACTOR-TRAILERS Assumptions regarding truck battery size are critical as they strongly affect the retail price and fuel economy of battery electric trucks, significantly affecting the technology payback period and the corresponding technology adoption rate. In general, the sizing approach considered by EPA resulted in reasonable battery sizes for most truck classes. However, the approach considered by EPA for battery electric tractor-trailers sleeper cabs and day cabs (referring to vehicle ID 78, 79, 80, 82, 84) resulted in very large and unrealistic battery sizes, exceeding 1,000 kWh in some cases and reaching 2,036 kWh for ‘vehicle ID 79’. This is driven by EPA’s assumption of the absence of opportunity charging for long-distance truck applications. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 12-13]

Trucks operating in long-haul will have the opportunity to recharge at truck stop stations during a driver’s mandatory break, resulting in a lower battery size without affecting the mission profile. Based on a recent ICCT publication, opportunity charging during the day can reduce the required battery mileage design point by more than 20% when using 350 kW charging technology and by more than 40% when using 1 MW charging technology (Basma et al., 2023). Based on independent discussions with leading truck OEMs, we conclude that trucks will likely be designed with battery sizes no greater than 1 to 1.2 MWh in energy capacity to minimize payload and packaging constraints. Futhermore, we conclude based on information provided via monthly megawatt multi-port charging meetings organized by Argonne National Laboratory since 2021 that the megawatt charging standard SAE J3271 capable of up to 3.5MW is on track to be finalized by 2025 (Bohn, 2023). [EPA-HQ-OAR-2022-0985-1553-A1, p. 13]

Basma, H., Buysse, C., Zhou, Y., & Rodríguez, F. (2023). Total cost of ownership of alternative powertrain technologies for Class 8 long-haul trucks in the United States. International Council on Clean Transportation. https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/

Based on our independent analysis, industry design decisions, and progress towards finalizing a megawatt charging standard, we recommend EPA revise its battery size assumptions for battery electric sleeper cabs and day cabs in the following manner:

- Size batteries according to the daily energy needs of the vehicle while assuming opportunity charging would occur during a driver's mandatory break.
- Consider the following charging rates for trucks at publicly accessible charging stations: 350 kW today and 1 MW as of 2027.
- Cap the battery size to 1 MWh due to payload and volume capacity constraints. When a larger battery is required, it can be assumed that the drivers stop more frequently for charging, which will increase labor costs. The increase in labor cost can be assumed to be proportional to additional needed charging time during the day outside the drivers' break time window. [EPA-HQ-OAR-2022-0985-1553-A1, p. 13]

With this sizing approach, we estimate that the battery size of a 500-mile sleeper cab is in the range of 900 kWh by 2027, as highlighted in Table A1 in Basma et al. (2023), and we recommend that EPA uses a similar approach to design the battery size of electric trucks. [EPA-HQ-OAR-2022-0985-1553-A1, p. 13]

Basma, H., Buysse, C., Zhou, Y., & Rodríguez, F. (2023). Total cost of ownership of alternative powertrain technologies for Class 8 long-haul trucks in the United States. International Council on Clean Transportation. https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/

EPA Summary and Response:

Summary:

EPA received comments on the use of en-route charging for tractors and other vehicles with long range. EDF pointed out that not all HD vehicles are depot charged as assumed in the proposal. They also cited a report from Roush that opportunity charging with 3,000 amp chargers can significantly increase the range of a vehicle with a 15 minute charge. They pointed out that incorporating high speed chargers would allow vehicles with smaller batteries and be able to cover additional miles. ICCT stated that 350 kW chargers can reduce battery sizes by 20% while 1 MW chargers can reduce battery size by 40% for tractors. ICCT also recommends capping batteries to 1 MWh. In addition, they state that by using opportunity charging in HD TRUCS, tractors could be sized with smaller batteries which would decrease their cost and number of payback years. They also suggested that the en-route charging can be completed during a driver's mandatory break and would therefore not create an additional cost since the vehicle would need to be stationary for the duration of the driver's break. Most of the comments on this issue are found in Chapter 4 of the RTC and are addressed there.

Response:

For the proposal, we assumed that the BEVs adopted during the timeframe of the rule would be charged once per day at a depot. Vehicles that would require overly large batteries to meet the daily VMT requirements were not included in the technology package to support the proposed rule and instead we included FCEVs for such vehicle types in the ZEV technologies portion of the technology packages for the potential compliance pathway in the proposal. However, we know that battery electric tractors are available in the market today, see RIA Chapter 1 for a list of available BEVs through MY2024. To reflect this reality and to address the comments from both ICCT and EDF (among others), we modified the approach in the final rule to include consideration of en-route charging using public 1 MW chargers for certain tractors. For the longest range day cabs and sleeper cabs, where we project the use of public charging, we find that approximately 30 minutes of mid-day charging at 1 MW is sufficient to meet the 90th percentile VMT in HD TRUCS assuming vehicles start the day with a full battery. These vehicles are evaluated using a public charging rate in HD TRUCS that is higher than the depot charging rate. For a more detailed discussion of en-route charging see RIA Chapters 2.2.1.2.2, 2.6.1.3, 2.4.4.2, 2.6.3, and 1.6.1.3. In the final rule, all BEVs included in the modeled potential compliance pathway's technology package have batteries less than 1MWh in size. Please see RIA Chapter 2.9 for analyses of weight and volume payload impacts.

3.4 Component Cost

3.4.1 Battery Cost

Comments by Organizations

Organization: Clean Air Task Force et al.

1. Stronger standards are feasible based on BEVs.

a. EPA is correct that battery prices will continue to fall and that domestic battery manufacturing capacity will grow.

EPA appropriately concludes that the cost to manufacture lithium-ion batteries, the single most expensive component of a BEV, has dropped significantly in recent years and will continue to fall in future years. 88 Fed. Reg. at 25930. The agency further notes that this trajectory will likely accelerate due to manufacturers' announced plans to invest billions of dollars in BEV technology and development, as well as the significant incentives in the BIL and IRA that reduce costs for manufacturers to produce and sell BEVs. Id. There is ample research to support these findings, as these trends are already established and well-underway. [EPA-HQ-OAR-2022-0985-1640-A1, p. 42]

According to the International Energy Agency's (IEA) Global EV Outlook 2023, there are several indicators that battery prices will continue to fall.166 The price of lithium carbonate has increased over the past two years, but it dropped 20 percent between January and March 2023, returning to its late 2022 level. The trend, if sustained, "could translate into lower battery prices."167 Moreover, several of the events that exacerbated the supply chain disruptions leading to mineral shortages will likely be less severe over the coming years. These include the COVID-19 pandemic, the demand surge as the world economy started to recover, and Russia's invasion of Ukraine in February 2022.168 As supply chains approach pre-pandemic levels of reliability, markets will better absorb the disruptions of the previous few years, contributing to lower battery prices. [EPA-HQ-OAR-2022-0985-1640-A1, p. 43]

166 IEA, Global EV Outlook 2023, at 60 (2023), https://iea.blob.core.windows.net/assets/dacf14d2-eabc-498a-8263-9f97fd5dc327/GEVO2023.pdf.

167 Id.

168 Id. at 61.

Moreover, battery prices may continue to fall even if the market experiences some fluctuations in mineral supply and price. This is due to the reduction in cost of pack manufacturing, which today accounts for 20 percent of total battery cost (down from 30 percent a decade ago).169 Efficiency gains in pack manufacturing help decrease costs, even if individual cell production costs increase. As IEA summarizes, "[p]ack production costs have continued to decrease over time, down 5% in 2022 compared to the previous year…. Bloomberg New Energy Finance (BNEF) sees pack manufacturing costs dropping further, by about 20% by 2025, whereas cell production costs decrease by only 10% relative to their historic low in 2021."170 This means that overall battery prices may continue to fall despite temporary fluctuations in the price of minerals. [EPA-HQ-OAR-2022-0985-1640-A1, p. 43]

169 Id.

170 Id.

Many other studies confirm that "[b]attery prices have been consistently reducing more rapidly than projections."171 Projected battery costs have fallen so significantly that a Roush Industries report notes that "[b]attery cost projections made in 2017–2018 are already obsolete."172 In 2010, battery pack costs were over $1,000/kWh, but have fallen dramatically to approximately $132/kWh in 2021.173 Costs are expected to continue this downward trajectory, "reaching $100/kWh between 2023 and 2025 and $61–72/kWh by 2030.174 Auto manufacturers have endorsed these projections."175 Other analyses have projected battery costs falling to $100/kWh by 2025,176 reaching a range of $59-68/kWh by 2027.177 BNEF projects battery pack prices will drop to approximately $80/kWh in 2026 and $60/kWh in 2029, down from $137/kWh in 2020,178 and Ford has targeted $80/kWh by 2030.179 These trends confirm a consistent downward trajectory that many experts predict will continue. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 43 - 44]

170 Id.

171 See, e.g., Phadke et al., at 8.

172 Vishnu Nair et al., Technical Review, at 44, Figure 15 (Feb. 2, 2022).

173 MacIntosh et al., April 2022 EV Market Update, at 10. These 2021 battery pack price estimates are based on BloombergNEF, id. at 20.

174 Id. at 10.

175 Id.

176 Hunter et al., at 10.

177 Nair et al., Technical Review, at 36.

178 Colin McKerracher, The EV Price Gap Narrows, BloombergNEF (Jun. 25, 2021), https://about.bnef.com/blog/the-ev-price-gap-narrows/; Colin McKerracher, Hyperdrive Daily: The EV Price Gap Narrows, Bloomberg (May 25, 2021), https://www.bloomberg.com/news/newsletters/2021-05-25/hyperdrive-daily-the-ev-price-gap-narrows.

179 MacIntosh et al., April 2022 EV Market Update, at 20; Todd Gillespie, Rising Battery Costs Hit Carmakers, Threaten Climate-Change Path, Bloomberg Green (Nov. 30, 2021), https://www.bloomberg.com/news/articles/2021-11-30/even-the-battery-boom-can-t-escape-world-s-supply-chain-woes.

Battery prices have fallen for many reasons, including greater manufacturing scale and technological improvements, such as improved quality and material substitution. EPA is correct to "expect domestic manufacturing of batteries and cells to increase considerably over the coming decade." 88 Fed. Reg. at 25966. Industry and government have made substantial investments in developing the battery manufacturing sector and lowering battery costs. Many manufacturers are making strides toward significant domestic battery production, with at least 27 new battery plants announced since the passage of the IRA,180 further supporting this downward trend. Automakers have also announced research and production partnerships aimed at securing ready supplies of batteries and developing less-expensive batteries.181 For example, Daimler recently announced a battery technology partnership through which the company will work with lithium-ion battery manufacturer and developer Contemporary Amperex Technology Co. Limited for its supply of lithium-ion battery packs and to jointly work toward designing and developing next-generation battery cells and packs specifically for trucks.182 Additionally, in its Energy Storage Grand Challenge, the Department of Energy (DOE) announced a goal to reduce battery cost to $80/kWh by 2030 for 300-mile range EVs.183 The BIL also included additional funds aimed at "expand[ing] the processing and manufacturing of advanced batteries, including for [B]EVs and the electric grid."184 These federal funds include: $3 billion for battery material processing; $3 billion for battery manufacturing and recycling; $10 million for the Lithium-Ion Battery Recycling Prize; $60 million for Battery Recycling RD&D; $50 million for state and local programs; and $15 million for Collection Systems for Batteries. With these programs and investments taken together, some experts forecast that the global lithium-ion battery cell nameplate capacity will triple by 2025, with North America's capacity growth expected to outpace Europe's.185 [EPA-HQ-OAR-2022-0985-1640-A1, p. 44]

180 Dan McCarthy & Maria Virginia Olano, The Remarkable Upsurge in US Clean Energy Manufacturing, in Charts, Canary Media (June 6, 2023), https://www.canarymedia.com/articles/clean-energy-manufacturing/the-remarkable-upsurge-in-usclean-energy-manufacturing-in-charts; see also Charged, EV Supply Chain Dashboard (May 27, 2023), https://www.charged-the-book.com/na-ev-supply-chain-map (data courtesy of Prof. James Martin Turner) (finding that since the passage of the Inflation Reduction Act, there have been 25 new battery cell, battery pack or battery cell component manufacturing announcements, and another 5 under construction).

181 MacIntosh et al., April 2022 EV Market Update, at 23.

182 Commendatore.

183 MacIntosh et al., April 2022 EV Market Update, at 20; DOE, Department of Energy Releases Energy Storage Grand Challenge Roadmap (Dec. 21, 2020), https://www.energy.gov/articles/department-energy-releases-energy-storage-grand-challenge-roadmap.

184 MacIntosh et al., April 2022 EV Market Update, at 17.

185 Clean Energy Associates, ESS Supplier Market Intelligence Program H2 2022 Report Sample, at 8 (2023).

Advances in battery recycling technology are likely to lead to additional decreases in battery prices. The IRA added additional incentives through the Advanced Manufacturing Production Credit and the credit for Qualified Commercial Clean Vehicles. 88 Fed. Reg. at 25985. A report by Roush also details additional advancements in battery systems, such as lithium iron phosphate batteries, dry battery electrode coating processes, and tabless anodes, which will lead to greater efficiency and reduced costs for ZEVs.186 [EPA-HQ-OAR-2022-0985-1640-A1, p. 45]

186 Vishnu Nair & Gary Rogers, Roush Industries, Reducing Medium- and Heavy-Duty Fuel Consumption and Criteria Pollutants, at 7-8, 33-37 (2021). See also Himanshu Saxena et al., Roush Industries, Electrification Cost Evaluation of Class 2b and Class 3 Vehicles in 2027-2030, at 95-126 (2023), https://cdn.mediavalet.com/usva/roush/r0YBSBBv00edOiBP759yoA/3Hcv7F_W-0G9ek0ODPgNMg/Original/Electrification%20Cost%20Evaluation%20of%20Class%202b-3%20Vehicles%20in%202027-2030_ROUSH.pdf (describing improvements in BEV technologies).

Summarizing many of these recent trends and studies, the International Energy Agency recently concluded that due to "record sales of EVs, strong investment in battery storage for power (which are expected to approach USD 40 billion in 2023, almost double the 2022 level) and a push from policy makers to scale up domestic supply chains," there has been "a wave of new lithium-ion battery manufacturing projects around the world."187 EPA is correct to view these projects and overall trends as contributing to falling battery prices in future years. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45]

187 IEA, World Energy Investment 2023, at 21 (2023), https://iea.blob.core.windows.net/assets/8834d3af-af60-4df0-9643-72e2684f7221/WorldEnergyInvestment2023.pdf.

Organization: Clean Fuels Development Coalition et al.

D. The proposal relies on unsound battery costs projections.

As the proposal explains, "[o]ne of the most important factors influencing the extent to which BEVs are available for purchase and able to enter the market is the cost of lithium-ion batteries, the single most expensive component of a BEV." 88 Fed. Reg. 25,941. The proposal notes that "average lithium-ion battery costs have decreased by more than 85 percent since 2010" and that "battery pack costs are projected to continue to fall during this decade." Id. As a result, EPA projects battery costs of $111 per kWh in 2032. Id. at 25,981. [EPA-HQ-OAR-2022-0985-1585-A1, p. 25]

This projection isn't realistic. In 2022 battery costs were $153 per kWh, Electric Vehicle Battery Pack Costs in 2022 Are Nearly 90% Lower than in 2008, according to DOE Estimates, Office of Energy Efficiency & Renewable Energy (Jan. 9, 2023), https://www.energy.gov/eere/vehicles/articles/fotw-1272-january-9-2023-electricvehicle-battery-pack-costs-2022-are-nearly. While there has been a decrease in cost over the last decade, prices have not continued to drop. Instead, cost reduction curves have already begun to flatten out and battery costs rose 7 percent in 2022. [EPA-HQ-OAR-2022-0985-1585-A1, p. 25]

Many studies project battery costs to rise over the next few years. For example, E Source estimates battery cell prices will surge 22% from 2023 through 2026. Phil LeBeau, EV battery costs could spike 22% by 2026 as raw material shortages drag on, CNBC (May 18, 2022), https://www.cnbc.com/2022/05/18/ev-battery-costs-set-tospike-as-raw-material-shortages-drags-on.html. And Benchmark Mineral Intelligence projects that prices could become worse at the end of the decade as an increase in global electric vehicle manufacturing leads to massive lithium shortages beginning in 2029 and getting increasingly worse as through 2032. Eric Onstad et al., Lithium prices bounce after big plunge, but surpluses loom, Reuters (May 2, 2023), https://www.reuters.com/markets/commodities/lithium-prices-bounce-after-bigplunge-surpluses-loom-2023-04-28/. [EPA-HQ-OAR-2022-0985-1585-A1, p. 25]

Many analysts are projecting that material shortfalls—and resulting high prices—in part because of labor shortages. "The crunch spans engineers who design job sites, miners who extract raw metals and the truck drivers who haul them away for processing." Hardika Singh, 'War for Talent' at Mines Could Drive Up Cost of Energy Transition, Wall St. J. (June 8, 2023), https://www.wsj.com/articles/war-fortalent-at-mines-could-drive-up-cost-of-energy-transition-30b927eb. "Citi expects labor shortages, permitting challenges and other issues will propel lithium prices higher by as much as 40% by year's end [and] copper will jump 50% by 2025." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 25]

The proposal also fails to analyze the costs of different battery chemistries. For example, the proposal acknowledges that some cost reductions have emerged because electric vehicles have leveraged less expensive iron phosphate batteries in light-duty vehicles. 88 Fed. Ref. 25,961. But these batteries—while less expensive— have lower "gravimetric and volumetric energy densities," id., and thus are heavier and offer shorter range than those made with more expensive minerals. As a result, these batteries are not suitable for heavy-duty vehicles. The proposal cannot rely on price trends in batteries that cannot be used in heavy-duty vehicles to justify the feasibility of electric heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 25 - 26]

B. The proposed rule underestimates battery costs.

EPA projects battery costs of $111 per kWh in 2032. 88 Fed. Red. 25,981. But, as discussed above, 2022 battery costs were $153 per kWh, Electric Vehicle Battery Pack Costs in 2022 Are Nearly 90% Lower than in 2008, according to DOE Estimates, Office of Energy Efficiency & Renewable Energy (Jan. 9, 2023), https://www.energy.gov/eere/vehicles/articles/fotw-1272-january-9-2023-electricvehicle-battery-pack-costs-2022-are-nearly. While battery costs have decreased over the last decade, these and cost reduction curves have already begun to flatten out. Indeed, battery costs rose 7 percent in 2022. [EPA-HQ-OAR-2022-0985-1585-A1, p. 32]

The proposal also ignores the many studies project battery costs to rise over the next few years. See, e.g., Phil LeBeau, EV battery costs could spike 22% by 2026 as raw material shortages drag on, CNBC (May 18, 2022), https://www.cnbc.com/2022/05/18/ev-battery-costs-set-to-spike-as-raw-materialshortages-drags-on.html (projecting battery cell prices to surge 22% from 2023 through 2026); Eric Onstad et al., Lithium prices bounce after big plunge, but surpluses loom, Reuters (May 2, 2023), https://www.reuters.com/markets/commodities/lithium-prices-bounce-after-bigplunge-surpluses-loom-2023-04-28/ (projecting massive lithium shortages beginning in 2029 and getting increasingly worse as through 2032). [EPA-HQ-OAR-2022-0985-1585-A1, pp. 32 - 33]

The proposal also arbitrarily attributes recent cost reductions in batteries to technologies that cannot be used in heavy-duty vehicles. For example, the proposal accounts for cost reductions resulting from iron phosphate batteries in light-duty vehicles. 88 Fed. Reg. 25,961. But these batteries—while less expensive— have lower "gravimetric and volumetric energy densities," id., and thus are heavier and offer shorter range than those made with more expensive mineral, making them unsuitable for heavy-duty applications. The proposal cannot rely on price trends in batteries that cannot be used in its cost-benefit analysis. [EPA-HQ-OAR-2022-0985-1585-A1, p. 33]

Finally, as detailed above, EPA also excludes "both the IRA battery tax credit and vehicle tax credit" from consumer costs. 88 Fed. Reg. 26,079. This is unreasonable because (a) it is unclear if the industry will be capable of meeting the domestic sourcing requirements and (b) those costs are ultimately still paid by taxpayers. [EPA-HQ-OAR-2022-0985-1585-A1, p. 33]

Organization: Daimler Truck North America LLC (DTNA)

Considering the factors discussed above, we propose that EPA incorporate into its HD TRUCS analysis the alternative adoption rate schedule set forth in Table 6 below, to ensure that actual customer purchasing behavior is more accurately reflected in the standards adopted in the final rule. In the Company's experience, even customer willingness to adopt a new technology and to install infrastructure to support this new technology may not positively impact actual infrastructure availability, so DTNA does not include infrastructure considerations here; rather, we propose that an additional infrastructure scalar be applied to the adoption rate percentages that are ultimately adopted in the Phase 3 final rule, as discussed in Section II.C. [EPA-HQ-OAR-2022-0985-1555-A1, p. 27] [Refer to Table 6 on p.27 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

The Proposed Rule reflects incomplete, inaccurate, and overly optimistic assumptions about ZEV Total Costs of Ownership (TCO). Because EPA's assumptions regarding TCO and calculated payback period appear to be incomplete, inaccurate, and overly optimistic, it is questionable whether fleets will in fact adopt ZEV technologies at the rates that EPA suggests. In this section, DTNA addresses some of the cost inputs in the HD TRUCS tool based upon the Company's own data and advises on additional costs that should be included. DTNA shares EPA's optimism that some costs will fall as technologies develop, but the Company believes that all of the costs EPA uses to inform payback periods and adoption rates relied on for Phase 3 standard-setting should be updated every two years based on the best available market data from OEMs and other sources. [EPA-HQ-OAR-2022-0985-1555-A1, p. 28]

EPA's cost estimates inaccurately reflect or fail to account for a number of key inputs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 28]

Component Costs

EPA's projected pack-level battery costs of $145/kWh in MY 2027, falling to $111/kWh in MY 2032,53 do not appear to accurately reflect the actual cost of battery components. DTNA's battery cost targets for two different pack sizes are shown in Table 7 below. These targets are subject to change, based on raw material and other factors between now and start of production. In the Company's experience, smaller pack sizes are more expensive on a dollars per kilowatt-hour basis, as the cost of manufacturing the non-cell components are spread across a lower energy density. [EPA-HQ-OAR-2022-0985-1555-A1, p. 28] [Refer to Table 7 on p. 28 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

53 See Proposed Rule, 88 Fed. Reg. at 25,981 (Table II-11).

In battery pack manufacturing, a significant portion of the cost is derived from raw materials, which are subject to global price elasticity. Lithium prices over the last two years are shown in Figure 1 below. In 2022, the price of lithium spiked to approximately $85 per kilogram, compared to approximately $30 per kilogram a year previously. [EPA-HQ-OAR-2022-0985-1555-A1, p. 28] [Refer to Figure 1 on p. 29 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

The 2022 price spike likely occurred due to increased demand for lithium and supply pressures brought on by the COVID-19 pandemic. The Company is optimistic that lithium prices will continue to fall and normalize, but battery costs will remain sensitive to raw material prices and may not decrease year-over-year as EPA projects. Table 8 below shows the Company's projected battery costs if lithium were sourced at the peak $85/kg to serve medium- and heavy-duty truck needs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 29] [Refer to Table 8 on p. 29 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

EPA's battery cost estimates rely on assumptions about raw materials and critical minerals, the development of complex supply chains, projected future domestic mining and production, and global trade and geopolitics. EPA does not, however, account for the possibility that mineral costs could rise in the future, as global demand for BEVs increases. It is only appropriate that EPA periodically reassess the battery costs used in the HD TRUCS model to inform the payback period analysis. [EPA-HQ-OAR-2022-0985-1555-A1, p. 29]

EPA Request for Comment, Request #14: We request comment on our assessment and data to support our assessment of battery critical raw materials and battery production for the final rule.

- DTNA Response: As discussed in Section II.B.3.a of these comments, EPA has not adequately considered battery cost sensitivity to raw material pricing, and these costs should be periodically reviewed. [EPA-HQ-OAR-2022-0985-1555-A1, p. 160]

EPA Request for Comment, Request #32: We request comment, including additional data, on our analysis for consideration in the final rule regarding current and projected BEV component costs.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 163]

EPA Request for Comment, Request #33: We request comment, including data, on our approach and projections for battery pack costs for the heavy-duty sector, including values that specifically incorporate the potential impacts of the IRA.

- DTNA Response: See DTNA Response to Request # 20, above. In addition, DTNA is willing to confidentially share battery cost targets with EPA, as its costs are higher than EPA's projections. [EPA-HQ-OAR-2022-0985-1555-A1, p. 163]

Organization: Environmental Defense Fund (EDF)

c) Key EPA assumptions related to ZEV costs and deployment are overly conservative and when corrected, support more protective standards

i. EPA's ZEV technology and adoption modeling assumptions are too conservative

EPA's ZEV assumptions are too conservative and more reasonable assumptions would result in higher ZEV deployment projections, especially in key categories. [EPA-HQ-OAR-2022-0985-1644-A1, p. 53]

EPA is overestimating battery prices. In 2030, EPA assumes batteries without the IRA production tax credits will cost $120/kWh falling to $111/kWh by 2032. In their recent report on tractors, Roush projects that absent IRA credits HDV batteries will cost $98/kWh in 2030 and $88/kWh in 2032.131 Batteries make up the bulk of the powertrain costs for BEVs. As a result, if EPA were to adjust the battery costs used in this proposal, it would have a significant impact on BEV price, payback period, and the final rule stringency. [EPA-HQ-OAR-2022-0985-1644-A1, p. 53-54]

131 Roush conducted their study in 2022$. The prices presented from their study were deflated by 8% to adjust to 2021$ to be consistent with EPA.

Organization: Moving Forward Network (MFN) et al.

11.2. EPA's forecast of factors related to battery technologies are behind current market and future trends

EPA's forecast of battery cost per unit of battery power output ($/kWh) aligns with the best available knowledge and prediction of the market at this time. However, EPA's forecast of some of the other factors related to battery technologies like specific energy are behind where the market is currently and is trending in the future. These inputs can therefore cause the full cost of a heavy-duty BEV to be modeled higher than the most likely real-world scenarios. Therefore, even though the cost per kWh input is appropriate, the cost per BEV is likely an overestimate which would have resulted in a lower ZEV penetration rate than is actually technologically and economically feasible even under EPA's approach. [EPA-HQ-OAR-2022-0985-1608-A1, p. 104]

11.1.3. Modeled heavy-duty BEV costs could potentially decrease based on battery-related modeling inputs

EPA's HD TRUCS tool modeling and subsequent cost-benefit analysis for comparison to the No Action case are thorough, but likely overestimate the battery cost per heavy-duty BEV due to conservative technical assumptions made about the advancements of lithium-ion batteries that would replace materials, increase specific energy, or allow for the longer use of batteries through refurbishment or reuse. Therefore, the heavy-duty BEV sales forecasted through the HD TRUCS tool may be an underestimate if these assumptions had a significant impact on the total cost of ownership of BEVs. Additionally, although the mineral demand forecasts from Li-Bridge and other materials cited in the Proposed Rule's discussion of mineral demand are not directly related to HD TRUCS and EPA's cost analysis, the variables discussed below can also cause mineral demand forecasts to be higher than actual future material demand. [EPA-HQ-OAR-2022-0985-1608-A1, p. 92]

11.1.4. Battery costs per kWh will continue to decrease.

In its model, EPA uses an average HD battery cost (2021$/kWh at the pack-level) based on a literature review by ICCT as the input in the HD TRUCS model. 225 EPA also notes that according to BloombergNEF, global average pack prices were expected to reach $100/kWh by 2026 as the price increase in 2022 due to mineral price volatility will be resolved within a couple of years. We believe these costs are an appropriate representation of the market. Our own analysis, based on data available to BloombergNEF subscribers in their 2022 Lithium-ion Battery Price Survey, yields numbers just slightly below the costs EPA uses in its modeling as shown in Table 13 and Figure 29 below. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 102 - 103.] [See Table 13 ICCT's Average Battery Costs used by EPA and Alternate Cost Forecast, and Figure 30, ICCT's Average Battery Cost Used by EPA is Similar to An Alternative Cost Forecast located on p. 103 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

Table 13: ICCT's Average Battery Costs used by EPA and Alternate Cost Forecast[226]

Pack-Level Cost Comparison (2021$/kWh)						
	MY 2027	MY 2028	MY 2029	MY 2030	MY 3031	MY 2032
Cost EPA Used in HD TRUCS (Source: ICCT)	$ 145	$ 134	$ 126	$ 120	$ 115	$ 111
Alternate Cost Prediction (Source Data: BloombergNEF)	$ 139	$ 131	$ 123	$ 116	$ 111	$ 105

225 Ben Sharpe, Hussein Basma. A meta-study of purchase costs for zero-emission trucks. The International Council on Clean Transportation. (February 2022). https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22.pdf

226 BloombergNEF 2022 Lithium-Ion Battery Price Survey (subscription required).

227 BloombergNEF Electric Vehicle Outlook 2022 (subscription required).

We used battery cost data (2022$/kWh) for e-buses and commercial vehicles, global battery demand forecasts, and the most updated learning rate used by BloombergNEF after the 2022 price increase, and a 7.02% inflation rate between June 2021 and June 2022 to convert the data back to 2021$/kWh. 228 [EPA-HQ-OAR-2022-0985-1608-A1, p. 103]

228 Evelina Stoikou et al. Lithium-Ion Battery Price Survey. BloombergNEF. (December 6, 2022). This data includes 2022 e-bus and commercial battery cost data and historical and forecasted global battery demand data from 2010 - 2035, subscription required for full report.

Organization: PACCAR

II. EPA'S HEAVY DUTY TECHNOLOGY READINESS USE CASE SCENARIO ASSUMPTIONS ARE INACCURATE AND SHOULD BE REVISED

EPA created the Heavy-Duty Technology Readiness Use Case Scenario ("TRUCS") Excel spreadsheet to assess the commercial viability of zero-emission truck technologies. EPA used this detailed analytical tool to calculate HD vehicle energy usage, estimate overall vehicle costs, and forecast ZEV adoption rates. The proposed Phase 3 GHG reduction targets and standards result directly from EPA's TRUCS analysis. Any TRUCS input value variation, therefore, directly and substantially affects the defensibility and technical feasibility of the proposed Phase 3 standards. [EPA-HQ-OAR-2022-0985-1607-A1, p. 4]

Although EPA relied on surveys, research studies, and publicly available data to develop TRUCS input data, the data and the assumptions upon which EPA relied do not align with real-world OEM information. Such real-world information – much of which is confidential business information and includes component costs, efficiency, and performance targets – renders many TRUCS input values overly optimistic and leads to artificially inflated ZEV adoption rate estimates. PACCAR therefore respectfully requests that EPA revise its TRUCS analysis to include more accurate data to recalculate more precisely the predicted adoption rates, and to set the Phase 3 standards according to those revised values. [EPA-HQ-OAR-2022-0985-1607-A1, p. 4]

A. EPA SIGNIFICANTLY UNDERESTIMATES BATTERY COSTS

PACCAR's forecasted battery costs are significantly higher than those in TRUCS, even with certain strategic initiatives in place that PACCAR expects will generate lower battery costs than most competing OEMs. Table 1 below compares TRUCS assumed battery costs used to develop proposed Phase 3 standards with PACCAR's current Confidential Business Information MY2027-2032 battery cost forecast. [EPA-HQ-OAR-2022-0985-1607-A1, p. 5]

Organization: Tesla, Inc. (Tesla)

Battery Costs Continue to Decline

EPA's proposed rule also addresses battery costs as a factor in the rate of heavy-duty fleet adoption.130 The agency assumes the battery pack manufacturing costs for the Phase 3 GHG regulations will be at $111/kWh in MY 2032.131 Tesla believes this cost assumption is far too high and does not fully consider the documented and projected rapid decline in battery cell and pack costs. As DOE has recently documented, the energy density of lithium-ion batteries Increased by more than eight times between 2008 and 2020, allowing for BEVs to travel the same distance with a smaller battery pack, thus saving space, weight, and manufacturing costs.132 Similarly, DOE has found that BEV battery pack cost dropped 90% since 2008.133 [EPA-HQ-OAR-2022-0985-1505-A1, p. 18]

130 88 Fed. Reg. at 25980-81.

131 Id. at 25981.

132 DOE VTO, FOTW #1234, April 18, 2022: Volumetric Energy Density of Lithium-ion Batteries Increased by More than Eight Times Between 2008 and 2020 (Apr. 18, 2022). available at https://www.energy.gov/eere/vehicles/articles/fotw-1234-april-18-2022-volumetric-energy-density-lithium-ion-batteries

133 DOE, FOTW #1272, January 9, 2023: Electric Vehicle Battery Pack Costs in 2022 Are Nearly 90% Lower than in 2008, according to DOE Estimates (Jan. 9, 2023) available at https://www.energy.gov/eere/vehicles/articles/fotw-1272-january-9-2023-electric-vehicle-battery-pack-costs-2022-are-nearly

To the extent reductions have been profound in the light duty sector, the similarity in battery chemistries will carry over to the medium- and heavy-duty sectors. For example, UBS reports that leading manufacturers are estimated to reach battery pack costs as low as $67/kWh between 2022 and 2024.134 Recently, others have also projected costs significantly lower than EPA's past projections. BNEF's recent estimate is that pack prices go below $100/kWh on a volume-weighted average basis by 2024, hit $58/kWh in 2030,135 and could achieve a volume-weighted average price of $45/kWh in 2035.136 The National Academies of Sciences found high-volume battery pack production would be at costs of $65-80/kWh by 2030137 and DNV-GL has predicted costs declining to $80/kWh in 2025.138 The IPCC recently concluded similarly.139 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 18-19]

134 UBS, EVs Shifting into Overdrive: VW ID.3 teardown – How will electric cars re-shape the auto industry? (March 2, 2021) at 60 available at https://www.ubs.com/global/en/investment-bank/in-focus/2021/electric-vehicle-revolution.html

135 BNEF, Electric Vehicle Outlook 2021 (June 9, 2021) available at https://bnef.turtl.co/story/evo-2021/

136 BNEF, Hitting the Inflection Point: Electric Vehicle Price Parity and Phasing Out Combustion Vehicle Sales in Europe (May 5, 2021) available at

https://www.transportenvironment.org/sites/te/files/publications/2021_05_05_Electric_vehicle_price_parity_and_adoptio n_in_Europe_Final.pdf

137 NAS, Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy – 2025-2035 (March 31, 2021) available at https://www.nap.edu/resource/26092/BriefingSlidesPublicReleaseFinal20210331.pdf

138 DNV-GL, Tesla's Battery Day and the Energy Transition (Oct. 26, 2020) available at https://www.dnvgl.com/feature/tesla-battery-day-energytransition.html?utm_campaign=GR_GLOB_20Q4_PROM_ETO_2020_Tesla_Battery_Article&utm_medium=email&utm_source=Eloqua

139 IPCC, AR 6, Working Group III, Climate Change 2022: Mitigation of Climate Change (date) at 10-32 available at https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf (For example, according to IEA, battery pack costs could be as low as 80 USD per kWh by 2030 (IEA 2019a). In addition, there are clear trends that now vehicle manufacturers are offering vehicles with bigger batteries, greater driving ranges, higher top speeds, faster acceleration, and all size categories (Nykvist et al. 2019). In 2020 there were over 600,000 11 battery-electric buses and over 31,000 batteryelectric trucks operating globally (IEA 2021a).)

These cost estimates all were projected before the IRA passed Congress. IRA adds a significant new element to battery cost reduction as Section 45X provides domestically manufactured cells and finished batteries a production tax credit of $45/kWh.140 This production tax credit is predicted to cut one-third to one-half off the total cost of any BEV battery with both cells and pack built in the U.S.141 [EPA-HQ-OAR-2022-0985-1505-A1, p. 19]

140 Inflation Reduction Act, P.L. 117-169 (Aug. 16, 2022) at Section 13502.

141 Car and Driver, U.S.-Made EVs Could Get Massively Cheaper, Thanks to Battery Provisions in New Law (Feb. 3, 2023) available at https://www.caranddriver.com/news/a42749754/us-electric-cars-could-get-cheaper-inflation-reduction-actsection- 45x/

Finally, the agency's assessment should further recognize the technology forcing created by finalization of the proposed regulations by factoring in battery cost reductions that will likely be seen during the Phase 3 period as well, including LFP applications142 and sodium ion batteries.143 Indeed, battery technologies entering the commercialization phase such as silicon anodes, solid state batteries, and sodium-ion batteries are predicted to improve performance and costs and alter current material supply chains.144 The current regulatory impact statement only makes glancing reference to these technologies and the record is deficient in this respect. [EPA-HQ-OAR-2022-0985-1505-A1, p. 19]

142 See Draft RIA at 28; See also, CleanTechnica, Designwerk Offers LFP Battery Cells for The HIGH CAB Semi Lowliner (April 25, 2023) available at https://cleantechnica.com/2023/04/25/designwerk-offers-lfp-battery-cells-for-the-high-cab-semi-lowliner/

143 See Draft RIA at 35; See also, Bloomberg, Silicon Valley Startup Charts a Path to Cheaper Batteries (Feb. 22, 2023) available at https://www.bloomberg.com/news/articles/2023-02-22/silicon-valley-startup-charts-a-path-to-cheaper-evbatteries?cmpid=BBD022223_hyperdrive&utm_medium=email&utm_source=newsletter&utm_term=230222&utm_campaign=hyperdrive

144 BloombergNEF, Electric Vehicle Outlook 2023, Executive Summary (June 8, 2023) at 9 available at https://about.bnef.com/electric-vehicle-outlook/

Heavy-duty BEVs Are Rapidly Approaching, If Not At, Total Cost of Ownership Parity

EPA also solicits greater input on medium- and heavy-duty BEV total cost of ownership (TCO).146Reductions in battery costs are projected to lead to cost parity in many vehicle segments by 2025.147 Some analyses have suggested that parity will occur even earlier.148 Continued and expansive research and development in this sector can be expected to further drive down costs.149 Consistent with these declines, other key subsystems of BEV technology will continue to see cost reductions as manufacturers scale production.150 [EPA-HQ-OAR-2022-0985-1505-A1, p. 20]

146 88 Fed. Reg. at 25942.

147 MJ Bradley, Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness (Aug. 11, 2022) at 7. available at https://www.mjbradley.com/reports/medium-heavy-duty-vehicles-market-structure-environmentalimpact-and-ev-readiness (EVs in most market segments have the potential to achieve life-cycle cost parity with internal combustion engine vehicles by model year 2025 or earlier if M/HD battery costs follow a similar trajectory as battery costs for light-duty EVs).

148 UC Berkeley, 2035 Report: Transportation: Plummeting Costs and Dramatic Improvements in Batteries Can Accelerate Our Clean Transportation Future (April 2021) available at https://www.2035report.com/transportation/transportationnew/wp-content/uploads/2020/05/2035_Transportation_Report.pdf?hsCtaTracking=544e8e73-752a-40ee-b3a5-90e28d5f2e18%7C81c0077a-d01d-45b9-a338-fcaef78a20e7

149 See generally, Energy & Environment Sciences, Determinants of lithium-ion battery technology cost decline (Jan. 3, 2022) available at https://pubs.rsc.org/en/content/articlelanding/2021/ee/d1ee01313k

150 See generally, ICCT, A Meta-Study of Purchase Costs for Zero-Emission Trucks (Feb. 17, 2022) available at https://theicct.org/publication/purchase-cost-ze-trucks-feb22/ (Finding, inter alia, by 2030 key subsystems can achieve up to 40% to 60% cost reduction driven by technology and manufacturing scalability).

A recent ICCT analysis found that battery costs for zero-emission trucks are expected to halve by 2030 compared to 2022, reaching $120/kWh at the pack level with electric drive systems—including the transmission, motor, and inverter— forecasted to see cost reductions of over 60% by 2030, reaching $23/kW.151 Such reductions find upfront cost parity between battery electric trucks and their diesel counterparts achieved in the late 2020s.152 [EPA-HQ-OAR-2022-0985-1505-A1, p. 20]

151 ICCT, Purchase Costs of Zero-Emission Trucks In The United States To Meet Future Phase 3 GHG Standards (March 2, 2023) available at https://theicct.org/publication/cost-zero-emission-trucks-us-phase-3-mar23/

152 Id.

A reduction down to $120kWh per pack plus drivetrain would likely reduce BEVs well below cost parity. Indeed, a recent LBNL study found that recent reductions in battery prices and improvement in energy density have made long haul electric trucking viable in the near term.153 More directly, the study concluded: 'At the current global average battery pack price of $135 per kilowatt-hour (kWh) (realizable when procured at scale), a Class 8 electric truck with 375-mile range and operated 300 miles per day when compared to a diesel truck offers about 13% lower total cost of ownership (TCO) per mile, about 3-year payback and net present savings of about US $200,000 over a 15-year lifetime. This is achieved with only a 3% reduction in payload capacity.'154 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 20-21]

153 LBNL, Why Regional and Long-Haul Trucks are Primed for Electrification Now (Mar. 15, 2021) available at https://etapublications.lbl.gov/publications/why-regional-and-long-haul-trucks-are

154 Id.

Still other recent assessments of the total cost of ownership indicate that EPA stands on firm ground to strengthen the stringency in the rule. Indeed, some OEMs predict BEV cost parity in 2025 well ahead of the proposed rule's 2027 implementation date. Further numerous studies have found that heavy-duty BEVs outperform conventional trucks on a total cost of ownership basis.155 Tesla projects that its Semi will have energy costs that are half those of diesel, provide over $200,000 in fuel savings, and have a two-year payback period.156 Another manufacturer has found that BEVs could save fleets up to 80% on energy costs and 60% on repair.157 Yet another found that the benefits of electrifying heavy-duty truck fleets are significant with recent studies showing that operating costs for electric trucks can be between 14 and 52 percent lower and repair costs around 40 percent lower than their combustion-powered counterparts.158 CARB has found that battery-electric vehicles appear cost competitive with the established combustion technologies by 2025 in many use cases.159 Real world demonstrations have also proven this out.160 [EPA-HQ-OAR-2022-0985-1505-A1, p. 21]

155 See e.g., UC Berkley, 2035 Report: Transportation: Plummeting Costs and Dramatic Improvements in Batteries Can Accelerate Our Clean Transportation Future (April 2021) at 15 available at https://www.2035report.com/transportation/transportation-new/wpcontent/uploads/2020/05/2035_Transportation_Report.pdf?hsCtaTracking=544e8e73-752a-40ee-b3a5-90e28d5f2e18%7C81c0077a-d01d-45b9-a338-fcaef78a20e7 (finding BEV heavy-duty trucks already hold a TCO advantage today and, for heavy-duty trucks, an EV advantage of $0.05/mi in 2020 that increases to $0.22/mi in 2030—magnified by the large number of miles traveled by this class of vehicles. In absolute terms, in 2020 this translates to a $42,800 TCO advantage of electric heavy-duty trucks, which increases to $200,000 in 2030. The TCO advantage of EVs continues to grow through 2050).

156 See Tesla, Semi available at https://www.tesla.com/semi

157 Utility Dive, Lion Electric: EVs save transport firms 80% on energy, 60% on repair costs compared to diesel (Mar. 17, 2021) available at https://www.utilitydive.com/news/Lion-Electric-trucking-total-cost-of-ownershipdiesel/596835/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202021-03-17%20Utility%20Dive%20Newsletter%20%5Bissue:33047%5D&utm_term=Utility%20Dive

158 Argonne National Lab, Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains (April 2021) available at https://publications.anl.gov/anlpubs/2021/05/167399.pdf

159 CARB, Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document (Sept 9, 2021) available at https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf See also, Transport & Environment, Why the future of long-haul trucking is battery electric (Feb. 18, 2022) available at https://www.transportenvironment.org/wpcontent/uploads/2022/02/2022_02_battery_electric_trucks_HDV_factsheet.pdf

160 North American Council for Freight Efficiency, Electric Trucks Have Arrived: Documenting A Real-World Electric Trucking Demonstration (Feb. 2, 2022) available at https://nacfe.org/wp-content/uploads/edd/2022/01/RoL-Report-Executive-Summary-FINAL.pdf

Recently, the IEA has concluded, 'In the regions where electric trucks are becoming commercially available, battery electric trucks can compete on a TCO basis with conventional diesel trucks for a growing range of operations, not only urban and regional, but also in the heavy-duty tractor-trailer regional and long-haul segments.'161 Similarly, new analysis looking at the IRA's incentive have medium-duty TCO parity expect in 2024 with the heavy-duty sector to follow in the middle of the decade.162 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 21-22]

161 IEA, Global EV Outlook 2023, Trends in charging infrastructure available at https://www.iea.org/reports/global-evoutlook-2023/trends-in-charging-infrastructure#abstract (emphasis added)

162 McKinsey, Why the economics of electrification make this decarbonization transition different (Jan. 30, 2023) available at https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/why-the-economics-of-electrificationmake-this-decarbonization-transition-different?stcr=F2E91F7E3B364985951002C7AEE3335D&cid=other-eml-alt-mipmck&hlkid=5029d8f5ce4c43abb7c63ff53e942ad0&hctky=10204926&hdpid=4eb1e872-7192-48d7-b6cb-0642d205d4c5

In short, BEVs offer the best compliance technology near term and dramatically decreasing battery costs and numerous TCO studies further support emission standards leading to BEV deployment at levels surpassing those proposed by the agency. [EPA-HQ-OAR-2022-0985-1505-A1, p. 22]

Organization: Truck and Engine Manufacturers Association (EMA)

b) Revisions

HD TRUCS has close to 100 inputs that are used, and that can be modified, within the tool. Those multiple inputs cover costs, efficiency factors, and performance factors, to mention a few. During our review, EMA identified a subset of these inputs that we prioritized as elements where corrected values - - values different than were used in the NPRM - - need to be utilized. The five (5) prioritized inputs in need of correction and revision are described below. [EPA-HQ-OAR-2022-0985-2668-A1, p. 25]

Battery Pack Cost and Fuel Cell Stack Cost – These two revised inputs were run together as they are the core components of their respective powertrain systems. EMA's recommended 2027 cost of $183/kWh is used for the battery packs, as compared to the NPRM cost of $145/kWh. The fuel cell stack cost is $498/kW, versus $242/kW for the NPRM. The revised projected ZEV adoption rates from running EMA HD TRUCS with these two updated inputs are shown below for 2027 and 2032: [EPA-HQ-OAR-2022-0985-2668-A1, p. 35.] [See the Projected ZEV Adoption Rates for 2027 and 2032 Table on page 34 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Battery Pack Cost ($/kWh) – The HD TRUCS tool utilizes a cost of $138 per kilowatt-hour (kWh) (2019$) for the cost of a battery pack. That cost comes from a February 2022 paper published by ICCT. Within HD TRUCS, an adjustment factor is applied to this cost, which is in 2019 dollars, to bring it up to 2021 dollars, which adjusted cost is used in preparing the NPRM. This results in an assumed battery pack cost of $145/kWh. [EPA-HQ-OAR-2022-0985-2668-A1, p. 25]

OEMs, all of which have one or more BEV powertrains in production, provided EMA with their December 2022 cost for battery packs, along with the cost from approximately June 2022. The December 2022 average cost was $270/kWh hour, nearly double the cost estimated by ICCT. National labs and third-party expert consultants have consistently estimated that battery costs would fall substantially from 2019 through 2040. But, in fact, those costs have increased recently, rising from an average of $233 in June 2022, to $270 in December 2022. The critical elements for battery manufacturing have been in short supply, driving up prices. The pressure on the supply chain from LD ZEV growth, especially the volume increases from the growing regulatory mandates for more and more ZEVs, will continue to create supply and cost issues for the significantly smaller MHD market. Thus, the projections of falling costs are not accurate. [EPA-HQ-OAR-2022-0985-2668-A1, p. 25]

OEMs also provided future battery pack costs based on contracts, pending projects, and active development programs. The average cost for 2027 production is $183. Although notably reduced from current costs, this is still a 26% increase to the value used in the NPRM, making the $183/kWh a more appropriate value for use in the EPA version of HD TRUCS. Accordingly, EMA uses that value ($183/kWh) in the EMA HD TRUCS tool. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 25 - 26]

Organization: Valero Energy Corporation

Similarly, EPA cites to another ICCT study in support of the proposition that "[p]rojected costs [of HD ZEVs] are expected to decrease as manufacturing matures and materials improve."25 However, EPA fails to disclose that the ICCT study is simply based upon a review of recent literature, and caveats that it is predicated on "a dearth of publicly available data about the costs of battery-electric and hydrogen fuel cell trucks, as well as the cost breakdowns for the various systems in these vehicles."26 EPA further provides that it "considered this source to be a comprehensive review of the literature at the time of the HD TRUCS analysis for the cost of battery packs in the absence of the IRA".27 Based on a review of EPA's underlying source material, however, EPA's analysis and proposal is inconsistent and incomplete. [EPA-HQ-OAR-2022-0985-1566-A2, p. 6]

25 EPA's HD Phase 3 GHG Proposal at 25941 (citing to Sharpe, Ben and Hussein Basma. "A Meta-Study of Purchase Costs for Zero-Emission Trucks". The International Council on Clean Transportation. February 2022).

26 Sharpe, Ben and Hussein Basma. "A Meta-Study of Purchase Costs for Zero-Emission Trucks". The International Council on Clean Transportation. February 2022. https://theicct.org/publication/purchase-cost-ze-trucks-feb22/

27 EPA's HD Phase 3 GHG Proposal at 25980-81.

EPA is at a distinct advantage relative to general public commenters in that it has the ability to seek out reliable data and is obligated to provide such. For example, in the recently proposed Renewable Fuel Standard "Set Rule," EPA provided citations to various peer reviewed studies that demonstrated the work of researchers over the decades that the Renewable Fuel Standard has been administered by the EPA. Likewise, EPA has been issuing rules regulating emissions from heavy duty vehicles since 198528 and as the following examples show, EPA has instead chosen to rely on incomplete source material from third parties. [EPA-HQ-OAR-2022-0985-1566-A2, p. 6]

The proposal states that "BloombergNEF presents battery prices that would reach $100 per kWh in 2026."29 But EPA fails to disclose that BloombergNEF also identifies factors that may increase prices:

- “[T]he impact of rising commodity prices and increased costs for key materials such as electrolytes has put pressure on the industry in the second half of the year.”
- “[E]ven low-cost chemistries like [lithium iron phosphate] LFP, which is particularly exposed to lithium carbonate prices, have felt the bite of rising costs throughout the supply chain. Since September [2021], Chinese producers have raised LFP prices by between 10-20%.”
- “Kwasi Ampofo, head of metals and mining at BloombergNEF [has] said: ‘Prices for lithium have risen substantially this year as a result of constraints within global supply chains, rising demand in China and Europe and the recent production curbs in China.’” 30 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 6 - 7]

29 EPA’s HD Phase 3 GHG Proposal at 25980 (citing to Bloomberg NEF. ‘‘Battery Pack Prices Fall to an Average of $132/kWh, But Rising Commodity Prices Start to Bite.’’ November 30, 2021. https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/).

30 Bloomberg NEF. ‘‘Battery Pack Prices Fall to an Average of $132/kWh, But Rising Commodity Prices Start to Bite.’’ November 30, 2021. https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/.

EPA’s analysis selectively ignores price volatility in the lithium and battery materials market and national security concerns inherent in these statements and exacerbated by the proposed HD Phase 3 GHG rule. EPA also cites to several sources that warn of rising battery costs, yet EPA does not adequately consider these realities in its analysis. For example, EPA cites to a Bloomberg New Energy Finance (BNEF) blog post for the proposition that “recent information indicates that the [lithium] market is responding robustly to demand”.31 Yet the BNEF source, titled “Lithium-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh,”32 warns that:

“Rising raw material and battery component prices and soaring inflation have led to the first ever increase in lithium-ion battery pack prices since BloombergNEF (BNEF) began tracking the market in 2010. After more than a decade of declines, volume-weighted average prices for lithium-ion battery packs across all sectors [] increased to $151/kWh in 2022, a 7% rise from last year in real terms. The upward cost pressure on batteries outpaced the higher adoption of lower cost chemistries like lithium iron phosphate (LFP). BloombergNEF expects prices to stay at similar levels next year, further defying historical trends.” [EPA-HQ-OAR-2022-0985-1566-A2, p. 7]

31 EPA’s HD Phase 3 GHG Proposal at 25965.

32 Bloomberg New Energy Finance, “Lithium-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh,” December 6, 2022. https://about.bnef.com/blog/lithium-ion-battery-pack-prices-rise-for-first-time-to-an-average-of-151-kwh/.

Further, Kwasi Ampofo, head of metals and mining at BloombergNEF, is quoted as saying: “[l]ithium prices remain high due to persistent supply chain constraints and the slow ramp up in new production capacity.33 [EPA-HQ-OAR-2022-0985-1566-A2, p. 7]

33 Bloomberg New Energy Finance, “Lithium-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh,” December 6, 2022. https://about.bnef.com/blog/lithium-ion-battery-pack-prices-rise-for-first-time-to-an-average-of-151-kwh/.

EPA also claims that "[d]espite recent short-term fluctuations in price, the price of lithium is expected to stabilize at or near its historical levels by the mid-to-late 2020s."34 However, one of EPA's sources on this point is an article covering a Chinese study, which contains analysis specific to the Chinese spot market for lithium, which is inconsistent with the express intent of the IRA.35 For the abovementioned reasons, EPA misrelies on its authorities and must revise the proposal after giving due consideration to the data regarding HD ZEV costs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 7]

34 EPA's HD Phase 3 GHG Proposal at 25966.

35 Green Car Congress, "Tsinghua researchers conclude surging lithium price will not impede EV boom," July 29, 2022. https://www.greencarcongress.com/2022/07/20220727-tsinghua.html#:~:text=27%20July%202022,electrification%20in%20the%20long%20run.

Organization: Volvo Group

Phase 3 Proposed Stringencies

- Costs are too low based on current data and internally anticipated cost reductions, especially for batteries.

EPA Summary and Response

Summary:

A number of commenters provided cost estimates for the high voltage battery; these comments are from both industry and NGO groups. EMA shared values they believe are appropriate for battery packs during the time frame of the rule, based on future contracts which are higher than EPA's estimate. EMA recommends that EPA use a figure roughly 26% greater than estimated at proposal. PACCAR, Stellantis, and DTNA provided battery cost projections to the Agency which were submitted under claims of Confidential Business Information. DTNA also commented that EPA should consider all available data including that which can be provided by manufacturers in confidential settings, and asserted that, given data available today is limited, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data.

Valero Energy questioned EPA's reliance on the ICCT Working Paper 2022-09 value for battery pack cost given ICCT's caution about uncertainty within the market for this sector. The commenter further maintains that the ICCT Paper did not adequately explain or cite empirical support for averaging of the values, and that instead upper and lower bounds should be adopted for HD TRUCS cost inputs.

Although some commenters believe the battery costs used for the NPRM are too low, others believe the battery costs used are too high; these commenters include CATF, EDF, MFN and Tesla. CATF cited a plethora of sources that all indicated a decrease in battery costs in previous years and in future years. Their sources provided costs as low as $59-68/kWh in 2027. EDF referenced a Roush report of HDV battery cost of $98/kWh in 2030 and $88/kWh in 2032 without IRA adjustment. MFN believes the battery used for HDV will be less conservative than the one modeled by EPA in terms of both specific energy and energy density, this conservativeness is reflected in EPA's estimates of battery costs. The commenter's estimates align with BNEF where battery cost will decline to $100/kWh by 2026 as a result of mineral price stabilization. Tesla referenced an ICCT report where batteries would reach a cost of $120/kWh at the pack level by 2030.

The Clean Fuels Development Coalition, et. al., took exception to EPA applying "both the IRA battery tax credit and vehicle tax credit" to consumer costs on the basis that industry may not be capable of meeting the domestic sourcing requirement and the costs ultimately being paid by taxpayers.

Response:

Please see Chapter 2.4.3.1 of the RIA for a discussion of the battery costs for the final rule.

Regarding the commenter's concern with the inclusion of the IRA battery and vehicle tax credits from purchaser costs despite the costs being paid by taxpayers, this is the proper approach to estimating purchaser costs which are meant to estimate the costs purchasers will incur upon purchasing a new vehicle. Therefore, those tax credits should reduce the price paid by the purchaser. As we did in the NPRM, we have omitted the tax credits and taxes in our calculation of costs to society (see Section IV.E of the preamble) as these are transfers from taxpayers to purchasers and we present those transfers for full transparency in Section VIII.B of the preamble.

Regarding concerns over industry being capable of meeting the domestic sourcing requirements to realize the IRA tax credits, please refer to our response in Section 2.7 of this document.

Comments on minerals critical to battery production are addressed in Preamble Section II.D.2.ii.c and in Section 17.2 of this document.

EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

3.4.2 E-Drive

Comments by Organizations

Organization: Daimler Truck North America LLC (DTNA)

EPA's projections for e-Drive costs may also be inaccurate. Table II-12 in the Proposed Rule appears to reflect a combined cost per kilowatt for the eMotor, inverter, and gearbox combination. DTNA's e-Drive cost estimate, which includes EPA's components plus an eAxle, is shown in Table 9 below. EPA should consider the inclusion of an eAxle for some applications, as eAxles increase driveline efficiency by reducing gear losses and can offer the additional needed packaging space in the chassis for other components like battery packs. DTNA recommends that EPA apply eAxle costs to weight-sensitive applications with constrained packaging space, and that the Agency periodically reassess e-Drive cost inputs used in the HD TRUCS tool. [EPA-HQ-OAR-2022-0985-1555-A1, p. 29] [Refer to Table 9 on p. 30 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

EPA Request for Comment, Request #34: We request data on e-axle costs that we could consider for the final rule.

- DTNA Response: See DTNA Response to Request # 20, above. In addition, DTNA is willing to confidentially share e-drive costs with EPA, including an eAxle, and recommends EPA incorporate eAxle costs for at least some population of vehicles. [EPA-HQ-OAR-2022-0985-1555-A1, p. 163]

EPA Request for Comment, Request #35: We welcome comment, including data, on our assessment of e-drive costs.

- DTNA Response: See DTNA Response to Request # 20 and 34, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 163]

Organization: Dana Incorporated

eDrive Direct Manufacturing Costs

As an eDrive manufacturer, Dana believes that various configurations such as direct-drive, etransmissions, and e-axle will co-exist in the market. Each of these vehicle powertrain configurations has a certain level of manufacturing complexity. Dana believes that the market will demand multi-speed etransmissions and e-axles solutions that will drive higher product as well as manufacturing costs. Therefore, EPA must consider different direct manufacturing cost values for each vehicle powertrain configuration. [EPA-HQ-OAR-2022-0985-1610-A1, p. 5]

Dana also believes using only $1 kW unit may not accurately compare the cost of different powertrain configurations. For instance, a motor with 450 kW of power and 2,500 Nm of torque used as a direct drive would provide 2,500 Nm at the driveshaft, but with the same motor paired with a multi-speed eaxle, it would provide 450 kW but it could provide 28,000 Nm of peak torque, allowing it to be used in a much heavier type of vehicle platform. The cost to achieve 28,000 Nm of peak torque is higher even though $/ kW is the same. This exemplifies the issue of using power only as a cost metric. [EPA-HQ-OAR-2022-0985-1610-A1, p. 5]

Organization: Environmental Defense Fund (EDF)

Additionally, EPA's projection of motor costs are too high. In the same Roush study they project motor and inverter costs will be $8/kW in 2030 and 2032. EPA projects in their proposal these costs will be $16/kW and $15/kW for 2030 and 2032 respectively. [EPA-HQ-OAR-2022-0985-1644-A1, p. 54]

EPA Summary and Response

Summary:

Commenters focused on differing aspects of the e-drive[292] in their comments. Dana and DTNA both commented that there will be various configurations of e-drives for ZEV vehicles, and that EPA should reflect the variety of costs that may occur as a result of using different technologies such as eAxles, and multispeed transmissions. In particular, Dana was concerned that using only $/kW unit may not accurately compare the cost of different powertrain configurations, and DTNA requested that EPA apply eAxle costs to weight-sensitive applications with constrained packaging space. DTNA also commented that EPA should consider all available data including that which can be provided by manufacturers in confidential settings, and asserted that, given data available today is limited, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data.

EDF says that the HD TRUCS costs for e-motors are too high, and references Roush reports with e-motor costs of $8/kW for 2030 and 2032, much lower than EPA's e-motor value. DTNA provided CBI values of e-Drive system costs that include the combined eMotor, inverter, gearbox, and eAxle costs and are higher than the e-motor cost used in the NPRM. Tesla cited an ICCT report that projected cost reductions of 60% by 2030 and that the price of electric powertrain systems including the transmission, motor, and inverter would reach $23/kW (see Section 3.4.1 for Tesla Comment).

Response:

In the NPRM, the e-drive system in EPA's HD TRUCS included the electric motor (e-motor), power electronics and electrical accessories, and a driveshaft which can include a transmission system or gearbox. Although EPA used a $/kW cost estimate for e-motors, the gearbox costs are distinguished by application and weight categories that were developed for the Autonomie tool. The e-motor and gearbox cost, together with the power electronics, power accessories, and the final drive costs, sum to create the entire e-drive cost for each vehicle in HD-TRUCS. These costs were not a constant $/kW across all applications. We are retaining this methodology for the final rule as it reflects different e-drive costs for each vehicle in HD TRUCS depending on weight class, duty cycle, and axle configuration. For additional discussion on the components and costs associated with the e-drive system in HD TRUCS, see Chapter 2.4.3.2 of the RIA.

EPA did not estimate different costs for all potential e-drive permutations with emerging technologies. Instead, we relied on the components as described in the BEAN and Autonomie tools, so that we used underlying inputs for various e-drive components that are self-consistent. For example, we recognize that some emerging technologies, like e-axles, have the potential to realize further efficiency gains because they have fewer moving parts. EPA finds that the various configurations considered represent a reasonable approximation of the technology costs of e-drives.

There is no consensus about what is included in e-drive or e-motor costs, and these terms are sometimes used interchangeably. In fact, EPA's proposal included a table (Table II-12) of e-motor costs that were mistakenly labeled as e-drive costs. The other e-drive component costs were described in the surrounding NPRM preamble text, but the caption for Table II-12 may

[292] See Chapter 2.4.3.2.1 of the RIA for description of the HD TRUCS e-drive components and costs.

have led to confusion about whether the entire e-drive costs were all based on a constant $/kW and commenters may have misunderstood the total e-drive costs that are used in HD TRUCS, which are much higher than just the $/kW cost of the e-motor. The final rule includes the correct caption for the e-motor cost table, as shown in preamble Section II.E.1 and RIA Chapter 2.4.3.2, along with the costs for the other e-drive components.

EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

3.4.3 FC Stack & H2 Tank Costs

Comments by Organizations

Organization: California Air Resources Board (CARB)

4. FCEV Technology Costs

Affected pages: DRIA 185-194

CARB staff finds U.S. EPA's assumptions for component costs to be reasonable given available information and literature projections. CARB staff for the ACF regulation performed a similar analysis which determined the upfront costs of FCEVs through a component cost analysis. As noted by U.S. EPA and ICCT,217 there are a wide range of projections for fuel cell components in the future. U.S. EPA's assumptions appear, generally, to be on the conservative (higher) end of that range. [EPA-HQ-OAR-2022-0985-1591-A1, pp.63-64]

217 ICCT's A meta-study of purchase costs for zero-emission trucks, Working Paper 2022-09, February 2022. https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf

Organization: Daimler Truck North America LLC (DTNA)

FCEVs will likely not see significant availability and uptake until at least 2032, thus accurate cost projections cannot be made at this time. Existing FCEV technologies must be adapted, not simply scaled, to achieve HD performance requirements. EPA's cost estimates for hydrogen tanks may be reasonable for compressed hydrogen given the current market, but in the long-term, liquid hydrogen will be the primary fuel in the HD market to enable the 500 - 600 mile range that achieves comparable range to conventional diesel vehicles today. Gaseous hydrogen occupies too much volume to be carried on board in the required quantities to achieve a 500 - 600 mile range. [EPA-HQ-OAR-2022-0985-1555-A1, p. 30]

As neither liquid hydrogen tanks nor heavy-duty fuel cell stacks are being produced at scale today, DTNA does not have data to assist the Agency in estimating costs. In its April 2023 white paper on TCO for Class 8 alternative powertrain technologies, ICCT estimates 2030 fuel cell costs at $301/kg and hydrogen tank costs at $844/kg, which are notably higher than EPA's HD TRUCS projections of $200/kg and $660/kg respectively.55 These projected major component costs have significant impacts on the payback period calculation, thus they must be regularly reviewed to account for technology and market developments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 30]

> 55 See ICCT, Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States (April 2023), https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucksus- apr23.pdf (ICCT TCO White Paper) at Table 4.

EPA Request for Comment, Request #39: We request comment, including data, on our approach and cost projections for FCEV components

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. DTNA believes HD FCEV technology costs cannot be accurately predicted today. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 164]

EPA Request for Comment, Request #44: We request comment on this approach for both ICE vehicles and ZEVs, in addition to data on battery and fuel stack replacement costs, engine rebuild costs, and expected component lifetime periods.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 165] [Refer to section 2 of this comment summary]

Organization: Dana Incorporated

Fuel Cells

Dana is a component supplier of bipolar plates for fuel-cell and electrolyzer stacks and relies largely on publicly available information or customer shared information as knowledge of fuel cell costs. Given this, it appears that the direct cost of a fuel cell stack noted in the proposed rule is excessively high, if it is referring only to the stack and not to the entire fuel-cell system. For reference, below are some targets set by the European Joint Undertaking (https://www.clean-hydrogen.europa.eu/about-us/keydocuments/strategic-research-and-innovation-agenda en). This reference shows a fuel cell stack cost at less than €100 / kilowatt and a 2030 target of less than €50 / kilowatt versus $200 USD (approx. €185) in 2030. [EPA-HQ-OAR-2022-0985-1610-A1, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1610, page 4, for reference.]

Organization: MEMA

Take-away: Like motorcoach and sleeper applications, liquid fueling (hydrogen) or other renewable fuel capability, provided through publicly available infrastructure would be the best solutions path to address the variable performance demands and extended use these applications. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 18 - 19]

Recommendation: EPA expands the HD TRUCS model feasibility and cost sections to include the preceding applications and fuel sources. [EPA-HQ-OAR-2022-0985-1570-A1, p. 19]

Organization: PACCAR

B. EPA SIGNIFICANTLY UNDERESTIMATES FUEL CELL COSTS

PACCAR is developing and commercializing fuel cell powertrains and has received suppliers' fuel cell stack cost quotes. None of PACCAR's projected costs are as low as the values EPA used in TRUCS. Even the ICCT paper upon which EPA relied to estimate fuel cell stack costs acknowledges there is a great degree of cost uncertainty, e.g., ICCT estimated MY2025 fuel cell costs ranging from $50/kW to $750/kW.2 [EPA-HQ-OAR-2022-0985-1607-A1, p. 5]

2 "A Meta-Study of Purchase Costs for Zero Emissions Trucks" (Sharpe and Basma, 17 Feb. 2022)

ICCT recently published another paper that estimates fuel cell stack costs will be $301/kW in MY2030, which is significantly higher than TRUCS's $200/kW value (see Table 4 below).3 Based on the ICCT analysis, estimated MY2027 fuel cell stack will be $498/kW if linearly interpolating between MY2022 and MY2030, or $365/kW if using EPA's "learning curve" approach, working backwards from the $301/kW value. Considering (i) TRUCS assumes a typical tractor fuel cell power of 200 kW, and (ii) the difference between the ICCT paper MY2030 $301/kW estimate and EPA's assumed $200/kW MY2030 cost, TRUCS underestimates fuel cell cost by approximately $20,100. PACCAR therefore respectfully requests that EPA revise the TRUCS analysis with more accurate fuel cell cost figures. [EPA-HQ-OAR-2022-0985-1607-A1, pp. 5 - 6.] [See table 4 on page 6 of EPA-HQ-OAR-2022-0985-1607-A1.]

3 "Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States" (Basma et. al., April 2023)

Organization: Truck and Engine Manufacturers Association (EMA)

Fuel Cell Stack Cost – Fuel cell systems are an emerging technology within the MHD market. As such, there is significant uncertainty regarding the development of MHD fuel cells and their ultimate production costs. For EPA's HD TRUCS model, the Agency chose to rely on the fuel cell cost from an ICCT paper published in February 2022. That 2027 cost is $242 per kilowatt (kW). Significantly, a more recent ICCT paper on ZEV total cost of ownership (TCO), dated April 2023, includes a notably higher cost for the fuel cell stack, estimated at $498 for 2027. That value was determined through a linear interpolation of the ICCT data in Table 9 of the April paper, which noted stack costs of $827 in 2022 and $301 in 2030. [EPA-HQ-OAR-2022-0985-2668-A1, p. 26]

The estimated $498/kW value is consistent with the spread of data that EMA received from OEMs. As such, $498/kW is the value that EMA is using in EMA's version of HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 26]

Battery Pack Cost and Fuel Cell Stack Cost – These two revised inputs were run together as they are the core components of their respective powertrain systems. EMA's recommended 2027 cost of $183/kWh is used for the battery packs, as compared to the NPRM cost of $145/kWh. The fuel cell stack cost is $498/kW, versus $242/kW for the NPRM. The revised projected ZEV adoption rates from running EMA HD TRUCS with these two updated inputs are shown below for 2027 and 2032: [EPA-HQ-OAR-2022-0985-2668-A1, p. 35.] [See the Projected ZEV Adoption Rates for 2027 and 2032 Table on page 34 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Organization: Valero Energy Corporation

4. EPA's technological feasibility analysis relies on aspirational projections of EV battery, fuel cell stack and hydrogen fuel tank costs, while failing to discuss the associated uncertainties or probability of success.

EPA relies on a recent ICCT working paper46 for its projections of EV battery, fuel cell stack and hydrogen fuel tank costs over MY 2027-2032.47 The ICCT working paper compiles retail price projections for ZEV trucks based on a literature review of U.S. and EU sources, each of which provides projections, goals, or targets for 2025/2030. ICCT's summary of the range and average of the literature-projected costs are shown below.48 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 9 - 10]

46 ICCT Working Paper 2022-09, "A meta-study of purchase costs for zero-emission trucks," February 2022.

47 EPA HD TRUCS spreadsheet (Document ID EPA-HQ-OAR-2022-0985-0830), "Inputs" tab, Rows 4, 5, 44, 45, 103 and 104.

48 ICCT Working Paper 2022-09 at Figure 2.

ICCT acknowledges that "due to the nascent nature of the market, there is a lack of publicly available data on the costs of heavy-duty zero-emission vehicles and powertrains, especially for freight trucks."49 EPA nevertheless adopts the average costs from the ICCT working paper as fact, without any reference to the ICCT's expression of uncertainty in the surveyed literature projections. Moreover, EPA fails to consider the magnitude of cost ranges presented in the ICCT working paper and evaluate the sensitivity of its modeled impacts to the ranges of uncertainty. For example, the upper bounds of the ranges of the cost projections in the ICCT working paper in 2027 for energy battery, fuel cell and hydrogen storage are interpolated to be approximately 60% higher, 100% higher, and 60% higher than the respective average values.50 [EPA-HQ-OAR-2022-0985-1566-A2, p. 10]

49 ICCT Working Paper 2022-09 at 1.

50 ICCT Working Paper 2022-09 at Figure 2.

EPA fails to offer any explanation why it is reasonable to assume the average cost values from the ICCT working paper while disregarding the upper or lower bounds of the cost ranges, nor does it evaluate the sensitivity of its HD ZEV adoption modeling to these uncertainties. [EPA-HQ-OAR-2022-0985-1566-A2, p. 10] [See Figures 2 through 4, ICCT Costs, on page 10 and 11 of docket number EPA-HQ-OAR-2022-0986-1566-A2]

It should also be noted that EPA's input into HD TRUCS for the 2027 fuel cell stack cost of "230*Adj_Factor"52 does not match the average projection in Figure 2 of the ICCT Working Paper and is incorrect, according to EPA's approach. [EPA-HQ-OAR-2022-0985-1566-A2, p. 11]

52 EPA HD TRUCS spreadsheet (Document ID EPA-HQ-OAR-2022-0985-0830), "Inputs" tab, Cell G45.

EPA Summary and Response

Summary:

Several commenters addressed EPA's estimates for fuel cell costs. CARB agreed that EPA's estimates are reasonable, noting they used similar estimated values in their Advanced Clean Fleets rule proceeding. Dana thought the NPRM fuel cell cost estimates were too high, particularly if they represent the fuel cell stack alone, based on targets published by the European Joint Undertaking. EMA, however, referred to values from a more recent (2023) ICCT White Paper that shows a higher estimate than EPA's, and indicated that their members concurred with the higher ICCT estimates. DTNA (an EMA member) felt that fuel stack technology is too nascent to make any type of realistic cost estimate. They noted that existing component technologies still need to be adapted for the HD market and that fuel cell stacks are not being produced at scale now, and they stated that they do not believe accurate HD FCEV technology costs can be predicted now. They further said that because costs of major components impact payback, they must be reviewed regularly as the market matures to account for the best available data. DTNA, EMA, and PACCAR pointed to ICCT's revised estimates, which they say are more in line with available data, but they also noted that ICCT also recognizes there is significant uncertainty. Valero said that EPA failed to fully evaluate the uncertainties associated with the projected costs in HD TRUCS and identified a potential error in the HD TRUCS tool.

Only two commenters mentioned onboard hydrogen storage tank costs. DTNA noted that EPA's estimates for compressed hydrogen tanks may be reasonable. But they said that to accommodate long-distance ranges of over 500 miles in the longer-term, liquid hydrogen will be the primary fuel, and it is too soon to offer costs estimates for liquid tanks. Both DTNA and Valero referenced the 2023 ICCT study for onboard hydrogen storage tank costs.

MEMA also suggested that liquid hydrogen or other liquid renewable fuels, should be considered in HD TRUCS when evaluating feasibility and costs, provided through publicly available infrastructure to support them.

Response:

Hydrogen infrastructure is addressed in RTC Section 8.

As discussed in RTC Section 5.3 on storage tank packaging and in RIA Chapter 1.7.3, we did not consider liquid hydrogen explicitly in this rule and only evaluate HD FCEVs with 700 bar gaseous tanks that can accommodate a range of up to 500 miles prior to refueling, given that gaseous hydrogen technologies are predominantly used today and the readiness of liquid storage and refueling technologies is relatively low. However, compliance with the GHG standards in this rule is possible through numerous potential pathways as long as testing and other requirements are met.

Fuel Cell Costs:

For the NPRM, we relied on an average of costs from an ICCT meta-study that found a wide variation in fuel cell costs in the literature (Sharpe and Basma et. al, 2022). Valero suggested there was an error in our fuel cell cost estimate in HD TRUCS for MY 2027. In fact, there was an error in the writeup about our approach. In the DRIA Chapter 2.5.2.1, we said that we "averaged the 2025 cost values from the Sharpe and Basma meta-study, averaged the 2030 values, and then linearly interpolated to get MY 2027 values and adjusted to 2021$; we then applied the learning curve shown in DRIA Chapter 3.2.1 to calculate MY 2028– 2032 values.” We actually used the average values from 2030 ($191 per kW), and then applied our learning rates backwards[293] to get a MY 2027 value. Then we applied an adjustment factor to get from 2019$ to 2021$ and applied the learning curves shown in DRIA 3.2.1 to calculate MY 2028 to 2032 values.

For the final rule, we revised our fuel cell cost estimates from those in the NPRM. The revised fuel cell system cost estimates for the final rule are described in RIA Chapter 2.5.2.1.

We reviewed the ICCT paper that several commenters referenced. In March 2023, ICCT published a meta-study (Xie et. al, 2023)[294,295] that revised a meta-study from 2022 (Sharpe and Basma et. al, 2022).[296] Xie et. al adjusted estimates based on average inflation between 2020 and 2022. They replaced one source from the previous review of the literature (Transport & Environment) with another source (Interact Analysis)[297]. For fuel cells, they developed a cost curve by weighting primary research (Ricardo, Interact Analysis, and Roland Berger) twice as highly as secondary research. All sources referenced by ICCT appear to account for fuel cell system costs that include both the fuel cell stack and balance of plant (BOP).

[293] After applying our learning rates backwards, if one applied the learning rates to the newly calculated MY 2027 value, they would calculate the 2030 value we started with.
[294] Xie, et. al. “Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards”. The International Council of Clean Transportation, Working Paper 2023-10 (March 2023). Available online: https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf.
[295] The paper that commenters cite (Basma et. al, 2023) refers to costs from the Xie et. al paper.
[296] Sharpe, Ben and Hussein Basma. “A Meta-Study of Purchase Costs for Zero-Emission Trucks”. The International Council on Clean Transportation. February 17, 2022. Available online: https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf.
[297] We are unable to find this source.

Table 1: Sources of Information on ICCT's Fuel Cell Technology Costs

Sharpe & Basma (2022)[298]	Xie et. al (2023)[299]
Ricardo: $750/kW (2025); $525/kW (2030)	= Ricardo Strategic Consulting* (2021)[300]
T&E: $371/kW (2025); $186/kW (2030)	
	Interact Analysis* (2022)[301]
FCHJU: $370/kW (2025); $120/kW (2030)	= Roland Berger* (2020)[302,303]
Noll et. al: n/a	= Noll et. al (2021)[304]
NREL: $140/kW (2025); $124/kW (2030)	= Hunter et. al (2021)[305]
ANL: $50/kW (2025); $40-47/kW (2030)	= Burnham et. al (2021)[306]
UC Davis: $150/kW (2030)	= Burke and Sinha (2020)[307]
$200/kW (EPA estimate, 2030)[308]	**$301/kW (ICCT estimate, 2030)**

* Considered primary research by ICCT

[298] Sharpe, Ben and Hussein Basma. "A Meta-Study of Purchase Costs for Zero-Emission Trucks". The International Council on Clean Transportation. February 17, 2022. Available online: https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf.

[299] Xie, et. al. "Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards". The International Council of Clean Transportation, Working Paper 2023-10 (March 2023). Available online: https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf.

[300] Ricardo. "E-Truck Virtual Teardown Study: Final Report". ICCT. June 11, 2021. Available online: https://theicct.org/wp-content/uploads/2022/01/Final-Report-eTruck-Virtual-Teardown-Public-Version.pdf.

[301] Interact Analysis. (2022). Electrified Truck and Bus Powertrain Components (Americas & EMEA). A detailed quantitative and qualitative analysis of trends & challenges for components in electrified vehicles.

[302] Roland Berger. "Study summary. Fuel Cells Hydrogen Trucks: Heavy-Duty's High Performance Green Solution". December 2020. Available online: https://www.rolandberger.com/en/Insights/Publications/Fuel-Cells-Hydrogen-Trucks.html.

[303] Roland Berger. "Study report. Fuel Cells Hydrogen Trucks: Heavy-Duty's High Performance Green Solution". December 2020. Available online: https://www.clean-hydrogen.europa.eu/system/files/2021-03/FCH%2520HDT%2520-%2520Study%2520Report_final_vs.pdf.

[304] Noll, et. al. "Analyzing the competitiveness of low-carbon drive-technologies in road-freight: A total cost of ownership analysis in Europe". Applied Energy, Volume 306, Part B. January 15, 2022. Available online: https://www.sciencedirect.com/science/article/pii/S0306261921013659?via%3Dihub.

[305] Hunter, et. al. "Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks". NREL. September 2021. Available online: https://www.nrel.gov/docs/fy21osti/71796.pdf.

[306] Burnham, et. al. "Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains". ANL. April 2021. Available online: https://publications.anl.gov/anlpubs/2021/05/167399.pdf.

[307] Burke, Andrew and Anish Kumar Sinha. "Technology, Sustainability, and Marketing of Battery Electric and Hydrogen Fuel Cell Medium-Duty and Heavy-Duty Trucks and Buses in 2020-2040". UC Davis. March 2020. Available online: https://escholarship.org/uc/item/7s25d8bc.

[308] In the NPRM, we used the average values from 2030 and then applied our learning rates backwards to get a MY 2027 value. Then we applied an adjustment factor to get from 2019$ to 2021$ and applied the learning curves shown in DRIA 3.2.1 to calculate MY 2028 to 2032 values.

In Xie et. al, ICCT shows a range of costs used to calculate their estimates and lists minimum and maximum values from the literature. The volumes associated with the costs included in their assessment are not clear. For example, the high costs that they cite in 2020, which the sources indicate were identified in consultation with experts, appear to correspond with very low volumes without any economies of scale; projected costs decline as volume grows but the associated volumes are not clear. According to Ballard, a fuel cell developer, PEM stack and fuel cell balance of plant cost reductions of about 60 to 65 percent are possible even at a relatively small annual production volume of 10,000 trucks per year due to a low dependency on commodities compared to batteries.[309,310]

Both the Ricardo study and Burke and Sinha considered an analysis conducted by Strategic Analysis that was used to develop the DOE Class 8 technical targets for long-haul FCEV trucks.[311,312,313] The Hunter and Burnham analyses were conducted by DOE labs. DOE's work generally speaks about costs in terms of kWnet, or net system power. (According to James et. al, they design fuel cells for a net system power.[314]) DOE's targets estimated the heavy-duty fuel cell system cost to be $190 per kW in 2019 (2016$) based on a low manufacturing volume of 1000 units per year. DOE assumes 100,000 production units per year for their interim (2030) Class 8 target of $80 per kW and ultimate target of $60 per kW.[315]

During the DOE Hydrogen and Fuel Cell Technology Office's Annual Merit Review in 2023, DOE shared durability-adjusted modeled costs for a 275 kWnet fuel cell (2022). At 1,000 units per year, the cost of $302 per kWnet appears to be higher than the previous estimate of $190/kW, but it is still in line with future targets when considering volume projections. They noted that the cost at 50,000 systems per year of $196 per kWnet in 2021 could drop to a new interim target of $140 per kWnet by 2025 to meet the $80 per kW target for 100,000 units by 2030.[316]

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[309] Pocard, Nicolas. "Blog: Fuel Cell Price Drop 70-80% as Production Volume Scales". Ballard. February 11, 2022. Available online: https://blog.ballard.com/fuel-cell-price-drop.

[310] Hydrogen Council. "Path to hydrogen competitiveness: A cost perspective". January 20, 2020. Available online: https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf.

[311] James, et. al. "Mass Production Cost Estimation of Direct H2 PEM Fuel Cell Systems for Transportation Applications: 2018 Update". Strategic Analysis. December 2018. Available online: https://www.energy.gov/eere/fuelcells/articles/mass-production-cost-estimation-direct-h2-pem-fuel-cell-systems-7.

[312] The Ricardo study relied instead on fuel cell costs $1000-1500 per kW from a 2018 Hydrail Feasibility Study to reflect current market status by 2020. The Hydrail study acknowledged that costs (supplied by Ballard) are likely to trend downward as the production of PEM fuel cells expands to support transportation.

[313] Prepared for Metrolinx. "Regional Express Rail Program, Hydrail Feasibility Study Report". Revision B, February 2, 2018. Available online: https://assets.metrolinx.com/image/upload/Documents/Metrolinx/CPG-PGM-RPT-245_HydrailFeasibilityReport_R1.pdf.

[314] Net system power is the gross stack power minus balance of plant losses.

[315] Marcinkoski, Jason, et. al. "Hydrogen Class 8 Long Haul Truck Targets". U.S. Department of Energy, Program Record 19006. October 31, 2019. Available online: https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/19006_hydrogen_class8_long_haul_truck_targets.pdf?Status=Master.

[316] Papageorgopoulos, Dr. Dimitrios. "Fuel Cell Technologies Overview". U.S. Department of Energy. June 6, 2023. Available online: https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/review23/fc000_papageorgopoulos_2023_o.pdf.

Due to the wide range of projected costs in the literature, EPA contracted with FEV[317] to independently evaluate direct manufacturing costs of heavy-duty vehicles with alternative powertrain technologies, and EPA conducted an external peer review of the final FEV report.[318] In the report, FEV estimated costs associated with a Class 8 FCEV-dominated long-haul tractor with graphite fuel cell stacks, which are more durable than stainless steel stacks typically used in light-duty vehicle applications. FEV leveraged a benchmark study of a commercial vehicle fuel cell stack from a supplier that serves the Class 8 market. They also built prototype vehicles in-house and relied on existing expertise to validate their sizing of tanks and stacks.[319] When considering a range of costs based on lower production volumes from the literature, the FEV 2027 costs (in 2022$) came in on the lower end of projections. Table 2 includes FEV cost estimates for the fuel cell system, based on cost of both the stack and the BOP. They are in terms of kWgross (or gross system power):

Table 2 FEV Fuel Cell System Costs[320]

# Units	10,000	5,000	1,000
FC System	$89/kW	$114/kW	$147/kW

For the final rule, as described in RIA Chapter 2.5.2.1, we established MY 2032 fuel cell system DMCs using cost projections from FEV and ICCT.[321] We weighted FEV's work twice as much as ICCT's because it was primary research and because some of the values in ICCT's analysis were not transparent. We note that this method of weighting primary research more heavily than secondary research is generally appropriate for assessing predictive studies of this nature; indeed, it is consistent with what ICCT itself did. For FEV's work, we selected costs that align with the HD FCEV production volume that we project in our modeled potential compliance pathway's technology packages developed for this final rule, which is roughly 10,000 units per year in MY 2032, for a DMC of $89 per kW. (As noted above, Ballard points out that economies of scale are possible even at small production volumes of about 10,000 trucks.) For ICCT's work, we used the 2030 value of $301 per kW for MY 2032, since 2030 was the latest year of values referenced by ICCT from literature. Our weighted average yielded a MY 2032 fuel cell system DMC of $160 per kW, shown in Table 3. In order to project DMCs for earlier MYs, we used our learning rates shown in RIA Chapter 3.2.1. This yielded the MYs 2030 and 2031 DMCs shown in Table 3.

[317] FEV Consulting. "Heavy Duty Commercial Vehicles Class 4 to 8: Technology and Cost Evaluation for Electrified Powertrains—Final Report". Prepared for EPA. March 2024.
[318] FEV Consulting. "Heavy Duty Commercial Vehicles Class 4 to 8: Technology and Cost Evaluation for Electrified Powertrains—Final Report". Prepared for EPA. March 2024.
[319] ICF. "Peer Review of HD Vehicles, Industry Characterization, Technology Assessment and Costing Report". September 15, 2023.
[320] Daniels, Jessica and Alex Wang. Memorandum to docket EPA-HQ-OAR-2022-0985. FEV Component Cost Estimates. March 2024.
[321] Since the ICCT estimates do not indicate if the costs are in kWgross or in kWnet power, we treated them like the FEV values, or as if they were kWgross costs. This assumption is conservative because, if the costs are in kWnet, they would need to be adjusted down before combining them with FEV values.

Table 3 Fuel Cell System Direct Manufacturing Costs (2022$)

Year	MY 2030	MY 2031	MY 2032
FC System	$170/kW	$165/kW	$160/kW

See Section 12.3 of the RTC for comments and responses on learning curves.

We agree with DTNA's comment that FCEV component technology is still being adapted for the HD market, and we recognize their work with DOE through SuperTruck 3[322] and the efforts of DOE's Million Mile Fuel Cell Truck partnership to meet HD FCEV targets,[323] as described in RIA Chapter 1.7.6. In RIA Chapter 1.7.5, we also note that FCEV technology is being developed and demonstrated now while fuel cell and HD FCEV production is gearing up, and we expect that this final rule will provide greater certainty to the market to support timely supply of technologies. Our overall assessment is that early market HD FCEV production volumes to support the updated FCEV adoption levels in the modeled potential compliance pathway are possible in the MY 2030 to MY 2032 timeframe.

Onboard Hydrogen Fuel Tank Costs:

In the NPRM, similar to our approach for fuel cell costs, we relied on an average of costs from an ICCT meta-study that found a wide variation in onboard hydrogen storage tank costs in the literature (Sharpe and Basma et. al, 2022). And similar to the response to our fuel cell costs, commenters referred to ICCT's revised meta-study for better estimates.[324]

As mentioned above, ICCT published a revised meta-study with adjusted estimates based on average inflation between 2020 and 2022 (Xie et. al, 2023).[325,326] For the onboard hydrogen storage tank costs, they added one source (Interact Analysis[327]) to their assessment, and they weighted primary research (Ricardo and Interact Analysis) three times as high as secondary research to develop a cost curve. All referenced sources appear to be for usable hydrogen in Type IV 700 bar gaseous tanks made of carbon fiber.

Table 4 Sources of Information on ICCT's Onboard Hydrogen Storage Tank Technology Costs[328]

Sharpe & Basma (2022)	Xie et. al (2023)
Ricardo: $1289/kg (2025); $900/kg (2030)	= Ricardo Strategic Consulting* (2021)
T&E: $960/kg (2025); $880/kg (2030)	
	Interact Analysis* (2022)

[322] HDT Truckinginfo. "Daimler Working With Oregon State on SuperTruck 3 FCEV Project". January 17, 2023. Available online: https://www.truckinginfo.com/10190506/daimler-working-with-oregon-state-on-supertruck-3-fcev-project.
[323] U.S. Department of Energy. Million Mile Fuel Cell Truck. Available online: https://millionmilefuelcelltruck.org/.
[324] Xie, et. al. "Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards". The International Council of Clean Transportation, Working Paper 2023-10 (March 2023). Available online: https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf.
[325] Xie, et. al. "Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards". The International Council of Clean Transportation, Working Paper 2023-10 (March 2023). Available online: https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf.
[326] The paper that commenters cite (Basma et. al, 2023) refers to costs from the Xie et. al paper.
[327] We were unable to find this source.
[328] For citations, see footnotes for Table 1.

NREL: $533/kg (2025); $480/kg (2030)	= Hunter et. al (2021)
UC Davis: $375/kg (2025); $250/kg (2030)	= Burke and Sinha (2020)
$660/kg (EPA estimate, 2030)[329]	**$844/kg (ICCT estimate, 2030)**

* Considered primary research by ICCT

In Xie et. al, ICCT shows a range of costs used to calculate their estimates and lists minimum and maximum values from the literature. Like fuel cell costs, onboard gaseous hydrogen tank costs are dependent on manufacturing volume. The volumes associated with the costs included in ICCT's assessment are not clear. For example, the Ricardo analysis appears to consider volumes that range from 1,000 to 30,000 dual tank configuration units per year but the scaling assumed based on this data is not clear. According to the Hydrogen Council, tanks can achieve costs reductions of roughly 50 percent with an annual production of about 10,000 FCEVs.[330]

We contracted FEV[331] to independently evaluate onboard hydrogen storage tanks costs for 2027 (2022$) based on manufacturing volume, and EPA conducted an external peer review of the final FEV report.[332] FEV evaluated onboard hydrogen storage tanks costs for 2027 (2022$) based on manufacturing volume and estimated the following:

Table 5 FEV Costs for Onboard Hydrogen Storage Tanks[333]

# Units	10,000	5,000	1000
Onboard H2 Tank	$504/kg	$562/kg	$722/kg

These costs account for total hydrogen stored in a tank if only 80 percent of the tank's hydrogen is useable.[334]

Using the same approach taken for fuel cell system costs, as described in RIA Chapter 2.5.2.2, we established MY 2032 onboard storage tank DMCs using cost projections from FEV and ICCT. We weighted FEV's work twice as much as ICCT's because it was primary research and because some of the values in ICCT's analysis were not transparent. We note that this method of weighting primary research more heavily than secondary research is generally appropriate for assessing predictive studies of this nature; indeed, it is consistent with what ICCT itself did. For FEV's work, we selected costs for roughly 10,000 units per year in MY 2032, for a DMC of $504 per kg. For ICCT's work, we used the 2030 value of $844 per kW for MY 2032, since 2030

329 In the NPRM, we used the average values from 2030 and then applied our learning rates backwards to get a MY 2027 value. Then we applied an adjustment factor to get from 2019$ to 2021$ and applied the learning curves shown in DRIA 3.2.1 to calculate MY 2028 to 2032 values.

330 Hydrogen Council. "Path to hydrogen competitiveness: A cost perspective". January 20, 2020. Available online: https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf.

331 FEV Consulting. "Heavy Duty Commercial Vehicles Class 4 to 8: Technology and Cost Evaluation for Electrified Powertrains—Final Report". Prepared for EPA. March 2024.

332 ICF. "Peer Review of HD Vehicles, Industry Characterization, Technology Assessment and Costing Report". September 15, 2023

333 Daniels, Jessica and Alex Wang. Memorandum to docket EPA-HQ-OAR-2022-0985. FEV Component Cost Estimates. March 2024.

334 HD TRUCS assumes that 95 percent of the hydrogen in a tank can be accessed, or is useable, plus there is a 10 percent buffer added to the tank to avoid complete depletion of hydrogen. We have seen ranges of between 80 and 90 percent in the literature and did not receive comment on this input.

was the latest year of values referenced by ICCT from literature. Our weighted average yielded a MY 2032 fuel cell system DMC of $617 per kW. In order to project DMCs for earlier MYs, we used our learning rates shown in shown in RIA Chapter 3.2.1. This yielded the MYs 2030 and 2031 DMCs shown in Table 6.

Table 6 Onboard Hydrogen Storage Tank Direct Manufacturing Costs (2022$)

Year	MY 2030	MY 2031	MY 2032
Onboard H2 Tank	$659/kg	$636/kg	$617/kg

See Section 12.3 of the RTC for comments and responses on learning curves.

3.5 Intentionally Left Blank

3.6 Intentionally Left Blank

3.7 Maintenance and Repair

Comments by Organizations

Organization: Advanced Energy United

A large percentage of emissions reductions from the transportation sector will be accomplished by replacing gas- and diesel-powered buses, trucks and vans with EV models. EVs are not only much more energy efficient than gas-powered cars but are also less expensive to fuel and maintain over their lifetimes. Thus, the EPA's proposed rule presents an opportunity to decarbonize the largest source of emissions in the American economy while scaling up an emerging domestic market. Electrified transportation reduces our reliance on fossil fuels, strengthens America's energy independence, and produces economic benefits across the value chain of the automotive industry. [EPA-HQ-OAR-2022-0985-1652-A2, pp. 1 - 2]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

First, EPA concludes that electric vehicles come with substantial savings in maintenance and repair. See Draft RIA at 185. That conclusion is based on a 2022 study finding that the maintenance and repair costs for battery-electric vehicles will be 29 percent lower than those for internal-combustion-engine vehicles. Id. (citing Guihua Wang et al., Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks, Univ. of Cal., Davis, at 10 (Feb. 2022)). But the authors of that study emphasize the uncertainty underlying that finding: To sum up, currently there are very limited data on [maintenance and repair] costs for battery electric and fuel cell trucks. Even for the transit bus segment which has the most experience in advanced HD technology applications, there is no consensus on the maintenance cost comparison among diesel, battery, and fuel cell buses. [EPA-HQ-OAR-2022-0985-1660-A1, p. 27]

Wang et al., Estimating Maintenance and Repair Costs at 10 (emphases added). Although the study notes a consensus in existing research that maintenance and repair costs for electric vehicles, in the future, will be smaller than for conventional vehicles generally, see id., the degree of difference is critical to EPA's estimate of future sales: If the maintenance and repair costs for electric and conventional vehicles are not as far apart as EPA assumes, the payback period could be longer—and, in turn, the adoption rates of electric vehicles could be much lower. According to EPA's own analysis, the adoption rate could drop by 10 percent if the payback period is off by even one month. See Draft RIA at 232–33. The existing data, however, are inadequate to make reliable calculations of the degree of difference. [EPA-HQ-OAR-2022-0985-1660-A1, p. 28]

Second, EPA estimates operational savings without considering "midlife overhaul costs," which include "the cost resulting from an engine rebuild for a conventional diesel vehicle, a battery replacement for a battery electric vehicle, or a fuel cell stack refurbishment for a hydrogen fuel cell vehicle." Wang et al., Estimating Maintenance and Repair Costs at 10–11. EPA disregarded these costs on the ground that its "payback analysis typically covers a shorter period of time than the expected life of these components." Draft RIA at 185. That reasoning is illogical. Assuming (as EPA does) that net costs drive purchasing decisions, commercial-fleet owners are unlikely to buy an electric model if they anticipate that such vehicles will require costly midlife repairs that would erase any initial savings. Some evidence suggests that this will occur. For example, one report (performed by the California Air Resources Board) cited in the Wang study noted above posits that electric trucks will require battery replacement every 300,000 to 500,000 miles—much sooner than a comparable conventional vehicle is likely to require an engine rebuild. See Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document, Cal. Air Res. Bd., at 26 (Sept. 9, 2021) (indicating that a Class 8 heavy-duty diesel truck is likely to require an engine rebuild after 800,000 miles). The cost of major midlife repairs for electric vehicles also may be substantially greater. Compare, e.g., Certified Diesel Sols., When to Overhaul a Diesel Engine, https://tinyurl.com/2dch6xv3 (estimating cost of a diesel-engine rebuild between $20,000 and $40,000), with EPA, Heavy- Duty Technology Resources Use Case Scenario, at 2_BEV Tech (Apr. 10, 2023), https://www.epa.gov/system/files/other-files/2023-04/hd-tech-trucs-tool-2023-04.xlsm (Columns AJ & AK) (EPA's modeling suggesting that the cost of manufacturing batteries may be several multiples higher). The Senior Vice President of the American Transportation Research Institute cautions that heavy duty-vehicle operators are "going to be switching out the batteries on a Class 8 truck every four to seven years" and "pay between $85,000 and $120,000 for a replacement set." Cristina Commendatore, Report Pinpoints Top Challenges for Widespread Battery-Electric Vehicle Adoption, FleetOwner (Dec. 7, 2022), https://tinyurl.com/243euzxr. Thus, owners of electric heavy-duty vehicles could find themselves saddled with new and substantial midlife overhaul costs that cut into their operational savings. EPA should assess—not ignore—this issue before calculating the payback period. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 28 - 29]

Fourth, EPA explains that the operating costs for a battery-electric vehicle include "insurance" and "labor." Draft RIA at 182. Nevertheless, the agency does not evaluate either of these costs because it assumes that they will not "differ significantly" for owners of electric and internal-combustion-engine vehicles. Id. Available evidence suggests otherwise. According to a recent study, fleets considering electric-vehicles "are facing higher insurance costs," which "may be due to new and unfamiliar technology, overall higher purchase costs, and higher costs of repair after accidents." Medium- and Heavy-Duty Vehicle Electrification at 10. And although the labor costs associated with electric and internal- combustion-engine vehicles may eventually even out, owners will incur additional costs when they first begin incorporating electric vehicles into their fleets. Managers and maintenance staff will need to be retrained in the new technology or replaced by workers who are already up to speed. Id. at 11. These costs should likewise be factored into the agency's calculation. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 29 - 30]

Second, EPA concluded that the costs of the proposed rule would be offset by $250 billion in "operational savings" that heavy-duty operators would experience by shifting to electric vehicles. 88 Fed. Reg. at 26,082. This conclusion is doubly erroneous. As an initial matter, as explained above, the bulk of these purported savings come from $200 billion saved in repair-and-maintenance costs—an enormous sum that EPA bases on a single study that itself undercuts EPA's calculation. And the remainder of the operational savings that EPA estimates, including from pre-tax fuel savings and diesel exhaust fluid savings, are also unreliable for the reasons already stated. [EPA-HQ-OAR-2022-0985-1660-A1, p. 64]

More broadly, EPA's conclusion that these operational savings exist defies common sense. As EPA acknowledges, if abandoning internal-combustion-engine vehicles in favor of electric vehicles could actually be expected to result in huge operational savings, rational users of heavy-duty vehicles would likely already be switching. See 88 Fed. Reg. at 26,071; Draft RIA at 417 (noting that a "normally functioning competitive market" would "lead buyers to purchase [electric vehicles] willingly"). The fact that they are not doing so is a strong indication that EPA's asserted operational savings do not in reality outweigh the costs of switching to electric vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, p. 64]

Organization: American Highway Users Alliance

Repair and servicing of the EV was reported as costly because 'danger' in servicing the EV requires two technicians rather than one. [EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

Organization: American Trucking Associations (ATA)

Fleet maintenance of a ZEV needs to be better understood than it is currently. As a non-capital expense, estimating any expected savings over its lifespan is especially difficult. The previously mentioned fleet manager said their fleet relies on the OEM to repair their ZEVs but anticipates transitioning to in-house maintenance after the warranty expires. This fleet manager was not alone in his approach. All the fleets that we surveyed that had ZEVs in their fleets are currently contracting out the maintenance for the vehicles. Fleet operators need to gain knowledge on accurately calculating and assessing repair turnaround times, workforce training requirements, and occupational risks of maintaining and servicing high-voltage batteries (ranging from 600 to 800 volts) but see a benefit to doing the work in-house rather than sending the vehicle away. The same fleet manager highlighted that for the TCO to be justifiable, the acquisition costs of their box trucks would need to decrease by $100,000. Maintenance costs are unknown once battery warranties expire. Fleets told us these costs can have outsized impacts on their TCO. For example, a large national carrier cautioned that one outside-of-warranty battery repair or replacement job of $30,000 to $100,000 could be detrimental to an entire TCO structure. The calculation on BEV maintenance costs, they say, should only be assumed at a certain percentage if real-world average savings over the life of a vehicle can be proven. [EPA-HQ-OAR-2022-0985-1535-A1, p. 11]

Technicians' new skills to service

As EPA has noted, performing standard maintenance on BEVs leads to new or increased risk compared to ICE vehicles and requires corresponding safety training due to the following:29

- the presence of high voltage components and cabling capable of delivering a fatal electric shock;
- the storage of electrical energy with the potential to cause explosion or fire;
- components that may retain a dangerous voltage even when a vehicle is switched off;
- electric motors or the vehicle itself that may move unexpectedly due to magnetic forces within the motors;
- manual handling risks associated with battery replacement;
- the potential for the release of explosive gases and harmful liquids if batteries are damaged or incorrectly modified;
- the possibility of people being unaware of vehicles being in motion because when they are electrically driven, they are silent in operation; and the potential for the electrical systems on the vehicle to affect medical devices such as pacemakers. [EPA-HQ-OAR-2022-0985-1535-A1, p. 20]

29 U.S. Environmental Protection Agency, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3: Draft Regulatory Impact Analysis, pgs. 38-39, EPA-HQ-OAR-2022-0985, April 27, 2023.

EPA further notes that hydrogen-related fuel cell vehicles carry additional risks that can be mitigated through:30

- proper no/low leak designs for infrastructure, hydrogen fill equipment, vehicle connectors, and vehicle storage and supply;
- ambient hydrogen concentration monitoring and alarm;
- hydrogen pressure monitoring in the vehicle and infrastructure to indicate leaks;
- proper ventilation in and around hydrogen fueling equipment and fuel cell vehicles;
- vehicle controls to ensure the vehicle cannot be driven while fueling equipment is attached; and
- vehicle controls that isolate hydrogen storage in the case of an accident. [EPA-HQ-OAR-2022-0985-1535-A1, p. 20-21]

30 Ibid, pg. 76

Fleets will need to expand existing technician safety training and education to manage these potential risks. Maintenance facilities upgrades will also be needed to accommodate BEV and FCEV vehicles. For example, because hydrogen is lighter than air, shop ventilation and monitoring will be needed for fleets servicing FCEVs. For BEVs, isolating high-voltage service bays has been mentioned as a potential maintenance strategy. Fleets are in the initial stages of understanding how to adapt existing maintenance shops to accommodate BEVs and/or FCEVs. As many fleets conduct in-house maintenance on their vehicles, EPA should further investigate the proposed rule's impact on maintenance practices and facilities. [EPA-HQ-OAR-2022-0985-1535-A1, p. 21]

Organization: Arizona State Legislature

EPA believes 'lower maintenance and repair costs for [zero-emission vehicle] technologies as compared to [internal combustion engine] technologies, etc.' help justify the rule. 88 Fed. Reg. 25926, 25936 (Apr. 27, 2023). EPA acknowledges that '[d]ata on real-world [maintenance and repair] costs for [heavy-duty zero-emission vehicles] is limited due to limited [heavy-duty zero-emission vehicle] technology adoption today.' Id. at 25986. EPA speculates that fewer moving parts, not requiring fluids or exhaust filters, and regenerative braking systems will lead to lower maintenance and repair costs. Id. at 25986-987. Based on this speculation, EPA calculates the proposed rule will save a staggering $24 billion in repair and maintenance costs. Id. at 26,082. [EPA-HQ-OAR-2022-0985-1621-A1, p. 23]

EPA's assumptions are not supported by actual data. An analysis of the service and repair visits for about 19 million vehicles between the 2016 and 2021 model years found that electric vehicles cost more to repair than gas-powered vehicles.24 The study found that electric vehicles were 2.3 times more expensive than gas-powered vehicles to service in the first three months of ownership, and 1.6 times more expensive at the twelve-month mark.25 The study blamed the increased time that technicians spent as well as the fewer number of technicians that could work on electric vehicles charging a higher hourly rate.26 [EPA-HQ-OAR-2022-0985-1621-A1, p. 23]

24 Sean Tucker, Study: EVs Cost More to Repair, Less to Maintain, KELLEY BLUE BOOK, Aug. 17, 2021, available at https://www.kbb.com/car-news/study-evs-cost-more-to-repair-less-to-maintain/.

25 Id.

26 Id.

Organization: BorgWarner Inc.

We propose that EPA revisit how the lack of qualified technicians could impact the total cost of ownership for BEVs, and the maintenance and service needed to ensure reliable, consistent charging station operability as this could significantly impact HD fleet owners purchasing decisions. [EPA-HQ-OAR-2022-0985-1578-A1, p. 7]

Organization: California Air Resources Board (CARB)

5. Maintenance and Repair Operating Costs

Affected pages: 25986-25987

CARB staff concurs with U.S. EPA's methodology regarding maintenance and repair costs. Many recent announcements by manufacturers indicate that key components of BEVs and FCEVs, including batteries, will be able to last for ten years or longer.218,219 This supports U.S. EPA's assumptions that no midlife battery replacement or fuel cell refurbishment is necessary for a 10-year analysis. [EPA-HQ-OAR-2022-0985-1591-A1, p.64]

218 IAA Transportation 2022: Daimler Truck unveils battery-electric eActros LongHaul truck and expands e-mobility portfolio, September 18, 2022. https://media.daimlertruck.com/marsMediaSite/en/instance/ko/IAA-Transportation-1182022-Daimler-Truck-unveils-battery-electric-eActros-LongHaul-truck-and-expands-e-mobilityportfolio.xhtml?oid=52032525

219 Scania and Northvolt's new EV battery can power a truck for 1.5M km, April 21, 2023. https://electrek.co/2023/04/21/scania-northvolt-new-ev-battery-truck/

Organization: Clean Fuels Development Coalition et al.

E. The proposal overestimates maintenance savings.

Without any justification, EPA assumes that "the maintenance and repair savings are substantial due again to electrification of the HD fleet, with HD BEVs and FCEVs projected to require 71 percent and 75 percent, respectively, of the maintenance and repair costs required of HD vehicles equipped with internal combustion engines." 88 Fed. Reg. 26,080. The evidence points to the opposite conclusion: that Heavy Duty EVs are more costly to maintain than conventional alternatives. In testimony before the EPA, a representative from American Truck Dealers explained that owing to the immense danger of working on heavy-duty electric vehicles, a second repair technician is required to supervise work and to be at the ready to rescue—literally with a hook—the first technician if something goes wrong. See The American Truck Dealers Division, Dkt. No. EPA-HQ-OAR-2022-0985-1445 (May 3, 2023). [EPA-HQ-OAR-2022-0985-1585-A1, p. 35]

Organization: Daimler Trucks North America LLC (DTNA)

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #43: We followed this approach and applied a maintenance and repair cost scaling factor of 0.71 for BEVs and 0.75 for FCEVs to the maintenance and repair costs of diesel-fueled ICE vehicles. The scaling factors are based on an analysis from Wang et al. that estimates a future BEV heavy-duty truck would have a 29 percent reduction, and a future FCEV heavy-duty vehicle would have a 25 percent reduction, compared to a diesel-powered heavy-duty vehicle.488,489 We welcome comment on our approach and these projections.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 165]

Organization: Lion Electric, Co. USA

The absence of complex engine components, such as pistons, valves, and camshafts in a Lion vehicle reduces the likelihood of mechanical failures and may result in extended vehicle lifespan. This inherent simplicity can contribute to longer service life, reduced maintenance costs and fewer scheduled service visits compared to vehicles with internal combustion engines (ICEs). [EPA-HQ-OAR-2022-0985-1506-A1, p. 2]

Lion’s customers and partners say the savings between electric vehicles and diesel-powered ones is very clear: 80% in energy cost reduction and 60% maintenance cost decrease when organizations transition to all-electric MHDVs. (Source: Lion fact sheet). In fact, a school district operating an electric school bus can expect to see over $100,000 in lifetime fuel and maintenance savings, compared to an equivalent diesel bus. All About Total Cost of Ownership (TCO) for Electric School Buses | Electric School Bus Initiative [EPA-HQ-OAR-2022-0985-1506-A1, p. 2]

Organization: National Association of Chemical Distributors (NACD)

The largest savings calculated by the EPA are reductions in maintenance costs. Again, current demand for reduced emissions vehicle maintenance (particularly for trucks) is nearly non-existent, and the EPA uses data from 2019, when even less information was available on the repair costs for low emissions vehicles. One thing is for certain, if trucking firms were forced to quickly move toward these technologies, there would not be a sufficient supply of mechanics or vehicle parts to maintain all of these vehicles, even if they required less service than diesel powered trucks. This would certainly increase the cost of maintenance.6 The EPA relies on a single source for its estimate that the cost of maintenance for the required vehicles would be 71 percent of that of diesel trucks.7 Even this source provides a very large range for differential costs, with some estimates being as low as a 10 percent difference (not the 29 percent difference used in the RIA). Assuming that the cost differential for maintenance and repair is at this lower end would lead to a savings of $13.944 billion, or $1,066 per truck. This would amount to a savings of $1.2 billion for the chemical distribution industry. [EPA-HQ-OAR-2022-0985-1564-A2, pp. 2 - 3]

6 In addition, according to the RIA: Data on real-world maintenance and repair costs for heavy-duty BEVs is limited due to limited heavy-duty BEV technology adoption today. We expect the overall maintenance costs to be lower for heavy-duty BEVs than a comparable ICE vehicle for several reasons. First, an electric powertrain has fewer moving parts that accrue wear or need regular adjustments. Second, BEVs do not require fluids such as engine oil or DEF, nor do they require exhaust filters to reduce particulate matter or other pollutants. Third, the per-mile rate of brake wear is expected to be lower for BEVs due to regenerative braking systems. Several literature sources propose applying a scaling factor to diesel vehicle maintenance costs to estimate BEV maintenance costs. We followed this approach and applied a repair cost scaling factor of 0.71 to the maintenance and repair costs for diesel-fueled ICE vehicles that are shown in Table 2-29. The 0.71 scaling factor is based on an analysis from Wang et al. 2022, that estimates a future BEV HD vehicle would have a 29 percent reduction compared to a diesel-powered HD vehicle. In our payback analysis in HD TRUCS, we did not account for potential diesel engine rebuild costs for ICE vehicles, potential replacement battery costs for BEVs, or potential replacement fuel cell stack costs for FCEVs because our payback analysis typically covers a shorter period of time than the expected life of these components. Typical battery warranties being offered by HD BEV manufacturers range between 8 and 15 years today.97 A BEV battery replacement may be practically necessary over the life of a vehicle if the battery deteriorates to a point where the vehicle range no longer meets the vehicle’s operational needs.

7 The citation in the RIA refers back to a broken link. The paper is Wang, G. et. al., White Paper: The Current and Future Performance and Costs of Battery Electric Trucks: A Review of Key Studies and a Detailed Comparison of their Cost Modeling Scope and Coverage, National Center for Sustainable Transportation, June 7, 2022. It is a white paper, not a study published in any sort of journal, meaning that it has not been peer reviewed. The research was funded by the Federal Government.

Moreover, forcing more zero emission vehicles (ZEVs) on the road, as this proposal aims to do, may create backlogs in maintenance for these vehicles. As the National Automobile Dealers Association noted in their testimony before the EPA, ZEVs require more specialized labor that is less available for their maintenance compared to traditional diesel trucks.3 This adds additional strain on the limited technicians available to service heavy-duty trucks and will create backlogs in necessary services, again removing trucking capacity from the supply chain. [EPA-HQ-OAR-2022-0985-1564-A1, p. 3]

3 National Automobile Dealers Association, “Comment submitted by National Automobile Dealers Association, American Truck Dealers Division,” nada.org, NADA, https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0985-1445

Organization: National Automobile Dealers Association (NADA)

I. ATD dealers support continuous improvements in environmental and fuel economy performance of the fleet.

Without a doubt, alternative-fueled HDV sales have grown and will continue to grow. And America’s car and truck dealers are doing their part to embrace this technological revolution and facilitate the introduction of alternative vehicles into the fleet. As evidenced by activities at the 2022 and 2023 NADA/ATD Shows4, and by its work with the U.S. Departments of Transportation and Energy on the deployment of critical public charging facilities, ATD is committed to supporting alternative-fueled vehicles. To this end, NADA/ATD estimates that franchised dealerships are on track to spend billions in EV infrastructure.5 [EPA-HQ-OAR-2022-0985, p 1-2]

4 See Appendix A: “Everything Electric” at NADA/ATD Show 2022-2023.

5 This projection is based on available data from a selection of vehicle manufacturer brands and dealerships. This number reflects data from franchised dealerships that sell new light-, medium-, and/or heavy-duty vehicles.

Dealership investments necessary to sell and service ZEV HDVs vary widely with cost estimates costs ranging from $100,000 to over $1 million per store. These estimates do not necessarily include all the specialized equipment purchases needed to service ZEVs or the additional costs from local utilities for extending new power lines or adding transformers. In many cases, installing electric chargers requires a more comprehensive electric system, including new transformers and power lines. Installations of this magnitude can involve major construction, which is accompanied by permits, supply chain delays, and environmental safety requirements, all barriers that HDV dealers are working to overcome. [EPA-HQ-OAR-2022-0985, p 2]

As the frontline of customer education, HDV dealers are investing in staff training across departments so that prospective ZEV purchasers receive the most accurate, current, and complete information about ZEVs. Some dealers are taking that work to the next step with dedicated ZEV education programs. This includes bringing ZEV HDVs to local auto shows and customer events and even educating first responders on proper battery safety when responding to crashes involving ZEVs. [EPA-HQ-OAR-2022-0985, p 2]

These investments echo ATD’s long-standing support of continuous emission improvements for HDVs. At the same time, ATD has suggested consistently that new emissions mandates must not compromise the affordability, reliability, fuel economy, and/or serviceability of HDVs. This position reflects the fact that prospective customers will avoid purchasing or leasing new HDVs that cost too much, offer performance compromises, or pose risks of unacceptable downtime. [EPA-HQ-OAR-2022-0985, p 2]

This rulemaking occurs at a time when HDV dealerships and their customers are just beginning to evaluate alternative HDV technology options and to understand the infrastructure that is necessary to support those options. [EPA-HQ-OAR-2022-0985, p 2]

Organization: Tesla, Inc. (Tesla)

Still other recent assessments of the total cost of ownership indicate that EPA stands on firm ground to strengthen the stringency in the rule. Indeed, some OEMs predict BEV cost parity in 2025 well ahead of the proposed rule's 2027 implementation date. Further numerous studies have found that heavy-duty BEVs outperform conventional trucks on a total cost of ownership basis.155 Tesla projects that its Semi will have energy costs that are half those of diesel, provide over $200,000 in fuel savings, and have a two-year payback period.156 Another manufacturer has found that BEVs could save fleets up to 80% on energy costs and 60% on repair.157 Yet another found that the benefits of electrifying heavy-duty truck fleets are significant with recent studies showing that operating costs for electric trucks can be between 14 and 52 percent lower and repair costs around 40 percent lower than their combustion-powered counterparts.158 CARB has found that battery-electric vehicles appear cost competitive with the established combustion technologies by 2025 in many use cases.159 Real world demonstrations have also proven this out.160 [EPA-HQ-OAR-2022-0985-1505-A1, p. 21]

155 See e.g., UC Berkley, 2035 Report: Transportation: Plummeting Costs and Dramatic Improvements in Batteries Can Accelerate Our Clean Transportation Future (April 2021) at 15 available at https://www.2035report.com/transportation/transportation-new/wpcontent/uploads/2020/05/2035_Transportation_Report.pdf?hsCtaTracking=544e8e73-752a-40ee-b3a5-90e28d5f2e18%7C81c0077a-d01d-45b9-a338-fcaef78a20e7 (finding BEV heavy-duty trucks already hold a TCO advantage today and, for heavy-duty trucks, an EV advantage of $0.05/mi in 2020 that increases to $0.22/mi in 2030—magnified by the large number of miles traveled by this class of vehicles. In absolute terms, in 2020 this translates to a $42,800 TCO advantage of electric heavy-duty trucks, which increases to $200,000 in 2030. The TCO advantage of EVs continues to grow through 2050).

156 See Tesla, Semi available at https://www.tesla.com/semi

157 Utility Dive, Lion Electric: EVs save transport firms 80% on energy, 60% on repair costs compared to diesel (Mar. 17, 2021) available at https://www.utilitydive.com/news/Lion-Electric-trucking-total-cost-of-ownershipdiesel/596835/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202021-03-17%20Utility%20Dive%20Newsletter%20%5Bissue:33047%5D&utm_term=Utility%20Dive

158 Argonne National Lab, Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains (April 2021) available at https://publications.anl.gov/anlpubs/2021/05/167399.pdf

159 CARB, Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document (Sept 9, 2021) available at https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf See also, Transport & Environment, Why the future of long-haul trucking is battery electric (Feb. 18, 2022) available at https://www.transportenvironment.org/wpcontent/uploads/2022/02/2022_02_battery_electric_trucks_HDV_factsheet.pdf

160 North American Council for Freight Efficiency, Electric Trucks Have Arrived: Documenting A Real-World Electric Trucking Demonstration (Feb. 2, 2022) available at https://nacfe.org/wp-content/uploads/edd/2022/01/RoL-Report-Executive-Summary-FINAL.pdf

Organization: Valero Energy Corporation

EPA also does not acknowledge the ICCT's disclaimer that "very little information is available on the maintenance cost disparity between electric and conventional Class 2b and 3 vehicles."23 Further, per the ICCT, [i]In the United States, there is "little real-world evidence" to confirm the disparity in maintenance costs when comparing HD ZEVs relative to their diesel counterparts."24 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 5 - 6]

23 Mulholland, Eamonn. "Cost of electric commercial vans and pickup trucks in the United States through 2040." January 2022. https://theicct.org/publication/cost-ev-vans-pickups-us-2040-jan22/.

24 Mulholland, Eamonn. "Cost of electric commercial vans and pickup trucks in the United States through 2040." January 2022. https://theicct.org/publication/cost-ev-vans-pickups-us-2040-jan22/.

Organization: Zero Emission Transportation Association (ZETA)

i. Fuel and maintenance costs

EVs have fewer moving parts than their ICE counterparts, which makes them simpler to maintain and reduces the probability of a major malfunction. Reduced maintenance saves both time and money, particularly for fleet managers operating on tight margins. School districts, in particular, tend to lack the economic and labor resources to make repairs to their existing vehicles, thus making EVs a more attractive alternative. [EPA-HQ-OAR-2022-0985-2429-A1, p. 12]

A Class 8 electric truck costs 4.7 cents less per mile to maintain compared to its diesel counterpart and these maintenance savings alone can equate to thousands of dollars over the vehicle's lifetime.48 The EIA expects a 55% growth in total MHDV VMT between 2019 and 2050, largely driven by the rise of e-commerce.49 Due to HDVs' higher VMT and lower fuel economy, they stand to see significant cost savings from increased efficiency and lower dollar-per-mile costs with electrification. [EPA-HQ-OAR-2022-0985-2429-A1, p. 12]

48 "Calculating TCO for EVs: Where to Find the Greatest Long-Term Cost Savings for Medium- and Heavy-Duty Vehicles." Advanced Clean Tech News. (August 26, 2020) www.act-news.com/news/calculating-tco-for-medium-and-heavy-duty-evs/

49 "Annual Energy Outlook 2019," U.S. EIA, (2019) https://www.eia.gov/outlooks/aeo/

EPA Summary and Response:

Summary:

EPA indicated at proposal that HD ZEVs would experience significant maintenance and repair savings relative to their ICE counterparts. This finding was based on the simpler design of ZEVs, notably absence of pistons and valves, and fewer moving parts in general. 88 FR 25986-87. Multiple commenters, such as Lion Electric, a producer of HD BEVs, Advanced Energy United, CARB, EDF (located in Section 2), MFN (located in Sections 2 and 23 of the RTC), RMI (located in Section 3.11 of the RTC), Tesla (citing sources in addition to those cited by EPA), and ZETA agreed that BEVs or ZEVs would have lower maintenance and repair costs.

Other commenters questioned EPA's finding, however. These commenters include the American Free Enterprise Chamber of Commerce (AmFree), Arizona State Legislature, Clean

Fuels Development Coalition, National Association of Chemical Distributors, and Valero. Both American Highway Users and Clean Fuels Development Coalition indicated that it would take two technicians rather than one to service an HD BEV. ATA and NADA said that mechanics will require safety training for ZEV maintenance and repair. Arizona State Legislature (located in Section 5 of the RTC) said that EPA did not estimate the cost or timetable for safety training. NACD noted that even finding a sufficient number of qualified technicians would be an issue, and Borg Warner commented that EPA should look at how the lack of qualified BEV technicians could impact TCO. Other commenters, such as ATA (see also Section 19 of the RTC), NADA (see also Sections 6 and 19 of the RTC), and TRALA (located in Section 19 of the RTC) said that maintenance facility upgrades will be needed in order to service ZEVs.

More basically, several of these commenters challenged the empirical basis for EPA's estimates. In HD TRUCS, ZEV maintenance and repair costs are estimated by first calculating the baseline diesel maintenance and repair costs which are based on equations in the BEAN model which are based on work by Burnham, et al.[335], and then by applying BEV and FCEV scaling factors based on Wang, et al.[336] The Arizona State Legislature noted that EPA was relying on a single source, which itself quoted a large range of potential values. Arizona Legislature noted a multi-year study of light duty electric motor vehicles which showed repair costs averaging 2.3 times that of ICE vehicles due to the longer diagnosis time and lack of qualified technicians. AmFree noted that the paper that EPA used to support the scaling factors for ZEVs (Wang et al., Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks, University of California, Davis, 202) mentions limited data and uncertainty about maintenance cost comparisons. AmFree also notes that the degree of difference between diesel and BEV/FCEV maintenance and repair costs are critical to EPA's estimates of future sales. Other commenters, such as ATA and Valero mentioned concern about general levels of uncertainty.

Several commenters suggested that ZEV insurance rates would be higher due to higher costs for repairs due to workforce development and other factors. These comments are addressed in Chapter 3.8.2 of the RTC.

Several commenters also expressed concern about battery replacement costs or "midlife overhaul costs." These comments are addressed in Section 3.8.3 of the RTC.

DTNA commented that EPA should consider all available data including that which can be provided by manufacturers in confidential settings, and asserted that, given data available today is limited, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data.

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[335] Burnham, Andrew, David Gohlke, Luke Rush, Thomas Stephens, Yan Zhou, Mark A. Delucchi, Alicia Birky, Chad Hunter, Zhenhong Lin, Shiqi Ou, Fei Xie, Camron Proctor, Steven Wiryadinata, Nawei Liu, and Madhur Boloor. "Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains". April 2021. Accessible online: https://publications.anl.gov/anlpubs/2021/05/167399.pdf.

[336]See Table 6 on page 17. Wang, et al." Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks." February 2022. Available at: https://escholarship.org/content/qt36c08395/qt36c08395_noSplash_589098e470b036b3010eae00f3b7b618.pdf?t=r6zwjb.

Response:

Commenters did not dispute the fact that ZEV vehicles have fewer moving parts, which is typically indicative of fewer serviceable parts and fewer potential failures. Multiple cost assessment papers and the California Advanced Clean Fleets Regulation, Appendix G: Total Cost of Ownership,[337] use cost reduction factors for ZEV maintenance compared to internal combustion engine maintenance, and multiple commenters agreed with the assessment that ZEV maintenance and repair costs will be less expensive than those for internal combustion engines.

However, EPA agrees with commenters that there is some uncertainty in predicting cost reductions for maintenance and repair of ZEV heavy-duty vehicles before they are produced and operated at scale, since the available information about the costs for maintaining and repairing heavy-duty ZEV vehicles generally comes from pilot programs. A further uncertainty involves a potential need to retrain technicians to work on ZEVs. To address this concern EPA has phased in the ZEV cost reduction factors as discussed below.

The NPRM version of HD TRUCS calculated BEV maintenance and repair by applying a constant scaling factor of 71% to diesel vehicle maintenance and repair estimates for 2027 and beyond and calculated FCEV maintenance and repair by applying a constant scaling factor of 75% to diesel vehicle maintenance and repair estimates for 2030 and beyond. However, EPA agrees with some of the commenters that there may be a transition period during which costs for maintaining and repairing ZEVs will not yet be at their full savings potential due to the need to train more of the workforce specifically for ZEV maintenance and repair. To account for this period, EPA has phased in the ZEV scaling factors for maintenance and repair. As NACD pointed out, the Wang, et al.,[338] paper includes a range of cost reductions, for current and future battery electric and fuel cell trucks; therefore, for the version of HD TRUCS used for the final rule, instead of applying a single scaling factor for every year commencing in 2027 (for BEVs) or 2030 (for FCEVs) as at proposal, EPA is starting with a higher scaling factor and gradually decreasing it (i.e. gradually increasing the projected cost savings) over a 5-year period. The initial higher scaling factor comes from Wang et al. and reflects estimates for 2022. (See RIA Chapter 2.4.4.1 for more details on the phase-ins of the scaling factors for BEV and FCEV vehicles). EPA's approach of applying this factor commencing in 2027 or 2030 is consequently conservative given that technicians in those later years will be more experienced than they were in 2022.

The criticism that EPA used a single source to derive the scaling factors does not paint a full picture of EPA's selection of these values. EPA examined multiple papers with proposed scaling factors, see DRIA at 265 and sources cited in notes 93, 94 and 95, and selected the values in the Wang et al. paper because its methodology was supported by a ground up assessment of the

[337] See page G-20. California Advanced Clean Fleets Regulation, Appendix G: Total Cost of Ownership. Available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appg.pdf.

[338] See Table 6 on page 17. Wang, et al." Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks." February 2022. Available at: https://escholarship.org/content/qt36c08395/qt36c08395_noSplash_589098e470b036b3010eae00f3b7b618.pdf?t=r6zwjb.

differences in BEV, FCEV and diesel components, and the cost reduction (scaling factor) values in the paper fell within the range of other suggested scaling factor values in the literature.[339]

Regarding the maintenance and repair cost savings estimates themselves (as opposed to costs relating to service technicians), as noted in the comment summary above, the diesel M&R costs in HD TRUCS were developed from two equations in the BEAN model that were based on curves in the Burnham, et.al.[340] paper: one equation for semi-tractors, which EPA used for long haul tractors, and another equation based on box trucks, which EPA used for all vocational vehicles and for short-haul tractors. The box truck equation has a higher slope and intercept than the semi-tractor which means that the HD TRUCS vocational vehicle and short haul tractor diesel maintenance costs per mile (and therefore also the ZEV M&R savings per mile) were much higher than the long-haul tractors M&R costs (and savings) per mile.

Even though EPA did not receive any comments that specifically challenged the underlying diesel M&R estimates, EPA chose to take a conservative approach for the final HD TRUCS M&R savings calculations by using the semi-tractor equation for calculating diesel maintenance and repair costs per mile for all vehicles. This change reduced the overall maintenance cost estimates for diesel vehicles, which in turn reduces the overall savings from ZEV M&R, since the savings values are estimated as a cost reduction from the diesel maintenance and repair values. Lowering the diesel maintenance and repair costs, along with phasing in the ZEV scaling factors, together resulted in a substantial reduction in ZEV maintenance and repair savings estimates between the NPRM and the final rule. As such, this change further addresses the uncertainties associated with future ZEV maintenance and repair costs.

The article cited by the Arizona State Legislature from Kelly Blue Book[341] refers to an analysis of light-duty, not heavy-duty, vehicles.[342] While this article says that a predictive analytics firm, We Predict, found that EVs "cost more to repair than their gasoline engine counterparts," that article also states that that "EVs cost less in maintenance because they have fewer regular maintenance procedures." The reason it finds that EVs are more expensive is because technicians are spending more time working on EVs than they are on gasoline cars, and that those technicians cost more per hour. As noted earlier in this response above, EPA understands that costs for servicing ZEVs may be more expensive in the very near term than they will be once technicians are retrained and have gained some experience; EPA expects the service technician workforce to transition to a workforce that has the skills and experience needed to

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[339] NACD stated, mistakenly, that EPA's citation to Wang et al. in the DRIA (at 265 n. 96 and at 269 n. 139) refers back to a broken link. NACD refers to this paper as "Wang, G. et. al., White Paper: The Current and Future Performance and Costs of Battery Electric Trucks: A Review of Key Studies and a Detailed Comparison of their Cost Modeling Scope and Coverage, National Center for Sustainable Transportation, June 7, 2022." In fact, EPA cited (and utilized) Wang et al. "Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks (2022). The links in the DRIA are functioning. See docket number EPA-HQ-OAR-2022-0985-0681.

[340] See page 91. Burnham, Andrew, David Gohlke, Luke Rush, Thomas Stephens, Yan Zhou, Mark A. Delucchi, Alicia Birky, Chad Hunter, Zhenhong Lin, Shiqi Ou, Fei Xie, Camron Proctor, Steven Wiryadinata, Nawei Liu, and Madhur Boloor. "Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains". April 2021. Available at: https://publications.anl.gov/anlpubs/2021/05/167399.pdf.

[341] Tucker, Sean. "Study: EVs Cost More to Repair, Less to Maintain." Kelly Blue Book. Aug. 17, 2021. Available at: https://www.kbb.com/car-news/study-evs-cost-more-to-repair-less-to-maintain/.

[342] Heavy-duty ICE vehicle maintenance and repair may have some correlation with light-duty maintenance and repair, but the comparison does not consider the maintenance and repair costs of diesel engine and exhaust aftertreatment systems which are greater than the costs associated with light-duty vehicles maintenance and repair.

service ZEVs.[343] The Kelly Blue Book article supports EPA's expectation: the article states that, "The cost issue may fade as EVs become more common" and quoted We Predict "believes that EVs may prove less expensive in the long run." The article goes on to quote the We Predict CEO, James Davies: "The cost of keeping the vehicle in service for the EV, even as the EV gets older, becomes smaller and smaller and actually less than keeping an ICE [internal combustion engine] vehicle on the road, …That's not just maintenance costs, but all service costs."[344] EPA is not aware of any large datasets tracking heavy-duty ZEV maintenance and repair, and commenters who disputed maintenance and repair savings estimates did not supply any comprehensive heavy-duty ZEV maintenance and repair data for the industry as a whole. As described above, EPA phased in the scaling factors in HD TRUCS to address the near-term uncertainty of costs for heavy-duty ZEV maintenance and repair.

While commenters, such as NADA, expressed concerns about facility upgrade costs for some dealers, NADA also acknowledges that facility upgrades will vary significantly, and NADA did not provide supporting details for numeric inputs into the range of costs they asserted in their comments for EPA to evaluate or an estimate as to what proportion of dealers would see higher versus lower costs. EPA agrees that when new products are introduced dealers may encounter new costs. EPA accounts for dealer costs in the retail price equivalent (RPE) multipliers in assessing the costs of the rule. EPA's heavy-duty RPE factor for "Dealer new vehicle selling costs" includes a 6% markup over manufacturing cost for dealer costs, and EPA's assessment is that this appropriately addresses the costs identified by NADA that are associated with the final rule. Importantly, these costs discussed in RIA Chapter 3 are in addition to the costs incurred by dealerships prior to the commencement of this rule, the latter of which we view as not appropriately separated in NADA's general comment on this issue and which are not costs of the final rule. As shown in Section V.A.1 of the preamble, the reference case includes ZEV adoption that is projected to occur absent this final rulemaking. The ZEV adoption that has been occurring in the heavy-duty sector since MY 2021 drove the need for some dealers to already invest in facility modifications to accommodate ZEVs. Also, additional dealers will see ZEV sales, including beginning in 2024 as the first year of the ACT program begins in states, so they also will be investing separate from this final rule. Furthermore, the costs associated with significant build-out of infrastructure, such as new transformers, are not anticipated because a dealer would not need the number of EVSE installations that a fleet with a large number of vehicles at a depot that are charged simultaneously would need. (Indeed, as shown in our analysis of grid distribution impacts at the level of high-traffic freight corridors and localized parcels, we do not project the Phase 3 rule as resulting in significant buildout needs even for such depots. See RTC section 7 (Distribution.). We also have included grid infrastructure distribution costs, such as these, in our electricity prices in our analysis. See RIA Chapter 2.4.4.2.

EPA has carefully considered information made available to EPA. As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that

[343] For example, APTA has already developed and published recommended practices for Zero-Emission Bus Maintenance Training. See https://www.apta.com/wp-content/uploads/APTA-BTS-ZBT-RP-001-23.pdf.
[344] Tucker, Sean. "Study: EVs Cost More to Repair, Less to Maintain." Kelly Blue Book. Aug. 17, 2021. Available at: https://www.kbb.com/car-news/study-evs-cost-more-to-repair-less-to-maintain/.

future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive. Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, as described in RIA Chapter 2.

Comments on both BEV and FCEV safety and comments about the need for two service technicians rather than one for BEV maintenance and repair are addressed in Section 4.8 and 5.2 of the RTC.

Comments on infrastructure and EVSE maintenance are addressed in Section 6 of the RTC.

Comments related to economic impacts are addressed in Section 19 of the RTC.

3.8 Additional Costs

3.8.1 Other Costs

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

EPA also fails to account for infrastructure impacts from increased operation of heavier ZEVs on the road including road and bridge deterioration and commensurate reduced funding for infrastructure from fuel tax collections as EPA fails to account for the fact that ZEVs do not pay federal and state liquid transportation fuel taxes. [EPA-HQ-OAR-2022-0985-1659-A2, p. 30]

Organization: American Highway Users Alliance

Further, the lengthy NPRM and its lengthy draft Regulatory Impact Analysis (RIA) do not appear to include any consideration of the adverse impacts of the proposal on revenues flowing to the Highway Trust Fund (HTF) and resulting Federal highway infrastructure investment. The proposed rule in this docket seeks to accelerate a shift from the public's use of internal combustion engine (ICE) vehicles to electric vehicles (EVs). A substantial erosion of revenue into the HTF would result,3 placing major downward pressure on needed highway and bridge investment, which already faces an investment backlog of $786 billion per USDOT's latest 'Conditions and Performance Report.' Moreover, that $786 billion estimate was developed before recent significant inflation. [EPA-HQ-OAR-2022-0985-1550-A1, pp. 2-3]

3 The draft RIA includes a brief reference (page 429) that, under the proposed rule, fuel consumption would be 'reduced.' Fuel sales, which are subject to a Federal excise tax, generate the largest share of HTF revenue.

Failure to Consider Adverse Impact on Highway Investment

As noted earlier, the lengthy NPRM and its draft Regulatory Impact Analysis do not evidence any consideration of the adverse impacts of the proposal on revenues flowing to the Highway Trust Fund (HTF) and resulting Federal highway infrastructure investment. For decades, the largest source of Federal transportation infrastructure funding has been the HTF, which is largely dedicated to highway funding distributed to states. The proposed rule in this docket seeks to accelerate a shift from the public's use of ICE vehicles to EVs or other alternate fueled vehicles, or more fuel-efficient ICE vehicles. A substantial erosion of revenue into the HTF would result, placing major downward pressure on needed highway investment, which already faces an investment backlog of $786 billion per USDOT's latest 'Conditions and Performance Report.' [EPA-HQ-OAR-2022-0985-1550-A1, p. 8]

Moreover, that backlog estimate was developed before recent inflation of 50% or more just from Q1 2021 to Q3 2022 in the Federal Highway Administration's (FHWA's) highway construction cost index. That index also shows significant inflation from 2017 through the third quarter of 2022 – approximately 72%.7 EPA must reconsider what it proposes after seriously weighing, among other issues noted, the impact of the proposal on the HTF and highway investment, particularly given all of the benefits from those investments for highway safety and the economy. [EPA-HQ-OAR-2022-0985-1550-A1, p. 8]

7 For the NHCCI see – https://explore.dot.gov/views/NHIInflationDashboard/NHCCI?%3Aiid=1&%3Aembed=y&%3AisGuestRedirectFromVizportal=y&%3Adisplay_count=n&%3AshowVizHome=n&%3Aorigin=viz_share_link. The last entry for 2022 is an index reading of 2.786 (with 2003 as 1.000), while the index was at 1.62 at the start of 2017 (thus, an increase of 72% since the start of 2017).

Organization: Daimler Truck North America LLC (DTNA)

There are a number of TCO Inputs that EPA has not accounted for. [EPA-HQ-OAR-2022-0985-1555-A1, p. 34]

There are a number of TCO inputs that EPA has not accounted for in the HD TRUCS tool that should be included to more accurately inform payback periods and adoption rate projections for the Proposed Rule, including:

- Federal Excise Tax. As explained in Section I.B.4 of these comments, the FET adds 12% to the first retail sale of all new HD trucks, truck trailers, semitrailers, and tractors. Because of their higher upfront incremental cost, ZEV purchases will be subject to a significantly higher FET than conventional vehicle purchases. EPA should thus include FET in the HD TRUCS calculation because it impacts TCO. [EPA-HQ-OAR-2022-0985-1555-A1, p. 34]
- State Sales Tax. State sales tax is also applied to the purchase price of HDVs. Again, due to the higher incremental upfront cost of ZEVs, fleets will pay a significantly higher state sales tax on the purchase of an HD ZEV as compared to the tax paid on a conventional HDV purchase. To reflect these costs, EPA should apply an average state sales tax of approximately 5.5% in the HD TRUCS tool. [EPA-HQ-OAR-2022-0985-1555-A1, p. 34]
- State ZEV Registration Fees and Per-Mile Taxes. As described in more detail below in Section II.b.3.e, in recent years a number of states seeking to recoup gasoline tax revenues that are declining with increased ZEV uptake have enacted measures to impose extra registration fees or per-mile taxes on ZEV owners. EPA should ensure that these costs are captured in the HD TRUCS tool, especially as they become more widespread and are adopted by new states.62 [EPA-HQ-OAR-2022-0985-1555-A1, p. 35]

62 See National Conference of State Legislatures, 'Special Fees on Plug-In Hybrid and Electric Vehicles' (March 27, 2023), available at https://www.ncsl.org/energy/special-fees-on-plug-in-hybrid-and-electric-vehicles.

Organization: Dana Incorporated

Speculative Residual Resale Values

Residual values are essential when fleets determine their expected total cost of ownership (TCO) on new vehicles. Residual equipment values affect buying, financing, and leasing decisions for fleets. Far ZEVs, it is becoming a prevalent issue for their wide-scale adoption both in the initial and aftermarket applications. However, EPA should not include residual value estimates in its TCO and payback period estimations at this time. Any market valuation forecasts are speculative at this stage without a guarantee of the residual resale values for ZEVs for the transitional period. An overstatement/understatement of resale values will have an impact on adoption rates. [EPA-HQ-OAR-2022-0985-1610-A1, p. 2]

Organization: National Automobile Dealers Association (NADA)

1. State sales and FET taxes

In assessing payback periods, EPA has neglected to account for FET and state sales taxes. These taxes are additional costs levied on new HDV purchases. Because they are based on a percentage of an HDV's sales price, they are necessarily higher for ZEV HDVs due to their higher upfront costs. The chart below provides a real-world price comparison illustrating how FET and sales taxes compare across ZEV HDVs and comparable ICE HDVs. In this example, an average 5% state vehicle sales tax12 was used with Class 8 HDVs subject to an additional 12 percent FET. [EPA-HQ-OAR-2022-0985-1592-A1, p. 7.] [See Docket Number EPA-HQ-OAR-2022-0985-1592-A1, page 7, for referenced chart.]

12 Rachael Brennan, Auto tax rate by state, POLICYGENIUS (Jan. 20, 2023).

Throughout its regulatory impact analysis, EPA relies heavily on provisions arising from the IRA and the Infrastructure Investment and Jobs Act (IIJA) to promote ZEV HDV market growth. ATD believes that, in reality, these ambitious pieces of legislation will have limited impact on the adoption of ZEV HDVs. For example, the maximum $40,000 IRC Section 45W Clean Commercial Vehicle Tax credit is likely to be more than offset by the FET on a Class 8 ZEV tractor. Moreover, EPA incorrectly assumes that manufacturers will pass on all of the BEV manufacturing tax credits they receive in the form of lower ZEV HDV pricing. [EPA-HQ-OAR-2022-0985-1592-A1, p. 7]

2. Resale values

Resale value and vehicle depreciation is a key factor in determining HDV TCOs and first purchaser behaviors. ATD submits that the Phase 3 proposal fails to consider the impact of resale values. Resale values are based on the work a vehicle is capable performing and the expected maintenance and repair costs for a given period. Currently, there is no established resale history for ZEV HDVs. As a result, most dealerships and new HDV customers are conservatively factoring in the resale value as zero for purposes of their TOC calculations. HDV tractors typically have a 3-5 year trade cycle and HDV trucks range from 7-10 for most operations. Any reduction in resale value ultimately negatively impacts the TCO for first owners and increases payback periods. Consequently, first owners/adopters will be cautious when considering the purchase of ZEV HDVs. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 7 - 8]

3. Charging rates and charging downtime

A common phrase is the commercial truck space is – “Trucks that don’t move don’t make money.” EPA ignores this reality when it points to savings from lower fuel, DEF, and maintenance costs but fails to account for the costs associated with the necessary downtime for ZEV HDV charging. It appears that EPA assumes all ZEV HDVs will return to a centralized location to recharge for 12 hours overnight. This is unrealistic. For example, many HDVs drive exclusively at night to avoid traffic or operate with multiple duty cycles each day. These HDVs will incur significant charging and downtime costs, especially if Level 2 chargers are used.13 [EPA-HQ-OAR-2022-0985-1592-A1, p. 8]

13 According to the U.S. DOT the estimated BEV charge time from empty on a Level 2 charger is 4 – 10 hours and the estimated range added per hour of charging is 10 – 20 miles. Charger Types and Speeds, U.S. DOT (May 4, 2023).

4. Recommendations

ATD recommends that EPA act as follows:

- Work with EMA and its members to determine the appropriate assumptions, data, and calculations that should be included in HD TRUCS related to the price, feasibility, and timelines of technology packages and related components.
- Factor in FET and sales taxes, resale values, and charging-related downtime to more accurately determine HDV ZEV purchaser costs and related payback periods.
- Work with HDV fleet and owner/operators to ensure the accuracy of purchaser costs.

The above recommendations serve as a starting point. EPA must revise HD TRUCS to include additional and more accurate data points using feedback from stakeholders. These revisions must be reflected in the final Phase 3 GHG rule to help accurately forecast realistic payback periods and adoption rates. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 8.]

Organization: PACCAR

In addition, as electric-powered trucks displace diesel-powered trucks, they will also displace the transportation infrastructure-funding model that currently relies on revenue from diesel fuel taxes. As the diesel fuel-based tax base decreases, governments will need to replace that revenue, possibly through increased vehicle registration costs, but more likely by taxing energy flow through chargers. Although EPA specifically included state and federal diesel taxes in fuel costs, the Agency did not account for the inevitable corollary tax on charging costs for electrically powered vehicles needed to maintain transportation infrastructure tax revenue. EPA should therefore revise its TRUCS assumptions accordingly to take into account taxes on energy flow charging costs. [EPA-HQ-OAR-2022-0985-1607-A1, p. 8]

Organization: POET

EPA’s comparative cost analysis for ZEVs themselves also fails to address several important factors. As the Trinity report has identified, EPA compares powertrain, fuel, and maintenance costs of conventional vehicles and heavy-duty ZEVs, assumed to be incurred over the first ten years of those vehicles’ lifetimes.70 That limited list ignores other important costs:

- Resale value;
- Costs associated with vehicle downtime due to inoperability, repair, and recharging/refueling.71 [EPA-HQ-OAR-2022-0985-1528-A1, p. 17]

70 Attachment A at 5.

71 Id. at 6.

Organization: Truck and Engine Manufacturers Association (EMA)

Federal Excise Tax (FET) and State Vehicle Sales Tax – These two additions to the EMA HD TRUCS tool were run in parallel. For this scenario, the FET is set at 12% and the average State vehicle sales tax is set at 5.02%. The resultant revised adoption rates are in the table below: [EPA-HQ-OAR-2022-0985-2668-A1, p. 38. See the Projected ZEV Adoption Rates for MYs 2027 and 2032] [State Sales Tax Table on page 38 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

c) Additions

In the course of our analysis of HD TRUCS, EMA also identified three significant elements that EPA failed to include as inputs to the Agency's payback and adoption rate calculations: federal excise taxes, state vehicle sales taxes, and insurance cost differentials. EMA recommends that all three of these elements be incorporated into the HD TRUCS for the final rulemaking. These additions are included in EMA's HD TRUCS tool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 30]

The incorporation of the additional elements required modifications to the HD TRUCS tool. Columns of data were added to several worksheets in order to create the needed calculations and to display summary data, as was done by EPA in HD TRUCS. Numerous equations in Excel were modified to include the new data elements. The Payback macro on the Summary worksheet was revised to account for the added columns of data on specific worksheets. Where possible, the columns added and altered in the spreadsheets were changed using red text to help denote the affected content of the tool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 30]

Federal Excise Tax – Federal law requires that a 12% excise tax be applied to the purchase of all Class 8 vehicles, based on the purchase price of the vehicle. For HD TRUCS, this tax was not included. EMA recommends that the 12% tax be included on the difference between the ICE powertrain cost and the corollary ZEV powertrain cost for each vehicle type. Where the ZEV is more expensive than the ICE powertrain, the FET will add to the purchase costs for the owner. In years where the ZEV may be less expensive than the ICE, especially in the later years of the Phase 3 proposed regulation, the FET differential will reduce the overall purchase price for the owner. It should be noted that the FET only applies to Class 8 vehicles. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 30 - 31.]

State Vehicle Sales Tax – Each state is allowed to collect a tax on the sale of any vehicle within that state. Most states have a declared vehicle sales tax, while a few do not. Research shows that the average State vehicle sales tax is currently 5.02%. The table below shows the vehicle sales tax for each state. EMA recommends that the state vehicle sales tax be included in the final version of HD TRUCS. It should be noted that the state vehicle sales tax applies to all classes of vehicles. [EPA-HQ-OAR-2022-0985-2668-A1, p. 31. See the State Vehicle Sales Tax table on pages 31-32 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

b) Residual / Resale Value – The Phase 3 regulation fails to consider the cost impact that the first owner may experience when a ZEV is sold on the secondary market. Tractors typically have a 3-5 year trade cycle. Truck trade cycles range from 7-10 years in most operations. At the time of resale, the value of the vehicle is defined either by the leasing company, through the residual value in the lease contract, or by the value that the next purchaser pays for the vehicle. That value is based on the work the vehicle is capable of doing for a given time period, and the expected maintenance and repair costs that can be anticipated during its second life. The replacement cost of a BEV battery set, if needed, will be substantial as a service item. [EPA-HQ-OAR-2022-0985-2668-A1, p. 48]

Since there is no established resale history for BEV trucks, the secondary market for BEV trucks is most likely to be highly cautious in its assessment of future residual value and costs. That could work to decrease the value of a BEV truck in the secondary market versus its equivalent diesel vehicle. The reduction in resale value negatively impacts the TCO for the first owner, thus increasing the payback period and reducing the willingness of first owners to adopt the BEV technology and to purchase the ZEV. [EPA-HQ-OAR-2022-0985-2668-A1, p. 48]

These trade cycle effects and secondary market values are not considered in the current version of HD TRUCS (and are ignored in EPA's misuse of ACT's payback-based adoption rates). EMA recommends that these effects also be factored into the final rulemaking version of HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 48]

Organization: Valero Energy Corporation

3. EPA fails to account for key BEV and FCEV cost considerations in its payback analysis.

In the DRIA, EPA states that

"Given the wide range of diversity in the trucking industry, HD TRUCS analyzes a vehicle's operation during the first 10 years of ownership. We selected 10 years to include high mileage years and to reflect changes in maintenance and repair costs over time, since vehicle use (measured in VMT) and operating costs can change over the course of ownership and as a vehicle ages."36 [EPA-HQ-OAR-2022-0985-1566-A2, p. 8]

36 DRIA at 116.

While EPA believes that "the payback period is the most relevant metric to determine adoption rates in the HD vehicle industry,"37 the agency's total cost of ownership payback analysis fails to consider significant costs relative to BEVs and FCEVs, specifically costs related to battery/fuel cell stack replacement, resale value, repairs, insurance premiums, and motor vehicle accidents. [EPA-HQ-OAR-2022-0985-1566-A2, p. 8]

37 EPA's HD Phase 3 GHG Proposal at 25991-25992.

While EPA considers fuel saving as a component of the total cost of ownership for BEVs in an effort to portray BEV's as being cost competitive, or even advantageous versus their ICE counterparts, EPA fails to properly address insurance and depreciation, claiming they excluded them based on the unsupported and incorrect assumption that these costs are similar for BEVs and ICE vehicles.38 [EPA-HQ-OAR-2022-0985-1566-A2, p. 8]

Regarding resale value, EPA fails to consider the resale value disparity between HD ICEVs and HD BEVs/FCEVs. Even if the original owner of a ZEV is able to avoid having to replace a battery or fuel cell stack, a potential secondary owner would rightfully have serious reservations about buying a used HD BEV or FCEV versus a used HD ICEV. This uncertainty is likely to affect inventory values for fleets, which in turn may have consequences for financing. [EPA-HQ-OAR-2022-0985-1566-A2, p. 9]

Reducing reliance of liquid fuels will also lead to a direct decrease in both federal and state excise tax revenues from gasoline and diesel, as has been demonstrated in the numerous states that have already adopted ZEV mandates.228 This, in turn, will decrease state and federal funding for construction and maintenance of transportation infrastructure in the US, which is primarily funded from these tax revenues.229 Thus, not only will ZEV centric policy destroy the domestic production of asphalt used primarily for road construction and repairs, it will also lead to a precipitous decline in each state's ability to pay for road maintenance. [EPA-HQ-OAR-2022-0985-1566-A2, p. 47]

228 See Berkeley Research Group, Policy Briefs, The Effect of Zero-Emission Vehicle Policies on Dedicated Highway Infrastructure Funding in Maryland, Minnesota, New Jersey, Nevada, New York, Oregon, and Virginia, available at https://www.thinkbrg.com/insights/publications/effect-of-zev-policies-on-dedicated-highway-infrastructure-funding/.

229 Id.

EPA Summary and Response:

Summary:

Several commenters raised concerns about costs that were not included in the HD TRUCS model. These concerns include Federal Excise Tax (DTNA, EMA, NADA); State Sales Tax (DTNA, EMA, NADA); BEV component replacement costs (which purportedly will be higher for BEVs than for ICEVs) (TRALA, Valero); lower resale value (Dana, EMA, NADA, Valero, POET); costs associates with downtime for repairs (POET); additional cost due to vehicle accidents (Valero); more rapid depreciation (Valero); additional costs to account for charging during the work day (NADA, POET); additional state taxes to replace lost gasoline and diesel tax revenue, and state ZEV registration fees (AFPM, AHUA, PACCAR, DTNA, Valero).

Response:

Based on comments received and further analysis, as explained in RIA Chapter 2, we have added certain additional costs in HD TRUCS that are affected by the incremental purchase price differences of ZEVs and ICE vehicles. Our assessment is that these costs will be factored into purchasing decisions and are therefore appropriate to consider in our analysis of payback period for the final rule. Commenters correctly stated that EPA did not consider federal excise tax, state sales tax, and ZEV-specific registration fees at proposal, and EPA has accordingly added consideration of these three costs in HD TRUCS for the final rule. Please see Chapter 2 of the RIA for more information about these costs. As discussed in Section 3.8.2 of the RTC, we have also included consideration of incremental insurance costs (as part of annual operating costs).

Regarding comments on component replacement costs and costs associated with downtime for repairs, in both the proposal and final rule we have included the cost of vehicle maintenance and repair, which includes costs for maintenance components for both ICE and ZEV vehicles. We do not expect maintenance downtime to be greater for ZEV vehicles than for ICE vehicles; additionally, ZEVs will generally need less maintenance than ICE vehicles, as discussed in Section 3.7 of the RTC. For further discussion on our M&R analysis see RIA Chapter 2.4.4.1 and the previous comment response in section 3.7.

For a discussion of our change in approach from proposal for battery replacement in the final rule, see Section 3.8.3 of the RTC.

While commenters have pointed out that there is limited information on the resale of HD ZEVs, concerns regarding adequate information to project resale values and future ZEV resale values being lower than comparable ICE vehicles are addressed through our payback calculations and analysis approach. In our payback analysis, we have only included ZEV technologies in our technology packages that pay back within their typical first ownership period and therefore resale value does not impact this analysis. In other words, even if hypothetically the resale value of the BEV powertrain is $0 (which is obviously not a reasonable assumption for a ZEV during the timeframe of the Phase 3 standards), we project that ZEVs will pay back within their first ownership period (and so the purchaser will have recovered the equivalent of their upfront purchase cost before taking into account any resale value). Additionally, for the final rule, we have conducted a supplemental TCO analysis that includes the impact of residual value as a proxy for resale value. The results from our TCO analysis (RIA Chapter 2.12) show that the costs for owning and operating a ZEV will be lower than a comparable ICE vehicle for all MY 2032 BEVs and FCEVs in our technology packages to support the modeled compliance pathway when evaluated over a five-year time horizon including the impact of residual value. RIA Chapter 2.7.1 discusses in more detail our preference in using payback years over total cost of ownership in our assessment of feasibility of ZEV adoption in our modeled potential compliance pathway (although both metrics support the feasibility of the standards). We also note that there is uncertainty as to how future technological advances will affect the resale value of ICE vehicles; it is reasonable to expect that as purchasers become more used to ZEVs and realize the considerable operational savings, that may also reduce the resale value of ICE vehicles.

As for additional costs due to motor vehicle accidents for the final rule, we have addressed the incremental difference in costs of a vehicle accident through accounting for incremental insurance costs for both ICE and ZEV technologies. HD vehicles are generally insured for accidents, and insurance companies account for the cost of paying out claims in pricing their plans. Thus, we find that accounting for insurance costs reasonably reflects the costs for motor vehicle accidents. See Section 3.8.2 of this RTC for further discussion on ZEV insurance premiums and RTC Section 4.8 for further discussion on the safety of ZEVs.

We do not think it is appropriate to include an additional cost for opportunity charging for electric vehicles. In our analysis for the final rule, we have sized the batteries for the majority of vehicles to perform a single day's worth of work on a single charge, such that the vehicle would be recharged during its typical downtime (dwell period). With respect to the eight BEV types in HD TRUCS for which we project en-route charging in our modeled compliance pathway (these include tractors and coach buses), we have sized the battery of the mid-and long-range tractor vehicle types such that they can be driven the 50^{th} percentile daily VMT on one charge. For the longest range day cabs and sleeper cabs, on days when these vehicles are required to travel longer distances, we find that less than 30 minutes of mid-day charging at 1 MW is sufficient to meet the HD TRUCS 90th percentile VMT assuming vehicles start the day with a full battery). For further discussion on en-route charging see RTC Section 4 and RTC Section 3.3.4 and RIA Chapter 2.6.3. For an explanation of our projected costs for en-route charging, please see RIA Chapters 2.4.4.2 and 2.6.3.

For the final rule analysis, we have also included a cost for state registration fees that are specific to ZEVs. At this time, 18 states do not have any additional registration fee for ZEVs. For the states that do, the registration fees are generally between $50 and $225 per year.[345] While EPA cannot predict whether and to what extent other states will enact ZEV registration fees, we have nonetheless conservatively added an annual additional registration fee to all ZEV vehicles in our HD TRUCS analysis. Regarding lost state fuel tax revenue, see our response in RTC section 2.

Issues of additional cost relating to electrification infrastructure are addressed in Section 6 and 7 of this RTC.

3.8.2 Insurance

<u>Comments by Organizations</u>

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

Yet EPA has not considered this interaction, on safety directly or the associated increase in insurance costs,51 which is all the more critical to the Proposed Rule as commercial trucks are involved in 13 percent of all fatal crashes on U.S. roadways and these trucks will be heavier and faster under the Proposed Rule.52

> 51 Jason Metz & Michelle Megna, Electric Car Insurance: Why It Costs More (Jan. 4, 2023), https://www.forbes.com/advisor/car-insurance/electric-vehicle/ (explaining that electric vehicles are costlier to insure)
>
> 52 U.S. DOT, Federal Motor Carrier Safety Administration, “2020 Pocket Guide to Large Truck and Bus Statistics,” available at https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/2020-10/FMCSA%20Pocket%20Guide%202020-v8-FINAL-10-29-2020.pdf.

EPA also fails to account for the massive increase in insurance costs that must occur when significantly more expensive vehicles are mandated to be on the road, particularly when they are vehicles that insurance companies frequently “total”, i.e., scrap, after low-impact crashes due to liability concerns associated with battery fires. [EPA-HQ-OAR-2022-0985-1659-A2, p. 30]

Organization: Arizona State Legislature

Insurance claims data includes similar findings. A study found repairing mid-size and luxury-brand SUVs cost 53% more for electric vehicles than comparable gas-powered vehicles, and

[345] National Conference of State Legislatures. “Special Fees on Plug-In Hybrid and Electric Vehicles” March 2023, Available at: https://www.ncsl.org/energy/special-fees-on-plug-in-hybrid-and-electric-vehicles.

27% more for small, non-luxury electric vehicles.27 The study found that electric vehicles had more expensive driver assistance system sensors that were more likely to be damaged in a collision, heavier battery packs that resulted in collisions with greater momentum as well as more expensive materials to offset battery weight, and battery pack removal and reinstallation in order to spray paint.28 [EPA-HQ-OAR-2022-0985-1621-A1, p. 24]

27 Jim Henry, Repairing an Electric Vehicle Could Cost More Than Gasoline Cars: A New Kind of Sticker Shock, FORBES, July 25, 2022, available at https://www.forbes.com/sites/jimhenry/2022/07/25/repairing-an-electric-vehiclecould-cost-more-than-gasoline-cars-a-new-kind-of-sticker-shock/?sh=17c649ff5eee.

28 Id.

Organization: Clean Fuels Development Coalition et al.

Insurance costs: Electric vehicles are more costly to insure than conventional vehicles both because they have a higher upfront sticker cost and "because of higher repair and replacement costs for damaged parts."

Mark Rosanes, Do Electric Vehicles Cost More to Insure Than Gasoline-powered Cars?, Insurance Business (Oct. 28, 2022), https://www.insurancebusinessmag.com/us/news/auto-motor/doelectric-vehicles-cost-more-to-insure-than-gasolinepowered-cars-425631.aspx; see also Benjamin Preston, Electric Vehicles May Cost More to Insure Than Gasoline-Powered Cars, Consumer Reports (Apr. 27, 2023), https://www.consumerreports.org/money/carinsurance/electric-vehicles-cost-more-to-insure-than-gasoline-powereda6372607024. [EPA-HQ-OAR-2022-0985-1585-A1, p. 6]

Organization: Daimler Truck North America LLC (DTNA)

There are a number of TCO Inputs that EPA has not accounted for. [EPA-HQ-OAR-2022-0985-1555-A1, p. 34]

There are a number of TCO inputs that EPA has not accounted for in the HD TRUCS tool that should be included to more accurately inform payback periods and adoption rate projections for the Proposed Rule, including:

- Increased Insurance Premiums. Because the cost to purchase and replace an HD ZEV is higher than such costs for a conventional vehicle equivalent, EPA should account for the increased premiums that fleets will likely have to pay to insure their vehicles. DTNA does not have data that could be used to estimate these increases, but recommends EPA work with fleets to understand the increased cost of ZEV insurance. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 34-35]

Organization: POET

EPA's comparative cost analysis for ZEVs themselves also fails to address several important factors. As the Trinity report has identified, EPA compares powertrain, fuel, and maintenance costs of conventional vehicles and heavy-duty ZEVs, assumed to be incurred over the first ten years of those vehicles' lifetimes.70 That limited list ignores other important costs:

- Vehicle insurance costs;

Organization: Truck and Engine Manufacturers Association (EMA)

Insurance Cost Differential – The average insurance rate of 3% was run in the EMA tool to calculate the impact of annual insurance costs based on the difference in powertrain costs between an ICE vehicle and the corollary ZEV for each truck type and year. Below are the results from that model run: [EPA-HQ-OAR-2022-0985-2668-A1, p. 38] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032, Insurance Table on page 38 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

We expect fueling and charging costs and [maintenance and repair] costs to be different for ZEVs than for comparable diesel-fueled ICE vehicles, but we do not anticipate other operating costs, such as labor and insurance, to differ significantly, so the following subsections focus on [maintenance and repair] and fueling or charging costs. (Draft RIA, p. 162) [EPA-HQ-OAR-2022-0985-2668-A1, p. 32]

The percentage charged for insurance on commercial vehicles is determined by a variety of factors and will vary depending on the size of the fleet. ICCT in their April 2023 white paper on ZEV TCO (p.17), uses what they feel is an average insurance rate of 3% for determining annual insurance cost. OEMs have provided data of higher rates that their customers pay, but EMA believes the ICCT value of 3% is directionally correct for this rulemaking. As with taxes, some ZEV-truck types in certain years will carry insurance differential costs that add to the annual operating cost of the vehicle, and in other years, this factor will result in a cost reduction. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 32 - 33]

As such, EMA recommends that differential insurance costs be included in the annual operating cost for the final rulemaking assessment based on the powertrain differential cost calculated in HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 33]

Organization: Truck Renting and Leasing Association (TRALA)

Anecdotal evidence acquired by TRALA suggests that fleets considering ZEVs will face substantially higher insurance costs due to new and unfamiliar ZEV technologies, overall higher purchase costs of ZEV trucks, and higher costs of repair after accidents. It remains unclear whether EPA accounted for this cost in its Regulatory Impact Analysis (RIA). [EPA-HQ-OAR-2022-0985-1577-A1, p. 10]

Organization: Valero Energy Corporation

As for repairs, EPA's assessment of maintenance and repair costs focuses on the EV components and fails to consider that BEV manufacturers often reduce frame weight to compensate for heavy batteries, e.g., by using composite rather than metal frames, which are more susceptible to cracking and damage.45 In particular, EPA overlooks the fact that BEVs are more likely than ICEVs to be "totaled" following a motor vehicle accident due to the flimsiness of the composite frame metal frame and the integration of the batteries into the vehicle frame. As a result, the cost to insure a BEV or FCEV can be considerably higher than the cost to insure ICEVs. EPA does not appear to have included these costs in its consideration of the cost of ownership. [EPA-HQ-OAR-2022-0985-1566-A2, p. 9.]

45 https://whyy.org/articles/septas-cracking-battery-buses-raise-questions-about-the-future-of-electric-transit/.

EPA Summary and Response:

Summary:

Several commenters maintained that the proposed version of HD TRUCS failed to reflect a difference in insurance costs for BEVs when compared to ICE vehicles. AFPM commented that EPA did not account for higher insurance costs for more expensive vehicles. The Arizona State Legislature cited a study of light duty vehicles that found the cost to repair electric vehicles is higher than repair costs for comparable ICE vehicles due to advanced materials, advanced sensors, and battery pack removal and installation which all would increase insurance premiums. The Clean Fuels Development Coalition et al. cited a different study than the Arizona State Legislature, but the study had the same findings: BEVs are more expensive to insure because of higher repair costs. DTNA commented that due to purchase price and replacement cost of HD ZEVs, insurance premiums would be higher than for a comparable ICE vehicle and this differential should be included in HD TRUCS but did not suggest a value to use. POET referenced the Trinity report which stated that the EPA had not considered additional insurance costs in our payback calculations. EMA suggested that we should consider adding a 3% cost to the cost differential of BEVs and ICE vehicles in HD TRUCS, citing a 2023 ICCT paper, that EMA said was directionally correct for this rulemaking. TRALA cited anecdotal evidence that insurance costs, among others, would be significantly higher for BEVs than for ICE vehicles and requested clarity on the inclusion of increased insurance costs in HD TRUCS. Valero cited an article that found BEV transit buses were reducing their weight of the vehicle by making the frames out of composite material which caused cracking due to the weight of the vehicle. Their conclusions were that lightweighting vehicles by changing the material of the frame allows BEVs to be more susceptible to frame damage in the case of an accident and this would cause insurance rates to increase.

Response:

EPA received many comments regarding insurance rates for BEVs, and we agree with commenters that insurance costs should be included in our final analysis. EMA provided the only quantitative suggestion for estimating insurance premiums, based on an ICCT paper, that uses the differential upfront cost of the vehicle to calculate insurance differences. We consider this to be a reasonable approach. It is generally typical for more expensive vehicles to have higher insurance premiums, so an approach that relies on the upfront cost differences among technologies is a logical way to estimate the differences in annual insurance premiums, including differences associated with higher up-front, components, and repair costs. This value was added as an additional operating cost in HD TRUCS. See Chapter 2 of the RIA for insurance cost calculations.

Valero cites an instance of an EV bus using a composite frame which did not hold up under stress and maintains that this type of breakdown should be reflected as a cost of a Phase 3 rule. EPA's modeled potential compliance pathway does not consider composite construction or other forms of lightweighting. We project the same chassis construction for ZEVs (including all transit buses in HD TRUCS) as for ICE vehicles. We note, moreover, that lightweighting is not a phenomenon limited to ZEVs; manufacturers could also choose to implement lighter frames on

ICE vehicles in order to reduce their manufacturing costs and increase fuel efficiency.[346] However, the final GHG standards are not premised on the use of lightweighting in any vehicles.

See Section 3.7 above for our response to the Arizona State Legislature comment citing a study of light-duty vehicles and the effect on insurance costs.

3.8.3 Battery Replacement

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Second, EPA estimates operational savings without considering "midlife overhaul costs," which include "the cost resulting from an engine rebuild for a conventional diesel vehicle, a battery replacement for a battery electric vehicle, or a fuel cell stack refurbishment for a hydrogen fuel cell vehicle." Wang et al., Estimating Maintenance and Repair Costs at 10–11. EPA disregarded these costs on the ground that its "payback analysis typically covers a shorter period of time than the expected life of these components." Draft RIA at 185. That reasoning is illogical. Assuming (as EPA does) that net costs drive purchasing decisions, commercial-fleet owners are unlikely to buy an electric model if they anticipate that such vehicles will require costly midlife repairs that would erase any initial savings. Some evidence suggests that this will occur. For example, one report (performed by the California Air Resources Board) cited in the Wang study noted above posits that electric trucks will require battery replacement every 300,000 to 500,000 miles—much sooner than a comparable conventional vehicle is likely to require an engine rebuild. See Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document, Cal. Air Res. Bd., at 26 (Sept. 9, 2021) (indicating that a Class 8 heavy-duty diesel truck is likely to require an engine rebuild after 800,000 miles). The cost of major midlife repairs for electric vehicles also may be substantially greater. Compare, e.g., Certified Diesel Sols., When to Overhaul a Diesel Engine, https://tinyurl.com/2dch6xv3 (estimating cost of a diesel-engine rebuild between $20,000 and $40,000), with EPA, Heavy- Duty Technology Resources Use Case Scenario, at 2_BEV Tech (Apr. 10, 2023), https://www.epa.gov/system/files/other-files/2023-04/hd-tech-trucs-tool-2023-04.xlsm (Columns AJ & AK) (EPA's modeling suggesting that the cost of manufacturing batteries may be several multiples higher). The Senior Vice President of the American Transportation Research Institute cautions that heavy duty-vehicle operators are "going to be switching out the batteries on a Class 8 truck every four to seven years" and "pay between $85,000 and $120,000 for a replacement set." Cristina Commendatore, Report Pinpoints Top Challenges for Widespread Battery-Electric Vehicle Adoption, FleetOwner (Dec. 7, 2022), https://tinyurl.com/243euzxr. Thus, owners of electric heavy-duty vehicles could find themselves saddled with new and substantial midlife overhaul costs that cut into their operational savings. EPA should assess—not ignore—this issue before calculating the payback period. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 28 - 29]

[346] See, e.g., Constructing Lightweight Bus Structures with Stainless Steel, https://www.mobilityengineeringtech.com/component/content/article/48578-sae-ma-07195

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

Nor does it account for the emissions impacts from the full life cycle of ZEVs, particularly heavy-duty ZEVs with batteries that may not achieve either "useful life" standards or mandatory emission control technology warranties applicable to other vehicles with emission standards issued under the Clean Air Act. To the extent heavy-duty ZEVs and their batteries have not been demonstrated to achieve useful life standards and minimum emission control warranty requirements, in real-world operation, EPA must include their replacement costs as part of their analysis; EPA has not. [EPA-HQ-OAR-2022-0985-1659-A2, p. 14]

Organization: Arizona State Legislature

EPA recognizes that replacing an electric truck's battery 'may be practically necessary over the life of a vehicle if the battery deteriorates to a point where the vehicle range no longer meets the vehicle's operational needs.' 88 Fed. Reg. 25,987. EPA does not calculate the frequency or likelihood that a truck will need to replace its battery due to wear or accident. Nor does EPA calculate the cost of battery replacement. Battery replacement for a heavy-duty track can cost between $85,000 to $120,000.29 One battery replacement would obviate any cost savings estimated by EPA. [EPA-HQ-OAR-2022-0985-1621-A1, p. 24]

29 Cristina Commendatore, Report pinpoints top challenges for widespread battery-electric vehicle adoption, FLEETOWNER, Dec. 7, 2022, available at https://www.fleetowner.com/emissions-efficiency/article/21255957/atripinpoints-top-challenges-for-widespread-batteryelectric-truck-deployment-in-the-us.

Organization: California Air Resources Board (CARB)

5. Maintenance and Repair Operating Costs

Affected pages: 25986-25987

CARB staff concurs with U.S. EPA's methodology regarding maintenance and repair costs. Many recent announcements by manufacturers indicate that key components of BEVs and FCEVs, including batteries, will be able to last for ten years or longer.218,219 This supports U.S. EPA's assumptions that no midlife battery replacement or fuel cell refurbishment is necessary for a 10-year analysis. [EPA-HQ-OAR-2022-0985-1591-A1, p.64]

218 IAA Transportation 2022: Daimler Truck unveils battery-electric eActros LongHaul truck and expands e-mobility portfolio, September 18, 2022. https://media.daimlertruck.com/marsMediaSite/en/instance/ko/IAA-Transportation-1182022-Daimler-Truck-unveils-battery-electric-eActros-LongHaul-truck-and-expands-e-mobilityportfolio.xhtml?oid=52032525

219 Scania and Northvolt's new EV battery can power a truck for 1.5M km, April 21, 2023. https://electrek.co/2023/04/21/scania-northvolt-new-ev-battery-truck/

Organization: Clean Fuels Development Coalition et al.

Vehicle maintenance costs: This includes the standard maintenance that electrified heavy-duty vehicles would need to undergo (which the proposal underestimates, see generally The American Truck Dealers Division, Dkt. No. EPA-HQ-OAR-2022-0985-1445 (May 3, 2023), as well as vehicle battery replacement costs (which the proposal ignores) and battery disposal or recycling costs (which the proposal also ignores). EPA also ignores “midlife overhaul costs,” which include “the cost resulting from an engine rebuild for a conventional diesel vehicle, a battery replacement for a battery electric vehicle, or a fuel cell stack refurbishment for a hydrogen fuel cell vehicle.” G. Wang et al., Estimating Maintenance and Repair Costs for Battery Electric and Fuel Cell Heavy Duty Trucks, UC Davis, at 10–11 (Feb. 2022). The proposal illogically chooses to disregard these costs, ignoring its assumption in other areas of the rule that net cost drives purchasing decisions. DRIA at 185. [EPA-HQ-OAR-2022-0985-1585-A1, p. 5]

Organization: Daimler Trucks North America

EPA Request for Comment, Request #44: We request comment on this approach for both ICE vehicles and ZEVs, in addition to data on battery and fuel stack replacement costs, engine rebuild costs, and expected component lifetime periods.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 165]
- Response to Request # 20: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA’s comments.

Organization: MEMA

Additionally, specialized vehicle bodies are more unique to end-users’ needs, so there is higher cradle-to-grave ownership cycle costs, which means that battery replacement costs are going to weigh higher into fleet-level business cases and decision-making. These end-users with longer ownership cycles tend to adopt technology more cautiously, with a more measured approach due to limited resale markets. [EPA-HQ-OAR-2022-0985-1570-A1, p. 17]

Organization: Valero Energy Corporation

With regard to costs to replace key ZEV components such as batteries and fuel cells, EPA explains that it “did not account for potential diesel engine rebuild costs for ICE vehicles, potential replacement battery costs for BEVs, or potential replacement fuel cell stack costs for FCEVs because our payback analysis typically covers a shorter period of time than the expected life of these components.”39,40,41 While data is sparse due to the immaturity of heavy-duty ZEV technologies, some literature sources indicate that these components may require replacement well before the expiration of typical payback period. For example, E-Mobility Engineering reports:

“Packs designed with high cycle numbers for their lifetimes are expected to reach 80% of their nominal capacities – a figure widely accepted as their ‘end of life’ in the e-mobility world – between 4 and 10 years after their initial delivery.”42 [EPA-HQ-OAR-2022-0985-1566-A2, p. 8]

39 DRIA at 185.

40 For BEV, EPA indicates “we assumed the deterioration of the battery to be 20 percent over its life,” without any indication of the basis of the assumption or the projected length of the BEV life. DRIA at 217.

41 For FCEV, EPA cites an “interim target fuel cell system lifetime for a Class 8 tractor-trailer is 25,000 hours, which is equivalent to more than 10 years if a vehicle operates for 45 hours a week for 52 weeks a year,” without any indication of the basis of the target. DRIA at 195.

42 E-Mobility Engineering, “Challenge of batteries for heavy-duty EVs”, https://www.emobility-engineering.com/challenge-of-batteries-for-heavy-duty-evs/.

“Expected life” aside, the potential need for replacement of an EV battery or fuel cell stack carries a significant cost differential to the potential rebuild of a diesel engine, and EPA’s failure to consider the replacement of these components is a glaring gap in its payback analysis. Even if a battery replacement occurs outside the payback period considered by EPA, payback can be expected to “un-occur” quickly when a HDV owner is faced with the choice of whether to replace the battery/fuel cell stack or to terminate the life of the HDV. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 8 - 9]

EPA Summary and Response:

Summary:

Several commenters raised concerns about the cost of replacing a vehicle battery. They stated that battery replacement is a very large cost that should be accounted for as it will have a large effect on the payback calculation since the cost of batteries make up a large portion of the cost of an electric vehicle. (Clean Fuel Development Coalition, MEMA, Valero). Valero cites an article for the proposition that batteries with high cycle numbers are expected to reach the end of their useful life within 4-10 years in support of its contention that battery replacement cost should be included as a cost of the rule, and further maintains that EPA lacks authority for its statement at proposal that HD BEV battery warranties are typically for 8 to 15 years. CARB stated that batteries will be able to last for ten years or longer. DTNA commented that EPA should consider all available data, however since data is limited EPA should re-evaluate its assumptions on this issue on a regular basis.

Response:

EPA appreciates the concern expressed about battery replacement; we understand that the cost of batteries for HDVs is a significant portion of the overall cost of the vehicle and that replacing the battery would result in a different payback analysis than that contained in the NPRM for HD BEVs. As discussed in Chapter 2.7 of the RIA, we limit the BEVs in our technology packages to those that pay back in 10 years or less. Therefore, for the final rule we changed from proposal our process for sizing the BEV batteries in HD TRUCS so that they are designed to meet at least 10 years of operation before the battery range degradation exceeds 20%.

Specifically, in the analysis to support this final rule, EPA used a constraining factor to address this concern by setting 2,000 cycles as the expected life for a HD battery.[347,348] We chose

[347] Preger, Yuliya, et. al. “Degradation of Commercial Lithium-Ion Cells as a Function of Chemistry and Cycling Conditions”. Journal of The Electrochemical Society. September 2, 2020. Available online: https://iopscience.iop.org/article/10.1149/1945-7111/abae37.

[348] Tankou, Alexander, Georg Bieker, and Dale Hall. “White Paper—Scaling Up Reuse and Recycling of Electric Vehicle Batteries: Assessing Challenges and Policy Approaches”. International Council on Clean Transportation.

2,000 cycles as a conservative sizing value based on studies that show LFP batteries can maintain 80 to 95 percent state of charge at 3,000 cycles and NMC batteries can retain 80 percent state of charge at 2,000 cycles under typical operating conditions (discharge and charging power of 0.5 C or less and SOC swings of 20 to 80% or less). Our use of a 2,000 cycle limitation is consequently conservative because we project that many heavy-duty truck applications where durability is a primary concern will utilize LFP batteries. Thus, the final rule analyzes need for battery replacement and engine rebuilds in the same manner: we are sizing batteries and engines such that neither need replacement during the normal 10-year operating period (as well as the maximum payback period we consider reasonable in our analysis). In HD TRUCS, we calculate the number of battery cycles for each of the 101 vehicles and compare it to 2,000 cycles. We then increased the size of the battery if the number of cycles for a particular vehicle was greater than 2,000 cycles. A more thorough discussion of this topic can be found in Chapter 2.4.1.1.3 and 2.4.1.1.4 of the RIA.

We do, however, recognize that while the BEV batteries are sized in a way that batteries will not need replacement for the initial payback calculation, this does not necessarily extend to the entire life of the vehicle. Some vehicles, particularly tractors with high number of charge and discharge cycles may need replacement beyond the first 10 years of use. Therefore, for the final rule, we have added both battery replacement and ICE rebuild costs into the operating costs of our program cost analysis in RIA Chapter 3. Since this replacement occurs after the initial purchase and may be beyond the period of first ownership of the vehicle, we calculated the replacement cost of the battery and compared it to the engine-rebuild cost as described in Chapter 3.4.7.5 of the RIA. The cost of battery replacement and engine-rebuild are added to the final program costs.

Valero cited an undated article containing the anecdotal statement that batteries with high cycle numbers (unquantified) can be expected to reach the end of their useful life within 4-10 years.[349] The article fails to provide any data or analysis in support of this conclusion. EPA's well-documented analysis summarized above responds to this comment by documenting how EPA conservatively sized batteries for purposes of our HD TRUCS analysis such that no replacement is needed for the first 10 years of HD BEV operation.

3.9 Alternative Inputs and Sensitivities

3.9.1 Fuel Price Adjustments

<u>Comments by Organizations</u>

Organization: Daimler Truck North America LLC (DTNA)

Fuel Costs There is significant risk in projecting diesel, electricity, and hydrogen costs to inform payback periods four to nine years in advance. Diesel prices are sensitive to global

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February 2023. Available online: https://theicct.org/wp-content/uploads/2023/02/recycling-electric-vehicle-batteries-feb-23.pdf.

[349] https://www.emobility-engineering.com/challenge-of-batteries-for-heavy-duty-evs/. (unpaginated), statement appearing in ninth paragraph from the end of the article.

politics and economics and are highly volatile, as observed over the last several years. Prices fell drastically during the COVID-19 pandemic, followed by a sharp price increase when demand resurged faster than supply, creating a price spike in 2022, as shown in Figure 2 below. As fuel prices are a major piece of the TCO equation, high diesel prices will make the ZEV TCO case more attractive, whereas low diesel prices will keep conventional technologies competitive. DTNA also notes many fleet customers have bulk supply agreements and purchase diesel fuel for costs well below the retail price at the pump. EPA should ensure that the diesel prices projected in HD TRUCS reflect the price paid by fleets, and not the national average retail price. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 31-32] [Refer to Figure 2 on p. 32 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Organization: Environmental Defense Fund (EDF)

Under a high diesel fuel scenario, most BEV tractors have a payback period of less than 1 year.

In this sensitivity analysis, Roush used the high oil price scenario from AEO2023. The last couple years have seen record high diesel prices. Under such a scenario, the savings from BEV adoption increase tremendously. The TCO per mile of BEVs under the high diesel cost scenario is between 36% and 47% lower than ICEV. [EPA-HQ-OAR-2022-0985-1644-A1, p. 36] [See Figure 5 on p. 36 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

Organization: Moving Forward Network

In addition to providing significant absolute fuel cost savings relative to gasoline or diesel, driving on electricity also provides a significant price-stability advantage. As shown in Figure 17, for more than the last two decades, driving a passenger EV on residential electricity prices has been the cost equivalent of driving on dollar-a-gallon gasoline, whereas the price of gasoline itself jumps up and down in response to world events beyond our control. 168 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 79 - 80.] [See Figure 17, Equivalent Electricity and Diesel Prices: January 2001-April 2023 located on p. 80 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

168 Source data: EIA, Short Term Energy Outlook. Electricity prices shown in “eGallons” a Department of Energy metric that “represents the cost of driving an electric vehicle (EV) the same distance a gasoline powered vehicle could travel on one (1) gallon of gasoline.” Methodology available at: https://www.energy.gov/articles/egallon-methodology

The contrast is even more stark between electricity and diesel prices, as shown in Figure 18, which shows the cost of diesel compared to the “dollar-per-diesel-gallon-equivalent” cost of driving a Class 5 Step Van on electricity. 169 [EPA-HQ-OAR-2022-0985-1608-A1, p. 80.] [See Figure 18, Equivalent Commercial Electricity and Diesel Prices for Class 5 Step Van: January 2001-January 2023 located on p. 81 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

169 Source data for fuel prices: EIA, Short Term Energy Outlook. In this instance the Department of Energy’s “eGallon” methodology developed using the efficiencies of light-duty vehicles was adapted to reflect the fuel economy (mpg) and electricity consumption (kwh/mi) of a Class 5 Step Van, as documented by the California Air Resources Board, available at: https://ww2.arb.ca.gov/sites/default/files/2018-11/180124hdbevefficiency.pdf

The price stability advantage of electricity should further both consumer and fleet manager acceptance of EVs. In addition to saving money on fuel, fleet operators stand to benefit from no longer having to pay financial institutions hefty commissions and fees associated with hedging against fuel price volatility, and their customers will benefit from no longer being subject to "fuel surcharges" designed to reduce fleet exposure to the volatility of the world oil market. [EPA-HQ-OAR-2022-0985-1608-A1, p. 81]

Organization: Volvo Group

- EPA should update their analysis based on the most recent data, including the Energy Information Administration's 2023 Annual Energy Outlook. [EPA-HQ-OAR-2022-0985-1606-A1, p. 17]

EPA Summary and Response

Summary:

Some commenters believe the fuel prices, in particular, should include alternative scenarios beyond the AEO 2021 reference case scenario. EDF believes that high diesel cost scenario may be a more appropriate price for diesel, whereas DTNA asserts fuel price including diesel, electricity and hydrogen prices are difficult to predict into the future and that fleets have bulk agreements instead of retail pricing. Volvo said that EPA should update its analysis based on the latest data, including AEO 2023.

Response:

For the final rule, we have updated diesel prices to AEO2023 values using the Reference Case scenario. We have used AEO Reference Case scenarios in each of our HD GHG rulemakings to date, and are continuing to do so for Phase 3. The Energy Information Administration (EIA) is the recognized official source for such projections. The Reference Case fuel prices are lower than those suggested by EDF, but may be higher than what some fleets pay. We agree with the commenter that price stability for electricity compared to the volatility of oil prices may benefit BEV owners.

3.9.2 Inflation Adjustment

Comments by Organizations

Organization: Daimler Truck North America LLC (DTNA)

- Inflation and Rising Interest Rates. The Proposed Rule and supporting DRIA do not address the impacts of inflation and corresponding interest rate increases on vehicle prices and purchase costs. The majority of commercial vehicle purchases are financed through equipment loans, lines of credit, and other financing mechanisms. These financing options have become significantly more expensive in recent years due to rising interest rates. It is not clear how EPA has factored into its TCO estimates the substantial borrowing costs associated with financing the purchase of an HD ZEV, which will almost certainly be felt by purchasers over the next few decades unless interest rates decline substantially. Indeed, EPA's purchaser cost analysis is entirely devoid of any discussion of borrowing and financing costs for HD ZEVs, which are a substantial expense given the capital outlays needed to purchase the new technology.63 [EPA-HQ-OAR-2022-0985-1555-A1, p. 35]

63 See, e.g., CARB, Advanced Clean Fleets, Initial Statement of Reasons (Aug. 30, 2033), Appendix G: Total Cost of Ownership Discussion Document at G-15, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appg.pdf (estimating that 80% of fleets will finance new HD ZEV purchase at 5% annual percentage rate, and that 20% of fleets will finance at 15%, resulting in an average financing rate of 7%).

- Inflation and Other Economic Conditions. According to the U.S. Bureau of Labor Statistics, the purchasing power of the dollar declined about 7.4% between 2021 and 2022 because of inflation.42 Consumer price inflation (CPI), as measured by the 12-month change in the price index for personal consumption expenditures (PCE), was at 5.4 percent in January 2023,43 well over average inflation rates of the last 20 years.44 In projecting consumer uptake of new ZEV technologies, EPA does not consider that, given the current economic environment of high inflation, eroding purchasing power, and high interest rates, fleets likely do not have the appetite to take on or finance significant capital outlays over the next few years. This would especially include expensive investments in new technologies and supporting infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 26]

42 See U.S. Bureau of Labor Statistics, 'Consumer Price Index,' available at https://www.bls.gov/cpi/factsheets/purchasing-power-constant-dollars.htm#:~:text=This%20means%20that%20the%20purchasing,%2C%20on%20average%2C%20in%202021.

43 See Federal Reserve, Monetary Policy Report (March 3, 2023), available at https://www.federalreserve.gov/monetarypolicy/2023-03-mpr-summary.htm.

44 See U.S. Bureau of Labor Statistics, Databases, Tables, and Calculators by Subject, available at https://data.bls.gov/pdq/SurveyOutputServlet.

EPA Summary and Response:

Summary:

DTNA commented that EPA's purchaser cost analysis does not consider inflationary pressures that can discourage purchase of BEVs.

Response:

In the final rule, we have adjusted all dollar values to 2022 dollars which reflects the most recent data available regarding inflation and its impacts on the costs we estimate. Discussions for adjustment to 2022 dollars can be found in introduction of Chapter 3 of the RIA. By doing so, our cost analysis reflects purchasing power, including impacts of inflation, as of the most recent time for obtaining reliable, comprehensive data. Potential inflation (either increased or decreased inflation) after that cut-off date is beyond the scope of our analysis for this rule. See *Arkansas Dairy Co-op Ass'n v. U.S. Dept. of Agriculture,* 573 F. 3d 815, 831 (D.C. Cir. 2009) (upholding evidence consideration cutoff, stating "at some point the Secretary must stop reviewing evidence, and review the rulemaking record").

3.9.3 Other sensitivities

Comments by Organizations

Organization: Daimler Truck North America LLC (DTNA)

EPA should conduct a sensitivity analysis of all cost inputs used in the HD TRUCS analysis to understand the range of alternative ZEV uptake rates under different scenarios.

As discussed above, there is significant uncertainty in a number of EPA's cost projections, which have major implications for the calculated ZEV adoption rates and proposed CO2 standard stringency levels. DTNA strongly recommends that EPA conduct a sensitivity analysis of all costs used in the HD TRUCS tool, especially component costs and fuel costs, and calculate what the impact on ZEV uptake would be in those alternate scenarios. EPA should use this sensitivity analysis when conducting the periodic reviews of the appropriateness of the Phase 3 CO2 standards, as discussed in Section II.C.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 39]

EPA Request for Comment, Request #45: We request comment on our approach and assessment of future fuel, electricity, and hydrogen prices for the transportation sector.

- DTNA Response: Fuel prices are a critical piece of the TCO calculation and will have significant impacts on ZEV adoption rates. Future fuel, electricity, and hydrogen prices cannot be accurately be predicted four to nine years in advance, as these prices are subject to global economics, supply-demand relationships, infrastructure buildout rates, etc. EPA should consider all available data and re-evaluate fuel costs on a regular basis, as discussed in Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 165]

Organization: Valero Energy Corporation

C. The outcome of EPA's HD TRUCS modeling is highly sensitive to its unsupported assumptions.

As described above, EPA frequently and significantly relies on assumptions, estimates, and aspirational goals in the place of actual performance data for HD BEVs and FCEVs. Not only does EPA fail to discuss the uncertainties in the data, it also fails to adequately consider a scenario in which these assumptions, estimates, and aspirational goals do not come to perfect and complete fruition in the rulemaking timeline. [EPA-HQ-OAR-2022-0985-1566-A2, p. 18]

Figure 8 demonstrates the sensitivity of EPA's HD TRUCS modeling to following individual assumptions, estimates, and aspirational goals upon which EPA relies, as well the aggregate sensitivity to all of the listed modifications:

- Acceptable payload impact tolerances are reduced from 30% in EPA modeling to 5% or 0% (refer to Section III.A.1 of this letter);87
- The 2027 battery cost, fuel cell stack cost, and hydrogen fuel tank cost reflect the upper bound of the ICCT projected ranges (refer to Section III.A.4 of this letter);88

- The costs to install EVSE are increased to more realistic values (refer to Section III.A.6 of this letter);89 and
- The "learning gains" are reduced to 75% of EPA's predictions (refer to Section III.A.9 of this letter). 90 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 18 - 19.] [See Figure 8, HD TRUCS Sensitivity Analysis, on page 20 of docket number EPA-HQ-OAR-2022-0986-1566-A2.]

87 The sensitivity run modified EPA's original HD TRUCS run by changing cell F108 of the "Inputs" tab to 5% and 0%, respectively, and by changing cell H4 of the "A4a_Adoption Rates (BEV)" tab to 5% and 0%, respectively.

88 The sensitivity run modified EPA's original HD TRUCS run by changing cell G5 to "220*Adj_Factor," cell G45 to "680*Adj_Factor," and cell G58 to "1150*Adj_Factor" in the "Inputs" tab.

89 The sensitivity run modified EPA's original HD TRUCS run by changing cell F17 to 150,000; cell F19 to 20,000; cell F21 to 250,000; and cell F23 to 86,000 in the "Inputs" tab.

90 The sensitivity run modified EPA's original HD TRUCS run by changing cell H95 to 0.941, I95 to 0.900, J95 to 0.868, K95 to 0.843, and L95 to 0.823 in the "Inputs" tab.

Adjusting these four variables to be more closely aligned with reality, EPA's HD TRUCS model projects only a 4% ZEV adoption by MY 2027 and 11% by MY 2032, a significant reduction from the 16.8% and 46% adoption in EPA's original modeling: [EPA-HQ-OAR-2022-0985-1566-A2, p.19.]

Organization: Volvo Group

- The agency referenced many studies and analyses in their determination (ACT Research, ICCT, EDF/ERM, etc.), but many of those studies have already been shown to be outdated based on their model year 2021 and 2022 heavy duty ZEV sales projections when compared to actual industry sales volumes and vehicle registrations.
- EPA should update their analysis based on the most recent data, including the Energy Information Administration's 2023 Annual Energy Outlook. [EPA-HQ-OAR-2022-0985-1606-A1, p. 17]

EPA Summary and Response

Summary:

DTNA expressed concern over uncertainty in the cost projections in the modeled potential compliance pathway which have an effect on ZEV adoption rates. They recommended that we conduct a sensitivity analysis on all costs used in HD TRUCS, especially component costs and fuel costs, and how these changes affect adoption rates in the technology packages. They further suggested using the sensitivity analysis when conducting the DTNA-recommended periodic reviews of the Phase 3 standards. Volvo also recommended EPA update the final rule analysis using the more up-to-date information such as the AEO 2023. They also highlighted some sources EPA used, such as the ICCT report, which Volvo stated are outdated in their projections based on actual sales. Valero believes many data sources EPA relies on for the proposal are assumptions, estimates and aspirational goals, which Valero states does not match actual data for ZEVs. Valero states that they believe EPA fails to discuss uncertainties in data or assumptions and that if they do not come to true will lead to impacts on ZEV adoption rates.

Response:

As further explained in preamble Sections I and II, in setting future emission standards under our CAA section 202(a)(1)-(2) authority, given the prospective nature of the factors Congress directed EPA consider, EPA must necessarily identify potential technologies, evaluate the rate each technology could be introduced, and project associated cost of compliance. Thus, while we acknowledge that future projections inherently are subject to uncertainties, EPA has carefully analyzed the uncertainties and identified the considerations we found persuasive[350] Consistent with our standard setting authority the analysis EPA conducted for this final rule appropriately makes use of the best data available to us, including using data from AEO 2023 and other data as described in RIA Chapter 2.

DTNA suggested EPA include a sensitivity analysis as part of a periodic review of Phase 3. See preamble Section II.B.2.iii and section 2.9 of this RTC document for a discussion of reviews we may consider in post-rule implementation of the Phase 3 rule.

DTNA and Valero suggested that EPA conduct sensitivity analysis for the final rule using alternative inputs for HD TRUCS. As EPA notes above, and in the preamble and RIA for this final rule, EPA has used what we consider to be the most appropriate inputs for the HD TRUCS model for the analysis which informed the CO_2 emission standards established in this final rule. As described throughout preamble Section II and RIA Chapter 2, in many instances in determining inputs for HD TRUCS, EPA determined that the most appropriate inputs were a conservative approach based on the best data available l. Furthermore, EPA developed and assessed additional example potential compliance pathways that support the feasibility of the final standards including without producing additional ZEVs to comply with this rule (see RIA Chapter 2.11 for this example and others). These additional technology packages support that the performance-based standards are feasible at reasonable costs with even lower ZEV adoption rates than discussed in Valero's comment.

[350] Certainty is essentially impossible in making predictive judgments, and agencies are not absolved from decision making due to lack of prescience. See Rural Cellular Ass'n v. F.C.C., 588 F.3d 1095 (D.C. Cir. 2009 ("Where, as here, the FCC must make predictive judgments about the effects of increasing subsidies, certainty is impossible. … In circumstances involving agency predictions of uncertain future events, `complete factual support in the record for the Commission's judgment or prediction is not possible or required' since "`a forecast of the direction in which future public interest lies necessarily involves deductions based on the expert knowledge of the agency.'… Thus, when an agency's decision is primarily predictive, our role is limited; we require only that the agency acknowledge factual uncertainties and identify the considerations it found persuasive." See also, in the context of assessing future economic conditions, N. Am.'s Bldg. Trades Unions v. Occupational Safety & Health Admin., 878 F.3d 271, 299 (D.C. Cir. 2017) ("OSHA concluded that 'even in a lower price environment, hydraulic fracturing entrepreneurs will be able to implement the controls required by th[e] final rule without imposing significant costs, causing massive economic dislocations to the ... industry, or imperiling the industry's existence.' Given the inherent uncertainty in forecasting future economic conditions, OSHA's thorough consideration of Industry's concerns, and the delayed implementation timeline, OSHA's finding that the rule is economically feasible in hydraulic fracturing finds ample support in the record").

3.10 Feasibility

3.10.1 Payload

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

6. EPA Proposes Standards that Fail to Consider ZEV Market Demands.

EPA improperly relied on the general characterization of the heavy-duty vehicle and engine market as supplemented by incentives in the BIL and IRA to support its proposition that there will be a rapid increase in ZEV market penetration. But these ZEVs simply do not have the same range, load capacity, and intended use of existing fleets. To illustrate the needs the BEV market must meet, we are providing at Appendix I information on the sales and uses of Class 7 (26,001–33,000 pound) and Class 8 (33,001 pounds and over) HD vehicles from the U.S. Department of Energy.114 EPA's Proposed Rule provides little to no information regarding how— or whether—the ZEV mandate can meet current market needs for HD vehicles given the higher range115 and load capacity116 of current ICE HD engines, particularly diesel. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 30 - 31.] [See Appendix I on page 43-45 of docket number EPA-HQ-OAR-2022-0985-1659-A2.]

114 Stacy C. Davis and Robert G. Boundy, OAK RIDGE NAT'L LABORATORY – U.S. DEP'T OF ENERGY, "Transportation Energy Data Book," 40th ed. (June 2022), 5-4–5-13, available at https://tedb.ornl.gov/wp-content/uploads/2022/03/TEDB_Ed_40.pdf.

115 Beia Spiller et al., Medium- and Heavy-Duty Behicle Electrification: Challenges, Policy Solutions, and Open Research Questions (May 3, 2023), https://www.rff.org/publications/reports/medium-and-heavy-duty-vehicle-electrification-challenges-policy-solutions-and-open-research-questions/ ("The current available range for electric trucks is less than 200 miles on a single charge—much shorter than the range of comparable diesel vehicles, which . . . can go 2,000 miles without refueling.").

116 Id. ("The high density of batteries generally makes an MHDEV heavier than its diesel equivalent, and the payload may need to be reduced to compensate for the extra weight (Phadke et al. 2021). The extent to which the payload needs to be reduced is unclear, however, and likely depends on several factors, such as fleet operations and vehicle type.").

Notably, the cost to consumer also fails to account for the decreased range and loads for ZEV HDs in accounting for the payback occurring between three and seven years for long-haul tractors.. [EPA-HQ-OAR-2022-0985-1659-A2, p. 30]

Organization: American Highway Users Alliance

- Long-haul trucks require significantly heavier batteries (anywhere from 6,000 to 17,000 lbs.), which leads to reduced payload capacity. When trucks are less productive due to decreased payload capacity, limited mileage range, and downtime for charging, the consequence is that more trucks and drivers are needed to move the same amount of freight. Some of our large members running limited-scope BEV operations report the need for a 3:2 and sometimes even 2:1 ratio of battery-powered trucks relative to what their diesel trucks produce. Couple the need for more trucks with the fact that each BEV truck costs 2-3x that of today's clean diesel truck (a roughly $300,000 upcharge per unit) and it's easy to see that the negative economics of BEVs would be felt severely by the trucking industry and in turn shared by shippers and consumers... [EPA-HQ-OAR-2022-0985-1550-A1, p. 6]

Organization: American Soybean Association (ASA)

However, ZEV heavy-duty vehicles powered by electric battery technology create other problems for farmers. When hauling large cargos, shippers must consider whether they will box out (run out of space) or weigh out (reach the federal or state weight limit) first. When hauling soybeans, a truck will almost always weigh out first. A University of California, Davis, study estimated the average electric heavy-duty truck battery will weigh an additional 5,000 pounds compared to a semi with an internal combustion engine (ICE) on the road today.2 This means each truckload of soybeans will need to carry as many as 85 fewer bushels per trip. Given that one ICE semi can currently haul 910 bushels of soybeans before it weighs out, this would limit capacity by 9%. [EPA-HQ-OAR-2022-0985-1549-A1, p. 2]

Organization: American Trucking Associations (ATA)

Performance is key to whether heavy-duty ZEVs meet a given duty cycle's range, performance, and battery capacity requirements. Drivers regularly run short and long-haul routes, often including regional and interstate journeys. For example, a carrier transporting perishable agricultural products to and from a West Coast port runs routes to inland destinations like Colorado, St. Louis, Reno, and California's Central Valley. This operation's range and battery performance needs differ significantly from shorter hauls primarily within ten miles of a point of origination. Battery weight is a crucial factor. A bulk agricultural hauler moving mixed commodities to and from a facility can easily come up against weight limits with added batteries. [EPA-HQ-OAR-2022-0985-1535-A1, p. 10]

In addition to range and battery capacity, other performance factors also play a role in heavy-duty ZEVs. Power output, acceleration, and overall vehicle performance are crucial to ensuring vehicles can meet the demands of their duty cycles, regardless of climate or topographical conditions. ZEVs must be capable of the same payload while climbing steep inclines, maintaining high speeds on highways, and handling challenging extreme temperatures in a way that compares favorably with ICEVs. [EPA-HQ-OAR-2022-0985-1535-A1, p. 10]

Organization: Arizona State Legislature

Electric trucks cease to be profitable long before they reach the 30% payload capacity threshold. Electric-powered trucks can legally weigh a maximum of 82,000 pounds, 2,000 pounds more than diesel-powered trucks. 23 U.S.C. 127(s). Electric batteries can weigh up to 16,000 pounds, or almost one-fifth of the truck's weight.38 Using the University of California – Davis estimate that electric trucks will weigh 5,000 pounds more than diesel-powered trucks (6.1% of payload) results in cargo loss for electric trucks equivalent to 17,000 t-shirts, 16,000 apples, or one full car less than a diesel-powered truck.39 Trucking company net margins are generally between 2.5% and 6%, meaning a 6.1% payload loss can eliminate any profitability.40 Other studies put the payload loss at almost 14,000 pounds.41 Payload lost by electric battery weight will affect company decisions to purchase electric trucks in the first place, but EPA does not consider this issue. [EPA-HQ-OAR-2022-0985-1621-A1, p. 26]

The smaller cargo capacity will impact traffic and emissions as well. According to the American Transportation Research Institute, 'Battery weight increases price and vehicle range, but decreases cargo revenue weight. Ultimately more [battery electric vehicle] trucks will be needed on already congested roadways to haul the same amount of freight.'42 EPA does not calculate the increased emissions that will come from these additional trucks upstream or downstream, nor does it calculate the increased emissions from additional traffic congestion that may result from more trucks on the roads. Increased costs incurred by companies by additional trucks and trips to haul the same amount of goods no doubt will be passed on to consumers and increase the cost of goods families need; EPA does not consider this issue, either. a[EPA-HQ-OAR-2022-0985-1621-A1, p. 26]

42 American Transportation Research Institute, Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, Dec. 2022, 2, available at https://truckingresearch.org/wp-content/uploads/2022/12/ATRI-Charging-Infrastructure-Challenges-for-the-U.S.-EV-Fleet-Summary-12-2022.pdf.

EPA's failure to adequately consider weight limit issues is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 26]

Organization: Chevron

One performance issue of concern is the loss of cargo hauling efficiency associated with heavier battery electric vehicles. Battery electric trucks would carry heavy batteries which would reduce their load carrying capacity. Smaller cargo loads will require additional truck trips to deliver the same quantity of goods, reducing the overall utilization efficiency of the trucking fleet. [EPA-HQ-OAR-2022-0985-1552-A1, p.5]

Organization: Daimler Truck North America LLC (DTNA)

There are a number of TCO inputs that EPA has not accounted for in the HD TRUCS tool that should be included to more accurately inform payback periods and adoption rate projections for the Proposed Rule, including:

- Weight Penalty. EPA assumes that fleets will accept up to a 30% weight penalty for BEVs in certain applications. Fleets are likely to account for this reduction in payload capacity in the TCO calculation as the cost per ton of goods moved will increase, thus it should be factored in to HD TRUCS. [EPA-HQ-OAR-2022-0985-1555-A1, p. 35]

Likewise, EPA asserts that most vehicles 'cube out' (fill up with goods or passengers before reaching the maximum vehicle weight) before they 'gross out' (reach maximum vehicle weight before filling up with goods or passengers) and estimates that battery technology is suitable for applications up to a 30% weight penalty.45 EPA references a report prepared by the North American Council for Freight Efficiency (NACFE) in support of this weight penalty threshold.46 The referenced NACFE report explains that vehicle weight distribution data is often misinterpreted, due to the fact that data reflecting vehicle loads 'per run' is often misunderstood as vehicle loads 'per truck,' leading many to conclude that a significant percentage of trucks on the road operate well below their maximum weight capacity.47 As NACFE explains, however, the relevant metric for understanding weight distribution data 'is loads, not trucks.'48 'Because many loads are unpredictable, one day a truck may cube out and the next it might weigh out.'49 Fleets are thus unlikely to purchase vehicles with a weight penalty outside of very specific applications that have predictable loads, as they cannot be used as flexibly as a diesel-powered alternative. For these reasons, EPA's HD TRUCS tool does not adequately consider application suitability with respect to weight. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 26-27]

45 See DRIA at 234.

46 See id. at 271 (citing NACFE, 'Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors—Run on Less Electric Report' (May 5, 2022). Figure 16 (NACFE Report)).

47 See NACFE Report at 38.

48 Id.

49 Id.

Organization: Hill Bros. Inc.

Subject: Battery powered trucks will not work for expedited team freight

2. The batteries are too heavy and will not allow enough payload for a trade off. [EPA-HQ-OAR-2022-0985-1461-A1, p. 1]

Organization: Lynden Incorporated

An electric truck weighs approximately 9,000 pounds more than a diesel truck. This means that trucks will need to make additional trips to get the job done, increasing the total cost to deliver freight and ultimately increasing the number of trucks on the road and overall emissions. EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

Beyond cost, a wide variety of barriers to heavy-duty truck electrification are not sufficiently addressed in the Proposal. Battery weight is likely to significantly curtail the long-haul capabilities of heavy-duty electric trucks. As noted above, the battery can add an additional 16,000 pounds to an HD truck. This reduces the amount that trucks can carry and will result in a need for substantially more vehicles on the road to transport the same amount of cargo. Truck carriers near the maximum allowable weight will likely have to modify their operations in order to comply with the Proposal.

Organization: Owner-Operator Independent Drivers Association (OOIDA)

BEVs with heavier weights will displace payload capacity and require more trucks on the road. [EPA-HQ-OAR-2022-0985-1632-A1, p. 4]

Organization: POET

- Costs associated with the need for purchase of more than one ZEV or the continued use of conventional vehicles following purchase of a single HD ZEVs due to limited range, limited cargo carrying capacity, as well as poor gradeability when fully loaded; and [EPA-HQ-OAR-2022-0985-1528-A1, p. 17]

Beyond the issues with HD ZEV technology cost and U.S. EPA's payback analysis, there are other issues with the agency's technology assessment that led to overestimation of adoption rates for HD ZEVs. These include the assumption that vehicle purchasers will deem a HD ZEV with a 30% lower cargo carrying capacity as equivalent to a conventional vehicle (Chapter 2.8.1 of the DRIA) and the assumption that purchasers of HD BEVs will accept the relatively low electric ranges upon which the U.S. EPA has based its cost estimates for HD BEVs (Table 2-33) – many of which are considerably less than 100 miles. Further, although U.S. EPA considered gradeability in determining electric motor sizes for HD BEVs (Chapter 2.4.1.2) it is not clear how U.S. EPA accounted for the impact of grade on BEV range which would increase the need for larger more expensive batteries again making a favorable payback analysis more difficult to achieve. [EPA-HQ-OAR-2022-0985-1528-A1, p. 29]

Organization: Schneider National Inc.

The EPA assumes up to a 30% payload penalty is acceptable for BEV.

- Cutting payload would have an impact on shipper costs, staffing, inventory, etc. More loads would also potentially require more capacity. In our experience, as an example, approximately 20% of intermodal loads already max out due to weight under the current diesel truck equipment configuration (and, on belief, a ZEV would weigh ~4,000-6,000 pounds more than a diesel truck). [EPA-HQ-OAR-2022-0985-1525-A1, p. 2]

Organization: The Sulphur Institute (TSI)

TSI's concerns echo many concerns of other industry stakeholders when it comes to this rulemaking. One main concern is that heavier electric battery or hydrogen powered heavy trucks will reduce cargo payload for commercial tank trucks, requiring truck companies to either 1) increase their fleet size or 2) incur more trips per day in and out of the refineries to load and transport recovered sulphur. In a day of commercial vehicle driver shortage and government imposed electronic logging, making more trips per day or having more trucks to operate creates an even bigger challenge for an already stressed industry and is untenable in the long run, not to mention increased congestion on roads and highways. Many of the truck companies supporting sulphur recovery operations are small niche operating companies, with small fleets of trucks compare to over-the-road national companies. Having to increase fleet size to more expensive trucks and expand driver pools is an expensive proposition, and frankly, something these companies simply cannot sustain over the long run. [EPA-HQ-OAR-2022-0985-1624-A1, p. 1]

Organization: Truck and Engine Manufacturers Association (EMA)

The NPRM and HD TRUCS incorrectly assume that all commercial BEVs will be depot-charged at night, and that any commercial ZEVs that need to operate further from home will be FCEVs. The NPRM also assumes that trucking fleets will be able to devote up to 30% of each vehicle's cargo carrying capacity for batteries large enough to provide enough power for the vehicle's entire daily work. If a commercial vehicle cannot carry enough batteries to complete its daily work, or if it must travel too far from its home terminal, the NPRM assumes that a FCEV will be used instead of a BEV. Of course, those FCEVs will require an entirely separate infrastructure of hydrogen-refueling stations, which still needs to be designed and developed. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 45 - 46]

c) Payload Limitation Criteria for Vocational Vehicles – Vocational vehicle types and applications, in general, can be more sensitive to the loss of payload. In fact, the purchasers of concrete mixers, some dump truck applications, and tanker trucks will go to great lengths to reduce the chassis and body weight to enable additional payload to be carried to the job site. The vehicles are “spec’d” with smaller engines, aluminum components, even aluminum frame rails at times, no passenger seats, and the lightest and smallest necessary component options, as examples of the length purchasers will go to maximize payload. For these applications in particular, reduced payloads of 30% from using a BEV powertrain will be highly detrimental to their overall utility. Reduction in payloads of even 5% to 10% likely will require additional vehicles or vehicle trips to perform the same work as a diesel-powered vehicle. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 48 - 49]

HD TRUCS does not take this critical payload limitation into account for these types of vocational vehicles. This is the most evident in the Custom Chassis – Concrete Mixer regulatory subcategory, which has an 18% adoption rate of BEVs in 2027 and 35% in 2032. Those same vehicles are added into the HHD subcategory as well. [EPA-HQ-OAR-2022-0985-2668-A1, p.49]

EMA recommends that an adjustment be made to the payload loss limitation criteria in the final rulemaking HD TRUCS for these weight-critical vehicle types. [EPA-HQ-OAR-2022-0985-2668-A1, p.49]

Organization: Truck Renting and Leasing Association (TRALA)

Securing National Weight Exemptions for BEVs and FCEVs Will be Difficult

Battery electric or fuel cell trucks will incur a substantial weight penalty that can put truck gross vehicle weights over their allotted federal limits. Roughly 10-15% of truckloads hit their maximum federal weight limits due to the types of payloads they carry. Federal legislation passed in 2019 allows a 2,000-pound weight exemption for battery powered heavy-duty trucks. The problem is the additional battery weight for a Class 8 BEV could add up to16,000 pounds depending on the battery configuration. This is one of the primary reasons why Class 8 trucks will rely upon the development and advancement of Fuel Cell Electric Vehicles (FCEVs). Fuel cell vehicles will also experience additional weight issues but not to the extent of BEVs. OEMs estimate the additional weight of an FCEV compared to a comparable ICE vehicle will be somewhere in the range of 8,000 pounds. The longer the vehicle range the more battery cells or fuel cell modules required which in turn has a direct correlation to overall added vehicle weight. [EPA-HQ-OAR-2022-0985-1577-A1, p. 15

Federal legislation was introduced in May to secure a 2,000-pound weight exemption for hydrogen-powered trucks. However, a 2,000-pound weight allowance for either BEVs or FCEVs is a mere drop in the bucket. Federal legislation to acquire additional weight exemptions to offset added ZEV technology weight will be extremely difficult given strong opposition from select industry, safety, and infrastructure interests. [EPA-HQ-OAR-2022-0985-1577-A1, p. 15]

With respect to infrastructure concerns, the American Society of Civil Engineers' (ASCE) 2021 Infrastructure Report Card gave the nation's roads a 'D' grade and its bridges a 'C' grade.22 Roads and bridges need continual repair, rebuilding, and investment. Added vehicle weights and the high torque rates of ZEVs has the potential to accelerate the degradation of our nation's road networks. TRALA requests further analysis be undertaken to ensure that the increased use of all on-road ZEVs will not result in any detrimental impacts and unanticipated costs related to maintaining our nation's existing highway infrastructure. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 15-16]

Organization: Valero Energy Corporation

Due to federal weight constraints for tractor trailers, a long-haul BEV trucks would lose 20% of payload capacity compared with a diesel truck, reducing the available revenue per mile and increasing the number of trucks needed to avoid delay or interruption of nationwide freight services.108 [EPA-HQ-OAR-2022-0985-1566-A2, p. 24]The weight limitations for HDVs are based on the Dwight D. Eisenhower System of Interstate and Defense Highways, which limit the maximum gross heavy-duty vehicle weight, including the vehicle and cargo, to 80,000 pounds for ICE vehicles and 82,000 pounds for natural gas and electric battery vehicles, however different, lower, weight limits can be applicable depending upon various vehicle axle configurations.153 Given the enormous weight of the batteries deployed in HD BEVs, EPA's proposal will significantly increase the curb weight for HDVs and therefore reduce their ability to haul cargo. [EPA-HQ-OAR-2022-0985-1566-A2, p. 31]

153 23 U.S.C.A. § 127. Vehicle weight limitations - - Interstate System

By assuming that payload loss is acceptable, EPA arbitrarily dictates how businesses can and cannot use HDVs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 5]

. EPA assumes, with no supporting evidence, that a 30% loss of gravimetric payload is acceptable, across all classes of HDVs.

EPA assumes for the purposes of its HD TRUCS modeling that a gravimetric payload reduction (caused by battery weight) of less than 30% is acceptable, "since most vehicles cube out (fill up with goods or passengers before reaching maximum vehicle weight) before they gross out (reach maximum vehicle weight before filling up with good or passengers)."14 EPA bases the assumption on "publicly available data that was available at the time frame of this proposal" and cites a report by the North American Council for Freight Efficiency (NACFE) titled "Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors."15 [EPA-HQ-OAR-2022-0985-1566-A2, p. 4]

14 DRIA at 234.

15 DRIA at 234.

However, the NACFE report makes no such claim. In fact, in several places the NACFE report discusses longer BEV ranges as coming "at the sacrifice of significant payload capacity."16 Further, EPA cites a figure from the NACFE report for its data on freight weight data, maintaining that trucks "cube out" before they "weigh out." However, this data is from 2010.17 The trucking industry has undergone drastic changes and increased efficiencies since 2010. This data is now thirteen years old and does not account for the "e-commerce" boom, not to mention other developments in supply chain logistics. For example, online sales in 1998 were only $5 billion. Today, e-commerce sales top $800 billion.18 All of these additional sales have undoubtedly impacted freight weight data. Additionally, UPS, FedEX, and USPS have all changed their shipping rates since 2010, charging based on dimensions rather than weight with the goal of encouraging more efficient shipping practices and avoid cubing out before weighing out.19 Therefore, it could very well be the case that today's delivery trucks weigh out before cubing out. Even if the NACFE report did support EPA's assumption that a 30% payload reduction is acceptable, the NACFE report refers only to regional haul trucks – it would be inappropriate for EPA to extend the assumption to all types of heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1566-A2, p. 4]

16 NACFE, "Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors," 2022, at 3 and 25.

17 "In several reports, NACFE has cited freight weight data, including data shown in Figure 14, Figure 15, and Figure 16 from M.J. Bradley and New West Technologies. The graphs were originally reported in a 2010 National Academies of Sciences, Engineering and Medicine Transportation Research Board (TRB) report, Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles." Id. at p. 35.

18 Annual Retail Trade Survey Shows Impact of Online Shopping on Retail Sales During COVID-19 Pandemic, US Census Bureau (Apr. 27, 2022), https://www.census.gov/library/stories/2022/04/ecommerce-sales-surged-during-pandemic.html.

19 See, e.g., New FedEx and UPS Dimensional Weight

EPA also fails to account to the flexibilities inherent in diesel fueled trucks versus battery powered trucks. For example, a diesel truck could be fueled with the precise amount needed to haul the freight to the destination and return to the origin point. With a diesel truck, the weight of a vehicle plus the freight and the fuel can be fine-tuned for each trip. However, this is not the case with a BEV truck, which has the same battery weight for each and every trip. This does not allow the shipper to fine tune the weight of the vehicle just for the trip at hand. Even worse, the battery truck must be recharged every night, making it far less efficient than a diesel-powered model beyond just the lost cargo space due to the size of the batteries.20 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 4 - 5]

20 Fan Tong et al., Energy consumption and charging load profiles from long-haul truck electrification in the United States, Environmental Research: Infrastructure and Sustainability (Sept. 2, 2021), https://iopscience.iop.org/article/10.1088/2634-4505/ac186a/pdf (finding that even under the most optimistic case, electric trucks technical performance in terms of payload and range is still lower than that of a future diesel truck and that assuming the current technologies available today, the electric trucks would require a 65% increase in total vehicle distance traveled to make up for the reduced payload capacity).

EPA Summary and Response:

Summary:

Many commenters raised concerns about the reduction in payload due to increased tare weight of ZEVs. Their concerns include need for additional trips to carry the same amount of freight due to reduction in payload, consequent concerns over having additional drivers and trucks to meet freight demands, loss of operating margins, and increased congestion from the additional trucks, again, due to assumed reduction in payload .

The principal concern raised is that battery size and weight constrain payload so much as to render BEVs not economically viable. Several commenters indicated that BEVs would weigh out before cubing out—that is, due to added weight from the BEV powertrain, otherwise available cargo capacity would be lost. (American Soybean Ass'n, Arizona State Legislature, ATA, Chevron, Hills Bros., NACS, OOIDA, TRALA, TSI, Valero.) The American Soybean Association elaborated, indicating that BEVs on average weigh over 5,000 pounds more than their ICE counterparts[351], AHUA indicating an addition of 6,000 to 17,000 pounds, Schneider National indicating batteries would add 4,000 to 6,000 pounds to a truck, Lynden Incorporated indicating batteries would add 9,000 pounds, the NACS indicated that batteries would add 16,000 pounds to a HD truck as did the Arizona State Legislature and TRALA who further stated that FCEVs would weigh 8,000 pounds more than a HD truck. These commenters stated that this necessarily lost capacity raises significant questions as to BEV economic viability.

Several commenters had specific issues with EPA's proposed metric of a 30% payload loss; these commenters include AFPM, Arizona State Legislature, DTNA, EMA, Schneider, Valero, POET. TRALA further commented that loads weigh out before cubing out 10-15% of the time while Schneider National approximated from their own data that 20% of intermodal loads weigh out. Daimler commented that the assumed 30% weight penalty used in the analysis for the rule should be included in the cost of the vehicle as fleets would account for the additional cost of making up for the lost payload through additional trips or vehicles. Several commenters stated that EPA misunderstood the NACFE report. Daimler further commented that EPA had misinterpreted the NACFE report on which the agency had based its statement at proposal that HD vehicles would cube out before weighing out. DTNA maintains that: "[t]he referenced NACFE report explains that vehicle weight distribution data is often misinterpreted, due to the fact that data reflecting vehicle loads "per run" is often misunderstood as vehicle loads "per truck," leading many to conclude that a significant percentage of trucks on the road operate well below their maximum weight capacity." DTNA comment at pp. 29-30. The relevant metric is load, not trucks: "[b]ecause many loads are unpredictable, one day a truck may cube out and the next it might weigh out." Id. [2]Fleets are thus unlikely to purchase vehicles with a weight penalty outside of those few applications that have predictable loads. Valero Energy shares similar thoughts that NACFE does not make claim that 30% payload loss is acceptable. In addition, the NACFE report is from 2010, the industry has gone through significant changes since then as a result of e-commerce as well as new shipping practices. Furthermore, the NACFE report only accounts for regional haul vehicles; this value should not be extended to all heavy duty vehicles. Valero further stipulates that diesel trucks offer the flexibility in that it can be refueled as needed for the payload whereas BEVs battery size are fixed. EMA believes payload penalty from battery limit is too high for vocational vehicles; for some, even a 5 to 10% loss is too much to achieve their required duty cycle. EMA recommends adjustment to the payload cut off. POET also share similar belief that 30% payload loss is too high.

AHUA proports reduced payload capacity, limited mileage range, and downtime for charging will increase the need for additional trucks and drivers; this similar sentiment is expressed by POET and OOIDA. Likewise, Chevron and Lynden comments additional trips will be necessary for reduction in payload; Lynden further explains this will increase the number of vehicles on the

[351] Harvey, J., PhD, Saboori, A., et al. (2020) Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges. Available online: https://escholarship.org/uc/item/4z94w3xr

road and overall emissions. Valero comments on diesel trucks can fine tune their fuel amount for the work it needs to do, whereas BEVs has the same battery weight for every trip.

Response:

At proposal, EPA assumed that if a BEV could accommodate at least 70 percent of the standard payload used to demonstrate compliance with Phase 2 (see 40 CFR 1037.801) of a comparable ICE vehicle, the BEV would be considered to have sufficient payload capacity. DRIA at 234.As explained in Chapter 2.9.1 of the RIA, based on consideration of comments received, for the final rule we are not using a 30% payload reduction as an *a priori* metric for determining BEV suitability or the related NACFE study. Instead, we concluded that it is more appropriate and robust to assess each application in HD TRUCS on an individual basis and determine the suitability of each application for BEVs based on the payload difference between ICE vehicles and BEVs. . See RIA Chapters 2.9.1.1 and 2.9.1.2 discussing EPA's case-by-case determinations regarding payload for vehicles in HD TRUCS. EPA conducted two separate individualized types of determinations: one for battery payload weight, the other for battery volume. See RIA Chapter 2.9.1.1 and 2.9.1.2. We note further that this delineation responds to those comments relating to weighing out and cubing out, since we are conducting separate analyses for each of these issues.

Commenters are incorrect in asserting that added battery weight will impede HD BEVs from being able to negotiate steep grades. In HD TRUCS, we determined the motor power requirements to meet four performance metrics. These performance metrics are the peak power requirement of the ARB transient cycle, 0–30 MPH vehicle acceleration times, 0–60 MPH vehicle acceleration times, and the ability of the vehicle to maintain a constant cruise speed at 6 percent grade as described in RIA Chapter 2.4.1.2 and 2.8.5.4.

The comment from ATA that added payload can decrease ability of HD BEVs to operate across various (unspecified) duty cycles is also misplaced. Inputs to HD TRUCS include power requirements adequate to assure that each of the GEM test cycles are met. See RIA Chapter 2.4.1.2 and 2.8.5.4

Comments regarding payload penalty are exaggerated. As shown in RIA Chapter 2.9.1.1, many BEVs in HD TRUCS would not incur a weight penalty. For those that do, we conducted a further evaluation of the impact of the BEV weight on maximum payload capacity, including an analysis of the impact of selecting battery chemistries with higher specific energy (lower weight for a given battery range) on payload capacity. For the Class 8 dump trucks, the payload difference (loss) was modest: 2.6 percent or with the NiMn battery chemistry specific energy (226 Wh/kg) the payload loss is 1.3 percent. The tanker payload loss was 2 percent of maximum payload. EPA did not view these differences as sufficient to preclude utilization of BEV technology at the rates projected in EPA's modeled compliance pathway. See RIA Chapter 2.9.1.1 for detailed explanations, by vehicle. On the other hand, for concrete mixers and pumpers, EPA determined that battery size, energy demand, and corresponding costs were all significantly higher than EPA had projected at proposal and accordingly determined that EPA's optional custom chassis standards for Concrete Mixers/Pumpers and Mixed-Use Vehicles will remain unchanged from the Phase 2 MY 2027+ CO_2 emission standards. We found the weight to be reasonable for most of the tractors in HD TRUCS. EPA further examined when tractors are utilized at maximum load[352] and found that many commodities do not require transport at maximum load, for further discussion on our analysis of tractor loading based on commodities, see Chapter 2.9.1 of the RIA. Our ultimate conclusion was that our modeled compliance pathway projects a majority of these vehicles remain ICE vehicles, that ICE vehicles therefore would be available to accommodate those commodities for which maximum loads are needed, and that BEVs remain a viable alternative for other commodities. See RIA 2.9.1.1 for a vehicle-by-vehicle discussion. We likewise show in RIA Chapter 2.9.1.2 why BEVs in our analysis would not incur a volumetric penalty.

We also do not agree with the comments that BEVs will prove economically infeasible to operate because they will need to make so many more trips than their ICE counterparts. As discussed in RTC section 4.3.1 and in RIA Chapter 2.9.1.1, EPA has completed further analysis since the NPRM on the effect on payload comparing an ICE to BEV powertrain.[353] This analysis was performed to ensure that HD BEVs are capable of performing the same amount of work as ICE vehicles without incurring additional trips.

We have not included a cost for additional ZEVs required to perform the same work as ICE vehicles because, in general, we expect that our component sizing methodology (see RTC Section 3.3.1) describes ZEVs that can perform in full the work of a comparable ICE vehicle. As further explained in our response in RTC section 2.4, we acknowledge that there are some uses cases, including those with extreme daily VMT demands, for which ICE vehicles may be better suited during the timeframe of this rule. Our modeled potential compliance pathway accounts for this and includes ICE vehicles. For all of the HDV subcategories, that pathway projects that there would be ICE vehicles available to meet the needs of those vehicles that operate under extreme daily VMT demands.

Please see Section 3.3 of this RTC for responses to comments relating to range and battery sizing.

3.10.2 Intentionally Left Blank

3.10.3 Battery Volume

Comments by Organizations

Organization: Truck and Engine Manufacturers Association (EMA)

Battery Length Calculation in 2_BEV Tech worksheet – EPA included an assessment of battery volume in the NPRM (see Draft RIA Section 2.4.2, p.166). The volume assessment drives the calculation of the width of the battery based on the battery volume that is determined for each vehicle type within HD TRUCS. The calculation divides the battery volume by the presumed battery height (110% of the frame rail height) and by the battery length (wheelbase) of each vehicle type to calculate a battery width. However, if this entire rectangle is used for

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[352] DOE. Vehicle Technologies Office. Fact of the Week #1293. “In 2019, More Heavy Trucks Operated at 34,000 to 36,000 Pounds than Any Other Weight Category”. Available online: https://www.energy.gov/eere/vehicles/articles/fotw-1293-june-5-2023-2019-more-heavy-trucks-operated-34000-36000-pounds-any

[353] See Landgraf, Mike. Memorandum to docket EPA-HQ-OAR-2022-0985. “HD GHG Phase 3 Rule BEV Payload Analysis” February 26, 2024.

batteries on a BEV, there will be no room for the front or rear tires, since the prescribed dimensions violate the space envelope required for the tires. EMA recommends that the battery length factor be reduced to allow for a more realistic volume requirement for the batteries in HD TRUCS. Specifically, EMA reduced the length by 26 inches for non-tractors to allow space for the front tire. The overlap with the rear tire may be able to go between the frame rails behind the axle, since trucks have more frame extended behind the rear axle(s). For Class 7 tractors, which are a 4x2 axle configuration, the length should be reduced by 26 inches for both the front and rear axle, for a total reduction of 52 inches. The after-frame on tractors is very short to provide clearance for the landing gear of a trailer, so there is no space behind the axle for additional batteries. On Class 8 tractors, which have a tandem rear axle (6x4), the battery length needs a reduction of 26 inches for the front axle and 52 inches for the rear axle. The wheelbase on 6x4 configurations is measured to the centerline of the two rear axles, which necessitates additional reductions over Class 7 tractors. These battery-length errors allow HD TRUCS to include various tractors as BEVs when, in fact, there is insufficient space for the required battery. Those vehicles should be treated as FCEVs instead. The space needed for the frame rails also needs to be considered. Each of the two rails are about 3.5 inches wide. EMA believes this is a less significant issue in the battery width limitation evaluation, so it is not included in the corrections to EMA HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 24]

EPA Summary and Response:

Summary:

EMA commented that the calculation used in determining the length of battery in the battery volume calculation in HD TRUCS was inaccurate. They commented that the calculation did not account for wheels and tires when determining the length of the battery and that the value we used (wheelbase) should be shortened to account for the steer tire and the drive tires. EMA gave values that could be used to account for wheels and tires in determining the overall length of the battery. They also pointed out that the calculation for width did not account for the width of the frame rails and gave a value that can be used for the width of the frame.

Response:

EPA generally agrees with EMA that our calculation for battery length in the proposal should have accounted for wheels and tires, and we also understand the criticisms about factoring in the width of the frame. However, we have taken a different approach for the final rule. Instead of calculating the specific volume of the battery for each vehicle, we have compared the battery size in kWh of the vehicles in HD TRUCS to comparable current BEVs. If the comparison showed that the battery size of the vehicle in HD TRUCS was similar to or smaller than current production BEVs, that battery was determined to have no packaging constraints. If the battery size of the vehicle in HD TRUCS was significantly larger than current production BEVs, then that battery was determined to have packaging constraints and would not be possible to package on the vehicle. This is a conservative approach as we are presume that battery energy density will increase over time allowing the same amount of energy to be stored in a physically smaller battery. This new approach is more robust because it compares packaging to existing BEVs, so we are confident that similar battery volumes can be packaged. For further discussion on our analysis for battery volume and packaging see Chapter 2.9.1.2 of the RIA.

3.11 Payback Period, Baseline, Projected Compliance Pathway, TCO

3.11.1 Baseline

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

a. Current Adoption Of Electric Vehicles

Today, electric vehicles are barely used in the heavy-duty industry. Manufacturers offer very few models, and heavy-duty vehicle operators do not buy them. The few that have been purchased are almost all show-pieces purchased by local governments. [EPA-HQ-OAR-2022-0985-1660-A1, p. 19]

Battery-Electric Vehicles. For the current model year, there are only 120 heavy-duty battery-electric vehicle models available for purchase. See U.S. Dep't of Energy, Alternative Fuels Data Ctr., Alternative Fuel and Advanced Vehicle Search, https://tinyurl.com/4pmta4a6 (last accessed June 12, 2023).2 Those models are spread between several categories, including step vans, vocational/ cab chassis vehicles, street sweepers, refuse haulers, tractors, passenger vans, shuttle buses, transit buses, and school buses. Id. The limited number of options may be a result of exceedingly low demand. In 2022, for example, there were a mere 2,000 electric buses registered in the United States, making up only 2 percent of buses overall. See IEA, Electric Bus Registrations and Sales Share by Region, 2015-2022 (Apr. 26, 2023), https://tinyurl.com/yckwdj3e. In that same year, there were a mere 3,100 electric trucks registered in the United States, making up only 0.4 percent of trucks overall. See IEA, Electric Truck Registrations and Sales Share by Region, 2015-2022 (Apr. 26, 2023), https://tinyurl.com/4z2c2rm5. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 19 - 20]

Fuel-Cell Vehicles. The number of heavy-duty fuel-cell vehicle models is even lower. For the current model year, there are only four heavy-duty fuel-cell models available for purchase. See U.S. Dep't of Energy, Alternative Fuels Data Ctr., Alternative Fuel and Advanced Vehicle Search, https://tinyurl.com/ymvf2u6z (last accessed June 13, 2023).3 Three are transit buses, and the fourth is a street sweeper. Id. There are thus zero available 2023 fuel-cell models for many of the vehicle categories in the heavy-duty industry. And the models that are available are barely used in the United States. In 2022, for example, there were approximately 200 fuel-cell buses registered nationwide, accounting for only 0.2 percent of buses overall. See IEA, Trends in Electric Light- Duty Vehicles (2023), https://tinyurl.com/mpwrhuev. [EPA-HQ-OAR-2022-0985-1660-A1, p. 20]

> 3 EPA reports that there are 16 available heavy-duty fuel-cell models. Draft RIA at 76–77. Again, EPA includes models from prior and future years, as well as internal-combustion-engine models that can be retrofitted into electric vehicles through a costly conversion process. See id.

By and large, the heavy-duty industry has not embraced a shift from internal- combustion-engine vehicles to electric ones. [EPA-HQ-OAR-2022-0985-1660-A1, p. 20]

Organization: Clean Air Task Force et al.

A. EPA must use an accurate baseline in promulgating vehicle standards.

Under section 202(a)(1), EPA must, as a consequence of its Endangerment Finding, adopt standards that address the threat that GHG emissions from heavy-duty vehicles pose to public health and welfare. See 42 U.S.C. § 7521(a)(1). Standards that do no more than track anticipated market trends, when stronger standards are technically and economically feasible, do not satisfy this statutory mandate in the face of ever-growing risks and impacts of climate change. A factual prerequisite to determining whether proposed emission standards will have any independent effect or will instead merely track, or trail, anticipated market developments, is to develop an accurate baseline (or "reference case," as EPA refers to it in the proposal). Reflecting this reality, OMB's Circular A-4 provides that identifying an appropriate baseline is a "key element" of a regulatory analysis.40 Accordingly, an agency's failure to use an appropriate baseline in developing its regulatory action is arbitrary and capricious. See Leather Indus. of Am., Inc. v. EPA, 40 F.3d 392, 404-05 (D.C. Cir. 1994) (holding that EPA's selenium limits for land-applied sewage sludge were arbitrary and capricious because they were based on overly conservative baseline exposure assumptions); Stewart v. Azar, 366 F. Supp. 3d 125, 154 (D.D.C. 2019) (striking down Department of Health and Human Services' approval of state Medicaid demonstration project because it was based on an irrational baseline); cf. Am. Equity Inv. Life Ins. Co. v. SEC, 613 F.3d 166, 178 (D.C. Cir. 2010) ("The SEC could not accurately assess any potential increase or decrease in competition, however, because it did not assess the baseline level of price transparency and information disclosure under state law."); Or. Nat. Desert Ass'n v. Jewell, 840 F.3d 562, 568 (9th Cir. 2016) (noting that in the context of NEPA, "[t]he establishment of a baseline is not an independent legal requirement, but rather, a practical requirement in environmental analysis often employed to identify the environmental consequences of a proposed agency action.") (citation and internal quotation marks omitted). It is therefore imperative that EPA develop an accurate baseline of HD ZEV penetration and use that baseline to help inform the stringency of its final standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 20]

40 OMB, Circular A–4: Regulatory Analysis, at 2 (Sept. 17, 2003), https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf.

B. The proposal underestimates baseline HD ZEV penetration levels.

EPA's proposed standards are too lenient in part because they rely on underestimates of future baseline HD ZEV market penetration levels, which causes EPA to underestimate the feasibility of higher stringency levels that would be achievable through greater deployment of zero-emission technologies. Finalizing the standards as proposed would fail to achieve the emissions reductions necessary to meet EPA's statutory mandate to protect public health and welfare, including by facilitating greater use of improved emission control technologies. See, e.g., NRDC v. EPA, 655 F.2d 318, 328 (D.C. Cir. 1981) (stating that "Congress intended the agency to project future advances in pollution control capability" and noting that Clean Air Act section 202(a)(2) embodies Congress's intent that EPA "press for the development and application of improved technology rather than be limited by that which exists today."); 88 Fed. Reg. at 25949 (noting that EPA "has clear authority to set standards under [Clean Air Act] section 202(a)(1)–(2) that are technology forcing when EPA considers that to be appropriate.").41 EPA has recognized in the past that underestimating the baseline has a direct impact on the stringency of emission regulations. See, e.g., Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards 87 Fed. Reg. 17414, 17561 (proposed Mar. 28, 2022) (recognizing that considering a more accurate (higher) baseline HD ZEV market penetration could lead to more stringent standards). [EPA-HQ-OAR-2022-0985-1640-A1, pp. 20 - 21]

41 See also 81 Fed. Reg. 73478, 73809 (Oct. 25, 2016) (EPA's HDV GHG Phase 2 standards were "predicated on performance of technologies not only currently deployed but those which reasonably can be developed during the phase in period.").

Here, EPA's baseline HD ZEV penetration rates are too low because they unreasonably assume essentially no baseline ZEV adoption due to natural market forces and instead model the level of ZEVs resulting only from the ACT rule in California and some of the other states that have adopted the ACT rule.42 This approach results in an unrealistic underestimate of baseline HD ZEV sales. [EPA-HQ-OAR-2022-0985-1640-A1, p. 21]

42 See EPA, Draft Regulatory Impact Analysis (DRIA), at 317 ("To estimate the adoption of HD ZEVs in the reference case, we assumed a national level of ZEV sales based on volumes expected from ACT in California and the other states that have adopted ACT. We used those volumes as the numeric basis for a projection of the number of ZEVs nationwide in the 2024 and later timeframe.") Here, EPA considered ZEV sales that would occur in California and five ACT-adopting states (Oregon, Washington, New York, New Jersey, and Massachusetts), but did not account for two additional states that have since adopted the rule (Vermont and Colorado). See Sierra Club, Vermont Adopts Rules for Cleaner Cars and Trucks (Dec. 1, 2022), https://www.sierraclub.org/vermont/vermont-adopts-rules-cleaner-cars-and-trucks; Colo. Dep't Pub. Health & Env't, Colorado Adopts New Measures to Increase Availability of Zero-Emission Trucks That Offer Lower Operating and Fuel Costs (Apr. 21, 2023), https://cdphe.colorado.gov/press-release/colorado-adopts-new-measures-to-increase-availability-of-zero-emission-trucks-that.

In fact, as explained in this section, the level of ZEV sales EPA models for its proposed standards—which is based on payback period as the driver of ZEV adoption43—is actually a more reasonable assessment of a likely baseline level of ZEV sales. Specifically, the ZEV penetration rates that EPA anticipates will result from the standards merely track one projection of market trends rather than reflect any additional feasible adoption of emissions-reducing technology. The payback period approach on which EPA relies to set its standards, then, more appropriately informs baseline ZEV adoption, i.e., what the heavy-duty ZEV market would be expected to achieve without considering the effect of Phase 3 standards on ZEV adoption. [EPA-HQ-OAR-2022-0985-1640-A1, p. 21]

43 EPA based its payback periods on a report by ACT Research titled "Charging Forward: 2020-2040 BEV & FCEV Forecast & Analysis: Commercial Electric and Fuel Cell Vehicle Multi-Client Study." DRIA, at 231-32 ("[W]e relied on the ACT Research method to assess adoption rates, which we modified to account for the effects of our proposed regulation."). Citing a licensing agreement, EPA declined to make the ACT Research report available in the public docket. Memorandum from George C. Mitchell, Mem. to Docket No. EPA-HQ-OAR-2022-0829 (Apr. 7, 2023), https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-0931. Furthermore, the report is not available in the EPA Reading Room. Instead, it is available only for purchase from ACT Research by paying a $25,000 fee. ACT Research, Are You Charging Forward to Zero Emissions?, https://www.actresearch.net/consulting/special-projects/commercial-vehicle-decarbonization-forecast-reports (last visited June 10, 2023) (PDF of pricing information attached to this comment letter). Thus, we cannot make an assessment of the accuracy, reasonableness, or appropriateness of ACT Research's data, assumptions, methodology, analysis, findings, and conclusions. This, in turn, prevents us from assessing and commenting on the reasonableness of EPA's heavy reliance on the report and on EPA's approach to determining payback periods. We object to EPA's withholding of this critical material from the public docket, which has prevented us from offering meaningful comment on a key aspect of the proposal.

Several additional analyses project baseline levels of HD ZEV penetration that are very close to the level of ZEVs that EPA anticipates manufacturers will produce to comply with the proposed standards, further supporting a higher baseline and calling into question EPA's approach. And data on government, manufacturer, and fleet policies, investments, and commitments underscore the accuracy of these higher levels of baseline HD ZEV penetration. EPA should revise its baseline in the final rule to reflect what would actually occur under baseline circumstances, which would result in higher baseline HD ZEV sales shares. A more accurate baseline would involve ZEV penetration levels closer to those that EPA projected would result from the proposed standards. See EPA, Draft Regulatory Impact Analysis (DRIA) at 319, Tbl. 4-7 (showing projected ZEV adoption rates under EPA's proposed standards). Assuming a more accurate and reasonable HD ZEV baseline, it becomes clear that a national stringency level at least as protective of public health and welfare as the ACT Rule, implemented nationwide, is entirely feasible and more aligned with EPA's mandates under the Clean Air Act. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 21 - 22]

1. The payback period analysis that EPA relies on in proposing the stringency of its standards should instead be used to inform EPA's regulatory baseline.

Circular A-4, which provides guidance to federal regulatory agencies on the rulemaking process, explains that a regulatory baseline "should be the best assessment of the way the world would look absent the proposed action," and should include consideration of the "evolution of the market."44 In EPA's proposal, the Agency explains that in setting its proposed standards it relied primarily on a method developed by ACT Research based on technology payback period to inform its ZEV adoption level because "payback is the most relevant metric to the HD vehicle industry," and "only ACT Research's work directly related payback period to adoption rates." DRIA at 232. Payback period, however, is of key relevance to a baseline-level analysis—especially for heavy-duty vehicles. EPA's proposal does not consider payback period to inform its baseline HD ZEV penetration rates, but it should. Heavy-duty vehicles are generally purchased to fulfill a business need such as delivery services, municipal work, transporting people or goods, construction, refuse collection, and freight delivery. 88 Fed. Reg. at 25938. As EPA notes, "[b]usinesses that operate HD vehicles are under competitive pressure to reduce operating costs, which should encourage purchasers to identify and rapidly adopt new vehicle technologies that reduce operating costs." 88 Fed. Reg. 26071. Thus, market trends, payback periods, and total cost of ownership of vehicles are and have always been relevant to a baseline-level inquiry. While it is possible that some HDV purchasers refrain from purchasing ZEVs even when they make economic sense, it is unreasonable to wholly disregard payback periods in setting the baseline—especially when Circular A-4 directs EPA to consider "market trends" in doing so—and consider them only in setting the standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 22]

44 OMB, Circular A-4, at 15.

EPA also explains that ZEV adoption rates typically follow an S-curve, DRIA at 231, and cites several additional sources modeling HD ZEV adoption, including research by government, nonprofit, and private entities.45 These additional sources, however, actually consider and/or project HD ZEV penetration rates in a baseline scenario—i.e., what would happen under market conditions absent the Phase 3 standards—and each projects ZEV penetration consistent with or even higher than that EPA anticipates will result from its proposed standards. Essentially, EPA appears to simply propose to codify a baseline level of HD ZEV penetration, rather than drive additional feasible adoption of emission control technologies to achieve the emissions reductions necessary to protect public health and welfare. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 22 - 23]

45 EPA notes that it considered the following studies: Ellen Robo & Dave Seamonds, ERM, Technical Memo to Environmental Defense Fund: Analysis of Alternative Medium- and Heavy-Duty Zero Emission Vehicle Business-As-Usual Scenarios (May 16, 2022) [hereinafter Robo & Seamonds, Technical Memo], https://www.erm.com/contentassets/154d08e0d0674752925cd82c66b3e2b1/edf-zev-baseline-technical-memo-16may2022.pdf; Peter Slowik et al., ICCT & Energy Innovation, Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States, at ii (2023), https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23-2.pdf; Baha M. Al-Alawi et al., Calstart, Global Sales Targets for Zero-Emission Medium- and Heavy-Duty Vehicles—Methods and Application (2022), https://globaldrivetozero.org/site/wp-content/uploads/2022/02/CALSTART_Global-Sales_White-Paper.pdf. EPA also considered several models: MA3T-TruckChoice, see Zhenhong Lin et al., Oak Ridge Nat'l Lab'y, Presentation of Transportation Energy Evolution Modeling (TEEM) Program (June 22, 2021), https://www.energy.gov/sites/default/files/2021-07/van021_lin_2021_o_5-28_1126pm_LR_FINAL_ML.pdf; Oak Ridge Nat'l Lab'y, Transportation Energy Evolution Modeling (TEEM) Program, https://www.energy.gov/eere/vehicles/articles/transportation-energy-evolution-modeling-teem-program-1 (last visited June 14, 2023); Nat'l Renewable Energy Lab'y (NREL), T3CO: Transportation Technology Total Cost of Ownership, https://www.nrel.gov/transportation/t3co.html (last visited June 14, 2023); Argonne Nat'l Lab'y, BEAN: Benefits Analysis, https://vms.taps.anl.gov/tools/bean/ (last visited June 14, 2023); and Pacific Northwest Nat'l Lab'y, GCAM: Global Change Analysis Model, https://gcims.pnnl.gov/modeling/gcam-global-change-analysis-model (last visited June 14, 2023).

The baseline HD ZEV penetration projections from the analyses EPA cites, along with those of other relevant analyses, are shown in comparison to projected ZEV penetration rates in EPA's baseline and proposed standards in Table 2, below. Comparing the levels in each of these baseline projection analyses to EPA's baseline, and the proposed standards highlights that EPA's baseline HD ZEV sales projections are unreasonably low, and that in fact EPA's proposed standards would merely codify a reasonably anticipated market-driven heavy-duty ZEV penetration level. [EPA-HQ-OAR-2022-0985-1640-A1, p. 23.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 23-24, for Table 2]

Each of the analyses in Table 2 endeavors to model what the market is likely to do absent the Phase 3 standards. The values show a range due to differing underlying assumptions regarding the impact of state and federal policies, along with assumptions regarding market trends, but all show baseline ZEV penetration rates much higher than EPA's baseline and more consistent with the level of ZEV penetration that EPA predicts will result from its proposed standards. A payback period approach like the one EPA uses in its standard-setting analysis is by no means the only consideration relevant to estimating HD ZEV baseline penetration levels, but payback periods are reasonable and important factors to consider in setting the baseline ZEV penetration rate. In considering payback period for the baseline, however, EPA should consider sources in addition to the ACT Research report. As explained in footnote 43, the Agency has not made that report available in the public docket, making it impossible for commenters to understand whether the ACT Research payback periods are accurate or reasonable. In addition to considering payback period, EPA should consider other relevant factors that inform baseline HD ZEV sales, such as federal and state rules, programs, and incentives, and fleet and manufacturer commitments—many of which also inform the baseline analyses listed in Table 2. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 24 - 25]

2. EPA's HD ZEV baseline should account for all state-level rules and investments.

EPA's proposal correctly notes that "a number of states have signaled interest in greater adoption of HD ZEV technologies and/or establishing specific goals to increase the HD electric vehicle market." 88 Fed. Reg. at 25947.57 EPA highlights a few of these state-level goals, such as the Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding (MOU) organized by Northeast States for Coordinated Air Use Management (NESCAUM), but the Agency underestimates the depth and breadth of state-level commitments and fails to incorporate their effects on HD ZEV sales directly into the baseline. For the final rule, EPA should utilize a baseline that takes into account (1) the projected HD ZEV sales to be achieved in all states that have adopted the ACT rule,58 including the most recent states to have adopted that rule; (2) projected sales to be achieved in all states that have signed the NESCAUM MOU; and (3) at least some modest level of ZEV adoption by other states based on factors that will independently drive adoption of HD ZEVs: extensive and growing government, fleet, and manufacturer commitments, achieved or near-term HD ZEV cost favorability, and the impacts of the BIL and IRA on market-based adoption. [EPA-HQ-OAR-2022-0985-1640-A1, p. 25]

57 See also 87 Fed. Reg. at 17440, 17595–17598 (noting that numerous states "have announced plans to shift the heavy-duty fleet toward zero-emissions technology," and detailing examples such as states' and cities' expansion of electric bus fleets).

58 Advanced Clean Trucks Regulation, Cal. Code Regs. tit. 13, §§ 1963-1963.5, 2012-2012.2 (2019), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fro2.pdf.

a. EPA's baseline should account for all states that have adopted the ACT rule.

EPA notes that for its baseline, the Agency "assumed a national level of ZEV sales based on volumes expected from ACT in California and the other states that have adopted ACT," and "used those volumes as the numeric basis for a projection of the number of ZEVs nationwide in the 2024 and later timeframe." DRIA at 317. EPA has now granted California's ACT rule waiver request, 88 Fed. Reg. at 25947 n.186, and the Agency should continue to include sales required under the ACT in its final baseline HD ZEV penetration levels. For the proposal, EPA assumes ACT-level ZEV sales in California plus five additional states that have adopted ACT under Clean Air Act section 177: Oregon, Washington, New York, New Jersey, and Massachusetts. DRIA at 317 n.iii; 88 Fed. Reg. at 26040 n.656. EPA also notes that Vermont recently adopted ACT under section 177 and that Vermont's adoption was not included due to timing issues, but that it "provides additional support for the ZEV levels in our reference case." Id. at 26040 n.657. In fact, Vermont and Colorado both have adopted the ACT rule,59 and the ACT-level HD ZEV sales requirements for both states should be calculated and included in EPA's baseline for the final rule. HD ZEV sales in ACT-adopting states will need to reach between 30 percent (Class 7–8 tractors) and 50 percent (Class 4–8 trucks) by 2030, and 40 percent (Class 7–8 tractors) to 75 percent (Class 4–8 trucks) by 2035 in order to meet the ACT targets.60 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 25 - 26]

59 See Sierra Club, Vermont Adopts Rules for Cleaner Cars and Trucks (Dec. 1, 2022), https://www.sierraclub.org/vermont/vermont-adopts-rules-cleaner-cars-and-trucks; Colo. Dep't Pub. Health & Env't.

60 Advanced Clean Trucks Regulation, Cal. Code Regs. tit. 13, § 1963.1, Table A-1 (2019); see also Rachel MacIntosh et al., EDF, Electric Vehicle Market Update 15 (April 2022) [hereinafter MacIntosh et al., April 2022 EV Market Update].

b. EPA's baseline should account for significant ZEV adoption in the states that are in the process of adopting ACT and the states that have signed the NESCAUM multi-state MOU.

As EPA correctly explains, "there have been multiple actions by states to accelerate the adoption of HD ZEVs" in addition to the ACT rule. 88 Fed. Reg. at 25930. EPA notes that 17 states and the District of Columbia have signed the NESCAUM MOU, "establishing goals to support widespread electrification of the HD vehicle market." 88 Fed. Reg. at 25931. The multi-state MOU targets ZEV sales equaling 30 percent of all HDV sales by 2030 and 100 percent of all HDV sales by 2050.61 In July 2022, NESCAUM and the MOU states issued a comprehensive and detailed Action Plan to meet their goals.62 An analysis by ICCT estimates that 36 percent of all HDV sales in MOU states (excluding California) would be ZEVs in 2030 if all states implement the goals set out in the MOU.63 [EPA-HQ-OAR-2022-0985-1640-A1, p. 26]

61 NESCAUM, Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding, at 3-4 (2022) [hereinafter NESCAUM, MOU], https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf; 88 Fed. Reg. at 25947.

62 NESCAUM, Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Action Plan: A Policy Framework to Eliminate Harmful Truck and Bus Emissions (2022) [hereinafter NESCAUM, Action Plan], https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan-dual-page.pdf.

63 Arijit Sen et al., ICCT, Benefits of the 2020 Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding 5 (2022), https://theicct.org/wp-content/uploads/2022/04/md-hd-mou-benefits-apr22.pdf.

Moreover, EPA correctly "anticipate[s] more jurisdictions will follow" with proposals to fully adopt the ACT rule. 88 Fed. Reg. at 25948. In April 2022, Connecticut passed legislation authorizing the state's Department of Energy and Environmental Protection to adopt the ACT rule.64 Rhode Island is currently in the midst of a rulemaking process to adopt the ACT rule, with the comment period having just closed on May 24, 2023,65 and in April 2023, Maryland's General Assembly passed a bill directing the state to adopt the ACT rule.66 [EPA-HQ-OAR-2022-0985-1640-A1, p. 26]

64 See Sierra Club, Connecticut General Assembly Passes Legislation for Clean Trucks, Clean Air (Apr. 29, 2022), https://www.sierraclub.org/press-releases/2022/04/connecticut-general-assembly-passes-legislation-for-clean-trucksclean-air.

65 See R.I. Dep't Env't Mgmt., Advanced Clean Cars II (ACCII) & Advanced Clean Trucks (ACT), https://dem.ri.gov/environmental-protection-bureau/air-resources/advanced-clean-cars-ii-advanced-clean-trucks (last visited June 15, 2023).

66 Calstart, By Paving the Way for Clean Trucks, Maryland Reaffirms Its Position as a Climate Leader, https://calstart.org/calstart-applauds-maryland-for-adopting-clean-truck-legislation/ (last visited June 15, 2023).

HDV sales in ACT and MOU states, including California, make up a significant portion of national HDV sales—about 36.5 percent.67 Despite mentioning the MOU, the proposal does not factor into its baseline the fact that ZEVs will be added to the heavy-duty fleet more rapidly in these 17 states and the District of Columbia, which make up more than a third of national HDV sales, or that several of these states are poised to adopt the ACT rule soon.68 EPA's baseline must reflect the impact of these significant commitments to ZEVs by the MOU signatories. [EPA-HQ-OAR-2022-0985-1640-A1, p. 27]

67 Claire Buysse et al., Racing to Zero: The Ambition We Need for Zero-Emission Heavy-Duty Vehicles in the United States, ICCT (Apr. 8, 2022), https://theicct.org/racing-to-zero-hdv-us-apr22/. This is consistent with MOVES projections for MY 2027, which show 215,328 heavy-duty sales in all the MOU states, as compared to 589,910 total heavy-duty sales nationally, or 36.5 percent of all sales.

68 The MOU signatories are: California, Colorado, Connecticut, Hawaii, Maine, Maryland, Massachusetts, Nevada, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, Washington, and the District of Columbia. See NESCAUM, MOU.

c. EPA should consider the impacts of California's Advanced Clean Fleets rule.

On April 28, 2023, the California Air Resources Board (CARB) approved the ACF rule, which will result in even faster growth in heavy-duty ZEV sales in California.69 The ACF rule will regulate public and private fleets, new mobility fleets, large employer fleets, rental fleets, and delivery fleets, with the "goal of achieving a zero-emission public bus and truck fleet in California by 2045 and significantly earlier for certain market segments like last mile delivery and drayage trucks."70 The ACF regulations are expected to be fully effective by 2024, increasing HD ZEV uptake in California even more than the ACT rule alone.71 [EPA-HQ-OAR-2022-0985-1640-A1, p. 27]

69 CARB, California Approves Groundbreaking Regulation That Accelerates the Deployment of Heavy-Duty ZEVs to Protect Public Health (Apr. 28, 2023), https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect.

70 MacIntosh et al., April 2022 EV Market Update, at 15.

71 Id.

CARB has explained that the ACF regulation "is projected to significantly increase the number of medium- and heavy-duty ZEVs in California beyond the ZEV sales expected from the ACT regulation," with ZEV sales greater under ACF and ACT together than ACT alone for all model years covered by EPA's proposed standards, and beyond.72 Although the ACF Rule has not yet been fully finalized under California state law, fleets are already planning for ACF implementation; as one industry compliance expert has advised fleets, "[t]here is a lot of coordination that's going to be required between groups like operations, finance and vehicle procurement," and "coordination needs to start happening now."73 If the ACF regulation is finalized and enforceable before finalization of EPA's rule, EPA should include ACF-related HD ZEV sales in its baseline. Otherwise, EPA should conduct a sensitivity analysis of the impact of ACF on its baseline. Regardless, the fact that the industry is already planning to increase HD ZEV deployment in response to ACF provides further support for strong Phase 3 standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 27]

72 CARB, Public Hearing to Consider the Proposed Advanced Clean Fleets Regulation, Staff Report: Initial Statement of Reasons 1, Fig.1 (2022), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf (showing ZEV increases under ACF for all years through 2049).

73 John Kingston, Advanced Clean Fleets Rule: Like It or Not, It's Time to Get Ready, Freight Waves (June 1, 2023), https://www.freightwaves.com/news/advanced-clean-fleets-rule-like-it-or-not-its-time-to-get-ready (comments of Sean Cocca, director of compliance at the advisory firm of Gladstein, Neandross & Associates).

3. EPA's baseline should account for other government, fleet, and manufacturer commitments and investments.

While including all ACT-adopting and MOU states in the baseline would result in more accurate projections and therefore more appropriate standards, even these more accurate estimates would fail to reflect growing HD ZEV deployment in other states. Significant future HD ZEV deployment will be driven by other federal government programs, local government programs, and private sector investments. The proposal notes a few of these public and private programs, investments, and commitments, but it fails to capture the depth and breadth of the pace at which these commitments are being announced. This section offers a non-exhaustive survey of some of the many investments already made. Several sources are regularly updated and available to EPA to track the rapidly expanding HD ZEV market.74 [EPA-HQ-OAR-2022-0985-1640-A1, p. 28]

74 For updated information, EPA should consult the following resources: EDF, Electric Fleet Deployment & Commitment List, https://docs.google.com/spreadsheets/d/1l0m2Do1mjSemrb_DT40YNGou4o2m2Ee-KLSvHC-5vAc/edit#gid=1902784037 (last visited June 15, 2023) (tracking, under the "Production" tab, fleet-level orders, vehicles in operation, commitments, production, and EV certified dealerships); CALSTART, Zero-Emission Technology Inventory, https://globaldrivetozero.org/tools/zeti/ (last visited June 15, 2023) (tracking HDV ZEV models and commercial availability); DOE, Federal and State Laws and Incentives, Alternative Fuels Data Center, https://afdc.energy.gov/laws (last visited June 15, 2023) (tracking federal, state, and local laws and commitments within all ZEV sectors).

a. State policies and commitments and local government actions

On the state level, commitments and incentives extend beyond the ACT rule and the multi-state MOU, even in states that have adopted ACT and/or signed the MOU. For example, CARB's Innovative Clean Transit regulation directs large transit agencies to make 25 percent of new bus purchases zero-emission in 2023, increasing to 50 percent by 2026 and 100 percent by 2029.75 [EPA-HQ-OAR-2022-0985-1640-A1, p. 28]

75 Sandra Wappelhorst & Felipe Rodríguez, Decarbonizing Bus Fleets: Global Overview of Targets for Phasing Out Combustion Engine Vehicles, ICCT (Dec. 9, 2021), https://theicct.org/decarbonizing-bus-fleets-global-overview-of-targets-for-phasing-out-combustion-engine-vehicles; CARB, Innovative Clean Transit Fact Sheet (May 16, 2019), https://ww2.arb.ca.gov/resources/fact-sheets/innovative-clean-transit-ict-regulation-fact-sheet.

Significant state-level commitments have been made in other states beyond the ACT and MOU states as well. In fact, all 50 states plus the District of Columbia have announced goals, made commitments, promulgated regulations, and/or provided financial incentives (such as rebates and funding) specific to the heavy-duty sector.76 These heavy-duty sector programs are in addition to many broader state and local programs targeted at ZEV adoption generally (across all vehicle sectors), which also exist in all 50 states,77 and include programs such as: medium- and heavy-duty or diesel emissions reduction funding, rebates, or HDV replacement grants in states such as Delaware, Idaho, Indiana, Iowa, Michigan, Montana, New Mexico, Ohio, South Dakota, Texas, and Wyoming;78 allowance for HD ZEVs to exceed weight limits in Arizona; ZEV school and/or transit bus programs and incentives in Illinois, Minnesota, Missouri, Oklahoma, Texas, West Virginia, and Wisconsin; and a diesel refuse truck replacement program in Nebraska.79 Additionally, states beyond those that have adopted the ACT rule or signed the MOU have been forming smaller regional collaborations aimed at HD ZEV adoption. For example, Illinois, Indiana, Michigan, Minnesota, and Wisconsin signed an MOU establishing the Regional Electric Vehicle Midwest Coalition, which "aims to create [a] cohesive regional framework to accelerate the transition to electric vehicles."80 One of the Regional Electric Vehicle Midwest Coalition's three key foundations is to accelerate medium- and heavy-duty fleet electrification.81 These state actions—reaching across the nation—should be considered when setting a nationwide level of ZEV penetration for EPA's baseline. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 28 - 29]

76 See DOE, Federal and State Laws and Incentives.

77 Information on regulations and programs in all states, including those that have signed the MOU or adopted ACT regulations, is available in id., and from the N.C.Clean Energy Tech. Ctr., Database of State Incentives for Renewables and Efficiency (DSIRE), https://programs.dsireusa.org/system/program (last visited June 15, 2023).

78 Many of these programs are funded as part of the Volkswagen Environmental Trust/Volkswagen settlement.

79 This list is compiled from information available at DOE, Federal and State Laws and Incentives. This list is a non-exhaustive sample of programs and investments and does not include the vast array of programs and incentives available in the MOU and ACT states.

80 MacIntosh et al., April 2022 EV Market Update, at 16.; Regional Electric Vehicle Midwest Coalition, Memorandum of Understanding Between Illinois, Indiana, Michigan, Minnesota, and Wisconsin 1 (2021), https://www.michigan.gov/documents/leo/REV_Midwest_MOU_master_737026_7.pdf.

81 Id

Cities and local entities are also committing to ZEV technologies in the heavy-duty sector. The Los Angeles Department of Transportation has committed to electrifying its entire transit fleet by 2030 or sooner.82 Numerous other cities and localities across the country have set zero-emission transit and/or school bus commitments or piloted zero-emission bus programs, including programs in Chicago, Seattle, New York City, and Washington, D.C. 87 Fed. Reg. at 17597. Arizona—not an ACT or MOU state—had the largest year-over-year increase in zero-emission transit bus deployment in the past year, with an increase of 280 percent.83 Forty-seven U.S. states and the District of Columbia had funded, ordered, or deployed full-size zero-emission HD transit buses as of September 2022.84 Notably, the region comprised of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas—none of which are ACT or MOU states—had the highest growth rate in zero-emission buses (129 percent compared to 2021), and seven out of ten of the states with the largest numerical increases in full-size zero-emission transit buses (compared to 2021) were states that had not adopted the ACT rule or signed the multi-state MOU.85 [EPA-HQ-OAR-2022-0985-1640-A1, p. 29]

82 Los Angeles Dep't Transp. Transit, Zero-Emission Bus Rollout Plan 4 (2020), https://ww2.arb.ca.gov/sites/default/files/2020-12/LADOT_ROP_Reso_ADA12172020.pdf.

83 Rachel Chard et al., Calstart, Zeroing in on ZEBs 1 (2023), https://calstart.org/wp-content/uploads/2023/02/Zeroing-in-on-ZEBs-February-2023_Final.pdf.

84 Id. at 6–8.

85 Id. at 9.

According to data from the World Resources Institute (WRI), there are now electric school bus commitments in districts in all 50 states and the District of Columbia.86 These commitments are growing especially rapidly in the South. Prior to October 2022, over 50 percent of electric school bus commitments were in California, but now, California's share accounts for only 39 percent of commitments—"only a little more than the South's 34% share of commitments."87 Moreover, these commitments are being announced not only in cities and suburbs, but also in rural areas. In September 2022, only 19 percent of school districts with at least one committed electric school bus were in rural areas; by December 2022, 41 percent of districts with at least one committed electric school bus were classified as rural.88 At least 5,612 electric school buses have been ordered, delivered, put in operation, or funded through government awards as of December 2022, in more than 895 school districts.89 WRI notes that "[t]his is almost double the number of both buses and districts with electric school buses in just three months" since WRI's previous dataset.90 States and cities across the country also have ordered not just electric school and transit buses, but other Class 4–8 ZEVs, such as refuse and fire trucks. Again, these orders are happening in states beyond those that have signed the MOU or adopted the ACT rule, such as Wisconsin, Florida, Oklahoma, Tennessee, Arizona, Texas, and Alaska.91 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 29 - 30]

86 Leah Lazer & Lydia Freehafer, The State of Electric School Bus Adoption in the US, Electric School Bus Initiative (Apr. 26, 2023), https://electricschoolbusinitiative.org/state-electric-school-bus-adoption-us?utm_medium=email+&utm_source=blog&utm_campaign=adoption_blog (relying on data collected by WRI).

87 Id.

88 Id.

89 Id.

90 Id.

91 EDF, Electric Fleet Deployment & Commitment List (listing, under the "Deployments" tab, HD ZEVs already deployed or ordered by public entities nationwide).

By accounting for ZEV adoption only in states that have adopted the ACT rule, EPA's proposal fails to capture the speed and breadth of state and local government actions, including and beyond the ACT rule and the multi-state MOU. At least some modest level of HD ZEV uptake in states that have not adopted the ACT rule or signed the MOU is likely—and already taking place—and would lead to baseline HD ZEV penetration rates closer to those EPA models for its proposed standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 30]

b. Private fleet commitments

While EPA's proposal mentions a few examples of private fleet ZEV commitments, again it fails to capture the speed and breadth of these commitments, which are driven not only by governmental policy but also by private industry interests.92 These purchases are happening throughout the nation. [EPA-HQ-OAR-2022-0985-1640-A1, p. 30]

92 See Section III.D, infra for a further discussion of these private industry interests and purchaser acceptance of and preference for ZEVs.

According to EDF's Electric Fleet Deployment & Commitment List, commercial fleets have already ordered or deployed at least 27,510 Class 4–8 HD ZEVs.93 These orders cover the full range of heavy-duty applications—from last-mile delivery vehicles to trucks intended to cover longer distances—and include large orders such as 300 Class 8 tractors by A.P. Moller-Maersk; 871 Class 8 tractors by Anheuser-Busch Co.; 105 Class 5 step vans by Bimbo Bakeries USA; 104 Class 8 tractors by DHL Worldwide Express; 500 tractors and box trucks by Pride Group Enterprises; 4,000 Class 5 vans by Ryder System, Inc.; 851 Class 8 tractors by Sysco; and 11,644 Class 4–8 tractors, vans, and box trucks by UPS Inc.94 EPA should factor such commitments and deployments into its HD ZEV baseline market penetration estimates. At the very least, these fleet commitments show significant momentum toward greater HD ZEV deployment within private fleets nationwide and offer further evidence that baseline HD ZEV market penetration rates in EPA's proposal are too low. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 30 - 31]

93 EDF, Electric Fleet Deployment & Commitment List.

94 Id.

In addition, numerous tools and resources are available to fleet managers who are considering or in the process of transitioning their fleets to ZEVs. These resources build off of the extensive fleet commitments cited above and can help smooth the adoption of ZEVs across the HD market.95 [EPA-HQ-OAR-2022-0985-1640-A1, p. 31]

95 See, e.g., Electrification Coalition, Piloting the Transition to Freight Electrification: Lessons Learned in Electrifying On-Road Medium- and Heavy-Duty Vehicles (2023), https://electrificationcoalition.org/wp-content/uploads/2023/06/Piloting-Freight-Web.pdf; Electrification Coalition, Dashboard for Rapid Vehicle Electrification: DRVE Tool, https://electrificationcoalition.org/resource/drve/ (last visited June 13, 2023); EDF, Fleet Electrification Solution Center, https://www.electricfleet.org/ (last visited June 13, 2023); Ryan Kennedy, Overcoming roadblocks to fleet electrification, Freightwaves (June 12, 2023), https://www.freightwaves.com/news/overcoming-roadblocks-to-fleet-electrification.

c. Manufacturer commitments

Government and fleet commitments work in connection with manufacturers producing HD ZEVs, and manufacturers are in fact planning to rapidly increase HD ZEV production to meet growing demand. Manufacturers have comprehensive plans to produce HD ZEVs, and have indicated that they expect additional states to adopt the ACT and ACF rules.96 EPA should consider manufacturers' vehicle offerings, plans, and commitments when estimating baseline HD ZEV market penetration for the final rule, as well as when considering the appropriate stringency of emission standards that drive adoption of zero-emission technologies. [EPA-HQ-OAR-2022-0985-1640-A1, p. 31]

96 David Taube, California Truck Emissions Rules Appear Poised to Spread Across North America, TransportDive (May 17, 2023), https://www.transportdive.com/news/ceos-say-states-will-follow-california-emissions-regulation/650369/.

At May 2022's Advanced Clean Transportation Expo, manufacturers such as Cummins and Navistar announced commitments to deploying zero-emission technologies at a rapid pace. Cummins CEO Tom Lineburger stressed the need "to move faster for the sake of our kids and grandkids,"97 and Navistar CEO Mathias Carlbaum suggested that "[b]y 2030…50% of all trucks by volume will be BEVs."98 Navistar's CEO reiterated to reporters that "[w]e believe 50% of our sales will be electric by 2030," and that 100 percent of sales would be ZEVs by 2040.99 Cummins (the largest supplier of diesel engines for HDVs) also announced a partnership with Daimler on FCEVs, and Amy Davis, the president of Cummins' New Power unit, noted that the partnership was "an important milestone for both companies as we work to accelerate the shift to a carbon-free economy."100 Navistar plans to sunset their diesel development programs starting in 2027,101 and in July 2022, the company announced that its newest combustion vehicle would be its last for North America.102 Similarly, HD manufacturer Daimler Truck North America recently announced the "beginning of the end of the diesel era."103 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 31 - 32]

97 Jack Roberts, Cummins CEO: Get on the Path to Net-Zero Emissions, HDT Truckinginfo (May 12, 2022), https://www.truckinginfo.com/10170751/cummins-ceo-get-on-the-path-to-net-zero-emissions.

98 Jack Roberts, Navistar CEO Calls for Long-Term Commitment to Get to Net Zero, HDT Truckinginfo (May 12, 2022), https://www.truckinginfo.com/10170459/navistar-ceo-calls-for-long-term-commitment-to-get-to-net-zero.

99 Alan Ohnsman, Big Rigs Going Electric as Navistar, Cummins, Daimler Rev Up Next-Generation Trucks, Forbes (May 13, 2022).

100 Id.

101 Gladstein, Neandross & Associates, State of Sustainable Fleets 2023 Market Brief 7 (2023) [hereinafter Gladstein, Neandross & Associates, State of Sustainable Fleets], https://cdn.stateofsustainablefleets.com/2023/state-of-sustainable-fleets-2023-market-brief.pdf.

102 Alan Adler, Navistar's New Internal Combustion Engine Will Be Its Last, FreightWaves (Aug. 16, 2022), www.freightwaves.com/news/navistars-new-internal-combustion-engine-will-be-its-last.

103 Gladstein, Neandross & Associates, State of Sustainable Fleets, at 7.

According to the American Council for an Energy-Efficient Economy, "[g]rowing numbers of electric truck and bus models are reaching the market or are scheduled to be on the market soon, with models ranging from heavy-duty pickup trucks to 18-wheel tractor-trailers."104 The pace of innovation in this sector has accelerated in recent years. In 2016, Oak Ridge National Laboratory identified just eight commercially available medium- and heavy-duty ZEV options.105 By 2019, there were about 70 HD models available from 27 manufacturers,106 and that number has continued rapid growth. EPA's DRIA includes updated information showing that currently there are "over 170 models produced by over 60 manufacturers that cover a broad range of applications, including school buses, transit buses, straight trucks, refuse haulers, vans, tractors, utility trucks, and others, available to the public through MY 2024." 88 Fed. Reg. at 25961, DRIA at 44–51. EPA notes that the number of available models is expected to grow to about 200 models by 2024. Id. at 44. CALSTART's Zero-Emission Technology Inventory provides further evidence that the growth of zero-emission medium- and heavy-duty models in the United States and Canada has been rapid, with more manufacturers entering the market and the number of available ZEV models growing.107 [EPA-HQ-OAR-2022-0985-1640-A1, p. 32]

104 Steven Nadel & Peter Huether, ACEEE, Electrifying Trucks: From Delivery Vans to Buses to 18-Wheelers, at iv (2021), https://www.aceee.org/research-report/t2102.

105 Paige Jadun et al., NREL, Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections through 2050, at 20 (2017), https://www.nrel.gov/docs/fy18osti/70485.pdf (citing Alicia K. Birky et al., Oak Ridge Nat'l Lab'y, Transportation Electrification Beyond Light Duty: Technology and Market Assessment (2017), https://info.ornl.gov/sites/publications/Files/Pub72938.pdf).

106 Union of Concerned Scientists, Ready for Work: Now is the Time for Heavy-Duty Electric Vehicles 8–9 (2019), https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf.

107 CALSTART, Model Availability to Follow Upward Trajectory, ZETI Analytics, https://globaldrivetozero.org/tools/zeti-analytics/ (see table titled "Growth of Models Available by Region and OEMS by Region Trending Upwards").

These numbers are certain to increase further, as is evidenced by the increasing frequency of new HD ZEV product announcements and commitments by manufacturers. A sampling of these are included below in Table 3. [EPA-HQ-OAR-2022-0985-1640-A1, p. 32.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 32-36, for Table 3]

While the above table includes a sample of relevant product announcements and commitments, new commitments, technological developments, and investments are being announced every day. The progress and potential in the manufacturing sector further underscores both that EPA's proposed baseline HD ZEV market penetration projections are underestimated, and that much higher deployment is eminently feasible. EPA should consider manufacturers' vehicle offerings, plans, and commitments when estimating baseline HD ZEV market penetration for the final rule, as well as when considering more stringent emission standards that drive adoption of zero-emission technologies. EPA is correct to note that "[s]tandards…can create conditions under which companies invest in major innovations," DRIA at 420, and this is especially true if the standards are set at a level that exceeds the technology's market-based penetration rate. Because EPA's proposed standards essentially mirror what would happen in a world "if the proposed rule is not adopted,"142 they reflect the baseline rather than an appropriate level of stringency under section 202(a) of the Clean Air Act. EPA should instead set its final standards at a level that will lead to greater deployment of zero-emission technologies (and produce greater emission reductions) than the market would otherwise achieve. [EPA-HQ-OAR-2022-0985-1640-A1, p. 36]

142 See Circular A-4, at 2.

4. Recent cost estimates support the viability of HD ZEVs across vehicle segments and should inform EPA's baseline.

Declining costs for HD ZEVs also support a baseline market penetration rate higher than EPA's baseline and more consistent with rates EPA projects may occur under its proposed standards. EPA notes that "[t]he lifetime total cost of ownership (TCO)...is likely a primary factor for HD vehicle and fleet owners considering BEV and FCEV purchases," and cites analyses by ICCT, Phadke et al., and the Rocky Mountain Institute (RMI) showing near-term TCO parity. 88 Fed. Reg. at 25942. [EPA-HQ-OAR-2022-0985-1640-A1, p. 37]

Numerous cost studies, including those cited by EPA, estimate that at least some categories of HD ZEVs have already reached TCO parity with their diesel counterparts—even prior to accounting for IRA incentives and credits—and more categories will reach TCO parity prior to 2027, or faster now that IRA is in effect. EPA should consider these favorable cost projections in its estimates for baseline HD ZEV market penetration. [EPA-HQ-OAR-2022-0985-1640-A1, p. 37]

The estimates cited by EPA include: (1) pre-IRA projections from ICCT (2019),143 which concluded that at least some HD ZEVs could reach cost parity in the "early 2020s;" (2) pre-IRA projections from Phadke et al. (2021), which suggested "that BEV TCO could be 13 percent less than that of a comparable diesel combustion vehicle if electricity pricing is optimized," 88 Fed. Reg. at 25942;144 and (3) a post-IRA RMI analysis showing that the IRA will result in the TCO of electric trucks falling below the TCO of comparable diesel trucks about five years faster than without the IRA.145 See 88 Fed. Reg. at 25942. Several additional recent studies not included in EPA's proposal also estimate when various classes of HD ZEVs will reach cost parity with their conventional counterparts. These studies generally show that transit buses, refuse trucks, school buses, and Class 4–7 short-haul rigid trucks such as delivery and utility vehicles—which together make up approximately 47 percent of the entire HD market—either have already reached cost parity with their diesel counterparts for some vehicle categories, or will do so by 2027 for nearly all categories.146 And these studies were conducted pre-IRA, meaning that for most of these categories, TCO parity could be sped up by at least 5 years based on the RMI analysis cited in EPA's proposal,147 with parity already achieved for at least some additional vehicles. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 37 - 38]

143 Dale Hall & Nic Lutsey, ICCT, Estimating the Infrastructure Needs and Costs for the Launch of Zero-Emission Trucks, at ii (2019), https://theicct.org/publication/estimating-the-infrastructure-needs-and-costs-for-the-launch-of-zero-emission-trucks/.

144 Amol Phadke et al., Lawrence Berkeley Nat'l Lab'y, Why Regional and Long-Haul Trucks are Primed for Electrification Now 8 (2021), https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf.

145 Ari Kahn et al., The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, RMI (Aug. 25, 2022) [hereinafter Kahn et al., The Inflation Reduction Act], https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/.

146 See, e.g., Dan Welch et al., Int'l ZEV Alliance, Moving Zero-Emission Freight Toward Commercialization, (Oct. 2020), https://www.zevalliance.org/zero-emission-freight-2020/; Ehsan Sabri Islam et al., Argonne Nat'l Lab'y (ANL), A Detailed Vehicle Modeling & Simulation Study Quantifying Energy Consumption and Cost Reduction of Advanced Vehicle Technologies Through 2050 (Oct. 1, 2021), https://anl.app.box.com/s/xzhqi4x5sw3anw6rbgz7f67l6ti0qikd (using ANL's BEnefit ANalysis modeling); see also ANL, Vehicle Systems & Mobility Group, BEAN, https://vms.es.anl.gov/tools/bean/ (last visited June 15, 2023); Chad Hunter et al., NREL, Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks (2021), https://www.nrel.gov/docs/fy21osti/71796.pdf; Andrew Burnham et al., ANL, Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains (2021), https://publications.anl.gov/anlpubs/2021/05/167399.pdf; Dana Lowell & Jane Culkin, M.J. Bradley & Associates, Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness (2021), https://www.edf.org/sites/default/files/documents/EDFMHDVEVFeasibilityReport22jul21.pdf; CARB, Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document: Advanced Clean Fleet Workshop (2021), https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf; Vishnu Nair et al., Roush Industries, Technical Review of: Medium and Heavy-Duty Electrification Costs for MY 2027-2030 (2022) [hereinafter Nair et al., Technical Review]; Ledna et al.; Sara Kelly et al., ICCT, ICCT Comments on EPA's Proposed Heavy-Duty Engine and Vehicle Standards 23 (May 10, 2022).

147 Kahn et al., The Inflation Reduction Act.

Several very recent post-IRA analyses of TCO parity have found even more encouraging estimates of near-term parity. In comparing BEV, FCEV, and diesel long-haul tractor-trucks, ICCT found that long-haul BEVs are expected to have the lowest TCO by 2030 in all of the states ICCT investigated.148 The ICCT study also found that even at high daily mileages, BEVs would still achieve a better TCO compared to their diesel counterparts, because day-to-day mileage variability for these vehicles is low.149 An analysis by Roush considering seven segments of medium- and heavy-duty trucks found that, for vehicles purchased in 2027, ZEV TCO was projected to be lower than diesel TCO for all segments.150 [EPA-HQ-OAR-2022-0985-1640-A1, p. 38]

148 Hussein Basma et al., ICCT, Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States, at i (2023), https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/.

149 See Hussein Basma & Ray Minjares, ICCT, Battery-Electric Trucks: The Most Affordable Path to Decarbonizing Tractor-Trailers 9 (Apr. 27, 2023), https://theicct.org/wp-content/uploads/2023/04/Battery-electric-trucks_-The-most-affordable-path-to-decarbonizingtractor-trailers.pdf.

150 This analysis considered the following HDV market segments: transit bus (Class 8); school bus (Class 7); shuttle bus (Class 3-5); delivery and service van, box and stake truck (Class 3); short haul delivery, service, box, and stake truck (Class 6-7); short haul delivery and service van, box and stake truck (Class 4-5); and refuse hauler (Class 8). Nair et al., Technical Review, at 18, 20.

Another recent ICCT analysis considered upfront cost parity (i.e., the purchase price, separate from total cost of ownership), and found that even upfront cost parity between BEVs and their diesel counterparts is expected in the late 2020s or early 2030s for most truck segments.151 And, as EPA cited in the proposal, RMI's latest analysis concluded that "with the IRA, the total cost of ownership of electric trucks will be lower than diesel ones approximately five years sooner than without the law," finding this to be "true for urban trucks that travel locally in cities an average of 50–100 miles a day; regional trucks that move 100–250 miles per day and return to the same depot; and long-haul trucks that travel 250 or more miles between cities and need to recharge en route."152 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 38 - 39]

151 Yihao Xie et al., ICCT, Purchase Costs of Zero-Emission Trucks in the United States to Meet Future Phase 3 GHG Standards 22 (2023), https://theicct.org/publication/cost-zero-emission-trucks-us-phase-3-mar23/.

152 Kahn et al., The Inflation Reduction Act.

EPA should comprehensively consider the numerous relevant studies pointing to rapidly declining costs for HD ZEVs in the classes and time periods covered by the proposal. The cost studies show that many HD ZEVs were already both technically feasible and cost effective, or would become so prior to MY 2027 in the absence of the IRA, and the IRA's incentives and credits increased the number of feasible and cost-effective options. As Daimler Truck AG's chief technology officer explained, "In the very moment that the customer starts benefiting more from a zero-emission truck than from a diesel truck, there is no reason to buy the diesel truck anymore."153 By failing to consider the full literature of cost projections in informing the baseline, EPA assumes inappropriately low baseline HD ZEV adoption and, as a result, proposes standards that are too lenient and themselves actually reflect a reasonable baseline ZEV penetration rate. [EPA-HQ-OAR-2022-0985-1640-A1, p. 39]

153 Cristina Commendatore, Daimler Truck to Ramp Down ICE Spending, Focus on ZEVs, Fleetowner (May 25, 2021), https://www.fleetmaintenance.com/equipment/emissions-and-efficiency/article/21224178/daimler-truck-to-ramp-down-ice-spending-focus-on-zevs.

5. EPA should more fully account for the extent to which BIL and IRA incentives will independently drive adoption of HD ZEVs.

The BIL and IRA will channel billions of dollars into the HD ZEV sector. EPA included two provisions of the IRA within its quantitative analysis of HDV technology adoption and costs, the Advanced Manufacturing Production Credit and the credit for Qualified Commercial Clean Vehicles. See 88 Fed. Reg. 25985. While these credits will have important effects in driving adoption of HD ZEVs, EPA errs in not including additional impacts of the BIL and IRA in its analysis. Furthermore, EPA should ensure that impacts of the BIL and IRA are included in its calculation of the baseline as well as in the costs and outcomes of the standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 39]

The IRA and BIL will drive significant HD ZEV adoption independent of the Phase 3 standards. Numerous analyses conducted in the wake of BIL and IRA passage have found that these laws will dramatically increase HD ZEV adoption.154 For example, ICCT finds that HDV

ZEV sales penetration will rise from 48 percent in 2035 to up to 56 percent when accounting for the IRA.155 EPA should accordingly ensure that these important laws are reflected in its estimate of baseline HD ZEV market penetration. [EPA-HQ-OAR-2022-0985-1640-A1, p. 39]

154 See, e.g., Kahn et al., The Inflation Reductin Act; Clean Air Task Force, Federal Funding Programs to Support Advanced Clean Trucks Implementation: A Guide for States (2023), https://cdn.catf.us/wp-content/uploads/2023/04/13154057/act-federal-funding-resource.pdf;

155 Slowik et al., at ii (2023).

As EPA appropriately describes in section 1.3.2 of the DRIA, the BIL and IRA include numerous incentives, grants, and other programs that will help to spur deployment of low emission HD vehicles, including BEVs and FCEVs. These programs will, among other things, provide both direct grants and tax credits to lower acquisition costs of vehicles and increase the range of cost-effective applications,156 help entities conduct planning for fleet electrification,157 enable deployment of charging and hydrogen fueling infrastructure,158 and facilitate advances in technology that can lower future vehicle costs. These programs also invest in vehicle and battery manufacturing and recycling, driving cost reductions and increasing domestic supply. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 39 - 40]

156 See, e.g., 42 U.S.C. § 7432 (appropriating $1 billion to EPA to create a program that awards grants and rebates for the costs of replacing existing class 6 and 7 HDVs with ZEVs, purchasing, installing, operating, and maintaining infrastructure needed for ZEVs, associated workforce development and training, and planning and technical activities needed to support the deployment of ZEV); 26 U.S.C. § 45W (providing up to $40,000 in tax credits to assist with vehicle replacements and reduce the effective cost of commercial ZEVs).

157 See, e.g., 42 U.S.C. § 7432.

158 See, e.g., 26 U.S.C. § 30C (providing tax credits to qualified alternative fuel vehicle property); 42 U.S.C. § 16161a (providing $8 billion to DOE to fund regional hydrogen hubs across the country); 23 U.S.C. § 151 (appropriating $2.5 billion to support the build-out of clean charging and fueling infrastructure projects along designated alternative fuel corridors of the National Highway System).

An ERM analysis found that, considering only a portion of these programs, the BIL would provide over $19.4 billion in funding toward medium- and heavy-duty ZEV purchases.159 A further analysis of a portion of IRA programs calculated an additional $2.8 billion in funding toward medium- and heavy-duty ZEV purchases, resulting in a 46 percent increase in ZEV sales projections in 2029 compared to a scenario not including the IRA.160 However, EPA does not consider the full range of BIL and IRA programs, accounting only for the Advanced Manufacturing Production Credit and the credit for Qualified Commercial Clean Vehicles. While it may be difficult to quantify the aggregate impact of these programs on the scale and cost of deployment of HD ZEVs, EPA should nevertheless ensure that this impact is accounted for in its analysis. As it stands, not assessing the impact of these programs quantitatively results in an inaccurate and overly conservative baseline and cost analysis. [EPA-HQ-OAR-2022-0985-1640-A1, p. 40]

159 Robo & Seamonds, Technical Memo, at 7

160 Robo & Seamonds, IRA Supplemental Assessment, at 1–2.

In sum, EPA's proposal underestimates the baseline HD ZEV market penetration in several ways, as the Agency itself recognizes. See DRIA at 417 ("It is possible that EPA's reference case is underestimated, and adoption of ZEVs, and other technologies, will occur more rapidly than EPA predicts in this proposal.") EPA should update its baseline assessment to account for the vast amount of highly relevant data and information showing strong ZEV sales even in a world absent the proposed action. EPA should reconsider its baseline in light of (1) current market projections indicating significantly higher baseline HD ZEV sales, including those upon which EPA relies to set the ZEV penetration levels under the proposed standards; (2) federal, state, local, and private sector actions supporting a much higher baseline HD ZEV penetration rate; (3) recent HD ZEV cost estimates supporting the viability of ZEVs across vehicle segments; and (4) the extent to which BIL and IRA incentives will independently drive adoption of HD ZEVs. All of these factors make clear that EPA's standards essentially codify what the market would do at baseline. To comply with its duties to protect public health and welfare, EPA must go well beyond this level in its Phase 3 emission standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 40]

Organization: ClearFlame Engine Technologies

EPA should integrate State Low-Carbon Fuel Standards and other SLF-focused programs, just as it is integrating ZEV-focused state programs [EPA-HQ-OAR-2022-0985-1654-A2, p. 11]

In the ABT section of the Proposal, EPA seeks comment on how California's Advanced Clean Truck Rule and its adoption by other states (collectively, referred to herein as the '177 States,' for the Clean Air Act section that authorizes states to adopt California vehicle emission standards for which California has received an EPA waiver from the federal standards) might shape the future truck and bus market.30 We agree that EPA should rely on current trends that are propelled by the certainty of state regulation in determining nationwide production volumes. Just as EPA may rely on the actions of California and the 177 States to accelerate heavy-duty electrification to determine future nationwide production volumes, it should integrate and rely on trends in California and other states that have or are planning to adopt a Low Carbon Fuel Standard (or comparable Clean Fuel Standards) to gauge the decarbonization potential of a transition to lower-carbon intensity fuels. This change in the carbon intensity of the nation's fuels is equally important to the overall structure and success of the Final Rule. [EPA-HQ-OAR-2022-0985-1654-A2, pp. 11-12]

30 See, e.g., Proposal at 43, and at 235.

Organization: Daimler Truck North America LLC (DTNA)

EPA's assumptions about the existing Phase 2 rule are inaccurate and must be accounted for when setting Phase 3 standard stringencies.

The technology packages upon which the proposed Phase 3 CO2 standards are based assume ICE vehicles that comply with the existing Phase 2 MY 2027 CO2 standards using emission-reduction technologies such as low rolling resistance tires; tire inflation systems; efficient engines, transmissions, and drivetrains; weight reduction; and idle reduction technologies.94 As EPA explains, '[t]hese vehicles are used as baselines from which to evaluate costs and effectiveness of additional technologies and more stringent standards on a per-vehicle basis.'95 [EPA-HQ-OAR-2022-0985-1555-A1, p. 42]

94 See Proposed Rule, 88 Fed. Reg. at 25,958 ('For each regulatory subcategory, we selected a theoretical ICE vehicle with CO2-reducingtechnologies to represent the average MY 2027 vehicle that meets the

existing MY 2027 Phase 2 standards.'); 25,959, Tables II-1 and II-2 (reflecting GEM inputs used by EPA to make the fleet average technology package that meets existing MY 20207 CO2 tractor and vacation vehicle emission standards).

95 Id.

Despite EPA's statement in the Proposed Rule that its Phase 2 CO2 standards were not 'in any way premised on the application of ZEV technologies,'96 DTNA's understanding is that many manufacturers may have incorporated ZEVs into the strategies they use under the Phase 2 program to meet currently-applicable CO2 standards using an averaging approach because they are not able to achieve the necessary level of emissions performance using conventional Phase 2 technologies alone, given slower-than-anticipated adoption rates. EPA does not acknowledge this in the Proposed Rule, nor the implications for Phase 3—that because manufacturers are already relying on ZEV production volumes to certify vehicle families under the Phase 2 standards, they will have to produce ZEVs at levels that significantly exceed EPA's projected ZEV uptake rates to comply with the Phase 3 CO2 stringency levels that EPA proposes. [EPA-HQ-OAR-2022-0985-1555-A1, p. 42]

96 Id. at 25,957.

The GHG-reduction technologies upon which the Phase 2 standards were based have proven to be less effective and adopted at lower rates than what the Agency projected during that rulemaking. For instance, the Agency projected ambitious adoption rates for technologies like advanced aerodynamic features and tire rolling resistance that did not come to pass, due to cost, feasibility, application suitability, and other issues.97 EPA's predictions about adoption rates for improved gear efficiency and idle reduction technologies also proved to be overly ambitious.98 Other technologies, like waste heat recovery, that EPA predicted would reduce GHG emissions from diesel engines, may not be feasible to bring to production due to complexity and cost issues, as well as conflicting priorities with regard to the new Low NOx emissions standards set by the EPA. The result has been that manufacturers have had to incorporate significant numbers of ZEVs into their fleets to obtain certification under the current Phase 2 standards, a consequence that was unanticipated by EPA. [EPA-HQ-OAR-2022-0985-1555-A1, p. 43]

97 See EPA, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2; Final rule, 81 Fed. Reg. 73,478, 73,709 (Oct. 25, 2016) (projecting 100% adoption rates for low rolling resistance tires); 73,557 (projecting WHR adoption rates of 1% of tractor engines by 2021, 5% by 2024, and 25% by 2027, with nearly all being used on sleeper cabs).

98 As examples, in DTNA's experience, customers have chosen not to adopt start-stop and idle shutdown technologies at all, citing convenience and other factors.

There is a further unintended consequence of the Agency using overly ambitious technology projections as the basis for its GHG standards that EPA should consider carefully: the significant detrimental impacts on the emissions performance of manufacturers' conventional fleets, for which there will still be a market for years to come. Manufacturers needing to produce and sell large volumes of ZEVs to meet stringent CO2 standards are likely to transition their high-performing conventional vehicles to a ZEV platform first. This is because the customers who are most likely to buy high-performing conventional vehicles are the ones most likely to have a compelling business case for reducing fuel costs—thus they are already highly motivated to transition their fleet to ZEVs. As a result, manufacturers will prioritize transitioning their high-performing conventional vehicles to ZEVs, as these vehicles are the most likely to have willing buyers, leaving a worse-performing conventional fleet. It is thus incorrect for EPA to assume that the remaining ICE fleet will maintain, on average, compliance with the existing Phase 2 MY 2027 standards. To address this imbalance and to avoid unintended consequences that may have a net-negative impact on emissions performance, EPA should perform a new feasibility analysis on the existing Phase 2 standards, re-evaluating the level at which the remaining conventional fleet will perform. [EPA-HQ-OAR-2022-0985-1555-A1, p. 43]

Organization: Environmental Defense Fund (EDF)

d) EPA's primary proposal reflects a conservative assessment of ZEV deployment in the coming years.

EPA uses a reference case that assumes ACT levels of ZEV sales in California and the five states that had already adopted ACT at time the proposal was issued: Oregon, Washington, New York, New Jersey, and Massachusetts. The reference case does not assume any additional ZEV sales as a result of regular market trends. EPA's primary proposal sets a stringency level roughly equivalent to ZEV adoption projected under ACT Research's adoption curve based on payback period. [EPA-HQ-OAR-2022-0985-1644-A1, p. 60]

EPA's reference case should more accurately reflect ZEV deployment that will occur due not only to ACT but to the landscape of factors that will facilitate ZEV sales, including market trends, other state actions like ACF, the NESCAUM MOU, and federal government and private investments. The payback period analysis discussed above, which EPA relies on in setting its proposed stringency level, is better suited to inform the reference case. EPA's proposed standards should build on this improved baseline to achieve emissions reductions consistent with ACT-level ZEV deployment nationally and additional reductions in the tractor and bus categories. [EPA-HQ-OAR-2022-0985-1644-A1, p. 60-61]

Organization: National Parks Conservation Association (NPCA)

Regarding EPA's proposed baseline for HD ZEV market penetration, NPCA agrees with numerous other commenters the approach taken by EPA in this rulemaking is far too conservative, and severely underestimates potential HD ZEV sales that will take place in the near future. For instance, EPA's analysis appears to look only at outdated projections conducted by CARB regarding HD ZEV adoption under California's Advanced Clean Trucks rule and fails to take into consideration additional factors such as additional state regulatory requirements, dropping costs, improving technology, and growing public interest in HD ZEVs. EPA's California-focused analysis of ACT HD ZEV potential fails to account for the growing list states that have adopted ACT, Omnibus, or HD Memorandum of Understanding (MOU), nor does it consider additional commitments at the federal, state, local, and private level. It also fails to account for California's recent enactment of its even more stringent Advanced Clean Fleets Rule. This underestimation of HD ZEV potential unjustly diminishes justifications for the feasibility of stringent ZEV advancements in the coming years. EPA's final rule must adequately account for all of the above listed factors in determining baseline HD ZEV sales. [EPA-HQ-OAR-2022-0985-1613-A1, p. 4]

Organization: RMI

Electric Heavy-Duty Market

The electrification of specific trucking applications can be economically advantageous today, yet, in some respects, electric heavy-duty truck adoption is inhibited by the lack of adequate vehicle supply and the need for a greater variety of Medium Duty Trucks (MDT) and Heavy Duty Trucks (HDT) vehicle models to meet the diverse requirements of freight hauling. The EPA tailpipe emissions standards could galvanize greater vehicle supply in these segments. [EPA-HQ-OAR-2022-0985-1529-A1, p. 3]

The following analysis focuses on tractor-trailers, also referred to as semi-trucks, as these trucks drive 177 billion miles per year while consuming an average of six times more energy per mile than a passenger car in the United States. Because they drive so many miles and use so much energy, semis will be the majority of the US heavy-duty electric truck load. Over the past seventy years, trucking and America's two million licensed heavy-duty truck drivers have become increasingly essential. Truck trips have increased 30% in the past 30 years and are projected to increase 66% more by 2050.4 The fact that these energy-intensive trucks are also frequently concentrated in depots with dozens or hundreds of vehicles will have profound implications for the grid as those vehicles electrify.5 [EPA-HQ-OAR-2022-0985-1529-A1, p. 3]

4 Ari Kahn, Emily Yang, and Wouter Vink, Making Zero-Emissions Trucking Possible, Mission Possible Partnership, 2022, https://missionpossiblepartnership.org/wp-content/uploads/2022/11/Making-Zero-Emissions-Trucking- Possible.pdf.

5 Kahn et al., Preventing Electric Truck Gridlock, RMI, 2023 https://rmi.org/insight/preventing-electric-truck-gridlock/?utm_medium=email&utm_source=spark&utm_content=spark-a&utm_campaign=2023_06_01

Most of these trucks have the economic and technical potential to electrify. Currently, electric trucks (e- trucks) are most viable for short- and medium-haul trucking, which are not a majority of truck miles traveled, but are the majority of trucks in operation. Loosely speaking, semi-trucks fit into three operational categories: short, medium, and long haul. Short- and medium-haul trucks travel fewer than 100 and 300 miles per day respectively. They return to a depot or home location, unlike long-haul trips that can traverse the country. And while these long-haul trucks make up around a quarter of the stock, they contribute to over half of total miles traveled. The North American Council on Freight Efficiency (NACFE) estimates that 50% of the approximately 1 million medium haul heavy-duty trucks are electrifiable based on route lengths today6, while RMI analysis for New York State and California indicates that 49% of all HDT using less than 300 miles per day and returning to a base are also electrifiable today.7 [EPA-HQ-OAR-2022-0985-1529-A1, pp. 3-4] [Refer to Figure on p. 4 of docket number EPA-HQ-OAR-2022-0985-1529-A1]

6 Roeth et al., Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors, NACFE, May 5, 2022, https://nacfe.org/wp-content/uploads/edd/2022/05/HD-Regional-Haul-Report-FINAL.pdf

7 Jessie Lund et al., Charting the Course for Early Truck Electrification, RMI, 2022, https://rmi.org/insight/electrify-trucking/.

The market for e-trucks is growing and electric trucks are improving, with greater efficiency and battery capacity extending trucks' range and capabilities. Incumbent and new manufacturers have trucks that offer sufficient range and reliability for many customers today, and those trucks are improving, following the trend of electric cars that increased efficiency, improved range, and increased charging speed. Vehicle drivetrains, manufacturing efficiency, and battery cells are continuously improving, reducing average vehicle costs by approximately 5% per year.8 [EPA-HQ-OAR-2022-0985-1529-A1, p. 4]

8 BloombergNEF model price for 2019–2021: $18/kWh annual decrease and GNA 2022 State of Sustainable Fleets.

Thanks to Existing Policy EV Trucks are Affordable

State Policy Driving Demand

Policy at the state level is already driving heavy-duty fleet electrification. Over the next several years, state regulations that require the sale of zero-emissions trucks and government incentives for vehicles, chargers, and electric or hydrogen fuel are the carrots and sticks that will help generate e-truck sales. Starting in 2024, California's Advanced Clean Trucks (ACT) regulation requires electric truck sales phase ins, culminating in 40% to 70% of new truck sales being zero emissions by 2035.9 California is not alone. Six states have codified their commitment to ACT, while seven other states and the District of Columbia are in various stages of rulemaking.10 [EPA-HQ-OAR-2022-0985-1529-A1, pp. 4-5]

9 The 2035 sales requirement is: 40% for tractor trailers, 55% for class 2b-3 medium-duty trucks, and 75% for medium- and heavy-duty 'straight trucks'(https://www.freightwaves.com/news/california-gets-epa-waiver-to-move-ahead-with-advanced-clean-trucks-rule).

10 'Advanced Clean Trucks Fact Sheet,' California Air Resources Board, August 20, 2021, https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet.

Organization: Southern Environmental Law Center (SELC)

In order to properly evaluate the feasibility of the proposed standards, EPA must develop an accurate projection of the ZEV adoption that will occur in the heavy-duty vehicle sector without the proposed standards. An inaccurate model that assumes artificially low baseline ZEV adoption rates is likely to cause EPA to adopt standards that are too lenient or that could be achieved under business-as-usual conditions. A recent report by the International Council on Clean Transportation, for example, estimated that 15 percent of all Class 4-8 vehicle sales will be ZEVs by model year 2025 and 39 percent by 2030, even without the proposed Phase 3 standards.50 These projections seem to be much higher than the ZEV adoption rate used by EPA in its reference case and technology package modeling.51 As noted throughout the proposed rulemaking, there are a number of factors that have resulted in increased ZEV adoption in the heavy-duty vehicle sector in recent years, and ZEV deployment is expected to continue to accelerate. EPA must therefore improve its modeling to account for higher rates of baseline ZEV adoption to ensure it adopts the strongest standards possible. [EPA-HQ-OAR-2022-0985-1554-A1, p. 7]

50 Pierre-Louis Ragon et al., INT'L COUNCIL ON CLEAN TRANSP., Potential Benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles, app. A (Apr. 2023), https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf. The "potential market growth" projection in this report is "based on market conditions in combination with state ACT rule adoption and federal subsidies under the Inflation Reduction Act." Id. at 5.

51 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 25932 (Apr. 27, 2023); U.S. EPA, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory ImpactAnalysis 318 (Apr. 2023) [hereinafter "Phase 3 Draft Regulatory Analysis"].

Among other things, EPA must fully account for the ACT program that has been adopted by California and eight other states.52 The ACT program establishes binding requirements in participating states that progressively increase the percentage of medium- and heavy-duty ZEVs that must be sold in these states starting in model year 2025. By model year 2035, ZEVs will be required to make up approximately 55 percent of Class 2b-3 vehicle sales, 75 percent of Class 4-8 vehicle sales, and 40 percent of Class 7-8 tractor sales in participating states,53 which make up over 20 percent of the nation's medium- and heavy-duty vehicle fleet.54 Proper consideration of the ACT program is especially important if EPA moves forward with its proposal to use a "nationwide production volume" as part of the averaging, banking, and trading program.55 Based on conflicting statements in the regulatory documents, it is not clear how EPA incorporated the ACT program into its assessment.56 What is clear is that this program will have a direct impact on ZEV deployment in states that have adopted the program and an indirect impact on ZEV deployment in other states as more heavy-duty ZEVs are made available in the market. [EPA-HQ-OAR-2022-0985-1554-A1, p. 7-8]

52 ELEC. TRUCKS NOW, States Are Embracing Electric Trucks, https://www.electrictrucksnow.com/states (last visited June 9, 2023).

53 See CAL. AIR RES. BD., Updated Informative Digest, 5 (Jan. 20, 2021), https://ww3.arb.ca.gov/regact/2019/act2019/uid.pdf. The ACT program provides some compliance flexibility through the use of credits. Id. at 6.

54 Press Release, Earthjustice, New York State Advances Clean Trucks Rule to Electrify Vehicles (Dec. 30, 2021), https://earthjustice.org/news/press/2022/new-york-state-advances-clean-trucks-rule-to-electrify-vehicles.

55 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 26009-10 (Apr. 27, 2023).

56 Compare id. at 25989 ("The approach we used to select the proposed standards . . . does not specifically include accounting for ZEV adoption rates that would result from compliance with the California ACT program.") with Phase 3 Draft Regulatory Analysis, supra note 51, at 317-18 ("Because the ACT waiver was only recently granted, for this proposal EPA used the ZEV sales volumes projections that could be expected from ACT in the reference case as an overall projection for national ZEV sales volumes, as we made this projection prior to the granting of the ACT wavier.").

EPA must also incorporate consideration of other regulatory programs and state policies that are likely to impact nationwide baseline ZEV adoption rates into its assessment. For example, 11 jurisdictions in addition to the states that have adopted the ACT program have committed to a goal of having at least 30 percent of all new medium- and heavy-duty vehicle sales be ZEVs by no later than 2030, and 100 percent of sales being ZEVs by no later than 2050 under the Multi-State Medium- and Heavy-Duty Vehicle Memorandum of Understanding (MOU).57 Other regulatory programs and state fleet commitments, like California's Innovative Clean Transit rule58 and Advanced Clean Fleets rule,59 may also impact baseline ZEV adoption rates. [EPA-HQ-OAR-2022-0985-1554-A1, p. 8]

57 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding, https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf/ (last updated Mar. 29, 2022).

58 CAL. CODE REGS. tit. 13, §§ 2023 et seq. (2019).

59 Advanced Clean Fleets Rule, 35-Z Cal. Regulatory Notice Reg. 997 (Sept. 2, 2022) (indicated that the new regulation will appear in CAL. CODE REGS. tit. 13, §§ 2012-16).

In addition to state level programs and policies, vehicle manufacturers and other companies have made public announcements of their intent to shift their fleets to ZEVs.60 This shift, as well as declining costs and other economic forces, are likely to drive higher deployment of medium- and heavy-duty ZEVs in coming years. A study by the National Renewable Energy Laboratory found that ZEVs in all medium- and heavy-duty vehicle classes could reach cost parity with diesel vehicles by 2035, even without incentives.61 Coupled with the deployment of charging and refueling infrastructure, this could result in ZEVs accounting for 42 percent of medium- and heavy-duty sales by 2030, and over 99 percent of sales by 2045.62 [EPA-HQ-OAR-2022-0985-1554-A1, p. 8]

60 Pierre-Louis Ragon et al., supra note 50, at 2-3.

61 Catherine Ledna et al., NAT'L RENEWABLE ENERGY LAB'Y, Decarbonizing Medium- & Heavy-Duty On-Road Vehicles Cost Analysis (Mar. 2022), https://www.nrel.gov/docs/fy22osti/82081.pdf.

62 Id.

Organization: Tesla, Inc. (Tesla)

Deployment of Medium- & Heavy-Duty Vehicle Electrification Will Scale Rapidly

In general, EPA's proposed standards are set at a level less stringent than the depth and pace of electrification technology deployment that has already occurred and will be accelerated through market forces and numerous other state and federal policies. BEV deployment, like other technologies, will follow a S curve leading to a much more rapid pace of adoption between now and when the Phase 3 regulations take hold. Indeed, many manufacturers have rapidly placed innovative technology across major portions of their new vehicle offerings in only a few model years.78 BEV technology will continue to follow similar paths, and deployment has already been shown to outperform the traditional S curve.79 [EPA-HQ-OAR-2022-0985-1505-A1, p. 13]

78 See e.g. Hula, et al, Analysis of Technology Adoption Rates in New Vehicles, SAE International (April 1, 2014) available at https://www.epa.gov/sites/default/files/2016-10/documents/2014-01-0781_0.pdf

79 Ark Investment, Electric Vehicles Are Outperforming the Traditional S-Curve Dynamics (July 2, 2019) available at https://ark-invest.com/articles/analyst-research/ev-growth-outperforming-the-traditional-s-curve-dynamics/

In its proposal, EPA utilizes the latest EIA estimates to characterize heavy-duty BEV sales that project out BEV sales share of less than 1% in key market segments in 2050.80 This assumed baseline is woefully low, cuts against many projections, and is not fully supported by the record. Indeed, as EPA indicates, the BEV market is dynamic and changing rapidly.81 One recent report published two months before passage of the Inflation Reduction Act (IRA) found that revenue from the electric truck market was growing at a compound annual growth rate of 54%.82 In another example, NREL has found economics will drive much faster adoption with ZEV sales possibly reaching 42% of all medium- and heavy-duty trucks by 2030.83 It even projects out a scenario where ZEV sales reach >99% by 2045, and 80% of the sector transitions to ZEVs by 2050, reducing CO_2 emissions by 69% from 2019.84 A new analysis views the heavy-duty haul market as 50% electrifiable right now.85 Still other analyses have found that most ‘market segments have the potential to be fully mature by 2025, with EV models available from multiple companies, including the majority of major OEMs that currently have 90% market share of the inuse fleet.’86 Further, it is predicted the pace of electrification in the truck sector will increase rapidly over the next decade.87 Recent sales suggest this pace of adoption is already occurring.88 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 13-14]

80 Draft RIA at 11.

81 88 Fed. Reg. at 25940.

82 Charged, New Reports Analyze US Electric Truck Market and Global Off-Highway EV Market (June 16, 2022) available at https://chargedevs.com/newswire/new-reports-analyze-us-electric-truck-market-and-global-off-highway-evmarket/?utm_source=ChargedEVs.com+Email+Newsletter+Opt-in&utm_campaign=c0d41568d2-Daily+Headlines+RSS+Email+Campaign&utm_medium=email&utm_term=0_6c05923d39-c0d41568d2-343935020

83 NREL, Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis (March 8, 2022) available at https://www.nrel.gov/docs/fy22osti/82081.pdf

84 Id.

85 NACFE, Charting the Course for Early Truck Electrification (May 2022) available at https://rmi.org/insight/electrifytrucking/?mc_cid=09f3d727f2&mc_eid=544476f6c1 (Analysis shows that approximately 65 percent of medium-duty trucks and 49 percent of heavy-duty trucks — are regularly driving short enough routes that they could be replaced with electric trucks that are on the market today); See also, NACFE, Electric Trucks Have Arrived: The Use Case For Heavy-Duty Regional Haul Tractors (May 2022) available at https://nacfe.org/heavy-duty-regional-haultractors/?mc_cid=09f3d727f2&mc_eid=544476f6c1

86 MJ Bradley, Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness (Aug. 11, 2022) at 6 available at https://www.mjbradley.com/reports/medium-heavy-duty-vehicles-market-structure-environmentalimpact-and-ev-readiness

87 See, Wood Mackenzie, US electric truck sales set to increase exponentially by 2025 (Aug. 10, 2020) available at https://www.woodmac.com/press-releases/us-electric-truck-sales-set-to-increase-exponentially-by-2025/ (finding there were just over 2,000 electric trucks on US roads at the end of 2019 and project this to grow to over 54,000 by 2025); BNEF, EV Outlook 2021 (heavy-duty electric trucks become economically attractive in urban duty cycles by the mid-2020s. Megawatt-scale charging stations and the emergence of much higher energy density batteries by the late 2020s result in battery electric trucks becoming a viable option for heavy-duty long-haul operations, especially for volume-limited applications.) available at https://bnef.turtl.co/story/evo-2021/page/3/2?teaser=yes

88 Fleet Owner, Pace of heavy EV sales quickens with two recent deals (Mar. 22, 2022) available at https://www.fleetowner.com/emissions-efficiency/electric-vehicles/article/21237583/pace-of-heavy-ev-sales-quickenswith-two-recent-deals

As with EPA’s proposal, these estimates do not take into account the BEV sales impacts that will result from California’s newly adopted Advanced Clean Fleets (ACF) program. 89 ACF will require last mile delivery and yard trucks to transition to ZEVs by 2035, work trucks and day cab tractors must be zero-emission by 2039, and sleeper cab tractors and specialty vehicles must be zero-emission by 2042.90 Moreover, the ACF rule has accelerated the rate of BEV deployment under the original ACT rule to embrace an end to combustion truck sales in 2036.91 In California alone, the original ACT rule was estimated to require the deployment of 100,000 heavy-duty ZEVs in 2030 and 300,000 by 2035.92 [EPA-HQ-OAR-2022-0985-1505-A1, p. 14]

89 88 Fed. Reg. at 25973.

90 California Air Resources Board, Advanced Clean Fleets Regulation Summary available at https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-summary

91 CARB, California approves groundbreaking regulation that accelerates the deployment of heavy-duty ZEVs to protect public health (April 28, 2023) available at https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulationaccelerates-deployment-heavy-duty-zevsprotect#:~:text=The%20Advanced%20Clean%20Fleets%20rule%20includes%20an%20end%20to%20combustion,accelerated%20benefits%20for%20California%20communities.

92 CalMatters, California Mandates Zero-exhaust Big Rigs, Delivery Trucks (July 6, 2020) available at https://calmatters.org/environment/2020/06/california-zero-emission-trucks/

The adoption of forward-looking heavy-duty electrification policies in numerous other states will also drive more rapid electrification of the medium- and heavy-duty sectors.93 As the agency discusses, the ACT regulation will drive significant emission reductions and medium- and heavy-duty vehicle electrification through Model Year (MY) 2035.94 Additionally, seven states – Colorado95, Massachusetts, New Jersey, New York,96 Oregon, Vermont, and Washington – have already adopted those standards. Several additional states, including Connecticut, Maine, Maryland, and Rhode Island,97 are expected to adopt the rule soon. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 14-15]

93 88 Fed. Reg. at 25947.

94 Id.; See also, CARB Advanced Clean Trucks Fact Sheet (Aug. 20, 2021) available at https://ww2.arb.ca.gov/resources/factsheets/advanced-clean-trucks-fact-sheet.

95 Colorado Dept. of Health and Environment, Colorado adopts new measures to increase availability of zero-emission trucks that offer lower operating and fuel costs- (April 21, 2023) available at https://cdphe.colorado.gov/pressrelease/colorado-adopts-new-measures-to-increase-availability-of-zero-emission-trucks-that

96 See, ICCT, Benefits of Adopting California Medium- and Heavy-Duty Vehicle Regulations In New York State (May 27, 2021) available at https://theicct.org/publication/benefits-of-adopting-california-medium-and-heavy-duty-vehicle-regulations-innew- york-state/

97 Rhode Island Dept. Env. Mgmt., DEM Announces that Rulemaking Process to Implement Draft Clean Car & Truck Emissions Standards is Set to Start at May 18 Public Listening Session (May 10, 2023) available at https://dem.ri.gov/pressreleases/dem-announces-rulemaking-process-implement-draft-clean-car-truck-emissions-standards

If the eighteen states98 that have adopted the current California light duty ZEV standards also adopt California's ACT rule, it is estimated that 1 in 8 trucks sold in 2030 will be electric.99 Importantly, the ACT rule incentivizes early action from manufacturers, further supporting a significant increase in deployment of zero emissions trucks in the near term in states that adopt the ACT rule. Further, the adoption of the ACF will only serve to accelerate this through required sales. [EPA-HQ-OAR-2022-0985-1505-A1, p. 15]

98 CARB, States that have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act (May 13, 2022) available at https://ww2.arb.ca.gov/resources/documents/states-have-adopted-californias-vehicle-standards-undersection-177-federal

99 Union of Concerned Scientists, We Can Electrify One in Three Heavy Duty Trucks by 2030: Here's How. (Mar. 22, 2022) Available at https://blog.ucsusa.org/sam-wilson/we-can-electrify-one-in-three-heavy-duty-trucks-by-2030-heres-how/

While the agency also notes the multi-state NESCAUM Memorandum of Understanding (NESCAUM MOU),100 it should ensure that the deployment of BEV technology envisioned under the agreement is included in the NOX (and GHG) baseline assessment. More specifically, in July 2020,101 fifteen states and the District of Columbia announced that they entered the joint NESCAUM MOU wherein they committed to working together to advance and accelerate the market for electric medium- and heavy-duty trucks. The parties agreed to a goal that 100% of new medium- and heavy-duty vehicle sales would be zero emission by 2050, with an interim goal of 30% sales by 2030. A recent analysis found that expanding the NESCAUM MOU nationally would result in more than half of the fleet being electric by 2045 and reduce annual GHG emission reductions 5% of U.S. truck emissions in 2035 increasing to an 18% reduction in U.S. truck emissions in 2045.102 Another found that these states adopting the ACT rule would lead to over 756,000 medium- and heavy-duty ZEVs deployed between 2024 and 2035.103 [EPA-HQ-OAR-2022-0985-1505-A1, p. 15]

100 88 Fed. Reg. at 25947(This effort was organizing by the Northeast States for Coordinated Air Use Management (NESCAUM). The state signing on to the MOU were California, Connecticut, Colorado, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.).

101 NESCAUM, 15 States and the District of Columbia Join Forces to Accelerate Bus and Truck Electrification (July 14, 2020) available at https://www.nescaum.org/documents/multistate-truck-zev-mou-media-release-20200714.pdf/

102 Rhodium Group, States Pave the Way for a Zero-Emission Vehicle Future (Aug. 13, 2020) available at https://rhg.com/research/states-zero-emission-vehicles/.

103 CALSTART, Zeroing in on Zero Emission Trucks (Jan. 2022) at 21 available at https://calstart.org/wpcontent/uploads/2022/02/ZIO-ZETs-Report_Updated-Final-II.pdf

Interest in the NESCAUM MOU and its goals continues to expand. 104 In September 2021, the Province of Quebec signed on to the NESCAUM MOU. Virginia followed suite in December 2021, and Nevada just joined at the end of March 2022, bringing the total number of signatories to seventeen states, one province, and the District of Columbia. The signatory states have committed to working together through the existing multi-state ZEV Task Force105 to develop and implement an Action Plan to help states meet these ambitious goals. In March, the Draft Multi-State Medium-and Heavy-Duty Zero-Emission Vehicle Action Plan was released for public comment.106 Notably, the first recommendation in the draft Action Plan called for the signatory states to adopt the ACT regulation. As noted in the plan:

- While market-enabling programs such as incentives are also important, regulatory requirements mandating MHD ZEV sales provide market certainty needed to drive investments in zero-emission technologies and charging and fueling infrastructure at the pace and scale required for rapid electrification. Indeed, the ZEV sales mandate for passenger vehicles, established by California and adopted by other states, has prompted unprecedented investment in light-duty zero-emission technologies and substantial growth in the market share of light-duty ZEVs. The ACT regulation may be an even more important driver of electrification of the MHD vehicle sector given the costs and characteristics of trucks and buses.107 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 15-16]

104 Transport Dive, States band together to push for nationwide fleet electrification (May 5, 2022) available at https://www.transportdive.com/news/nevada-joins-nescaum-multi-state-zero-emissions-vehicle-mou/622520/

105 NESCAUM, ZEV Task Force, Multi-State ZEV Action Plan (2018) available at https://www.nescaum.org/documents/2018- zev-action-plan.pdf/

106 NESCAUM, Releases Draft Multi-State Medium-and Heavy-Duty Zero-Emission Vehicle Action Plan for Public Comment (March 10, 2022) available at https://www.nescaum.org/documents/announcement-mhd-zev-ap-public-draft.pdf/

107 NESCAUM, Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Action Plan (March 10, 2022) available at https://www.nescaum.org/documents/mhd-zev-action-plan-public-draft-03-10-2022.pdf at 25.

Moreover, a new analysis indicates adoption of the ACT rule in these states would significantly expand the BEV market and lead to 36% of all new medium- and heavy-duty vehicles being powered by zero-emission engines in 2030.108 [EPA-HQ-OAR-2022-0985-1505-A1, p. 16]

108 ICCT, Benefits of the 2020 Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding (Apr. 27, 2022) available at https://theicct.org/publication/md-hd-mou-benefits-apr22/

Electrification of the Federal Medium- and Heavy-Duty Fleet

The agency's Phase 3 proposal also does not appear to consider the role electrification of the federal medium and heavy-duty fleet will play in driving the transition to electrification. In late 2021, the President issued Executive Order 14057 directing all federal agencies, inter alia, to maximize acquisition and deployment of zero emission medium- and heavy-duty vehicles.109 In seeking to decarbonize the federal fleet, the President directed the U.S. Government to procure '100 percent zero-emission vehicle acquisitions by 2035.'110 Turning over the U.S. Government fleet will require the transition of 103,00 medium-duty trucks and 39,000 heavy-duty trucks.111 Not only will this significantly reduce the fleets' cost per mile to operate the vehicles and the fleet's collective GHG emissions, these procurement policies will further accelerate the demand for and heavy-duty technologies.112 [EPA-HQ-OAR-2022-0985-1505-A1, p. 16]

109 President Biden, E.O. 14057, 'Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability,' 86 Fed. Reg. 70935 (Dec. 13, 2021) at 204.

110 Id. at 102(a)(ii).

111 McKinsey, Net-zero emissions in US government fleets (April 18, 2022) available at https://www.mckinsey.com/Industries/Public-and-Social-Sector/Our-Insights/Net-zero-emissions-in-US-government-fleets

112 Id.

Organization: Valero Energy Corporation

3. EPA must consider the regionality of the increased electrical demand.

EPA fails to anticipate a regional roll-out of HD PEVs and makes no attempt to model the impacts of regionalized PEV charging demand on the electric power sector. In contrast, in the proposed Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, EPA expects and attempts to account for a "highly regionalized initial rollout of electric vehicles under the California ZEV program."189 EPA's failure to consider the regional adoption of HD ZEVs and the associated regionalization of PEV charging demand is a major flaw in EPA's otherwise weak analysis of electrical grid impacts. [EPA-HQ-OAR-2022-0985-1566-A2, p. 39.]

189 88 Fed. Reg. 29303 (May 5, 2023).

EPA explains in the DRIA that it "granted the ACT [(Advanced Clean Trucks)] rule waiver requested by California under CAA section 209(b) on March 30, 2023, which did not allow enough time for EPA to consider a different approach for this proposal."190 The coordination and timing of EPA's approval of the ACT waiver request and EPA's proposed motor vehicle tailpipe standards were wholly within EPA's control – self-imposed time constraints are no excuse for an inadequate regulatory impact analysis. [EPA-HQ-OAR-2022-0985-1566-A2, p. 39.]

190 DRIA at 255.

EPA further explains

"With the recent granting of the ACT waiver, we intend to consider how vehicles sold to meet the ACT requirement in California and other states that may adopt it under CAA section 177 would impact or be accounted for in the standard setting process approach described in the preamble in Section II. For example, we may adjust our reference case to reflect the ZEV levels projected from ACT in California and other states. We also may consider increasing the technology adoption rates in the technology packages and correspondingly increase the stringency of the proposed Phase 3 emission standards to account for the incremental difference in the projected ZEV adoption levels from the proposed Phase 3 emission standards and the adoption levels projected from ACT in those states."191 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 39 - 40.]

191 DRIA at 255

When EPA adjusts the reference case and Phase 3 emission standards to reflect projected impacts of ACT, EPA must perform a more comprehensive and regionally disaggregated analysis of impacts to the electrical grid and provide additional opportunity for review and comment on that new analysis. This information is central to the proposed rule and should be made available for comment before EPA can issue a final rule on the basis of such information. [EPA-HQ-OAR-2022-0985-1566-A2, p. 40.]

EPA Summary and Response:

Summary:

AmFree states that the heavy-duty industry has not embraced a shift from internal-combustion-engine vehicles to electric ones, citing a limited number of models of BEVs and FCEVs available today and a limited number of registrations as well.

ClearFlame Engine Technologies supports the use of trends that are propelled by state regulations in determining nationwide production volumes, such as California's Advanced Clean Trucks rule. They recommend integrating and relying on trends in California and other states that have or are planning to adopt a Low Carbon Fuel Standard (or comparable Clean Fuel Standards) to gauge the decarbonization potential of a transition to lower-carbon intensity fuels.

Daimler Trucks North America comments that many manufacturers have incorporated ZEVs into the strategies they use under the Phase 2 program to meet currently-applicable CO2 standards and that the ICE vehicles in their fleets are lower-performing than EPA anticipated. They stated this is due to lower adoption rates of the GHG-reduction technologies upon which the Phase 2 standards were based. Additionally, they stated that customers who are more likely to purchase high-performing ICE vehicles are more likely to purchase ZEVs, leaving a worse-performing ICE vehicle fleet. Thus, they assert that it is incorrect for EPA to assume that the remaining ICE vehicle fleet will maintain, on average, compliance with the existing Phase 2 MY 2027 standards and we should perform a new feasibility analysis on the existing Phase 2 standards, re-evaluating the level at which the remaining ICE vehicle fleet will perform.

Valero Energy Corporation criticized EPA for not modeling regional roll-out of HD plug-in electric vehicles and asserted that EPA must perform a more comprehensive and regionally disaggregated analysis of impacts to the electric grid and provide additional opportunity for review and comment on that new analysis.

The other commenters maintained that the baseline from which EPA assessed standard stringency and associated costs and benefits was mistakenly conservative. (CATF, EDF, National Parks Conservation Ass'n, RMI, SELC, Tesla.) These comments assert that the proposed standards merely reflect what the market would otherwise produce in violation of the requirements of section 202(a)(1) (as interpreted by the D.C. Circuit) to adopt standards which go beyond this 'business as usual' outcome. They also cite studies estimating greater future HD ZEV adoption than our baseline and point to state policies, such as California's ACT and ACF programs, as supporting greater HD ZEV adoption in the baseline. For example, CATF argued that the baseline must necessarily reflect all of the following, since they state that all of these indicate what will happen in the absence of federal regulation:

- California ACT standards
- California ACT standards as adopted by the so-called section 177 states;
- California ACF program
- NESCAUM MOU states
- The effects of federal funding beyond the Advanced Manufacturing Credit and Qualified Commercial Vehicle Credit considered by EPA at proposal;
- State and local initiatives (itemized and discussed in detail in the comment);
- Manufacturer and fleet production and purchase public commitments;
- ZEV adoption for vehicles for which EPA's payback analysis shows ready payback;
- ZEV adoption for vehicles where there are reliable indications of price parity with ICE vehicles before or during the model years of the proposal, including transit buses, refuse trucks, school buses, delivery vehicles, and (by MY 2030) long-haul tractors (citing ICCT April 2023 White Paper);
- The commenter includes citations to cases holding agency action arbitrary and capricious due to miscalculation of a baseline, and also cites OMB Circular A-4 for

the need to properly state a baseline as part of the process of calculating costs and benefits of agency actions. The commenter further maintains that the proposal violates CAA section 202(a)(1) by proposing standards which produce no emission reductions beyond those which would occur without the regulation.

Response:

Regarding AmFree's comments on the current state of the heavy-duty industry, we agree that there are relatively few models and registrations of BEVs and FCEVs today as discussed in the Executive Summary of the preamble and RIA Chapter 1. However, we also note in those sections significant interest, commitments, and investments towards applying such technologies to HD vehicles from manufacturers, fleets, state and local governments, as well as incentives under the IRA and BIL. We expect that the number of models and registrations of BEVs and FCEVs will increase significantly in the coming years. EPA also finds that the final rule provides sufficient lead-time for the development and application of BEV and FCEV technologies.

We appreciate ClearFlame's support for considering state regulations in determining nationwide production volumes of ZEVs. Regarding integrating or relying on trends in California and other states that have or are planning to adopt a Low Carbon Fuel Standard (or comparable Clean Fuels Standards) to gauge the decarbonization potential of a transition to lower-carbon intensity fuels, the requested action is outside the scope of this rulemaking. See also our responses in RTC Section 9.

Regarding Daimler Trucks North America's comments, we do not agree that our modeling baseline is improper. For the purposes of modeling the projected impacts of the Phase 3 standards, our approach appropriately reflects the emissions associated with the regulatory baseline, including among other things HD GHG Phase 2 and ACT, and the reduction in emissions attributable to this rule. This approach is consistent with Circular A-4, which states "Your baseline should reflect, when appropriate and feasible, the future effect of current government programs and policies. More specifically, the baseline should attempt to reflect relevant final rules (especially if their requirements are being modified by the regulation under consideration) …."[354] The Phase 2 Rule is an existing regulation, and therefore it is appropriate to consider that rule in the baseline. The same is true for ACT.

We acknowledge that the baseline reflects one potential compliance pathway for the regulations modeled (not including Phase 3). While this baseline is not necessarily consistent with any individual firm's compliance pathway, it is a reasonable projection to represent the baseline emissions from the industry as a whole. That is the case even taking as true DTNA's premise that it and some other manufacturers may produce more ZEVs and worse-performing ICE vehicles in MY 2027 than projected by Phase 2. This is not a situation where regulated entities are unable to comply with a prior regulation; rather we expect, and DTNA does not contest, that it and the industry generally are capable of complying with Phase 2. The fact that DTNA may employ different technologies than we projected in Phase 2 is a feature of the performance-based nature of the standards, not a defect in modeling. Further, in our evaluation of MY 2021 and MY 2022 heavy-duty GHG certification results, we find that there are ICE vehicles being built that already meet the Phase 2 MY 2027 emission standards, well in advance of MY 2027. Thus, given that Phase 2 is an existing final rule, the only question is how to model

[354] Circular No. A-4 (Nov. 9, 2023), 11-12.

Phase 2 compliance in the baseline. We think the agency's chosen modeling, which is based on the Phase 2 rule's projections of technology adoption, is a reasonable way to model the industry as a whole.

We note that similar to our modeling of Phase 2, our modeling of the final standards also represents one potential compliance pathway, which may differ from the pathway that any specific manufacturer or the industry ultimately take, and which reasonably estimates the emission reductions under the Phase 3 standards. For discussion of the notion that the ICE vehicle fleet will be worse performing than the Phase 2 MY 2027 standards, see RTC Section 2.4.

Regarding Valero's comments, we have updated from proposal our baseline to account for regional differences in HD ZEV adoption and we have modeled the impacts of these differences. See preamble Sections V, II.D, and II.E and RIA Chapter 4.

See also RIA Chapter 4 and RTC section 2.4 for our response regarding EPA's consideration of CARB's ACT regulation, including uncertainties in the final rule baseline for ZEV adoption and our final rule reference case ZEV adoption sensitivity analysis.

We agree that the baseline we presented in the proposal was conservative in part because it did not fully account for the ACT rule. As described in Section V.A.1 of the preamble, and Chapter 4.2.2 of the RIA, our baseline for this final rulemaking ("FRM baseline", and also referred to as our final rule reference case) shows increased ZEV adoption for all heavy-duty vehicle types compared to the baseline for the proposal. This FRM baseline reflects manufacturers' compliance with ACT in eight states and a lower, non-zero level of ZEV adoption in the other 42 states.[355]

We acknowledge that our FRM baseline does not explicitly reflect many of the items in the bulleted list in our comment summary above such as the ACF rule, NESCAUM MOU states, and public commitments by manufacturers and fleets for production and purchase of ZEVs, respectively, with the exception of the ACT rule in eight states who have finalized its adoption and which we have accounted for in the FRM baseline. Many of these items do not represent enforceable requirements, and they may or may not occur in the absence of the Phase 3 program. For example, we are not including CARB's ACF regulation in our baseline because at the time of this rulemaking, EPA is still reviewing the waiver request for the ACF regulation. However, we recognize and have taken into consideration that these other measures may have an impact on the market regardless of whether they are enforceable. To provide one example, in summer 2023, major manufacturers signed an agreement committing to meet the Advanced Clean Fleets 100% ZEV sales requirement in California, subject to certain conditions.[356] For the reasons detailed in

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[355] At the time we performed the inventory modeling analysis, seven states had adopted ACT in addition to California. Oregon, Washington, New York, New Jersey, and Massachusetts adopted ACT beginning in MY 2025 while Vermont adopted ACT beginning in MY 2026 and Colorado in MY 2027. Three other states, New Mexico, Maryland, and Rhode Island adopted ACT (beginning in MY 2027) in November and December of 2023, but there was not sufficient time for us to incorporate them as ACT states in our modeling.

[356] See CARB-EMA Agreement i-ii ("The OEMs Commit to Meet CARB Truck Regulations *** The OEMs commit to meet, in California, the requirements of the relevant regulations as specified below and any agreed upon modifications per this Agreement, regardless of the outcome of any litigation challenging the waivers/authorizations for those regulations, or CARB's overall authority to implement those regulations. *** The ACT regulation, as it

preamble Section V and RIA 3, our FRM baseline generally has higher ZEV adoption rates than the baseline used in the proposal. Further discussion of the FRM baseline can be found in Preamble Section V.A.1.

The commenters do not sufficiently explain how to include the requested items in estimating the baseline ZEV adoption. They, in particular CATF, support their comments with citations to the literature. However, the literature estimations vary over a wide range—indicating uncertainty in the methodologies—and the literature doesn't appear to consider several important real-world factors which would in general be expected to slow down or reduce ZEV sales. These include such factors as ZEV product research and development timelines, ZEV manufacturing timelines, the availability of ZEV models, manufacturing or infrastructure constraints, driver preferences, and other factors. For example, EDF and ERM conducted a follow-up analysis of their HD ZEV sales projections after the IRA passed in 2022 in which they anticipate that approximately six percent of medium- and heavy-duty sales would be ZEVs.[357] In fact, EPA certified approximately 3,400 HD BEVs in MY 2022, which represents less than one percent of the market—significantly less than EDF and ERM's projection. This difference can likely be attributed in part to their omission of the real-world factors stated above.

CATF suggests that the adoption rates we presented in the proposal are actually a reasonably anticipated market-driven HD ZEV penetration level and so should be included in the baseline. We disagree because, while the payback-adoption rate analysis indicates what is achievable when limited only by the economics associated with payback, there are additional, important real-world factors that may affect ZEV adoption. EPA's analysis considers these additional factors, which include ZEV product research and development timelines, ZEV manufacturing timelines, the availability of ZEV models, manufacturing or infrastructure constraints, driver preferences, critical mineral and related supply chain availability, and other factors.

CATF also recommends considering payback period for the baseline. As described in Section V.A.1 of the preamble, among vocational vehicles in the FRM baseline, ZEV adoption rates increase with weight class which trends inversely with payback period as shown in RIA Chapter 2.9.2. Similarly, ZEV adoption rates are greater for short-haul tractors than long-haul tractors in the FRM baseline, which is also consistent with our payback analysis. We do not anticipate the payback period at the individual vehicle level to be affected by the Phase 3 standards, so the payback periods shown in RIA Chapter 2.9.2 are indicative of payback periods we would expect in the baseline.

We do not agree that the standards violate the Act because they produce no emission reductions. As we explain in preamble Section V, we expect the standards to produce significant GHG reductions. We further explain our interpretation of the statute in preamble Section I and II.G, and in RTC section 2.4.

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existed on March 15, 2021, and the 100 percent ZEV sales requirement set forth in Cal. Code Regs title 13, section 2016, as it existed on April 28, 2023."). Available online: https://ww2.arb.ca.gov/sites/default/files/2023-07/Final%20Agreement%20between%20CARB%20and%20EMA%202023_06_27.pdf.

[357] Robo, Ellen and Dave Seamonds. Technical Memo to Environmental Defense Fund: Investment Reduction Act Supplemental Assessment: Analysis of Alternative Medium- and Heavy-Duty Zero-Emission Vehicle Business-As-Usual Scenarios. ERM. August 19, 2022. Page 9. Available online: *https://www.erm.com/contentassets/154d08e0d0674752925cd82c66b3e2b1/edf-zev-baseline-technical-memo-addendum.pdf.*

3.11.2 Payback Period

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

Assumptions in EPA's analysis of ZEV adoption rates are too limiting

Fully incorporating the results of state actions as recommended above would not be sufficient to bring EPA's projections of ZEV adoption to highest feasible levels. Certain key elements of EPA's ZEV analysis tool, HD TRUCS, are overly conservative, leading to low projections of ZEV adoption. These include battery and payback period requirements. [EPA-HQ-OAR-2022-0985-1560-A1, p. 5]

Payback requirements may also unnecessarily constrain ZEV adoption. Time to payback determines projected ZEV penetration through the HD TRUCS adoption rate schedule set out in in Table 2-73 (p.232) of the Draft Regulatory Impact Analysis (DRIA) .16 The schedule imposes onerous payback requirements in part because it does not differentiate by vehicle type. Typical first vehicle ownership period varies across type, affecting the payback period sought by the prospective buyer. An adoption rate under 45% in MY 2032 for a 1-2 year payback, as HD TRUCS dictates, is surprisingly low, even for the long-haul tractors purchased by large fleets that may sell their trucks after a few years. Indeed, fleets commonly cited 18 months as an acceptable payback period for efficiency technology in the Phase 1 and Phase 2 heavy-duty rulemaking processes. For a vocational fleet likely to own its vehicles for many years, one would expect that a payback period of several years would be acceptable and that MY 2032 adoption rates would reflect that. Furthermore, the Phase 3 program should be expected to play a role in tuning the vehicle market to properly value fuel cost savings for used as well as new vehicles. Hence, assigning high adoption rates to vehicles that pay back well within the life of the vehicle would be reasonable and would lead to adoption rates substantially higher than the proposed standards reflect. [EPA-HQ-OAR-2022-0985-1560-A1, p. 6]

16 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

Organization: American Trucking Associations (ATA)

4. The Upfront Costs of ZEVs are High and Fleets are Looking for Proof Prices Will Come Down

ZEVs' upfront acquisition costs are generally much higher than ICEVs, making it difficult for fleets to embrace electrification until they see meaningful year-over-year upfront purchase price declines. Before incentives, costs can be two to three times higher for BEVs and up to seven times higher for hydrogen fuel cell Class 8 trucks.13 Across the industry, acquisition costs are often greater than or equal to three-fifths of the TCO.14 For many fleets, calculating the TCO is a complex math problem that cannot be easily confirmed without significant expense and trial and error. Case studies alone are insufficient to validate assumptions due to each fleet's unique operating characteristics, including configuration, duty cycle, and cost.15 [EPA-HQ-OAR-2022-0985-1535-A1, p. 10]

13 Class 4-6 battery electric delivery vehicles can range from $100,000 to $200,000, while Class 8 over-the-road vehicles can cost $400,000 or more before incentives. Diesel MDV is around $75,000 and HDV is $165,000.

14 See, e.g., Volvo Trucks North America, Press Releases, "Volvo Trucks' New Electromobility Total Cost of Ownership Tool Demonstrates Financial, Environmental Benefits of Volvo VNR Electric," October 23, 2022; and Dana, Inc., Total Cost of Ownership Tool, n.d.

15 These variable inputs can be non-linear, colinear, and frequently interconnected, further complicating the TCO calculation process.

In calculating TCO, fleets generally think about capital and non-capital expenses. Capital expenses can be depreciated to offset some, though not all, of the significantly higher MSRP on a ZEV. Capital expenses are also expected to retain some residual value at the end of their useful lives, but there is little data to estimate these values for heavy-duty ZEVs. The fleet survey conducted by ATA confirms that most fleet respondents were uncertain about ZEVs' residual value. Reducing MSRP would be an impactful way to offset the uncertainty around TCO and encourage adoption. However, many fleets worry about the uncertainties of EPA's BEV price and cost assumptions because the technology is a new product category. They worry capacity improvements in batteries or efficiency gains in the cost-per-unit capacity will not necessarily translate into direct price reductions in the near to medium term, as projected under the proposed rule. Notably, battery and component costs have remained comparatively stable in the light-duty market for BEVs. Similarly, a midsize fleet manager running a mixed truckload and less-than-truckload operation shared they have seen prices increase year-over-year due to component pricing. [EPA-HQ-OAR-2022-0985-1535-A1, p. 11]

Another way to view these cost increases is their relationship to vehicle purchase prices. EPA estimated the Phase 2 2027 costs would increase the price of tractors by 12 percent and vocational vehicles by 3 percent.18 Using EPA's minimum vehicle price estimate of $100,000 for tractors and vocational vehicles, this equates to a 2027 ZEV price increase of 9 to 15 percent for vocational vehicles and 61 percent for tractors. For perspective, even with the IRA vehicle tax credits in place, these increases will be on par and surpass the U.S. consumer price increases of 9 percent in 2022, reaching its highest level in more than 40 years. The projected price increases associated with the proposed rule is a significant concern and requires further analysis of how purchasers will respond. [EPA-HQ-OAR-2022-0985-1535-A1, p. 14]

18 U.S. Environmental Protection Agency and Department of Transportation, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles-Phase 2: Final Rule, Federal Register Vol, 81. No. 206. pg. 73482, October 25, 2016.

Organization: California Air Resources Board (CARB)

In its recent ACF rulemaking, CARB staff estimated the impact that regulation would have on vehicle costs for both ICE vehicles and ZEVs. CARB staff developed those estimates through a lengthy public process and through literature reviews of numerous sources discussing ZEV costs. CARB staff determined that although the vehicle acquisition costs for battery electric vehicles (BEV) and fuel cell electric vehicles (FCEV) will exceed the respective acquisition costs for their ICE counterparts until at least 2030, the costs for some categories of BEVs and FCEVs will decrease to below the costs of their ICE counterparts after 2030 as declining battery and component costs and economies of scale are expected to decrease the incremental costs of ZEVs as the market for ZEVs expands.26 CARB staff's findings are corroborated by numerous other studies evaluating ZEV prices—including in markets beyond California—over time. 27,28,29,30,31,32,33,34,35,36,37,38 [EPA-HQ-OAR-2022-0985-1591-A1, pp.17-18]

26 Staff Report, ACF regulation, Chapter VIII.B.5.

27 Atlas Public Policy, Assessing Financial Barriers to Adoption of Electric Trucks, 2020 (web link: https://atlaspolicy.com/wp-content/uploads/2020/02/Assessing-Financial-Barriers-to-Adoption-of-Electric-Trucks.pdf last accessed August 2022).

28 Environmental Defense Fund, Technical Review of Medium-Duty and Heavy-Duty Electrification Costs for MY 2027-2030, 2022 (web link: https://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf last accessed March 2023).

29 ERM, Investment Reduction Act Supplemental Analysis: Analysis of Alternative Medium- and Heavy-Duty Zero-Emission Vehicle Business-As-Usual Scenarios, 2022 (web link: https://www.erm.com/contentassets/154d08e0d0674752925cd82c66b3e2b1/edf-zev-baselinetechnical-memo-addendum.pdf last accessed January 2023).

30 Hydrogen Council, Path to Hydrogen Competitiveness – A Cost Perspective, 2020 (web link: https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf last accessed August 2022).

31 The International Council on Clean Transportation, A meta-study on purchase costs for zero-emission trucks, 2022 (web link: https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf last accessed March 2023).

32 ICF International, Comparison of Medium-Duty and Heavy-Duty Technologies in California, 2019 (web link: https://caletc.aodesignsolutions.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf last accessed August 2022).

33 McKinsey, Preparing the World for Zero-Emission Trucks, 2022 (web link: https://www.mckinsey.com/~/media/mckinsey/industries/automotive%20and%20assembly/our%20insights/preparing%20the%20world%20for%20zero%20emission%20trucks/preparing-the-world-for-zeroemission-trucks-f.pdf last accessed March 2023).

34 North American Council for Freight Efficiency, Guidance Report: Medium-Duty Electric Trucks Cost of Ownership, 2018 (web link: https://nacfe.org/wp-content/uploads/2018/10/medium-duty-electric-trucks-cost-of-ownership.pdf last accessed August 2022).

35 North American Council for Fuel Efficiency, Regional Haul, 2019 (web link: https://nacfe.org/regional-haul/ last accessed August 2022).

36 North American Council for Fuel Efficiency, Viable Class 7/8 Electric, Hybrid, and Alternative Fuel Tractors, 2019 (web link: https://nacfe.org/future-technology/viable-class-7-8/ last accessed August 2022).

37 University of California Los Angeles, Zero-Emission Drayage Trucks – Challenges and Opportunities for the San Pedro Bay Ports, 2019 (web link: https://innovation.luskin.ucla.edu/wp-content/uploads/2019/10/Zero_Emission_Drayage_Trucks.pdf last accessed August 2022).

38 Union of Concerned Scientists, Ready to Work – Now is the Time for Heavy-Duty Electric Vehicles, 2019 (web link: https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf last accessed August 2022).

CARB staff further evaluated the total cost of ownership (TCO) of ZEVs versus ICE vehicles39 by comparing TCOs of gasoline, diesel, natural gas, battery electric, and hydrogen fuel cell vehicles in six applications on a per-vehicle basis. CARB staff's analysis indicates that the TCO for BEVs appears to be cost competitive with established combustion technologies by 2025 in a variety of use cases, and that BEVs offer significant savings in the walk-in van, refuse truck, and day cab categories, even by 2025. FCEVs also appear to be cost competitive with combustion-powered technologies in the 2025 to 2030 timeframe for some vehicle types. Moreover, despite the higher upfront costs associated with vehicle costs and infrastructure, cost savings from lower fuel costs and operational costs will result in a positive TCO for ZEVs, and the TCO for ZEVs is expected to further decrease over time as costs continue to decline. [EPA-HQ-OAR-2022-0985-1591-A1, pp.18-19]

39 See Appendix G to the Staff Report; Available here: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appg.pdf

G. Estimated Cost and Economic Impact

1. Overall Comments on Economic Impact Analysis

Affected pages: NPRM 25974-25998 and DRIA 157-261

In assessing U.S. EPA's economic analysis, CARB staff performed a comparison versus the cost and economic analysis performed for the recently adopted ACF regulation. The ACF analysis included direct costs on affected businesses including upfront costs, operating costs, and other miscellaneous costs associated with transitioning MD vehicles and HDVs from ICE vehicles to ZEVs. Staff's ACF analysis was developed through a lengthy public process. Staff held public workgroup meetings on December 9, 2020, September 9, 2021, and February 11, 2022, to discuss costs associated with ZEVs and their infrastructure. Through these meetings, staff solicited feedback on data sources to use, updated our assumptions discussing CARB's economic analysis for the regulation, and solicited public input on appropriate sources. CARB staff also performed literature reviews to identify sources discussing ZEV costs. Through this process, CARB was able to ensure the analysis was using up-to-date information which reflects the current state of the truck market and future projections on ZEV costs. [EPA-HQ-OAR-2022-0985-1591-A1, p.59]

U.S. EPA's findings that ZEVs have lower costs than ICE vehicles and a positive payback period are well supported by literature and consistent with CARB's ACF analysis. In addition to CARB staff's recent economic analysis for the ACT regulation194,195 and ACF regulation,196,197 numerous other third-party analyses have found similar conclusions.198,199,200,201,202,203,204,205,206,207,208 While ZEVs have higher upfront costs due to incremental vehicle costs and infrastructure costs, lower operating costs from fuel savings and reduced maintenance expenses deliver a positive TCO to fleet operators. [EPA-HQ-OAR-2022-0985-1591-A1, pp.59-60]

194 CARB, Public Hearing to Consider the Proposed Advanced Clean Trucks Regulation - Staff Report: Initial Statement of Reasons, 2019 (web link: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/isor.pdf last accessed May 2023)

195 CARB, Attachment C Updated Costs and Benefits Analysis for the Proposed Advanced Clean Trucks Regulation, 2020 (web link: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/30dayattc.pdf last accessed May 2023)

196 CARB, Public Hearing to Consider the Proposed Advanced Clean Fleets Regulation - Staff Report: Initial Statement of Reasons, 2022 (web link: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf last accessed May 2023)

197 CARB, Appendix B Updated Costs and Benefits Analysis, 2023 (web link: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acf15db.pdf last accessed May 2023)

198 Atlas Public Policy, Assessing Financial Barriers to Adoption of Electric Trucks, 2020 (web link: https://atlaspolicy.com/wp-content/uploads/2020/02/Assessing-Financial-Barriers-to-Adoption-of-Electric-Trucks.pdf last accessed August 2022).

199 CleanTechnica. Tesla Police Vehicle Brings Huge Monetary Savings To Westport, Connecticut, June 2021 (web link: https://cleantechnica.com/2021/06/02/tesla-police-vehicle-brings-huge-monetary-savings-to-westportconnecticut/ last accessed March 2023).

200 Environmental Defense Fund, Technical Review of Medium-Duty and Heavy-Duty Electrification Costs for MY 2027-2030, 2022 (web link: https://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf last accessed March 2023).

201 ERM, Investment Reduction Act Supplemental Analysis: Analysis of Alternative Medium- and Heavy-Duty Zero-Emission Vehicle Business-As-Usual Scenarios, 2022 (web link: https://www.erm.com/contentassets/154d08e0d0674752925cd82c66b3e2b1/edf-zev-baselinetechnical-memo-addendum.pdf last accessed January 2023).

202 Hydrogen Council, Path to Hydrogen Competitiveness – A Cost Perspective, 2020 (web link: https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf last accessed August 2022).

203 ICF International, Comparison of Medium-Duty and Heavy-Duty Technologies in California, 2019 (web link: https://caletc.aodesignsolutions.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf last accessed August 2022).

204 McKinsey, Preparing the World for Zero-Emission Trucks, 2022 (web link: https://www.mckinsey.com/~/media/mckinsey/industries/automotive%20and%20assembly/our%20insights/preparing%20the%20world%20for%20zero%20emission%20trucks/preparing-the-world-for-zeroemission-trucks-f.pdf last accessed March 2023).

205 North American Council for Fuel Efficiency, Regional Haul, 2019 (web link: https://nacfe.org/regional-haul/ last accessed August 2022).

206 North American Council for Fuel Efficiency, Viable Class 7/8 Electric, Hybrid, and Alternative Fuel Tractors, 2019 (web link: https://nacfe.org/future-technology/viable-class-7-8/ last accessed August 2022).

207 University of California Los Angeles, Zero-Emission Drayage Trucks – Challenges and Opportunities for the San Pedro Bay Ports, 2019 (web link: https://innovation.luskin.ucla.edu/wp-content/uploads/2019/10/Zero_Emission_Drayage_Trucks.pdf last accessed August 2022).

208 Union of Concerned Scientists, Ready to Work – Now is the Time for Heavy-Duty Electric Vehicles, 2019 (web link: https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf, last accessed August 2022).

CARB staff finds broadly that U.S. EPA has performed a robust analysis on the economic impact of ZEVs. However, staff has identified numerous areas where U.S. EPA's assumptions may be overly conservative and are resulting in potentially higher costs than expected. By assuming vehicles are more costly, U.S. EPA's analysis generates lower payback periods which in turn result in lower standards per U.S. EPA's methodology to tie the Proposed Standards to the payback period. [EPA-HQ-OAR-2022-0985-1591-A1, pp.60-61]

CARB staff also note that U.S. EPA's analysis is based on solely BEVs or FCEVs for each vehicle configuration. In reality, manufacturers are developing both BEV and FCEV models for the same vehicle configurations, and as a result a greater portion of the market will be addressed than any technology can do individually. BEVs and FCEVs can address the needs of fleets with different preferences, so U.S. EPA's methodology will underestimate the number of ZEVs which can be deployed through development of multiple low and zero-carbon technologies. [EPA-HQ-OAR-2022-0985-1591-A1, p.61]

3. BEV Powertrain Cost Calculation

Affected pages: NPRM 25974 and DRIA 177-181

CARB staff has noted the cost of a BEV's powertrain in the NPRM for numerous vehicle configurations behaves in an unexpected manner. Costs decline from 2027 to 2030, then increase from 2030 to 2032. Given that the component costs and learning factors lead to cost reductions over time, this increase in cost appears to be unwarranted. CARB staff seeks further clarification in this regard. [EPA-HQ-OAR-2022-0985-1591-A1, p.63]

6. Payback Period

Affected pages: 25989-25996

U.S. EPA's economic analysis is used to determine a payback period for BEV and FCEV technologies versus diesel, which is the main input in setting the Proposed Standards for the Phase 3 rulemaking. [EPA-HQ-OAR-2022-0985-1591-A1, p.64]

Typically, new vehicles are purchased by larger fleets who operate these vehicles for a length of time, then sell them into the secondary market to predominantly smaller fleets.220,221 Larger fleets typically have a thorough, data-driven process to procure vehicles which is commonly based off a TCO analysis comparing different options. Smaller fleets typically have less sophisticated procurement decision making and face challenges such as access to capital which leads to the short-term payback period being a more critical determining factor. Given that U.S. EPA's NPRM applies to new vehicle sales, it is important to recognize that the decisions of larger fleets will be the key driver, not smaller fleets or fleets as a whole. As a result, TCO is a key parameter which must be assessed. [EPA-HQ-OAR-2022-0985-1591-A1, pp.64-65]

220 ICCT, No Fleet Left Behind: Barriers and Opportunities for Small Fleet Zero-Emission Trucking, 2022 (web link: https://theicct.org/wp-content/uploads/2022/10/small-fleet-ze-trucking-oct22.pdf, last accessed June 2022).

221 CCJ, New Truck Buyers Dictate the Portfolio Planning of Used Truck Buyers, 2023 (web link: https://www.ccjdigital.com/trucks/used-trucks/article/15307006/new-truck-buyers-dictate-used-truckselection, last accessed June 2023)

U.S. EPA's analysis for 2032 shows ZEVs in nearly all applications have a payback period under six years with many applications having a payback period of less than two years. On a TCO basis, this means the entire upfront cost has been recouped and the ZEV will deliver operational savings versus its diesel counterpart for the rest of its operations. Given this information, fleets will see a major cost advantage in purchasing ZEVs and risk falling behind competitors if they do not expeditiously transition to ZEVs. [EPA-HQ-OAR-2022-0985-1591-A1, p.65]

Based on these facts, the adoption rates reflected by U.S. EPA in 2027 and 2032 are far too pessimistic regarding uptake of ZEVs by fleets. Larger fleets who purchase ZEVs are conscious of all costs associated with operating a vehicle over its lifetime and will make decisions on the expected total costs. Given this, the adoption rates for vehicle configurations which pay back between zero and four years is far too low, with some values as low as 18 percent. U.S. EPA's own analysis notes that a typical ownership period can be ten years, indicating that the ZEV technology will deliver significant savings to the vehicle's operator over the expected lifetime. In addition, U.S. EPA should consider whether the cap of adoption rate above 80 percent is warranted – if a technology option simultaneously has lower upfront costs and lower operating costs, it is hard to imagine a reason one out of five fleets will consciously avoid that technology. [EPA-HQ-OAR-2022-0985-1591-A1, p.65]

CARB staff also recommends U.S. EPA reevaluate the Proposed Standards after reassessing the payback period given how the standards are dependent on the payback period. CARB staff recognizes that HD ZEV technology is in its nascent stages, especially in some categories, but this development is already underway and will continue improving between now and 2027 and then further before 2032. [EPA-HQ-OAR-2022-0985-1591-A1, p.65]

Organization: Daimler Truck North America LLC (DTNA)

In the Proposed Rule, EPA establishes a direct relationship between payback period and technology adoption rates, which are used to project future adoption levels for each vehicle category considered in the HD TRUCS tool. In doing, so, it appears that EPA has made a number of questionable assumptions about purchaser behavior that will likely undermine the accuracy of its adoption rate projections. There are also a number of real-world factors and fleet considerations not addressed by the Agency or the sources it relies upon that could further preclude future ZEV adoption at the rates that EPA projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 19]

EPA's analysis of payback periods and adoption rates is distorted by incorrect assumptions about the impacts of the Phase 3 regulations and future technology improvements on purchaser behavior. EPA performed a literature review to establish the payback period/adoption rate relationship, including the Americas Commercial Transportation Research Company LLC (ACT Research) 'Charging Forward' report, the National Renewable Energy Laboratory (NREL) Transportation Technology TCO tool, Oak Ridge National Laboratory's Market Acceptance of Advanced Automotive Technologies model, Pacific Northwest National Laboratory's Global Change Analysis Model, ERM's market growth analysis done on behalf of the Environmental Defense Fund (EDF), Energy Innovation's United States Energy Policy Simulator used in analysis by the International Council for Clean Transportation (ICCT) and Energy Innovation, and CALSTART's Drive to Zero Market Projection Model.29 All of these sources project adoption rates based on their own sets of assumptions and predictions, which should be reviewed as the market matures and new data becomes available. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 19-20]

29 See id. at 231-32.

EPA relies most heavily on ACT Research's Charging Forward report methodology, but makes several modifications that DTNA believes are not supported by data. Table 3 below shows EPA's proposed adoption rates compared to the adoption rates derived from the ACT Research 'Charging Forward' report: [EPA-HQ-OAR-2022-0985-1555-A1, p. 20] [Refer to Table 3 on p. 20 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

ACT Research's adoption rate model assigns an adoption percentage rate based on payback year, stated to be based on experience. ACT Research then uses the percent difference in TCO to provide another driver of adoption.31 EPA asserts that a faster adoption rate compared to the ACT Research schedule is reasonable due to the assumed impact of the Phase 3 regulations and the more modest 80% constraint that the Agency applies to the less-than-zero-year payback period.32 EPA further increases the adoption rate in 2032, stating that 'ZEV technology will be more mature; fleet owners and drivers will have had more exposure to ZEV technology, which may alleviate concerns of reliability and result in a lower impression of risk of these newer technologies; and infrastructure to support ZEV technologies will have had more time to expand.'33 [EPA-HQ-OAR-2022-0985-1555-A1, p. 20]

31 See ACT Research, 'Charging Forward' 2020-2040 BEV & FCEV Forecast & Analysis (December 2021) at 105, available at https://www.actresearch.net/consulting/special-projects/commercial-vehicle-decarbonizationforecast-reports.

32 See DRIA at 232.

33 Id.

DTNA disagrees with these reasons for increasing ACT Research's projected adoption rates, as the requirements in the Proposed Rule will apply to manufacturers and will not directly impact consumer purchasing decisions, as discussed in more detail in Section II.B.3.c of these comments. Despite its estimation that more than 150 HD BEV models were available in the United States in 2021,34 EPA cites data provided in the EIA 2022 AEO that BEV and FCEVs made up less than 0.1% of Class 7-8 sales in that year.35 As adequate supply is already available in the market with limited demand, it is unreasonable to assume that a regulation impacting only ZEV supply will have a significant impact on purchaser behavior and adoption rates.36 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 20-21]

34 See id. at 44.

35 See id. at 11 (citing U.S. Energy Information Administration, Annual Energy Outlook 2022, Table 49: Freight Transportation Energy Use (March 2022), https://www.eia.gov/outlooks/aeo/data/browser/#/?id=58-AEO2022®ion=0).

36 EPA notes that EIA's AEO forecasts do not account for incentives provided by tax credits enacted under the IRA, see DRIA at 12; however, it is unlikely that IRA tax credits will alter the payback period/adoption rate relationship, only the calculated payback period.

While future ZEV technology improvements have a positive impact on purchaser behavior, EPA already accounts for this in the declining costs and improved efficiencies used to calculate improved payback periods year-over-year in the HD TRUCS tool. It is not appropriate to consider technology improvement in both the TCO and adoption rate calculations. Fleet owners and drivers may have some increased exposure to ZEVs by 2032, but significantly increasing adoption rate projections fails to account for the additional challenges discussed below, and FCEV technologies will still be new to the market compared to BEV options. Further, infrastructure expansion is unlikely to enable this increased adoption rate in 2032, as discussed in Section II.B.3.b of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 21]

Finally, in our experience, most large on-highway fleets operate on a regular 3-5 year vehicle trade cycle. Fleets invest in new technologies to earn a payback, not simply to break even, so adoption rates are highest for technologies where payback occurs in less than half the trade cycle. The Company has observed a rapid decline in adoption rates for payback periods that exceed 2 years. Vehicle resale values generally begin to decrease after 4 years, further reducing the adoption rates of technologies with payback periods of 4 years or more. The adoption rates projected by both EPA and ACT Research, as shown in Table 3 above, thus appear to over-estimate adoption rates for ZEVs with payback periods longer than 2 years. [EPA-HQ-OAR-2022-0985-1555-A1, p. 21]

Historical adoption rates for fuel-economy improvement technologies do not provide a sound basis for predicting customer acceptance of ZEV technologies. The ACT Research method and other literature relying on historical adoption rates of fuel-economy improvement technologies for conventional vehicles to predict ZEV adoption rates will result in significant over-projection, as minimally invasive options like aerodynamic components naturally see much greater adoption rates than ZEVs that require dedicated charging infrastructure and are more limited to specific route and weight applications. Furthermore, the adoption rate models that EPA references in the DRIA are based on existing GHG reduction technologies, which are well-established and are minimally invasive compared to ZEVs. It is unlikely ZEVs will see uptake rates higher than the uptake rates for minimally-invasive aerodynamic and other changes. Finally, historically the highest GHG technology adoption rates have been in the long-haul segment, where the cost-per-mile metric is compounded by the high daily mileage driven. These applications are the least suitable for BEVs and FCEVs, until technologies and charging and fueling infrastructure networks are significantly expanded. [EPA-HQ-OAR-2022-0985-1555-A1, p. 21]

The Zero Emission Truck Market Assessment prepared by CARB in support of its ACT regulations evaluated ZEV application suitability based on range, weight, and vehicle space constraints, and considered charging/fueling infrastructure access as return-to-base operations, but did not necessarily consider whether infrastructure can be made available at those bases.38 CARB evaluated Class 4-7 and Class 8 categories, and determined what percentage of vehicles may be suitable for BEV and FCEV technologies, shown in Table 5 below. CARB determined 72-73% of Class 4-7 vehicles could be suitable for ZEVs, but found only 29-36% of Class 8 vehicles could be suitable for ZEVs.39 Given these findings, DTNA believes 73% should be the maximum possible Class 4-7 adoption rate, and 36% should be the maximum possible Class 8 adoption rate, in lieu of the values that EPA proposes in Table II-23 of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 23] [Refer to Table 5 on p. 23 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

38 See CARB, Advanced Clean Trucks, Initial Statement of Reasons (Oct. 22, 2019), Appendix E: Zero Emission Truck Market Assessment, available at https://ww3.arb.ca.gov/regact/2019/act2019/appe.pdf.

39 Id. at 4.

In DTNA’s experience, a favorable payback period does not by itself guarantee high rates of technology adoption. While payback period is certainly an important factor for fleets considering technology adoption, a favorable payback period alone does not guarantee high rates of technology adoption. For example, drive wheel fairings are a mature, relatively low cost technology that typically result in a fuel economy payback within the fleet trade cycle. However, DTNA’s drive wheel fairing adoption rate in the HD fleet is less than 5%. Fleets are often deterred from utilizing this technology because drive wheel fairings are easily damaged, increasing overall cost and vehicle downtime. [EPA-HQ-OAR-2022-0985-1555-A1, p. 23]

DTNA has observed similarly low uptake of tire pressure monitoring systems (TPMS), due in part to a longer calculated payback period (greater than 2 years) and added complexity for tire changes. If a roadside tire replacement occurs, the TPMS sets diagnostic errors, requiring additional downtime to repair after the tire change. [EPA-HQ-OAR-2022-0985-1555-A1, p. 24]

To illustrate this phenomenon, we take the example of DTNA's experience with ZEV uptake in California, which has the most developed ZEV market in the United States. To assess the accuracy of the payback period/adoption rate relationship on which the Proposed Rule is based, DTNA used California's HVIP TCO estimator tool to estimate the current payback period for a Class 8 tractor.40 Using a 200 mile/day use case, we adjusted the calculator's default values to represent the Company's vehicle pricing and current estimates of California diesel and electricity prices. We included the Federal Excise Tax (FET) but excluded Low Carbon Fuel Standard (LCFS) program participation. Two example payback periods using these inputs and two different incentive values are shown below: [EPA-HQ-OAR-2022-0985-1555-A1, p. 24] [Refer to Scenarios 1 and 2 on p. 24 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

40 See California HVIP, 'Total Cost of Ownership Estimator,' available at https://californiahvip.org/tco/.

DTNA believes these estimated payback periods in the 3 - 6 year range to be reasonably accurate for the scenario described. Based on EPA's proposed adoption rate table, these payback periods should result in 13 - 18% ZEV adoption. However, the Company is currently experiencing Class 8 BEV tractor uptake of less than 1% in California, despite additional regulatory drivers for fleet adoption. [EPA-HQ-OAR-2022-0985-1555-A1, p. 25]

Based upon these considerations of ZEV suitability, EPA should adopt more conservative maximum adoption rates. EPA states in the Proposed Rule that it limited the maximum penetration rate to 80% to account for the 'actual needs' of purchasers related to two primary areas of its analysis, namely application suitability and infrastructure availability.37 DTNA submits, however, that an 80% maximum adoption rate over-represents the fraction of the market where BEVs or FCEVs are suitable in the near-term and that application suitability is inadequately addressed in the HD TRUCS methodology. [EPA-HQ-OAR-2022-0985-1555-A1, p. 23]

37 Proposed Rule, 88 Fed. Reg. at 25,992.

EPA Request for Comment, Request #18: We request comment on this approach [payback period] and any supporting data on the potential for these and additional technologies to be available in the HD market in the MY 2027 through MY 2032 timeframe.

- DTNA Response: EPA's approach to the payback period/adoption rate relationship underpinning its proposed CO2 standard stringency levels does not accurately reflect the HD ZEV market, and overlooks a number of complex considerations including infrastructure challenges, reluctance to adopt new technology, inflation and other economic concerns, and vehicle suitability, as discussed in Section II.B.3 of these comments. EPA should not consider proposed penetration rates of any vehicle types outside of the BEV and FCEV categories included in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #48: Thus we request comment and data on our proposed adoption rate, including schedule and methods. We also request comment and data to support other adoption rate schedules; see also Section II.H.

- DTNA Response: EPA's ZEV uptake projections in the Proposed Rule are overly optimistic and do not account for a number of fleet considerations including infrastructure availability, reluctance to adopt new technology, inflation and other economic conditions, and vehicle suitability to fleet operations, as discussed in Section II.B.3 of these comments. DTNA therefore proposes an alternate adoption rate schedule based on CARB's estimate of ZEV suitability and the Company's experience with GHG technology uptake rates, as detailed in Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 166]

EPA Request for Comment, Request #49: For example, some owners may not have the ability to install charging infrastructure at their facility, or some vehicles may need to be operational 24 hours a day. Under our proposed standards, ICE vehicles would continue to be available to address these specific vehicle applications. We request comment, data, and analysis on both of these considerations and our use of an 80 percent volume limit.

- DTNA Response: EPA's 80% volume limit significantly over-estimates ZEV suitability with respect to infrastructure and operational needs. As discussed in Section II.B.3 and Appendix A to these comments, DTNA's telematics data indicates that only a small fraction of vehicles are returning to base at the end of their workdays. In addition, return-to-base operations depend on ready availability of infrastructure at a given site, which is not at all guaranteed. CARB assessed 72% maximum suitability in Classes 4 through 7, and 36% in Class 8 applications based on range, weight, and return-to-base operations. DTNA recommends EPA cap its ZEV maximum volumes at these rates, as explained in Section II.B.3.a. [EPA-HQ-OAR-2022-0985-1555-A1, p. 167]

EPA Request for Comment, Request #51: We request comment and data on our projected adoption rates in the technology packages [ZEV + assumption that ICE meets 2027] as well as data supporting higher or lower adoption rates than the projected levels. We also request comment on projecting adoption rates out through MY 2035.

- DTNA Response: See DTNA Response to Request # 2, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 167] [Refer to section 2 of the comment summary]

EPA Request for Comment, Request #76: We request comment and data on acceptance of HD ZEVs.

DTNA Response: Throughout its comments on the Proposed Rule, DTNA provides details and supporting data on the factors influencing acceptance of HD ZEVs, including ZEV suitability, TCO, and infrastructure availability. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172]

Organization: Energy Innovation

II. THE EPA SHOULD UTILIZE OTHER INDEPENDENT ANALYSIS AND TRANSPARENT METHODS TO FORECAST ZEV ADOPTION RATES. THE EPA SHOULD ALSO ACCOUNT FOR THE IMPACT OF ADDITIONAL FACTORS THAT MAY ACCELERATE LEARNING CURVES FOR HDV BEVS IN THE NEAR FUTURE.

In response to the EPA's request for comments on its approach to selecting ZEV technology adoption rates based on payback, we offer the following observations and propose adjustments to the methodology for the EPA's consideration. [EPA-HQ-OAR-2022-0985-1604-A1, p. 7]

First, nine states have adopted California's Advanced Clean Trucks (ACT)v rules (as of June 2023). According to the National Automobile Dealers Association, medium- and heavy-duty truck sales from franchised dealerships in these nine states made up nearly 24 percent of total HDV sales volume nationwide in 2022.14 As such, applying a uniform approach to forecast ZEV technology adoption rates in all states does not fully reflect the impact of ACT states on the share of HDV sales (nor does it capture the ripple effect on the HDV market as a whole). Accordingly, ZEV adoption in ACT states should be accounted for separately in the EPA's methodology and should mirror the adoption rates defined by each state's standard. As more ZEVs are produced and sold in ACT states, production costs will decline, making them cheaper across state borders. [EPA-HQ-OAR-2022-0985-1604-A1, p. 7

iv California, Colorado, Maryland, Massachusetts, New York, New Jersey, Oregon, Vermont, and Washington.

v The Advanced Clean Trucks (ACT) rule, adopted first by the California Air Resources Board in June 2020, requires truck manufacturers to transition from diesel trucks and vans to electric zero-emission trucks, phasing in available heavy-duty zero-emission technology starting in 2024 with full transformation over the next two decades. See https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks.

14 "ATD Data 2022: Annual Financial Profile of America's Franchised New-Truck Dealerships" (National Automobile Dealers Association, 2022), https://www.nada.org/media/5008/download?inline, 6.

Second, in the original Draft Regulatory Impact Assessment (DRIA),vi the EPA cites the ACT Research report ChargeForward (December 2021) as the source of equation 2-61 that defines the relationship between payback period and technology adoption rates for HDVs.15 The now-redacted equation 2-61 was used to inform EPA's methodology to produce the adoption rate schedule for model year (MY) 2027 and MY 2032 in EPA's model, HD TRUCS. The assumptions derived from the ACT Research study impact forecasted ZEV technology adoption rates, which influence the stringency of the rule and the future of the HDV market. The EPA states that "the adoption rate method used for this proposal was developed after considering methods in the literature to estimate adoption rates in the HD vehicle market," and it provides a list of other methods they considered (including a January 2023 study by the International Council on Clean Transportation (ICCT) and Energy Innovation, Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the U.S. (ICCT-EI Study), among several others).16 But, it states "of these methods explored, only ACT Research's work directly related payback period to adoption rates…and thus we relied on the ACT Research method to assess adoption rates."17 The EPA's reliance on a method from a single proprietary study (with the hefty price tag of $25,000 for access18) to estimate technology adoption rates is highly concerning because it restricts transparency and accessibility of data and underlying assumptions and methodologies. All interested stakeholders should have the opportunity to review any underlying assumptions, methods, data, and approaches used to determine the proposed rule. Energy Innovation did not purchase the ACT Research study and therefore lacks insight into the details underlying the methodology to derive the equation and other assumptions regarding payback and adoption rates. We see the EPA's reliance on this source as a limitation in the proposed rule's core assumptions about adoption rates. We suggest the EPA take an alternative approach to its methodology and use sources that are transparent, independently verifiable, and available at no cost for interested stakeholders. [EPA-HQ-OAR-2022-0985-1604-A1, p. 7]

vi The original DRIA was subsequently edited after being posted online. The new version online contains redacted information (equation 2-61 and table 2-72), presumably because they were proprietary to ACT Research.

15 "Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3, Draft Regulatory Impact Analysis (DRIA)" (Assessment and Standards Division Office of Transportation and Air Quality U.S. Environmental Protection Agency, April 2023), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf. 231.

16 "DRIA," 31-2.

17 "DRIA," 32.

18 "Are You Charging Forward to Zero Emissions?," ACT Research, n.d., https://www.actresearch.net/consulting/specialprojects/commercial-vehicle-decarbonization-forecast-reports.

Third, the EPA applied the "conservative limit" of 80 percent market share for all vehicle classes "after consideration of the actual needs of the purchasers."19 The EPA states that it does "not expect heavy-duty OEMs to design ZEV models for the 100th percentile VMT daily use case for vehicle applications" and it recognizes "there is a wide variety of real-world operation even for the same type of vehicle."20 While it is always challenging to predict which technology evolutions will occur in the future, assuming the HDV market will be the same as it is today a decade from now ignores the likelihood that technology advances in EV models, batteries, charging infrastructure, and real-world HDV operations will be notably different by 2032. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 7 - 8]

19 U.S. EPA, "Proposed Rules," 25992.

20 U.S. EPA, 25992

Applying a static limit on market adoption for the duration of the proposed rule (i.e., model years 2027 – 2032) puts an arbitrary constraint on the model and heavily discounts the likelihood of breakthrough technological advances (as well as market and consumer adaptations) over the next decade. It also ignores recent trends in EVs that will impact learning curves for the HDV sector (discussed further below). [EPA-HQ-OAR-2022-0985-1604-A1, p. 8]

The light-duty vehicle (LDV) EV market provides several illustrative examples of the fast pace of technology evolution and market adaptation (which were unanticipated just a few years ago). Figure 4 shows the exponential growth in the number of models with a range of 300 miles or greater in less than a decade. And Figure 5 shows a similar trend between 2010 and 2021 for global EVs. Other non-transportation examples further illustrate this point, such as smartphones, semiconductors, cloud storage, and cryptocurrency—all game-changing technologies whose rapid growth was near-impossible to accurately predict in their nascent years. [EPA-HQ-OAR-2022-0985-1604-A1, p. 8.] [See Figure 4, Light-Duty EVs with Range of 300 Miles or Greater,on page 8 of docket number EPA-HQ-OAR-2022-0985-1604-A1 and Figure 5, Evolution of Average Range of EVs by Powertrain, on page 9 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

Considering the aforementioned issues, Energy Innovation conducted an independent analysis of technology adoption rates that we hope the EPA considers as it develops the final rule. Below is an overview of our methodology, the results of our analysis for different HDV vehicle classes, and key takeaways. We have also attached with our comments the spreadsheet used to develop the analysis. We are happy to discuss this analysis in greater detail with the EPA and any interested stakeholders. [EPA-HQ-OAR-2022-0985-1604-A1, p. 9]

A. HDV Sales Adoption Methodology

To estimate the sales of HDVs with different engine types, we used a logit allocation based on total cost of ownership (TCO). This approach follows our methodology from the ICCT-EI Study with a few modifications. The logit allocation assigns sales shares to different vehicle technologies based on the TCO of different vehicles using an assumed financial horizon and discount rate. Vehicle costs, maintenance costs, fuel prices, vehicle distances, and remaining inputs to the TCO paper are all sourced from the referenced ICCT-EI Study. [EPA-HQ-OAR-2022-0985-1604-A1, p. 9]

We made two modifications for this analysis to estimate sales for a rule affecting future sales. First, our prior modeling used an inflated share-weight for ICE HDVs, depending on vehicle class. This assumption limited the uptake of BEVs, even at TCO parity. For this analysis, we use a value of 1 for all engine types across all vehicle classes to reflect the growth in market supply along the timeline on which the rule takes effect. A share-weight of 1 results in higher BEV shares at a given TCO, but reflects the potential for vastly increased supply of BEV HDVs over the next 5-10 years. Second, we updated the financial horizons used for different vehicle classes from our prior modeling. Previously we assumed a financial horizon of 6 years (as an average duration of first owner vehicle ownership) across all HDV classes. In this analysis, the financial horizon varies from 5 to 12 years depending on the vehicle class and the typical owner type (for example, municipal buses will have a longer financial horizon given that cities typically own and finance fleets over a longer period than commercial trucking companies). Our results are also translated into sales shares for different payback periods to align with the approach the EPA used in its proposed rule. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 9 - 10]

B. HDV Sales Adoption Analysis Findings

Applying the methodology outlined above, we generated market sales share curves based on payback period for the years 2027 (orange line) and 2032 (blue line), and compared them with the EPA/Act Research curves (gray line) for the following HDV classes: Rigid Trucks (4-5, 6-7, and 8); Tractor Truck (short-haul and long-haul); Refuse Truck; and Buses (school bus, other bus 6-8, small bus 4-5, and transit bus 6-8). We removed the 80 percent cap to allow for 100 percent market sales share where the payback was <0. For all vehicle classes, we see greater market sales share for both 2027 and 2032 than what the EPA forecasts in its proposed rule. [EPA-HQ-OAR-2022-0985-1604-A1, p. 10.] [See Figures 6(a) – 7(i). Market sales share adoption for 2027 and 2032, on pages 10-11 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

C. Key Takeaways from HDV Sales Adoption Analysis

We observe similar levels of adoption when the payback period is zero or negative, with values typically at or above 80 percent. However, given projected cost trends (taken from the ICCT-EI Study) and especially when layered with IRA incentives, there will be several classes of HDV BEVs with paybacks of <0 years in the future. [EPA-HQ-OAR-2022-0985-1604-A1, p. 11]

While our model captures the ability of sales share to exceed 80 percent when this occurs, the EPA's current approach, as noted above, caps sales shares at 80 percent, regardless of the payback period (even if zero or negative). Based on our analysis, we observe that this cap artificially constrains the deployment of BEVs in the EPA's modeling and does not reflect changes in consumer purchasing behavior as BEV prices fall. In addition, a static 80 percent cap applied for all vehicles fails to differentiate across vehicle classes and vehicle types. For example, while it may be true that a BEV may not be a viable technology for certain long-range heavy-duty tractor trailers, given today's technologies and charging infrastructure, a class 4 truck that travels long distances could be a BEV far more easily, based on charging needs and usage patterns. The EPA should consider amending its methodology to increase the limit when payback periods are highly beneficial to the end user, adjust the cap for differences across vehicles and end uses, and/or gradually increase the cap over time to account for future technology improvements and adjustments to HDV use cases and consumer behavior. Furthermore, the EPA should consider binning sales estimates in vehicle miles traveled (VMT) deciles, to capture very high adoption in the lower and medium tier deciles. For example, for certain vehicle classes, for the first 90 percent of VMT, sales could reach 100 percent, but might only be 80 percent for the last 10 percent of VMT. This would yield an adoption rate of 98 percent, as opposed to a ceiling of 80 percent. [EPA-HQ-OAR-2022-0985-1604-A1, p. 12]

In addition, our approach yields significantly higher BEV adoption than the EPA's approach for all payback periods, especially those beyond 2 years. This is due to a combination of using a logit function that is less price sensitive (our function parameters are derived from the Pacific Northwest National Laboratory's Global Change Analysis Model (GCAM)21 and methodology) and a discount rate of 15 percent. Using our methodology, we ran some sensitivity analyses to approximate the deployment curves in the EPA's proposed rule, and it required applying some extreme assumptions (e.g., discount rates of 80 percent or higher and a logit exponent of around -40 compared to a value of -8 from the GCAM model). [EPA-HQ-OAR-2022-0985-1604-A1, p. 12]

21 "GCAM: Global Change Analysis Model," Global Change Intersectoral Modeling System (GCIMS), n.d., https://gcims.pnnl.gov/modeling/gcam-global-change-analysis-model.

Absent more detailed documentation from the ACT Research methodology and EPA's approach to determine adoption rates, and with only the outputs from the TRUC tool available, we call into question the methodology and assumptions the EPA is relying on to inform ZEV technology adoption for the proposed level of stringency of the rule. The EPA's more conservative approach relies on a more limited set of assumptions for technology adoption rates that may reflect today's limitations for BEVs in the HDV market but fail to fully account for future technology advancements and relevant factors impacting learning curves (discussed below). We urge the EPA to consider updating its methodology and use other curves, like our analysis or other independent and verifiable analyses that are aligned with published and publicly available models. [EPA-HQ-OAR-2022-0985-1604-A1, p. 12]

III. MODELING SHOWS THAT NEW FEDERAL POLICIES COMBINED WITH STATE POLICIES WILL ADVANCE THE HDV ZEV MARKET FASTER, WHICH SUPPORTS THE EPA'S ADOPTION OF ALTERNATIVE, MORE STRINGENT TAILPIPE STANDARDS.

We appreciate that the EPA has "considered new data and recent policy changes [the BIL and IRA] and [is] now projecting that ZEV technologies will be readily available and technologically feasible much sooner than [it] had projected."35 The EPA also notes that the "IRA in particular provides significant incentives for GHG reductions in the HDV sector."36 We agree, and our modeling supports these findings. [EPA-HQ-OAR-2022-0985-1604-A1, p. 16]

vii Available at https://theicct.org/publication/ira-impact-evs-us-jan23/ and attached to these comments.

35 U.S. EPA, "Proposed Rules," 25929 and 25939.

36 U.S. EPA, 25929.

In the ICCT-EI Study, we examined the impact of the IRA on the sale of new EVs in the LDV and HDV sectors in the U.S. through 2035.vii We used a customized Excel model based on Energy Innovation's U.S. EPS, using updated data on vehicle costs, battery pack estimates, efficiencies, charging behavior, future fuel prices, and state adoption of Advanced Clean Cars II (ACC II) rules and ACT rules. We have attached the full study with our comments. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 16 - 17]

We evaluated three IRA Scenarios: Low, Moderate, and High, with different assumptions for each scenario to reflect how certain provisions of the IRA (the Personal Tax Credits for Clean Passenger Vehicles (30D), the Commercial Vehicle Tax Credits (45W), and the Advanced Manufacturing Production Tax Credit (45X)) are implemented and the value of incentives passed on to consumers. We compared these scenarios to a Baseline (no IRA with just California adoption of ACC II and ACT rules). We also evaluated the impact of state adoption of clean car and truck standards. For HDVs, for all scenarios, we assume the ACT rule is followed in states that had adopted it as of October 2022 (California, Massachusetts, New Jersey, New York, Oregon, and Washington).viii The ACT rule requires HDV manufacturers to sell ZEVs as increasing shares of their annual sales from 2024 to 2035. By 2035, ZEV sales would need to be 75 percent of Class 4–8 straight truck sales and 40 percent of tractor truck sales to meet these requirements.37 [EPA-HQ-OAR-2022-0985-1604-A1, p. 17]

viii Notably, more states have since adopted ACT rules for a total of nine states (California, Colorado, Maryland, Massachusetts, New York, New Jersey, Oregon, Vermont, and Washington).

37 "Advanced Clean Trucks Fact Sheet," California Air Resources Board, n.d., https://ww2.arb.ca.gov/resources/fact-sheets/advanced-cleantrucks-fact-sheet.

We found that the IRA will accelerate electrification in both the light-duty and heavy-duty sectors. For heavy-duty, we find a range of 39 to 48 percent ZEV sales share by 2030 and 44 to 52 percent by 2032. See Figure 11. [EPA-HQ-OAR-2022-0985-1604-A1, p. 17.] [See Figure 11, Projections of ZEV Sales for HDVs, on page 17 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

As shown in Figure 12, taken from the ICCT-EI Study, BEVs across different categories of HDVs make up increasing shares of new sales during the years that IRA incentives are available. When the IRA expires, some HDV classes will experience a drop in overall BEV shares of new sales, indicating the impact of the IRA on those vehicle markets. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 17 - 18.] [See Figure 12, ZEV Shares of HDV by Category, on page 18 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

A primary takeaway from our analysis is that the IRA’s financial incentives for vehicles and manufacturers enable and support the adoption of more stringent federal vehicle standards at a lower cost and higher benefit to consumers.38 However, ZEV sales shares from our analysis are not guaranteed. Federal tailpipe standards are a critical tool that give truck manufacturers a clear mandate to retool their production lines to produce zero-emission trucks at scale. [EPA-HQ-OAR-2022-0985-1604-A1, p. 18]

38 Slowik et al., “Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States.”

Another notable finding from our analysis is that new sales shares of BEVs exceed FCEVs by a wide margin for all vehicle classes, due to greater cost differentials for the vehicles (even with IRA incentives) and limited availability of hydrogen infrastructure, relative to electric charging infrastructure. While we support technology-neutral standards and believe they are most appropriate to ensure optimal flexibility, our analysis suggests that the economics and logistics of FCEVs may make BEVs the leading choice for compliance for the foreseeable future. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 18 - 19]

We invite the EPA to rely on our analysis to support adopting a more stringent set of emission standards that would be based on higher ZEV adoption rates on a national level. Specifically, the EPA has requested input on several alternative proposals, including “values in between the proposed standards and those that would reflect ZEV adoption levels (i.e., percent of ZEVs in production volumes) used in California’s ACT, values that would reflect the level of ZEV adoption in the ACT program, and values beyond those that would reflect ZEV adoption levels in ACT such as the 50- to 60-percent ZEV adoption range”39 and “represented by the publicly stated goals of several major OEMs for 2030.”40 See Table II-35 below from the proposed rule. We believe any of these alternatives would be advantageous in terms of accelerating the adoption of ZEVs and spurring a faster transition to clean vehicles in the HDV sector. Alignment with California’s ACT (and the nine states that have adopted that rule) would help create greater market consistency across the country and ensure all states and communities can benefit from clean, non-polluting trucks on the road. Although the vehicle categories are different in the ICCT-EI Study (Figure 5) from those in Table ES-441 below, we note that the adoption rates from our analysis are generally aligned and the ACT adoption rates are also aligned with what is needed for climate stability. [EPA-HQ-OAR-2022-0985-1604-A1, p. 19. See Table ES-4 Aggregated Projected ZEV Adoption Rates (from the proposed rule), on page 19 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

39 U.S. EPA, “Proposed Rules,” 25929.

40 U.S. EPA, 25929.

41 U.S. EPA, 25933.

Organization: Environmental Defense Fund (EDF)

These laws have also led to a significant decrease in upfront and lifetime ownership costs of EVs for consumers and fleets. An updated study by Roush Industries for EDF in May 2023 assessed and quantified, where possible, the key impacts of the IRA on the cost of electrifying medium- and heavy-duty vehicles that have access to overnight recharging at a central location (assessing the same vehicle classes from the earlier 2022 report, including Class 8 transit buses, Class 7 school buses, Class 3–7 shuttles and delivery vehicles, and Class 8 refuse haulers), using the previous study costs as a baseline.41 The analysis found that IRA credits help absorb the near-term higher upfront cost of battery electric vehicles (BEVs) and will accelerate the purchase parity with the segments analyzed. According to the research, all segments analyzed will now meet purchase price parity with their diesel counterparts if purchased as early as MY 2024, assuming reasonable economies of scale for BEV production. [EPA-HQ-OAR-2022-0985-1644-A1, p. 20-21]

41 H. Saxena, S. Pillai. 2023. Impact of the Inflation Reduction Act of 2022 on Medium- and Heavy- Duty Electrification on MYs 2024 and 2027, Roush for EDF (Attachment M).

The earlier cost projections by Roush in 2022 also showed that BEV operating costs are always lower than internal combustion engine vehicle (ICEV) operating costs.42 Because of this, the original analysis found that the time needed for a BEV to achieve total cost of ownership (TCO) parity with an ICEV could occur at the time of purchase in 2027 for a few of the segments analyzed and 1-4 years later for other segments. As shown in Table 3, the new IRA credits for BEVs and chargers will reduce the amount of time needed for BEVs to achieve TCO parity with ICEVs by an additional 1-2 years so that many segments analyzed will see TCO parity at the time of purchase as early as 2024. [EPA-HQ-OAR-2022-0985-1644-A1, p. 21] [See Table 3, p. 21 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

42 Nair, V., Stone, S., Rogers, G., Pillai, S. 2022. Medium- and Heavy-duty Electrification Costs for MY 2027-2030, Roush for EDF.

As a result of the IRA, the purchaser of a BEV in MY 2024 could save an estimated $18,000 on a Class 3 delivery van and $500,000 on an urban transit bus over the life of the BEV compared to a comparable diesel vehicle (Figure 1). If we assume that diesel fuel prices return to the prices occurring during the summer of 2022 ($5.18/gallon versus $3.25/gallon the lifetime savings due to switching to a BEV would increase to $33,000 for a Class 3 delivery van and $700,000 for an urban transit bus.43 [EPA-HQ-OAR-2022-0985-1644-A1, p. 21-22] [See Figure 1, p. 21 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

43 H. Saxena, S. Pillai. 2023. Impact of the Inflation Reduction Act of 2022 on Medium- and Heavy- Duty Electrification on MYs 2024 and 2027, Roush for EDF.

The IRA also includes tax credits and other incentives for several aspects of battery production. These IRA provisions could lead to lower-priced batteries and batteries with competitive prices where much of the manufacturing occurred in the U.S. and North America. [EPA-HQ-OAR-2022-0985-1644-A1, p. 22]

3. EPA’s ZEV adoption curve is overly conservative

Compounding the agency’s conservative cost assumptions, discussed above, several additional factors result in EPA’s modeled rate of ZEV adoption being overly conservative. First, EPA relies on an overly conservative estimation of the relationship between payback period and technology adoption percentage. Second, EPA artificially caps ZEV adoption at 80% even for vehicle types for which the upfront cost is lower for ZEVs than ICE vehicles. [EPA-HQ-OAR-2022-0985-1644-A1, p. 56]

One of the crucial elements in EPA's estimation of ZEV adoption in HD TRUCS is the relationship between payback period and adoption percentage. This equation has a first order impact on the stringency of the rule. In the DRIA, EPA identifies numerous studies that project the rate of zero-emission technology adoption in MHDVs. EPA surveyed this data though appear to have largely adopted a curve based on an ACT Research report.139 [EPA-HQ-OAR-2022-0985-1644-A1, p. 57]

139 Section 2.7.9 Technology Adoption in Greenhouse Gas Emission Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis

In addition, in their modeling, EPA caps adoption for any one of the 101 vehicle types at 80% even if the upfront cost of the ZEV is cheaper than the ICE vehicle. No other study, including the ACT Research equation included in the DRIA, makes such an assumption. EPA offers several rationales for the cap, including their choice to size the batteries to the 90th percentile of daily VMT, as well as the assumption that some uses or fleet owners may not be able to electrify their vehicles due to their need to operate the vehicles 24 hours per day or their inability to install EVSE.140 While it is a reasonable assumption, particularly in the first few years of increased HD ZEV adoption, that some vehicles would be less suited to electrification even with a short payback period, that impact should decrease as fleet owners become more familiar with the technology, business practices surrounding ZEVs become more robust, and a wider range of ZEV models become available. As such, we believe the imposed cap on ZEV adoption should lessen through the rule years and be substantially higher by 2032. [EPA-HQ-OAR-2022-0985-1644-A1, p. 57]

140 Ibid.

Additionally, an 80% cap in 2027 is too high. The same vehicles that need to operate 24 hours a day are presumably the ones with higher daily mileage. EPA provides no supporting evidence for the assumption that on top of the daily mileage concerns, there are an additional 10% of each vehicle type that could not be electrified in the next decade. [EPA-HQ-OAR-2022-0985-1644-A1, p. 57]

Central to establishing this relationship is an understanding of the impact of payback period on fleet owners' decisions to purchase vehicles with higher capital costs but lower operating costs such as many ZEVs. In their March 2022 study, NREL assumed the financial horizon for Class 3 vehicles is 3 years, Class 4-6 vehicles is 4 years, and Class 7-8 vehicles is 5 years.141 In a 2019 report by the National Academies of Sciences, Engineering, and Medicine, authors stated they "heard from manufacturers and purchasers that they look for 1.5- to 2-year paybacks or, in other cases, for a payback period that is half the expected ownership period of the first owner of the vehicle."142 With EPA's proposed rule, the assumed adoption of ZEVs drops from 80% if the payback period is less than 0 years to 55% if the payback period is between 0 and 1 years. In practice, this means that for vehicles with a payback period of one day only around half of vehicle purchasers would select the ZEV even though they would see savings starting on day 2 of the vehicle's life. This is inconsistent with the literature around financial horizons for vehicle owners. The adoption rate should remain high through at least a two-year payback period at which time a decline in adoption after that point would be more reasonable. [EPA-HQ-OAR-2022-0985-1644-A1, p. 57-58]

141 Muratori, Matteo et al. 2022. Decarbonizing Medium- and Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis, NREL Transforming Energy. https://www.nrel.gov/docs/fy22osti/82081.pdf.

142 National Academies of Sciences, Engineering, and Medicine 2019. Reducing Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two: Final Report. Washington, DC: The National Academies Press. https://doi.org/10.17226/25542. (Attachment V)

In both cases, studies stated one of the reasons vehicle owners might require shorter payback periods was uncertainty connected to the new technology. As a result, it should be expected that the adoption curve based on payback period EPA is utilizing will evolve between the beginning and end of the rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 58]

EDF acquired the inputs and results from a study on HD ZEV adoption conducted by NREL using their TEMPO model, referenced above, to create an alternative adoption curve based on payback period.143 144 Additional details about the methodology used to establish this curve are in Appendix BA.145 [EPA-HQ-OAR-2022-0985-1644-A1, p. 58-59]

143 Catherine Ledna et al. 2022. Decarbonizing Medium- and Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis, NREL Transforming Energy. https://www.nrel.gov/docs/fy22osti/82081.pdf

144 Matteo Muratori er al. 2021. Exploring the future energy-mobility nexus: The transportation energy & mobility pathway options (TEMPO) model. Transportation Research Part D, https://doi.org/10.1016/j.trd.2021.102967

145 The interpretation of the results and opinions stated are EDF's alone. EDF would like to thank NREL and Catherine Ledna for providing the underlying data and inputs.

Figure 10 shows the TEMPO data points, the curve based on the data, the two step-wise functions used by EPA in HD TRUCS, and the ACT Research curve from Equation 2-61 of the DRIA. The curve based on TEMPO data (the solid red curve) projects 100% adoption of ZEVs when the ZEV and ICE vehicle are the same price or the ZEV is cheaper (i.e., a payback period of less than 0 years). The ACT Research curve assumes only a 71% adoption of ZEVs when there is purchase price parity. While the adoption begins to decrease once there is a non-zero payback period, it declines at a slower rate than ACT Research's curve, particularly up to one year of payback. Analysis of the TEMPO model outputs indicates that the general shape of the ACT Research curve is reasonable but the adoption levels assumed for low payback periods is far too modest. Particularly for short payback periods (less than 2 years), this analysis shows that EPA is profoundly underestimating the resulting ZEV adoption. High adoption rates for technologies that start providing meaningful savings to vehicle owners after only a few years is also consistent with the available literature. [EPA-HQ-OAR-2022-0985-1644-A1, p. 59] [See Figure 10 on p. 60 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

EPA must reassess their technology adoption curve and better align the values they are using to curves such as the TEMPO model based curve presented here that have strong scientific backing and better align with the existing literature on financial horizons of fleet owners. [EPA-HQ-OAR-2022-0985-1644-A1, p. 60]

Organization: International Council on Clean Transportation (ICCT)

FORECAST OF ZEV ADOPTION

EPA proposes to define the stringency of its greenhouse gas standard based on a projection of future zero-emission vehicle sales. While the approach in principle is sound, our analysis has identified several improvements that, if corrected, would increase the potential benefits of this rule. [EPA-HQ-OAR-2022-0985-1553-A1, p. 2]

EPA has selected a model of technology adoption rates that we do not support. Central to the EPA approach is a market forecast of zero-emission vehicle (ZEV) adoption based on Equation 2-61 of the Draft Regulatory Impact Assessment. This model of ZEV technology adoption rates is taken from a proprietary study prepared by ACT Research. We find EPA's selection of the ACT Research study to be arbitrary. Furthermore, the selection of this study presents significant obstacles to public comment. The study is not available in the public docket and is not available from the EPA Reading Room. The study is available today for purchase at a cost of $25,000. This approach is not consistent with traditional standards of transparency that we think are necessary for the agency to defend and support its rulemakings. [EPA-HQ-OAR-2022-0985-1553-A1, p. 2]

To provide meaningful comment on this aspect of the rule, ICCT purchased the ACT Research report. Due to licensing limitations, we cannot comment on the specifics of the report. Based on our thorough review, we conclude that the report contains no empirical basis for equation 2-61 and cannot be used as the basis for the standards EPA proposes. [EPA-HQ-OAR-2022-0985-1553-A1, p. 2]

We consulted with several other research groups cited by EPA as the source of alternative technology adoption curves. We conclude and recommend that EPA adopt the TEMPO model, developed by the National Renewable Energy Laboratory (NREL), as the basis for projecting ZEV technology adoption rates. This model overcomes key deficiencies of the ACT Research-based curve by being based on validated empirical data, subject to peer-review, and freely available to the public. [EPA-HQ-OAR-2022-0985-1553-A1, p. 2]

Adoption of the TEMPO model would change the stringency of the proposed rule. All else being equal, we find replacing the EPA curve with a TEMPO-based curve would project a 37% ZEV market share in model year 2027 and a 60% market share in model year 2032. These estimates reflect the average share across all vehicle categories. We conclude that the selection of the TEMPO model, or a similarly robust and transparent model, is necessary for EPA to not only maintain traditional standards of transparency necessary to defend and support its rulemaking but to also utilize the best available data to project zero-emission vehicle sales. As a co-benefit, the rule will ensure greater benefits to public health and welfare. [EPA-HQ-OAR-2022-0985-1553-A1, p. 2]

Another element of the proposal that deserves reconsideration is the treatment of state zero-emission vehicle sales requirements in setting the stringency of the proposed standards. California and at least eight other states (Oregon, Washington, New York, New Jersey, Massachusetts, Vermont, Colorado, and Maryland) to-date have adopted the Advanced Clean Trucks (ACT) regulation, which sets minimum zero-emission truck sales requirements that exceed the ZEV technology adoption rate of the proposal. The stringency of the proposed standards does not take into consideration these higher state-mandated sales of zero-emission vehicles, but the proposal would nevertheless allow manufacturers to use these higher ZEV sales to demonstrate compliance. This compliance approach deviates from the approach taken in the Phase 2 standards. [EPA-HQ-OAR-2022-0985-1553-A1, p. 2]

Treating ZEV sales in manufacturer compliance determinations differently than for standard setting as EPA has proposed will result in adverse impacts. The higher ZEV sales in the nine states could be used by manufacturers to reduce the sales volume of ZEVs in the other states to a level far less than EPA's current market projection, potentially impeding investment in ZEV fleets and infrastructure in non-ACT states. Another result could be the higher ZEV sales in the nine states could allow manufacturers to certify and sell ICE vehicles with higher CO2 emissions in the non-ACT states. Either outcome could result in fewer zero-emission vehicles and less efficient ICE vehicles deployed in non-ACT states, which would generate an inequitable distribution of benefits among states. [EPA-HQ-OAR-2022-0985-1553-A1, p. 3]

This inconsistency can be resolved in one of two ways. The first and simplest way is for EPA to retain the Phase 2 provision that would exclude vehicle sales in the ACT states when determining compliance with the EPA standards. The second way is for EPA, in determining the stringency of its greenhouse gas (GHG) standards, to proportionally weight the higher sales of ZEVs in the nine states with its revised market-based projection of sales in the other 41 states. As an example, we conclude that a national weighted average 2032 ZEV sales for Class 4–8 vehicles would be 33% using data given in Table 5 instead of 27% as projected in EPA's proposal. EPA would set a corresponding numerical lower average national GHG standard based on this weighted average. The adoption of one of these two approaches would ensure greater overall benefits and a greater distribution of benefits from the rule. [EPA-HQ-OAR-2022-0985-1553-A1, p. 3]

ZEV TECHNOLOGY ADOPTION RATE This section responds to EPA's request for comment on their approach to selecting technology adoption rates for battery electric and fuel-cell electric vehicles based on payback period. While we support the approach in principle, we have identified changes to the approach that we think would strengthen the rule. [EPA-HQ-OAR-2022-0985-1553-A1, p. 6]

First, the EPA's approach to estimating technology adoption rates can be improved by reducing its reliance on a proprietary study. In section 2.7.9 of the Draft Regulatory Impact Assessment, EPA cites the ACT Research report ChargeForward published in December 2021(Mitchell, 2023). This report is the source of equation 2-61, which reflects a relationship between the payback period and the technology adoption rates given in Table 2-72, and which produces an adoption rate schedule for model years 2027 and 2032 in HD TRUCS given in Table 2-73. EPA cites other studies, including studies by CALSTART, NREL, and ICCT, but in our view chooses to arbitrarily rely exclusively on the ACT Research study to produce Table 2-73. [EPA-HQ-OAR-2022-0985-1553-A1, p. 6]

Mitchell, G. (2023, April 7). ACT Research: "Charging Forward: 2020-2040 BEV & FCEV Forecast & Analysis: Commercial Electric and Fuel Cell Vehicle Multi-Client Study" [Memorandum]. https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-0931

In light of the sensitivity of the EPA proposal to equation 2-61, ICCT sought to understand the empirical basis of this formula by securing a copy of the study. The ACT Research

ChargeForward report is not licensed for publication and is not available in the public docket or in the EPA reading room (Mitchell, 2023). An ACT Research website lists the price of the full North America version of the report at $25,000.2 This circumstance does not meet traditional standards of transparency and public access that have historically been necessary to justify EPA rulemakings. [EPA-HQ-OAR-2022-0985-1553-A1, p. 6]

2 https://www.actresearch.net/consulting/special-projects/commercial-vehicle-decarbonization-forecastreports

Mitchell, G. (2023, April 7). ACT Research: "Charging Forward: 2020-2040 BEV & FCEV Forecast & Analysis: Commercial Electric and Fuel Cell Vehicle Multi-Client Study" [Memorandum]. https://www.regulations.gov/document/EPA-HQ-OAR-2022-0985-0931 T

In order to provide comment on the empirical basis and technical underpinning of Equation 2-61, ICCT purchased the report from ACT Research. In purchasing the report, ICCT accepted a licensing agreement that restricts its ability to distribute or reproduce the report or selected data outside of the organization under any circumstance. For the purposes of these comments, we are limiting ourselves to generalizations of what we find in the report in order to honor the licensing agreement with ACT Research. [EPA-HQ-OAR-2022-0985-1553-A1, p. 6]

We conclude that the ACT Research report provides no data or any other empirical basis to support Equation 2-61. The equation is contained in a total-cost-of-ownership model provided with the report. This equation generates a projected share of ZEV sales in each calendar year that is applied equally across twelve vehicle categories selected to represent class 4-8 vehicles. The report is 200 pages in length and contains a one-paragraph description of the equation. This paragraph contains no citations, data or analysis. The paragraph points to the experience of the authors as the source of the equation. [EPA-HQ-OAR-2022-0985-1553-A1, p. 6]

Considering how fundamental this equation is to the stringency of the rule, we find its justification to be wholly inadequate, out of step with traditional standards of scientific rigor, and not representative of the deep technical research and scientific knowledge we know is available to support this rule. We do not support this equation as the basis for defining technology adoption rates. We are very concerned about the viability of the rule without a change in approach. [EPA-HQ-OAR-2022-0985-1553-A1, p. 6]

Furthermore, EPA claims that the considered technology adoption curve follows an S-shape curve. While ICCT takes no issue with the shape of the curve, we disagree with the decision to convert a smooth scurve into a step curve, where a discrete single value of adoption rate is assigned to a bin of payback periods. A step curve is not conceptually consistent with technology diffusion and should be revised. ICCT examined the impact of converting the s-curve into a step curve on the total ZEV adoption rate and found the s-curve shows a 7% higher total ZEV adoption rate by 2032. ICCT recommends using a smooth s-curve to represent technology adoption rates. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 6-7]

Moreover, EPA has modified the ACT research technology adoption curve to a seemingly arbitrary maximum adoption rate of 80%, a value below what we find in the ACT Research report. To justify this cap, EPA assumes that not all truck owners and fleets will have the financial and technical capacity to install and access chargers at their convenience. The proposal does not present an analysis of infrastructure needs to support this assumption. ICCT supports a 90% cap, which aligns with the assumption EPA makes that the energy storage system of the vehicle is sized to meet the 90th percentile of the truck's daily mileage. ICCT finds this assumption reasonable and a more appropriate basis for the cap. To support this point and respond to EPA's request for comment on infrastructure availability, we discuss trucks' infrastructure needs and the progress in fulfilling them in other sections of these comments. [EPA-HQ-OAR-2022-0985-1553-A1, p. 7]

Our view is the EPA rule can be strengthened through the adoption of an alternative technology adoption curve derived from empirical data, free to access, and open to public scrutiny. We propose EPA select a technology adoption curve which we refer to here as the TEMPO curve. The curve was derived by the Environmental Defense Fund (EDF) from the Transportation Energy & Mobility Pathway Options (TEMPO) Model (Muratori et al., 2021) and shared with the ICCT.3 The curve is capped at 90%, in line with our recommendation. The EPA curve, TEMPO curve, and combined EPA and TEMPO curves are presented in Figure 2 and tabulated in the appendix in Table A. 1. [EPA-HQ-OAR-2022-0985-1553-A1, p. 7] [Refer to Figure 2, Summary of the different Technology Adoption Curves, on p. 7, and Appendix Table A.1., Technology Adoption Curves Data, on p. 27 of docket number EPA-HQ-OAR-2022-0985-1553-A1]

Muratori, M., Jadun, P., Bush, B., Hoehne, C., Vimmerstedt, L., Yip, A., Gonder, J., Winkler, E., Gearhart, C., & Arent, D. (2021). Exploring the future energy-mobility nexus: The transportation energy & mobility pathway options (TEMPO) model. Transportation Research Part D: Transport and Environment, 98, 102967. https://doi.org/10.1016/j.trd.2021.102967

EPA has applied a faster adoption rate in comparison to the ACT research rates for the high payback periods bins due to the impact of the proposed regulation. ICCT supports this assumption. The proposed TEMPO curve doesn't take into account the impact of the proposed regulation on technology adoption. We develop another variant of the TEMPO curve considering EPA's adoption rates for payback periods above 6 years in 2027, and above 4 years in 2032. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 7-8]

We then examined the impact of the three different technology adoption curves on the total ZEV adoption rates: (1) EPA rates schedule, (2) TEMPO curve, and (3) TEMPO curve modified to include the impact of the proposed regulation (TEMPO+EPA). The total ZEV adoption rates are presented in Figure 3 for different technology adoption curves. The total ZEV adoption rate in 2027 is more than doubled when using the TEMPO curve, reaching 37%. In 2032, the total ZEV adoption rate reaches 60% under the TEMPO s-curve versus 46% under EPA's curve. In addition, when considering the impact of the proposed regulation on the technology adoption for the TEMPO curve (TEMPO + EPA), higher adoption rates are obtained, reaching 66% in 2032. [EPA-HQ-OAR-2022-0985-1553-A1, p. 8] [Refer to Figure 3, Total ZEV Adoption, on p. 8 of docket number EPA-HQ-OAR-2022-0985-1553-A1]

Based on the analysis presented in this section, ICCT recommends that EPA consider different technology adoption rates than the ones presented in Table 2-73 in the draft regulatory impact analysis and consider technology adoption curves that are derived from empirical data and follow a smooth s-curve such as the ones proposed by ICCT in this section (TEMPO and TEMPO+EPA curves). [EPA-HQ-OAR-2022-0985-1553-A1, p. 8]

SENSITIVITY OF ZEV ADOPTION RATES OF VOCATIONAL VEHICLES TO LEVEL 2 CHARGING ASSUMPTIONS EPA assumes that each Level 2 charging station (AC charging up to 19.2 kW in this context) will not be shared by more than one truck. EPA explicitly states that this is a conservative assumption. Level 2 charging is considered the main charging technology for step vans, box trucks, shuttle and school buses, and utility trucks. Given the long dwell times of these vehicles and their relatively smaller battery sizes, it is technically possible to share charging ports between at least two trucks, and fleets will take advantage of port sharing among several trucks to reduce their capital investment. ICCT modified this assumption in the HD TRUCS model to investigate the impact on the payback period and adoption rates. The total ZEV adoption rate of vocational vehicles increased by 6% in 2027 and 4% in 2032 under this new assumption. [EPA-HQ-OAR-2022-0985-1553-A1, p. 8]

BENEFITS OF A RULE REFLECTING ICCT PROJECTIONS OF TECHNOLOGY FEASIBILITY, COST AND COMPLIANCE

The ICCT estimated the benefits of EPA's proposed ZEV uptake proposal and compared it against three more ambitious scenarios. In total, the four scenarios modeled were:

- EPA proposal: This assumes EPA's projected ZEV uptake for different classes of heavy-duty vehicles and no additional ICE technology improvement beyond the requirements to meet Phase 2 standards.
- EPA proposal + Cost-effective ICE technology improvements: This scenario combines EPA's projected ZEV uptake with ICE technology improvement outlined in Table 4 of this document.
- EPA proposal + Cost-effective ICE technology improvements + ICCT projected ZEV market growth including state ACT adoption: This scenario has more aggressive ZEV uptake until 2032 compared to EPA proposal in vehicle segments such as refuse trucks, Class 4-7 single unit short haul trucks, and Class 4-7 single unit long-haul trucks. This scenario considers market conditions in combination with state ACT rule adoption and federal subsidies under the Inflation Reduction Act (Slowik et al., 2023) This means that there is further increase in ZEV adoption beyond 2032, leading to 66% of the new HDV sales being ZEVs by 2045. The ICE technology improvements are carried over from the previous scenario.
- National ACT aligned ZEV pathway + Cost effective ICE improvements +100% ZEV sales in 2040: This scenario assumes every state adopts California's ACT, i.e. 100% new HDV sales being ZEVs by 2040 (Ragon, Buysse, et al., 2023). This scenario also aligns with the Global HDV MoU (Drive to Zero, 2021) that the United States is a signatory to. The ICE technology improvements are carried over from the previous scenario. [EPA-HQ-OAR-2022-0985-1553-A1, p. 19]

Slowik, P., Searle, S., Basma, H., Miller, J., Zhou, Y., Rodríguez, F., Buysse, C., Minjares, R., Kelly, S., & Pierce, L. (2023). Analyzing the impact of the Inflation Reduction Act on electric vehicle uptake in the United States. International Council on Clean Transportation. https://theicct.org/publication/ira-impactevs-us-jan23/

Ragon, P.-L., Buysse, C., Sen, A., Meyer, M., Benoit, J., Miller, J., & Rodríguez, F. (2023). Potential benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles. International Council on Clean Transportation. https://theicct.org/publication/hdv-phase3-ghg-standards-benefits-apr23/

Drive to Zero. (2021). Global Memorandum of Understanding on Zero-emission Medium- and Heavy-duty Vehicles. https://globaldrivetozero.org/mou-nations/

In 2032, the ZEV market growth scenario projects a 46% ZEV sales share of Class 4-8 HDVs, compared to 27% estimated by EPA's proposal. (See Table 5.) The National ACT scenario's

ZEV sales share is almost double that of EPA's projection in 2032, at 53%. [EPA-HQ-OAR-2022-0985-1553-A1, p. 19] [Refer to Table 5, ZEV Sales Shares for Class 4-8, on p. 20 of docket number EPA-HQ-OAR-2022-0985-1553-A1]

EPA's proposal is estimated to reduce tank-to-wheel (TTW) CO2 emissions 9% compared to 2019 levels by 2032 and 20% by 2050. EPA's proposal combined with cost effective ICE technology improvements results in an 11% TTW CO2 emission reduction compared to 2019 by 2032 and a reduction of 28% by 2050. The EPA proposal and ICE improvements combined with additional ZEV market growth potential projected by ICCT in previously published work leads to a 19% TTW CO2 emission reduction compared to 2019 by 2032 and a reduction of 48% by 2050. A final scenario aligned with a National ACT schedule would deliver a 21% TTW CO2 emission reduction compared to 2019 by 2032. The addition of a 100% zero-emission sales milestone to this scenario by 2040 would deliver a reduction of 91% by 2050. [EPA-HQ-OAR-2022-0985-1553-A1, p. 20]

In terms of cumulative emissions reductions between 2023 and 2050 compared to the EPA proposal, the addition of cost-effective ICE technology improvements alone reduces cumulative TTW CO2 emissions by 537 million tonnes. A scenario that includes these additional ICE efficiency improvements and additional ZEV sales in line with previously published ICCT projections would deliver a reduction of over 1.8 billion tonnes compared to the EPA proposal. And a scenario that reflects a National ACT schedule plus a 100% zero-emission sales milestone in 2040 would deliver a reduction of over 3.8 billion tonnes. [EPA-HQ-OAR-2022-0985-1553-A1, p. 21] [Refer to Figures 5 on p. 21 and 6 on p. 22 of docket number EPA-HQ-OAR-2022-0985-1553-A1]

Organization: Moving Forward Network (MFN) et al.

The IRA included a first-ever federal purchase incentive for ZE MHDVs, which helps to bridge the cost gap between ZEV and ICE models in many cases today. A recent study by ICCT examined the impact of IRA funding on the MHDV market. 155 The study found that, even before IRA incentives, ZE models are approaching upfront purchase price parity. By 2030, battery-electric Class 4-7 rigid trucks, refuse trucks, and transit buses will have favorable sticker prices, according to the study. When considering IRA incentives, this list grows substantially (see Table 6). [EPA-HQ-OAR-2022-0985-1608-A1, p. 75.] [See Table 6, Year of Retail Price Preference for HD BEV vs. ICE with IRA Qualified Commercial Clean Vehicles Tax Credit located on p. 76 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

155 Slowik, P. et al. Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Update in the United States. The International Council on Clean Transportation. (January 2023). https://theicct.org/publication/ira-impact-evs-us-jan23/

156 Id.

Total cost is perhaps even more relevant when considering MHDVs, given that they are crucial capital assets to businesses and must provide a meaningful return on investment. Due in large part to the significant fuel and maintenance savings offered by ZEVs, many studies estimate a total-cost preference for ZEVs over ICE models in the coming years, if not today (See Table 7). Notably, much of the literature on ZE MHDV total cost was published pre-IRA, meaning that lifetime cost parity would be reached sooner in many cases. However, post-IRA studies on total cost are emerging. One from ICCT examined the total cost of ownership of various propulsion technologies for long-haul Class 8 tractor trucks in seven key freight states: Georgia, California, Florida, Illinois, New York, Texas, and Washington. The study estimated that battery-electric long-haul Class 8 tractors would have a preferred total cost of ownership before 2030 in each of these states, and in Texas as soon as 2027. 157 The most recent BloombergNEF Electric Vehicle Outlook corroborated ICCT's results, finding that all classes of ZE MHDVs – even long-haul tractors – would have a preferred total cost of ownership in the U.S. by 2030. 158 Our analysis on incremental savings to fleets in Section 8.8 of this letter further confirms these findings. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 76 - 77.] [See Table 7, Earliest TCO Advantage for BEV Trucks over Fossil-fueled Trucks located on p. 77 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

157 Basma, H. et al. Total Cost of Ownership of Alternative Technologies for Class 8 Trucks. The International Council on Clean Transportation. (April 2023). https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf

158 BloombergNEF. Electric Vehicle Outlook 2023. Bloomberg Finance L.P. (June 2023). https://about.bnef.com/electric-vehicle-outlook/

159 California Air Resources Board. Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document. (September 2021). https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf

160 Eamonn Mulholland. Cost of electric commercial vans and pickup trucks in the United States through 2040. The International Council on Clean Transportation. (January 2022). https://theicct.org/wp-content/uploads/2022/01/cost-ev-vans-pickups-us-2040-jan22.pdf

161 Hunter, C. et al. Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks. National Renewable Energy Laboratory. (2021). https://www.nrel.gov/docs/fy21osti/71796.pdf

162 Nair, V. et al. Technical Review of: Medium and Heavy-Duty Electrification Costs for MY 2027-2030. Prepared for Environmental Defense Fund by Roush Industries, Inc. (February 2022). https://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf

Other clean air regulators are taking note of this. In April 2023, CARB adopted the Advanced Clean Fleet rule, which will require the largest truck fleets operating in California to begin transitioning to ZE MHDVs in 2024. This rule is anticipated to save California commercial fleets nearly $48 billion through 2050. 163 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 77 - 78]

163 California Air Resources Board. Appendix B: Updated Costs and Benefits Analysis. (2023). https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acf15db.pdf

Although aspects of both upfront cost and total cost of ownership were considered in the proposal, we find it particularly arbitrary that the ZEV Adoption Rates in no way reflects recent economic projections in the literature. 164 For example, while battery-electric refuse haulers have both preferred upfront and total costs today, the current proposal would only affect a 36 percent market-wide ZEV adoption rate in 2032 – nearly a decade after purchase price parity. The same is true across the board for this proposal. EPA anticipates that the ZEV adoption rate under the proposal for daycab tractors, a truck type that bears significant responsibility for pollution in port- and warehouse-adjacent communities, would be merely 12 percent the year they are expected to reach purchase price parity. [EPA-HQ-OAR-2022-0985-1608-A1, p. 78]

164 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. (2023). p. 210 https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

When faced with the overwhelming economic upsides for ZE MHDVs, opponents of clean trucks often suggest that long-haul electric trucks will either have penalized revenue or increased fleetwide VMT due to payload capacity loss from battery weight. These arguments, however, are undercut by recent studies showing that advancements in battery efficiency and density will close the payload capacity gap in the coming years. 165 [EPA-HQ-OAR-2022-0985-1608-A1, p. 78]

165 Ricardo Strategic Consulting. E-Truck Virtual Teardown. Prepared for The International Council on Clean Transportation. (June 2022). https://theicct.org/wp-content/uploads/2022/01/Final-Report-eTruck-Virtual-Teardown-Public-Version.pdf

Lastly, as EPA notes, there are several tax credits from the Inflation Reduction Act (including the §48C Advanced Manufacturing and the §45X Advanced Manufacturing Production tax credits) available to battery manufacturers that will reduce costs below what is represented in EPA's and our own analyses. [EPA-HQ-OAR-2022-0985-1608-A1, p. 104]

Organization: National Automobile Dealers Association (NADA)

C. EPA's assessment of upfront HDV costs and payback is incomplete and inaccurate.

After accounting for the IRC Section 45W HDV tax credits provided for in the Inflation Reduction Act (IRA), EPA estimates that the typical buyer of a new HDV ZEV would:

- Pay an average of between $900 and $11,000 more in upfront costs for a MY 2032 vocational ZEV HDV than for a comparable ICE HDV but would recoup those costs in 3 years or less through yearly operational savings.
- Pay an average of $17,000 more in upfront costs for a MY 2032 day-cab tractor ZEV HDV than for a comparable ICE HDV and would recoup these costs in 3 years or less though yearly operational savings.
- Pay an average of $15,000 more in upfront costs for a MY 2032 sleeper cab tractor ZEV HDV than for a comparable ICE HDV but would recoup these costs in 7 years or less though yearly operational savings. [EPA-HQ-OAR-2022-0985-1592-A1, p. 6]

These estimates were built using HD TRUCS. To develop HD TRUCS, EPA relied on literature to determine the cost of components and technology packages, and then applied TCO calculations and other data assumptions. EPA then used HD TRUCS to perform payback period calculations to determine the number of years it will take for the TCO of a ZEV HDV to be equal to that of a comparable ICE HDV. While HD TRUCS is a strong tool for the assessment of ZEV technologies in the marketplace, ATD submits that there are several aspects of HD TRUCS and the underlying data or assumptions that are incomplete and inaccurate. EPA must rectify these issues finalizing its Phase 3 GHG mandates to ensure that forecasted payback periods and adoption rates reflect reality. [EPA-HQ-OAR-2022-0985-1592-A1, p. 6]

ATD defers to the comments submitted by the Truck and Engine Manufacturers Association (EMA) and its members regarding HDV and technology package pricing and feasible timelines. Today, new ZEV HDV sales prices are approximately 3-5 times that of comparable ICE HDV prices, before any tax incentives or grants. Industry studies that align with this observation report that the cost of a 450-kWh ZEV HDV battery would be between $144,000 and $243,000 before taxes and fees, which pushes the base price of a Class 8 BEV tractor to $350,000 to $500,000 or three to five times the price of a new diesel HDV.11 While it is projected that battery prices may come down over time, it makes no sense to suggest that the prices of new ZEV HDVs will average a mere 10-20% above the price of new ICE HDVs in 2032. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 6 - 7]

11 Sustainable Fleets 2023: The Road from Diesel to ZEVs, HEAVY DUTY TRUCKING, (May 22, 2023); See also, Claire Buysse, How Much Does An Electric Semi Really Cost?, ICCT (Feb. 24, 2022).

Organization: RMI

Overall, the total cost of ownership (TCO) for electric vehicle ownership is less than that of diesel vehicle ownership. Electric drivetrains, the vehicle components that connect the engine to the wheels, are simpler than diesel drivetrains. These simpler mechanics result in significant reductions in maintenance costs. Additionally, electric vehicles are more energy-efficient than their diesel counterparts. Coupled with the price of electricity, EVs benefit from dramatic reductions in fueling costs. [EPA-HQ-OAR-2022-0985-1529-A1, p. 6]

IRA credits can dramatically shift the TCO parity for heavy-duty (HD) ZETs: for the long-haul segment, parity is expected in 2027, but not until 2038 without the credits. For urban and regional segments, the IRA credits enable the TCO for HD ZETs to be lower than that of HD diesel trucks today. Without the credits, the TCO parity would occur between 2026 and 2028.13 [EPA-HQ-OAR-2022-0985-1529-A1, p. 6] [Refer to Figure on p. 6 of docket number EPA-HQ-OAR-2022-0985-1529-A1]

13 Marie McNamara et al., How Policy Actions Can Spur EV Adoption in the United States, RMI, 2023, https://rmi.org/insight/how-policy-actions-can-spur-ev-adoption-in-the-united-states/.

The overall sales penetration of HD ZETs is projected to reach 59% without IRA credits and 78% with IRA credits. This penetration translates to an additional cumulative sales of 428,216 HD ZETs between 2022 and 2032.15 [EPA-HQ-OAR-2022-0985-1529-A1, p. 6] [Refer to Figure on p. 7 of docket number EPA-HQ-OAR-2022-0985-1529-A1]

15 Marie McNamara et al., How Policy Actions Can Spur EV Adoption in the United States, RMI, 2023, https://rmi.org/insight/how-policy-actions-can-spur-ev-adoption-in-the-united-states/.

Economic modeling of IRA incentives by both RMI and the International Council on Clean Transportation have projected that battery electric vehicles will reach cost parity with internal combustion engine vehicles within the next few years for most HDT duty cycles. If vehicle costs come down as expected and fleets can both procure and charge their vehicles, electric trucks could be 50% of sales in many locations by 2030.17 [EPA-HQ-OAR-2022-0985-1529-A1, p. 7]

17 Peter Slowik, et al., Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States, The International Council on Clean Transportation, 2023, https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23.pdf.

A fleet's purchase decision can be based on environmental commitments, fueling access, financial resources, and operating requirements, but for most fleets, cost is the driving concern; once electric trucks make the most economic sense for fleets, they increasingly adopt them. By getting to cost parity sooner, the IRA jumpstarts a virtuous cycle. Fleets start adding charging to their depots and look for e-trucks that meet their operational needs. Truck manufacturers and charger manufacturers respond to this demand with new and better products further improving electric truck costs and operational viability, driving even more adoption. Because of this, RMI projects that the IRA will lead to far greater electric truck sales, market constraints such as grid electricity supply, e-truck availability, and the time it takes to introduce new vehicle models.18 [EPA-HQ-OAR-2022-0985-1529-A1, p. 7]

18 Kahn et Al, The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, RMI, 2022, https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

Organization: State of California et al. (2)

1. Evidence Suggests Robust Zero-Emission Vehicle Adoption Rates in the Heavy-Duty Sector

Heavy-duty electrification technologies already exist today, and sales of these electric vehicles are expected to grow significantly in the coming years due to municipal, state, and national policies, manufacturer commitments, and growing industry demand. [EPA-HQ-OAR-2022-0985-1588-A1, p.20]

As of 2019, when the California Air Resources Board ("CARB") promulgated its Advanced Clean Trucks ("ACT") regulations, discussed in more detail below, nearly one hundred models of zero-emission trucks and buses were commercially available in California, with many more projected to be added to the market in the near future.147 As of 2022, the number of models available in the United States was closer to 200 and that number continues to grow.148 Original equipment manufacturers have made robust projections about the future of ZEVs in this sector. These manufacturers project that between 50 to 70 percent of their heavy-duty truck sales will be ZEVs by 2030 and 100 percent by 2040:

- Navistar's executives expect 50 percent heavy-duty ZEV sales by 2030 and 100 percent electric vehicle ("EV") or fossil free by 2040;149
- Daimler Truck has stated ZEVs will make up 60 percent of its sales by 2030 and 100 percent of sales by 2040;150
- Volvo Trucks set a global target of 50 percent of all new trucks sales to be battery or fuel cell electric in 2030, and 100 percent by 2040;151 and
- PACCAR predicts electric vehicle production in the U.S. will ramp up exponentially in the coming years to 100 percent by 2040.152 [EPA-HQ-OAR-2022-0985-1588-A1, pp.20-21]

147 ACT ISOR at ES-2.

148 ZETI Data Explorer, https://globaldrivetozero.org/tools/zeti-data-explorer/ (last accessed June 9, 2023); see also 88 Fed. Reg. at 25,961 (describing over 170 models produced by over 60 manufacturers that cover a broad range of applications, including school buses, transit buses, straight trucks, refuse haulers, vans, tractors, utility trucks, and others, available to the public through model year 2024).

149 Alan Ohnsman, Big Rigs Going Electric As Navistar, Cummins, Daimler Rev Up Next-Generation Trucks, Forbes.com (May 13, 2022), https://www.forbes.com/sites/alanohnsman/2022/05/13/big-rigs-going-electric-as-navistar-cummins-daimler-rev-up-next-generation-trucks/?sh=60de4269419d.

150 Nick Carey, Daimler Truck 'all in' on green energy as it targets costs, Reuters (May 20, 2021), https://www.reuters.com/business/autos-transportation/daimler-truck-all-in-green-energy-shift-targets-costs-2021-05-20/.

151 Seth Clevenger, Volvo Trucks Outlines Next Steps Toward Carbon-Free Transport Vision, Transport Topics (Oct. 24, 2021), https://www.ttnews.com/articles/volvo-trucks-outlines-next-steps-toward-carbon-free-transport-vision; see also Volvo Group North America, Volvo Lights: Bringing Battery-Electric Freight Trucks to Market (May 18, 2022), https://cdn.lightsproject.com/collateral/volvo-lights-lessons-learned-guidebook.pdf.

152 Global Commercial Vehicle Drive to Zero, Analysis of Public Sales Commitments of Medium- and Heavy-Duty Vehicle Manufacturers and Expected Volumes (Dec. 2021) at 8, https://globaldrivetozero.org/site/wp-content/uploads/2021/12/OEM-Analysis-Paper_December_2021.pdf.

And businesses that purchase heavy-duty vehicles are creating a robust demand for these vehicles—with many major companies making significant commitments in recent years towards electrifying their heavy-duty fleets. Some examples include:

- Walmart has committed to a 100 percent zero-emission vehicle fleet globally, including long-haul trucks, by 2040;153
- Amazon has pledged that half of its deliveries globally will be carbon neutral by 2030,154 and has purchased 100,000 battery-electric delivery vans with an eye towards that goal;155
- DHL Group has committed to a 60 percent electric last-mile delivery fleet by 2030 globally;156
- FedEx has projected that battery-powered vehicles will make up half of all of its van purchases by 2025, and 100 percent by 2030;157
- Ingka Group (parent company of Ikea) has committed to 100 percent zero-emission customer deliveries and services by 2025 globally;158
- PepsiCo has committed to reducing its direct emissions by 75 percent by 2030, which includes a wide-scale rollout of electric vehicles for its vehicle fleet;159 towards this goal, FritoLay (a division of PepsiCo) announced it will deploy over 700 electric delivery vehicles in the United States by the end of 2023;160
- Sysco Co. committed to electrify 35 percent of its fleet by 2030, and signed a letter of intent in 2022 to deploy up to nearly 800 battery electric Class 8 tractors by 2026;161
- And a significant number of companies, including Bayer, Biogen, ClifBar, DeLoitte, Genentech, GlaxoSmithKline, HP Inc., Lyft, and Siemens have joined the EV100 coalition, whereby they commit to fully electrify their fleets by 2030.162 [EPA-HQ-OAR-2022-0985-1588-A1, pp.21-22]

153 Jason Mathers, Environmental Defense Fund, Walmart commits to 100% zero-emission trucks by 2040, signaling electric is the future (Sept. 22, 2020), https://blogs.edf.org/energyexchange/2020/09/22/walmart-commits-to-100-zero-emission-trucks-by-2040-signaling-electric-is-the-future/.

154 Karen Weise & Neal E. Boudette, Can Anyone Satisfy Amazon's Craving for Electric Vans?, New York Times (Jan. 18, 2022), https://www.nytimes.com/2022/01/18/technology/amazon-electric-vans.html.

155 Press Release, Amazon, Amazon's electric delivery vehicles from Rivian roll out across the U.S. (July 21, 2022), https://www.aboutamazon.com/news/transportation/amazons-electric-delivery-vehicles-from-rivian-roll-out-across-the-u-s.

156 Press Release, DHL, How DHL Is Embracing Electric Vehicles (EVs) For a Greener, Sustainable Future (July 21, 2022), https://www.dhl.com/discover/en-sg/logistics-advice/sustainability-and-green-logistics/reasons-dhl-embraces-electric-vehicles.

157 Press Release, FedEx, Charging Ahead: FedEx Receives First All-Electric, Zero-Tailpipe Emissions Delivery Vehicles from BrightDrop (Dec. 17, 2021), https://newsroom.fedex.com/newsroom/global/brightdropev600.

158 Press Release, Ingka, Ingka Group accelerates towards 100% zero emission cars and vans (Nov. 10, 2021), https://www.ingka.com/news/ingka-group-as-a-member-of-ev100-signs-global-declaration-on-accelerating-the-transition-to-100-zero-emission-cars-and-vans/.

159 PepsiCo, Climate Change Action Strategy, https://www.pepsico.com/our-impact/esg-topics-a-z/climate-change (last accessed June 14, 2023).

160 Press Release, Frito-Lay, Frito-Lay Expedites 2040 Net-Zero Emissions Goal with Over 700 Electric Delivery Vehicles (April 20, 2023), https://www.fritolay.com/frito-lay-expedites-2040-net-zero-emissions-goal-with-over-700-electric-delivery-vehicles.

161 Jason Morgan, How Sysco Corp. plans to deploy 800 battery electric Class 8 trucks (and that's just the beginning), FleetEquipmentMag.com (Nov. 14, 2022), https://www.fleetequipmentmag.com/sysco-battery-electric-trucks/.

162 EV100 Members, theclimategroup.org, https://www.theclimategroup.org/ev100-members (last accessed June 16, 2023); see also Climate Group launches EV100+ to tackle world's most polluting road vehicles, theclimategroup.org (Sept. 20, 2022), https://www.theclimategroup.org/our-work/press/climate-group-launches-ev100-tackle-worlds-most-polluting-road-vehicles.

Indeed, in a comprehensive analysis of class 2b-8 fleet announcements, the Environmental Defense Fund found that there had been a nearly 8,500 percent increase in zero-emission deployments and commitments in commercial fleets in the United States between 2017 and 2022, with investments made by over 280 entities.163 [EPA-HQ-OAR-2022-0985-1588-A1, p.22]

163 Environmental Defense Fund, The ZEV future is here: An 8,500% increase in truck deployments, commitments is proof (July 12, 2022), https://blogs.edf.org/energyexchange/2022/07/12/the-zev-future-is-here-an-8500-increase-in-truck-deployments-commitments-is-proof/; see also BYD, More Game Day Cheers, Less Emissions: Anheuser-Busch Delivers New Era of Beer with Innovative Zero-Emission Fleet (Feb. 11, 2022), https://en.byd.com/news/more-game-day-cheers-less-emissions-anheuser-busch-delivers-new-era-of-beer-with-innovative-zero-emission-fleet/ (explaining Anheuser-Busch's initial efforts to transition its entire long-haul dedicated fleet to zero-emission vehicles); BYD, BYD and Einride Sign Largest-Ever Order for Heavy-Duty Battery Electric Trucks Outside of Asia (Feb. 22, 2022), https://en.byd.com/news/byd-and-einride-sign-largest-ever-order-for-heavy-duty-battery-electric-trucks-outside-of-asia/ (Swedish freight technology company Einride purchases 200 Class 8 electric trucks); Maersk, Maersk orders 110 Volvo VNR Electric trucks for North America (March 29, 2022), https://www.maersk.com/news/articles/2022/03/29/maersk-orders-110-volvo-vnr-electric-trucks-for-north-america (Maersk announces purchase of 110 electric Class 8 trucks).

In April 2023, EPA issued a Notice of Decision granting CARB's requested waivers of preemption under Section 209 of the CAA for several regulations governing heavy-duty vehicles in California, including the ACT regulations.164 The ACT regulations aim to accelerate the widespread adoption of ZEVs in the medium- and heavy-duty vehicle sector,165 and, to that end, set manufacturer ZEV sales requirements for vehicles with a gross vehicle weight rating ("GVWR") greater than 8,500 pounds, commonly referred to as medium- and heavy-duty vehicles.166 ACT specifies that by 2035, zero-emission truck/chassis sales would need to be 55 percent of Class 2b – 3 truck sales, 75 percent of Class 4 – 8 straight truck sales, and 40 percent of truck tractor sales. California also received a waiver for its Zero Emission Airport Shuttle (ZEAS) regulation, which will accelerate the adoption of ZEV technology in California airport shuttles.167 Under the ZEAS regulation, by December 31, 2027, at least 33 percent of each regulated airport shuttle fleet must be ZEVs.168 By December 31, 2031, the requirement goes up to 66 percent, and by December 31, 2035, 100 percent of each fleet must be ZEVs.169 [EPA-HQ-OAR-2022-0985-1588-A1, p.23]

164 88 Fed. Reg. 20,688 (April 6, 2023) (granting waivers of preemption under CAA Section 209 for California's Heavy-Duty Vehicle and Engine Emission Warranty Regulations and Maintenance Provisions, the Advanced Clean Trucks Regulation, the Zero Emission Airport Shuttle Regulation, and the Zero-Emission Power Train Certification Regulation).

165 ACT ISOR at ES-1, V-1.

166 The requirements specify percentages of ZEVs and near-zero emission vehicles (NZEVs). CARB Waiver Request Support Document for ACT, ZEAS, and ZEP Regulations (Dec. 20, 2021) at 2 & n.2 ("Waiver Request for ACT") (EPA-HQ-OAR-2022-0331-0003). ACT ISOR at ES-3, ES-4; Cal. Code Regs., tit. 13, §§ 1963, et sec. The ACT regulation implements the ZEV sales requirement through a "credit and deficit system," which allows manufacturers to "determine the vehicle types that are most cost effective for them to produce and to serve the [vehicle category] markets they choose and to make adjustments as the market expands." Manufacturers can generate a "ZEV credit" by "producing and selling a ZEV into California." Starting with the 2024 model year, truck manufacturers subject to the ACT regulation will "annually incur deficits based on the manufacturer's annual sales volume of on-road vehicles produced and delivered for sale in California." The deficits increase incrementally each year from model year 2024 (with required ZEV sales percentages ranging from 5% to 9% depending on weight class) to model years 2035 and beyond (ranging from 40% to 75%). For each model year, manufacturers must comply by retiring credits to offset their deficits. The ACT regulation also allows manufacturers to "bank" and trade credits. Manufacturers are subject to civil penalties if they fail to "retire an appropriate amount of ZEV . . . credits" and then fail to "make up those deficits" by the end of the next model year.

167 ZEAS ISOR at ES-1.

168 Waiver Request for ACT at 12.

169 Id. at 12.

And California is far from the only state to implement policies promoting innovative technologies, including electrification in the medium- and heavy-duty vehicle sectors. To date, eight other states have adopted California's ACT regulations: Massachusetts, New Jersey, New York, Oregon, Washington,170 Vermont,171 Colorado,172 and Maryland.173 In addition, 17 States and the District of Columbia have signed a Memorandum of Understanding establishing goals to support widespread electrification of the HD vehicle sector.174 These states represent over 36 percent of the market for heavy-duty vehicles in the United States.175 [EPA-HQ-OAR-2022-0985-1588-A1, pp.23-24]

170 88 Fed. Reg. at 25,939 n.77.

171 Sierra Club, Vermont Adopts Rules for Cleaner Cars and Trucks (Dec. 1, 2022), https://www.sierraclub.org/vermont/vermont-adopts-rules-cleaner-cars-and-trucks.

172 Colorado Department of Public Health and Environment, Colorado adopts new measures to increase availability of zero-emission trucks that offer lower operating and fuel costs (April 21, 2023), https://cdphe.colorado.gov/press-release/colorado-adopts-new-measures-to-increase-availability-of-zero-emission-trucks-that.

173 The Maryland Department of the Environment is required to adopt regulations that incorporate by reference California's ACT regulations, taking effect starting with model year 2027. See Calstart, By Paving the Way for Clean Trucks, Maryland Reaffirms Its Position as a Climate Leader, https://calstart.org/calstart-applauds-maryland-for-adopting-clean-truck-legislation/ (last accessed June 16, 2023).

174 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding (July 2020), https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf/.

175 Claire Buysse et al., Racing to Zero: The Ambition We Need for Zero-Emission Heavy-Duty Vehicles in the United States, The International Council on Clean Transportation (ICCT) (Apr. 8, 2022), https://theicct.org/racing-to-zero-hdv-us-apr22/.

Numerous state governments have also passed electric vehicle purchase mandates for state and local heavy-duty fleets, including California,176 Connecticut,177 Maine,178 Maryland,179 Massachusetts,180 New Jersey,181 New York,182 and Rhode Island.183 Further, numerous states and localities have implemented programs that provide purchase incentives or price relief to spur the replacement of conventional heavy-duty vehicles with zero-emission or alternative fuel vehicles, including Alabama,184 California,185 Idaho,186 Indiana,187 Iowa,188 Louisiana,189 Maryland,190 Michigan,191 Nebraska,192 New Jersey,193 Utah,194 and Washington.195 [EPA-HQ-OAR-2022-0985-1588-A1, pp.24-26]

176 California Code of Regulations Title 13, Section 2023.1 (By 2040, all public transit agencies must transition to 100% zero-emission bus fleets); California Public Resources Code 25722.5-25722.11, 25724 (By 2025, at least 15% of the state's fleet of new vehicles with a gross vehicle weight rating of 19,000 pounds or more must be zero-emission vehicles, and at least 30% must be by 2030).

177 Connecticut General Statutes § 14-164o, Senate Bill 4, 2022 (Beginning January 1, 2035, school districts may only purchase zero-emission school buses; by 2040, all school buses in Connecticut must be zero emission. School districts in environmental justice communities must transition to zero-emission buses by January 1, 2030).

178 Maine Revised Statutes Title 20-A M.R.S. § 5401(15-A) (by 2035, to the extent practicable 75% of school bus acquisitions must be zero-emission buses); P.L. 2022, ch. 693, § 3.

179 Maryland Statutes, Transportation Code 7-406 (Beginning in 2023, the Maryland Transit Administration may only purchase zero emission buses for the state transit bus fleet.); Maryland Statutes, Environmental Code 2-1505 (Beginning in fiscal year 2025, county Boards of Education may only purchase zero-emission school buses unless certain conditions are met.).

180 Executive Order 594, 2021 (By 2030, all vehicles with a GVWR of 14,000 lbs. or more must be ZEVs.); House Bill 5060, 2022; Session Law Chapter 448, Section 6A, 2016 (By December 21, 2030, all passenger buses purchased or leased by the Massachusetts Bay Transportation Authority must be ZEVs. By December 31, 2024, all passenger buses operated by the MBTA must be ZEVs.)

181 New Jersey Statutes § 48:25-3 (10% of new buses purchased by the New Jersey Transit Corporation must be ZEVs by December 31, 2024, and 100% by December 31, 2032); New Jersey Statutes § 27:1B-22 (All buses purchased by the New Jersey Transit Corporation must be 1) equipped with improved pollution controls that reduce particular emissions, or 2) powered by a fuel other than conventional diesel. Qualifying vehicles include hybrid electric vehicles and fuel cell vehicles).

182 New York Senate Bill 8006, 2022 (Beginning July 1, 2027, school districts entering new purchase or lease contracts may only purchase or lease zero-emission school buses powered by electricity or hydrogen.); Executive Order 22, 2022; Senate Bill 2838, 2022 (For state fleet medium- and heavy-duty vehicles, 10% must be ZEVs by 2026, 25% must be ZEVs by 2031; and 100% of MHDVs must be ZEVs by 2041.).

183 Rhode Island Public Transit Authority, Electric Bus Pilot Program, https://www.ripta.com/electric-bus/ (Funds from the Volkswagen Mitigation Trust are being used to replace older diesel buses with all-electric, zero-emission buses.).

184 State of Alabama, Department of Economic and Community Affairs, Volkswagen Environmental Mitigation Trust Beneficiary Mitigation Plan (Feb. 28, 2019), https://adeca.alabama.gov/wp-content/uploads/Beneficiary-Mitigation-Plan.pdf (making grants available for the replacement of qualified

medium- and heavy-duty vehicles, including freight trucks, port drayage trucks, buses, ferries, tugs, forklifts, and airport ground support equipment).

185 Santa Barbara County Air Pollution Control District, Clean Air Grants for On-Road Vehicles, https://www.ourair.org/grants-for-on-road-vehicles/ (The Santa Barbara Air Pollution Control District offers grants for the replacement of existing heavy-duty vehicles with zero-emission or near-zero-emission vehicles.) (last accessed June 16, 2023).

186 Idaho Department of Environmental Quality, Volkswagen and Diesel Funding, https://www.deq.idaho.gov/air-quality/improving-air-quality/volkswagen-and-diesel-funding/ (Funds from the Volkswagen Mitigation Trust and the Diesel Emissions Reduction Act grant are used to replace eligible vehicles or equipment with new engines, including in some cases electric engines, and to install EV supply equipment throughout Idaho.) (last accessed June 16, 2023).

187 Indiana Department of Environmental Management, Volkswagen Environmental Mitigation Trust Program, https://www.in.gov/idem/airquality/volkswagen-mitigation-trust/ (Funds from the Volkswagen Mitigation Trust Agreement may be used to pay some or all of the cost to repower or replace eligible diesel-powered vehicles with new diesel, alternative fuel, or all-electric engines or vehicles.) (last accessed June 16, 2023).

188 Iowa Department of Transportation, Diesel Emissions Reduction Act, https://iowadot.gov/dera/ (Part of Iowa's funds from the Volkswagen Mitigation Trust Agreement are used for projects that reduce diesel emissions, including diesel engine replacement with a zero-emission power source.) (last accessed June 16, 2023).

189 Louisiana Department of Environmental Quality, Volkswagen Environmental Mitigation Trust, https://deq.louisiana.gov/page/louisiana-volkswagen-environmental-mitigation-trust (Funds from Louisiana's portion of the Volkswagen Mitigation Trust were provided for, among other purposes, all-electric repower or replacement of airport ground support equipment, forklifts, and port cargo handling equipment, and the purchase, installation, and maintenance of EV charging stations.) (last accessed June 16, 2023).

190 Maryland House Bill 1391, 2022 (The Maryland Energy Administration is authorized to administer a program providing grants for the purchase of medium- and heavy-duty ZEVs, EV charging stations, or medium- and heavy-duty non-road equipment.).

191 Michigan Department of Environment, Great Lakes, and Energy, Fuel Transformation Program, https://www.michigan.gov/egle/about/Organization/Materials-Management/fuel-transformation-program (This program offers grants for eligible on- and off-road vehicles and equipment, including school buses and medium- and heavy-duty trucks, that reduce NOx emissions, improve air quality, and increase adoption of zero emission or alternative fuel vehicles and equipment.) (last accessed June 16, 2023).

192 Nebraska Department of Environment, Volkswagen Environmental Mitigation Trust Fund, http://deq.ne.gov/NDEQProg.nsf/OnWeb/AirVW (Funds from the Volkswagen Mitigation Trust have been used to replace diesel buses, including with electric buses; to replace diesel equipment, including with electric replacements; and to acquire and install EV charging stations.) (last accessed June 16, 2023).

193 New Jersey School Boards Association, Grants Available to Replace Diesel Vehicles with Electric, https://www.njsba.org/news-publications/school-board-notes/july-13-2021-vol-xlv-no-1/grants-available-to-replace-diesel-vehicles-with-electric/ (The New Jersey Department of Environmental Protection offered funds to replace medium- and heavy-duty diesel vehicles with electric.) (last accessed June 16, 2023); New Jersey Economic Development Authority, New Jersey Zero-Emission Incentive Program (NJ ZIP), https://www.njeda.gov/njzip/ (offers vouchers for the purchase of new medium- and high-duty ZEVs registered in New Jersey) (last accessed June 16, 2023).

194 Utah Department of Environmental Quality, Alternative Fuel Heavy-Duty Vehicle Tax Credit Program, https://deq.utah.gov/air-quality/incentive-programs-aq/alternative-fuel-heavy-duty-vehicle-tax-credit-program (income tax credits are available for the qualified purchase of a natural gas, electric, or hydrogen-electric heavy duty vehicle) (last accessed June 16, 2023).

195 Revised Code of Washington §§ 82.16.0496, 82.04.4496 (Businesses are eligible to receive tax credits for purchasing new or used medium- and heavy-duty alternative fuel vehicles and installing alternative fueling infrastructure. Alternative fuels include electricity and hydrogen.).

Recent incentive programs and commitments made at the federal level further underscore the changing landscape for ZEVs in the heavy-duty sector since EPA finalized the Phase 2 GHG Standards. The International Council on Clean Transportation projects the Inflation Reduction Act ("IRA") alone will cause HD ZEV sales to increase significantly, from 10 percent sales for the business-as-usual case to roughly 25 percent of sales in 2030 with the IRA in place.196 In November 2022 the Biden Administration added the United States as a signatory to the Global Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles, which commits the United States to a goal of 100 percent zero-emission truck and bus sales by 2040, with an interim goal of 30 percent new sales by 2030,197 commitments that the federal government confirmed in its Blueprint for Transportation Decarbonization.198 [EPA-HQ-OAR-2022-0985-1588-A1, p.27]

196 ICCT White Paper, Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States (Jan. 31, 2023), https://theicct.org/publication/ira-impact-evs-us-jan23/.

197 Global Commercial Vehicle Drive to Zero, Global Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles, https://globaldrivetozero.org/mou-nations/ (last accessed June 16, 2023).

198 U.S. Department of Energy, The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation (Jan. 2023), https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf.

Organization: Truck and Engine Manufacturers Association (EMA)

ACTResearch's Payback-based Adoption Function

In the DRIA Section 2.7.9 "Technology Adoption", the EPA references its use of ACTR's technology agnostic zero-emission vehicle (ZEV) adoption function based on payback period. ACTR's payback-based adoption function is one-half of what ACTR uses to calculate the financially driven adoption rates of ZEVs. We also use a TCO savings-based adoption formula (described more fully in a later section). Each factor, payback and TCO savings, is equally weighted in its contribution towards our final ZEV adoption rate. First, it should be noted that the EPA has now redacted the ACTR's payback-based adoption function and the corresponding binned adoption rate table from the DRIA upon ACTR's request as the specific formula is ACTR's copyrighted proprietary information. However, since EMA viewed the formula before the EPA updated the DRIA, we will discuss the exact equation here. [EPA-HQ-OAR-2022-0985-2668-A3, p. 3]

[FORMULA REDACTED]

ACTR's payback-based adoption formula was correctly written in the DRIA. We think of adoption in terms of "steps". The first step is essentially the minimum threshold, which in our modeling is 10 years. This means that adoption share points are only granted when the payback period is under 10 years. The way the formula above can be understood is as follows1:

- Step 1: The threshold. If under the 10-year threshold, "A" share point is awarded for every year under 10.

- Step 2: An additional “B” points are awarded for every year under seven years.
- Step 3: An additional “C” points are awarded for every year under four years.
- Step 4: An additional “D” points are awarded for every year under two years.
- Step 5: An additional “E” points are awarded for every year under one year. [EPA-HQ-OAR-2022-0985-2668-A3, p. 3]

1 Formula described with the exact share point values omitted and instead substituting “A, B, C, D, E”.

For example, if the payback period is 1.5 years, the payback-based adoption share points would be 32% (FORMULA REDACTED). Our payback period only starts to grant 100% adoption based on payback when the net manufacturing and infrastructure cost is less than the net operating cost. In other words, with respect to payback criteria, we apply 100% adoption when payback is immediate and there is upfront price parity. [EPA-HQ-OAR-2022-0985-2668-A3, p. 3]

EPA’s Use of ACTR’s Payback-based Adoption Function

The EPA uses ACTR’s payback-based adoption function with some modifications as described below.

The EPA imposes a maximum ZEV adoption rate of 80 percent for any given vehicle application. The EPA’s basis for this rate cap is that its HDTRUCS model is based on its use of the 90th percentile of average VMT data to size batteries and needs for each of its vehicle types. In this way, EPA is acknowledging that the assumptions in its model are not applicable to 100 percent of applications due to the myriad of operating characteristics that exists. EPA also notes that its 80 percent cap recognizes that some owners will have a hard time installing necessary on-site charging infrastructure. ACTR doesn’t take issue with the EPA placing the 80 percent cap on its adoption rates in this scenario. Typically, ACTR is supportive of applying measured, conservative assumptions when assessing adoption rates or new technologies, particularly when the expected benefits are based on assumed improvements over an extended timeframe. [EPA-HQ-OAR-2022-0985-2668-A3, p. 4]

On the other hand, the EPA also applies a faster adoption rate compared to ACTR’s methodology for payback periods greater than four years “due to the assumed impact of this proposed regulation and the additional 80 percent constraint” (DRIA p. 232). While the 80 percent cap on payback-based adoption rates makes sense to ACTR and shows an effort to factor in real-world variability, the decision to increase adoption rates for payback periods over four years is certainly a less conservative approach and would minimize the effects of the 80% cap. ACTR does not impose an assumed maximum ZEV adoption target when we perform our TCO analysis and ZEV forecasting. [EPA-HQ-OAR-2022-0985-2668-A3, p. 4]

The result of the EPA’s decision to increase adoption rates for payback periods of over four years means that EPA is expecting higher payback-based adoption rates for those payback years than ACTR would forecast. The specific ways in which the EPA increased adoption rates for payback periods greater than four years, as compared to ACTR, are further described below. [EPA-HQ-OAR-2022-0985-2668-A3, p. 4]

ACTR's payback-based adoption formula does not account for any amount of payback-based adoption if the payback period is 10 years or greater. Not only has the EPA increased its payback-based adoption rates for years 5-10, it has also added in additional bins for 10–15-year payback period and >15-year payback period (which indicates that the EPA has modified ACTR's formula to include additional steps). In ACTR's payback and TCO modeling, the useful life of our various vehicle applications ranges from 12-20 years – 12 years for higher mileage applications such as long-haul truck load and 20 years for lower mileage applications like school bus. Commercial vehicles are not typically held by one owner over their useful life and often change owners multiple times. Payback is an important factor in the decision to purchase a vehicle, and the aim for the original owner is typically to recover payback before or when reselling it. [EPA-HQ-OAR-2022-0985-2668-A3, p. 4]

While ACTR concedes that our first payback step for payback period below 10 years will not fit that criterion for every application, we make sure that the first step at 10 years is, at the very least, not longer than the assumed useful life of any of our commercial vehicle applications. In our experience, granting any shares of adoption based on payback periods that are longer than 10 years is not prudent, based on the inherent risk of adopting new technology for first purchasers. ACTR disagrees with the EPA's methodology in this regard. [EPA-HQ-OAR-2022-0985-2668-A3, pp. 4-5]

The table below compares ACTR's binned adoption rates based on payback period and the EPA's 2027 and 2032 binned adoption rates based on payback period.

[See TABLE, EPA-HQ-OAR-2022-0985-2668-A3, p. 5]

The EPA's payback-based adoption rates for payback periods greater than four-years are higher, compared to ACTR in its 2027 assumptions for BEV adoption. The EPA's model increases those adoption rates, as well as the adoption rate for payback periods of 1-2 years, in 2032. The EPA assumes that in 2032, FCEVs will be widely available, in addition to BEVs, and has modified the adoption rate criteria on the assumption that increased model availability will drive significantly higher adoption rates for the same payback timeframe. ACTR's adoption rate assumptions are propulsion system agnostic, so the wider availability of FCEVs would not change our formula in the outer years of our forecast. [EPA-HQ-OAR-2022-0985-2668-A3, p. 5]

Again, we will reiterate here that ACTR does not agree with the EPA's modification to ACTR's formula where payback-based adoption is granted for payback periods greater than 10 years. We would especially like to note the EPA's 2032 payback-based adoption rate for its >15 years payback bin. It is highly unlikely that any ZEV adoption would occur if solely based on a payback period of >15 years. [EPA-HQ-OAR-2022-0985-2668-A3, p. 5]

The EPA states in the DRIA that the MY 2032 schedule applies higher adoption rates than in MY 2027 due to the assumption that "ZEV technology will be more mature; fleet owners and drivers will have had more exposure to ZEV technology…and infrastructure to support ZEV technologies will have had more time to expand" (DRIA p. 232). ACTR does not inherently disagree with the assumption that there will be more infrastructure to support ZEVs and that fleets will have more exposure and comfort with these new technologies. However, we would not agree that those factors would specifically change payback-based adoption behavior. The decision to choose a ZEV vehicle based on payback is quantitative. The decision to choose a

ZEV vehicle based on having more exposure to ZEV technology is qualitative. [EPA-HQ-OAR-2022-0985-2668-A3, p. 5]

Missing Piece of the ZEV Adoption Equation

While the EPA is correct that payback period is an important factor in considering the adoption of ZEVs, we think that the EPA is failing to consider the impact that TCO has on adoption rates. ACTR uses both the payback-based adoption function as well as an adoption function based on TCO savings to determine ZEV adoption rates. Each criteria receives an equal weighting in determining our ZEV adoption rate. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

It is interesting that the EPA does not make use of a TCO savings-based adoption function when the DRIA does include broad discussion of its expectations for ZEV TCO and purchaser behavior in Section 6.2 “Purchaser Acceptance”. The EPA does expect that the ZEV options will have lower TCO compared to comparable ICE vehicles (DRIA p. 417). The EPA also recognizes that there is an interplay in purchasing decisions between upfront costs and TCO. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

ACTR uses a TCO savings-based adoption formula similar to our payback-based adoption formula. It works similarly – a certain number of adoption share points are awarded based on the incremental percentage of TCO savings compared to the determined threshold. It follows a similar step design to the payback-based function. The formula can be expressed as follows:

TCO Savings:

- If TCO delta < X% = 0 share points attributed towards adoption
- If TCO delta > X% = threshold share points, plus additional points depending on the magnitude of the incremental TCO savings beyond the threshold value [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

As mentioned previously, we give equal weight to our payback-based function and TCO savings-based function when determining ZEV adoption rates. This is our recognition that these two important decision-making factors should not be considered as stand-alone sole criteria, when, in fact, both considerations determine adoption rates. While some may favor payback to TCO-savings (and vice versa), our model looks at what the ZEV adoption rate would be, on balance, when considering both. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

The result of not utilizing both criteria for adoption rates would yield potential scenarios where a payback only based criteria would suggest higher adoption on its own than when both the payback and TCO savings function results are combined. The opposite can also be true, in cases where the combination of TCO savings and payback would suggest higher adoption rates. We think it is important to highlight that our resulting ZEV adoption rates based on both payback and TCO savings are often less aggressive than payback-based rates alone. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

Our research has shown that more than one single quantitative factor is used in the decision-making to switch to a ZEV, and the method for determining adoption rates based on financial assumptions should be reflected as such. ACTR disagrees with the EPA’s decision to base its ZEV adoption rates solely on payback periods. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

In conclusion, there are multiple ways in which the EPA has modified ACTR's payback-based adoption equation that are not aligned with our view of how the function should be used. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

- The EPA has increased the rate of ZEV adoption for payback periods greater than four years. Our quantitative and qualitative analyses do not support those increased adoption rates.
- The EPA has added adoption based on payback periods greater than 10 years and greater than 15 years (longer than most of ACTR's prescribed vehicle applications' useful lives). We would not expect payback-based adoption to occur if the payback period is greater than 10 years, particularly in the hands of the first purchaser.
- The EPA further increases the rate of ZEV adoption based on payback period again in 2032. While ACTR agrees that many improvements in infrastructure and familiarity with vehicles will occur, those are not always purely financial decisions. For this reason, ACTR's formula does not change over time.
- The EPA only considers a payback-based function for technology adoption. The absence of the addition of a TCO-based adoption function used in conjunction with the payback-based adoption function shows a lack of full consideration for all factors owners utilize when making truck buying decisions, especially when related to switching technologies. [EPA-HQ-OAR-2022-0985-2668-A3, p. 6]

Ultimately, a payback-period calculation is performed in HD TRUCS to determine the number of years it will take for the TCO of the ZEV technology/vehicle to be equal to that of the corollary ICE technology/vehicle for each of the 101 vehicle types. The payback period considers the differential powertrain costs, the EVSE costs, annual maintenance, repair and operation costs, along with tax and other credits from IRA and BIL to determine the number of payback years. [EPA-HQ-OAR-2022-0985-2668-A1, p. 22]

EPA then uses the calculated number of payback years to determine the associated ZEV-truck adoption rate for each vehicle type. HD TRUCS uses a table that correlates payback years with percentage-of-sales-based adoption rates for ZEV trucks. EPA claims that the table is based on work performed by ACT Research Company (ACT). However, EPA modified the table to include adoption rates for payback years beyond those used by ACT, and EPA also assigned higher adoption rates for certain payback periods based on its "good engineering judgment." Later in these comments, EMA will discuss ACT's detailed critique of EPA's use of ACT's work. [EPA-HQ-OAR-2022-0985-2668-A1, p. 22]

In that regard, and as further detailed in Ricardo's infrastructure needs assessment, installing the requisite ZEV-truck infrastructure over the next decade is a massive undertaking with a massive price tag. Because of the magnitude of that challenge, there is a significant risk that not all or even close to all of the required battery-recharging and hydrogen-refueling stations will be in place when and where needed, such that some significant numbers of anticipated ZEV-truck purchases and deployments will not be feasible. To account for that substantial likelihood, a suitable discount factor needs to be applied to the adoption rates and GEM-based standards derived through EMA HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 41 - 42.]

The discount factor is one that should be large enough to cover the risk that a fully sufficient ZEV-truck infrastructure will not be developed on-time. Accordingly, the scope of the percentage discount should equate to the percentage of the necessary infrastructure that might reasonably be expected to not be fully operational during the 2027-2032 regulatory time period. This is especially likely given the finite resources available in the ZEV market and the concurrent ZEV infrastructure build-out that is occurring in the LD sector. More specifically, if it is reasonable to expect that 25% of the required numbers of ZEV-truck recharging and refueling stations may not be in place and operational on-time, then a corresponding 25% discount should be applied to the ZEV-truck adoption rates and resultant GEM-based standards generated through EMA HD TRUCS. EMA believes that such a discount is warranted given the magnitude of the infrastructure challenge, as detailed in Ricardo's report (Exhibit "1"). [EPA-HQ-OAR-2022-0985-2668-A1, p. 42] [See the Exhibit 1, Ricardo Report, at docket number EPA-HQ-OAR-2022-0985-2668-A2.]

An additional discount is necessary from the starting-point adoption rate percentages calculated through EMA HD TRUCS to account for the fact that EPA has misapplied the payback-based adoption function that ACT Research Company (ACT) developed and that the Agency purports to have relied on. (See DRIA, Section 2.7.9.) In that regard, ACT has prepared a written critique of how EPA has misused ACT's payback-based adoption function. A copy of that written critique is attached to these comments as Exhibit "3." [EPA-HQ-OAR-2022-0985-2668-A1, p. 42] [See the Exhibit 3, ACT Report, at docket number EPA-HQ-OAR-2022-0985-2668-A4.]

As ACT explains, EPA: (i) has failed to include the TCO savings-based adoption formula that equally informs ACT's calculated adoption rates, and instead has solely utilized ACT's payback-based adoption function; (ii) has improperly utilized inflated adoption rates for payback periods greater than four years; and (iii) has improperly included payback-based adoption rates for payback periods beyond ten years, which is beyond the reasonable payback period that would be assessed and experienced by the original purchaser of a ZEV truck. Thus, ACT concludes in its written critique that "there are multiple ways in which EPA has modified ACT's payback-based adoption equation that are not aligned with ACT's view of how the function should be used." (ACT Response to DRIA, p. 7.) [EPA-HQ-OAR-2022-0985-2668-A1, p. 42]

ACT has prepared the following table depicting how EPA's overstated and overextended adoption rates differ from ACT's: [EPA-HQ-OAR-2022-0985-2668-A1, p. 42] [See the Exhibit 3, Payback-based Binned Adoption Rates, at docket number EPA-HQ-OAR-2022-0985-2668-A4.]

Given the material discrepancies between ACT's analyses and EPA's misapplication thereof, an additional corresponding discount will need to be applied to the starting-point adoption rate percentages that EMA has generated through its revised and corrected version of HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 43.]

Organization: Truck Renting and Leasing Association (TRALA)

EPAs methodology within its Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS) also assumes that all customers will choose minimal on-site charging power to keep capital costs low. 27 The agency's assumption for 19-50KW charging across many vehicle applications in medium heavy-duty vehicles seems fundamentally incorrect based on what TRALA is hearing from end-users about intentions to install 150KW-350KW charging on-site. This assumption does not match many end-users plans to future-proof their charging infrastructure to enable use across more vehicles and opportunity charging for multi-shift or peak operational periods. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

27 EPA's Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS) was specifically developed by EPA to evaluate HD ZEV technologies and costs under Phase 3.

Some MD truck applications, such as Class 4-8 box trucks, port drayage tractors, Class 4-7 step vans, and Class 6-7 flatbed trucks are used for routes similar to those of regional haul tractors which are projected in HD TRUCS to need 150-350KW charging. However, in HD TRUCS the applications mentioned above are only assumed to require 19-50KW chargers. TRALA recommends EPA issue a request for information (RFI) to end-users to acquire information on charging power needs for commercial vehicle operations and test these sensitive up-front cost assumptions that are used to project end-user willingness to adopt ZEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

To demonstrate the importance of testing this assumed critical input, EPA should run a sensitivity analysis to project the payback for all vehicle applications that are assumed to require 19-50KW charging if they require higher power DC charging. If, as many in industry suspect, most medium heavy-duty end-users require higher power charging in the 150-350KW and beyond range to maintain 1:1 productivity, this will change HD TRUCS model payback and ZEV projections. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

Organization: Volvo Group

- The agency's payback vs. adoption rate table (RIA 2.7.9, Table 2-73), shows fleets purchasing BEVs and FCEVs at payback periods of up to 15 years in 2027, and beyond 15 years in 2032. This is unrealistic, as most fleets look for a payback period of two years or less.

Organization: Zero Emission Transportation Association (ZETA)

b. Electric HDVs Have Lower Total Cost of Ownership than Comparable ICE Vehicles

HDEVs can offer substantial economic advantages to fleet operators. Fuel and maintenance costs, in particular, are areas with substantial cost reduction potential. In a survey of fleet managers, the most commonly cited motivation for electrifying their fleets was to meet sustainability goals (83%); lower total cost of ownership (TCO) was the second-most common reason (64%).39 [EPA-HQ-OAR-2022-0985-2429-A1, p. 10]

39 Steven Nadel and P. Huether, "Electrifying Trucks: From Delivery Vans to Buses to 18-Wheelers," ACEEE, (June 2021) https://www.aceee.org/sites/default/files/pdfs/t2102.pdf

Fleet managers are particularly sensitive to costs, and economics drive the majority of their business decisions. Currently, evaluating the upfront cost—rather than lifecycle—of vehicle acquisition is standard practice for both private and public fleet managers. When analyzed this way, fossil fuel-powered vehicles often outcompete HDEVs; however, TCO analyses regularly demonstrate that HDEVs are significantly cheaper than their ICE counterparts. Transitioning from an upfront cost-based decision-making model to one that considers the vehicle's entire lifespan—including purchase cost, depreciation, financing, fuel costs, insurance costs, maintenance costs, taxes, fees, and operational expenses—provides a more accurate picture of the true costs incurred via vehicle ownership. Under such considerations, HDEVs like transit buses, school buses, and vocational vehicles are already cost competitive with equivalent ICEVs.40 [EPA-HQ-OAR-2022-0985-2429-A1, p. 10]

40 Id.

Even before the passage of the Inflation Reduction Act (IRA), the International Council on Clean Transportation (ICCT) found that HDEVs have a TCO advantage over ICEVs in some U.S. regions and they are expected to reach cost parity nationally by 2035.41 That should be expected to accelerate with the passage of the IRA's 45W commercial clean vehicle tax credit, as discussed further below. ICCT also found that TCO savings hold even assuming lower-than-expected oil prices or higher electricity rates in the future. Even without the IRA tax credits, most classes of HDVs will have a payback period of less than 5 years by 2025. Considering most HDVs today have an average lifespan of 15 years, these cost savings make a strong economic case for fleet operators to make the switch to electric technologies. [EPA-HQ-OAR-2022-0985-2429-A1, p. 10]

41 "Purchase Costs of Zero-Emission Trucks in the United States to Meet Future Phase 3 GHG Standards" ICCT, March 2023 https://theicct.org/publication/cost-zero-emission-trucks-us-phase-3-mar23/

These savings are expected to grow in the coming years. By 2030, an electric day cab is expected to lower the TCO by more than 31% for savings of $239,000 over a vehicle's lifetime.42 Fleets that experience the highest fuel and maintenance costs from their diesel trucks would see the greatest cost reductions from an EV transition. Class 8 electric trucks with trips fewer than 500 miles will see the greatest TCO savings, largely when operating in environments with higher fuel prices and relatively low electricity prices.43 Because the upfront cost is paid back via savings on operations mile-by-mile, fleets with higher VMT would see the greatest reductions, which bodes well for long-haul trucking.44 See Figure 1 for a breakdown of the average yearly VMT by different HD vehicle classes. [EPA-HQ-OAR-2022-0985-2429-A1, p. 11.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 11, for Figure 1]

42 "Advanced Clean Fleets Total Cost of Ownership Discussion Document," California Air Resources Board, (September 9, 2021) https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf

43 Chad Hunter et al. "Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks," National Renewable Energy Laboratory, (September 2021) https://www.nrel.gov/docs/fy21osti/71796.pdf

44 Robert Prohaska, et al. "Medium-Duty Plug-in Electric Delivery Truck Fleet Evaluation," IEEE, (2016) https://doi.org/10.1109/ITEC.2016.7520262

<u>EPA Summary and Response:</u>

<u>Summary:</u>

Note that much of this material is summarized in RTC 2.4 above, and responded to there as well.

There were many comments regarding EPA's use of a payback metric at proposal as a means of developing a compliance pathway predicated on use of ZEVs. DTNA and EMA said, considered alone, payback is an incomplete metric. Commenters stated that other factors to consider are reluctance to utilize a new technology, effects of inflation, vehicle suitability, resale value, end of the IRA and other price incentives, critical material availability, and, most importantly, availability of supportive electric infrastructure. Commenters stated that in costing out payback, projecting fuel, raw material, and electricity costs far out into the future is problematic (noting, for example, the overall effect of decarbonization efforts on electricity prices and how uncertain that effect will be).

NGO commenters advocated for more stringent standards (see section 2.4 in this document). ACEEE discussed the length of a payback period, asserting that payback well within vehicle lifetime should be sufficient, noting especially that vocational fleets may own vehicles "for many years." They also questioned the relatively low percentages of projected ZEVs where EPA had estimated payback periods of 1-2 years. MFN noted that EPA's projected compliance path showed less ZEV utilization than many estimates in the literature, citing BloombergNEF, various of the ICCT White Papers, as well as the California ACF levels. RMI noted generally that total cost of ownership of BEVs would necessarily be less than for ICE vehicles due to their simpler drivetrains, which would occasion less maintenance costs.

Other NGO commenters were more specific. A number of commenters questioned the 80 percent cut off EPA had proposed as a cap on consideration of ZEV adoption in the NPRM's potential compliance pathway. Both EDF and Energy Innovation found some merit to EPA's premise that a cap reflected that ZEVs would not be suitable for all applications, but both of these commenters maintained that this would be less and the less the case over time. Consequently, they assert that EPA's methodology should at the least reflect a declining cap in the standard's out years. Both of these commenters also maintained that 80 percent was too conservative even for MY 2027, especially when coupled with the 90th percentile sizing VMT for the battery. EDF also argued that a cap makes no sense for those instances where EPA projects lower upfront costs for ZEVs than for their ICE vehicle counterparts. ICCT, on the other hand, supported a cap of 90 percent. DTNA challenged the 80 percent cap both because it is inconsistent with DTNA's telematics data, and also because the sales requirements for various HD vehicle categories in the ACT legislation are less than 80 percent. DTNA questioned why EPA's cap for those categories can be higher, that is, less restrictive, than the applicable ACT sales requirement.

As noted here and in RTC 2.4 above, commenters criticized EPA's use at proposal of the ACT Research payback equation. The comments pertained to alleged lack of transparency – stating that the equation was proprietary and so did not appear in the DRIA making comment difficult without getting access – as well as comments about the ACT Research payback equation. ICCT obtained the equation and alleged there was no substantive basis for it. ACT Research itself stated that EPA had misapplied the equation by leaving out various factors, including consideration of total cost of ownership.

Energy Innovation preferred an alternative method for assessing a ZEV-based compliance pathway. Their model uses a logit function less sensitive to price, developed by the Pacific Northwest National Laboratory, and also uses a 15 percent discount rate. They also removed the 80 percent cap where their model showed immediate payback. Under this alternative methodology, the commenter projected higher ZEV penetration for many of the vehicle classes:

2-4, 6-7, refuse trucks, and almost all bus segments. Moreover, the commenter stated that these estimates did not consider the effects of the IRA.

Both EDF and ICCT agreed that technology adoption follows an S-shape, as EPA posited. DRIA at 231. However, they believed the TEMPO model (developed by NREL, and noted by EPA at proposal, id.) was a better way to assess that shape. They posited standards of significantly increased stringency using this model.

These commenters also noted that the effect of the IRA, considered along with this different methodology, would justify standards more stringent still, based on price parity achieved in even earlier model years. EDF maintained that "An updated study by Roush Industries for EDF in May 2023 assessed and quantified, where possible, the key impacts of the IRA on the cost of electrifying medium- and heavy-duty vehicles that have access to overnight recharging at a central location (assessing the same vehicle classes from the earlier 2022 report, including Class 8 transit buses, Class 7 school buses, Class 3–7 shuttles and delivery vehicles, and Class 8 refuse haulers), using the previous study costs as a baseline.41 The analysis found that IRA credits help absorb the near-term higher upfront cost of battery electric vehicles (BEVs) and will accelerate the purchase parity with the segments analyzed. According to the research, *all segments analyzed will now meet purchase price parity with their diesel counterparts if purchased as early as MY 2024*, assuming reasonable economies of scale for BEV production." See Att. M to the EDF comment. They continued that "As a result of the IRA, the purchaser of a BEV in MY 2024 could save an estimated $18,000 on a Class 3 delivery van and $500,000 on an urban transit bus over the life of the BEV compared to a comparable diesel vehicle (Figure 1). If we assume that diesel fuel prices return to the prices occurring during the summer of 2022 ($5.18/gallon versus $3.25/gallon the lifetime savings due to switching to a BEV would increase to $33,000 for a Class 3 delivery van and $700,000 for an urban transit bus)." Citing H. Saxena, S. Pillai. 2023. Impact of the Inflation Reduction Act of 2022 on Medium- and Heavy- Duty Electrification on MYs 2024 and 2027, Roush for EDF.

Energy Innovation maintained that the IRA would accelerate electrification in the heavy-duty sector by 39-48% by MY 2030, and 44-52% by MY 2032 (using their suggested methodology and then modeling various estimates (low, medium, and high) for IRA effects, plus effects of ACT).

TRALA expressed concern that EPA's assumption of 19-50kW charging for certain applications of vehicles in HD TRUCS may be inaccurate. They stated that since box trucks, port drayage tractors, step vans, and flatbed trucks are more like "Regional Haul" tractors, HD TRUCS should apply the same 150-350 kW charging to those applications. They indicate that the difference would impact upfront costs, which would affect customers' willingness to adopt ZEVs. They requested EPA obtain more information from end-users and perform a sensitivity analysis for the impact on payback and ZEV projections.

DTNA provides an example of a BEV with a payback period in the 3 - 6 year range, but states that they are currently experiencing Class 8 BEV tractor uptake of less than 1% in California, despite additional regulatory drivers for fleet adoption. DTNA also believes 73% should be the maximum Class 4-7 adoption rate and 36% should be the maximum Class 8 adoption rate.

ICCT noted that manufacturers' compliance with the ACT rule in California and the at least eight other states who have adopted ACT would allow manufacturers to sell fewer ZEVs and/or more-emitting ICE vehicles in non-ACT states than ACT states while maintaining compliance with the proposed standards (since the proposed standards are less stringent than ACT). This could impede investment in ZEV fleets and infrastructure in non-ACT states and generate an inequitable distribution of benefits among states.

The State of California et al. (2) noted numerous considerations that support HD ZEV adoption including the ACT regulation (and EPA's granting of waivers of preemption for CARB's ACT and Zero Emission Airport Shuttle regulation), manufacturer goals for ZEV sales, businesses' commitments towards electrifying their heavy-duty fleets, states' policies to promote electrification of the HD vehicle sector, and federal actions including the IRA and the federal government's Blueprint for Transportation Decarbonization.

Response:

We evaluated the comments regarding the appropriateness of ACT Research payback and adoption rate relationship, and we agree with commenters that the approach developed by NREL for use in the TEMPO model is more transparent and its methodology otherwise appropriate. For the final rule, we are continuing to use the same payback period method we used in the proposal, but have revised the adoption rates that correspond to the payback period bins based on data from NREL's TEMPO model instead from the ACT Research-based model. See RIA Chapter 2.7 for additional details.

Regarding EMA's request for a discount factor and DTNA's requests for certain maximum adoption rates, we note that the final rule assessment of payback includes a cap that simulates a discount factor (e.g., in the MY 2027 payback table at 20% and 37% cap in 2030). We also note that we are committing to post-rule implementation monitoring, including monitoring of infrastructure deployment, as discussed in Preamble II.B.2.iii.

We have retained the caps on adoption rates in our modeled potential compliance pathway. As explained in Preamble Section II.G.5 and RTC section 2.4, the caps serve as proxies for uncertainties that can affect feasibility of the standards, including timing of infrastructure deployment, purchaser risk aversion and other unwillingness to invest in new technology, availability of critical minerals and associated supply chains, and adequacy of battery manufacture. EPA has necessarily had to make predictive judgments as to all of these factors and believes there are reasoned solutions to all of them. At the same time, EPA is allowing for potential constraints posed be these uncertain factors and has done so by means of the caps, consistent with EPA's structuring of the standards to carefully phase in the stringency of the standards in the earliest years of the Phase 3 rule. EPA thus does not accept the comments of Energy Innovation and others that adoption rates in the modeled compliance pathway should be a function of payback alone. That would ignore the effects of all of these considerations, which EPA believes must be or are appropriate to account for and which EPA has thus done in a balanced and measured approach to support the stringency of the final standards. For a similar reason, we consider ICCT's suggested cap of 90% to reflect insufficient consideration of these potentially constraining factors.

The cap levels reflect EPA's best engineering judgment, consistent with these principles. Rather than the undeviating 80% cap which EPA proposed, 88 FR at 25992, we revised our final approach so that the cap level varies by model year, starting at a much lower adoption cap of 20% in MY 2027, and increases to a 70% adoption cap in MY 2032. See RIA Chapter 2.7.2.

These cap levels fall within the range suggested by a number of commenters. The maximum cap of 70% in 2032 reflected consideration of the noted range of comments from DNTA that suggested 36% for Class 8 vehicles. DTNA suggested that Class 4-7 ZEVs with payback rates of <0 years would have an adoption rate of 72 percent, and Class 8 ZEVs with payback rates of <0 years would have an adoption rate of 36 percent, noting that these rates are consistent with CARB's 2019 initial market assessment for the ACT rule for vehicles that scored a 1 or a 2 in their suitability assessment. However, we note that for the final ACT program, CARB increased the ZEV requirements compared to those that were initially proposed. In addition, for purposes of responding to this commenter's comparison to CARB's assessment and the ACT rule, we note that the category 1 and 2 suitability totals in CARB's 2019 assessment are aggregated totals and are therefore not directly comparable to the 101 vehicle-type level of aggregation to which we have applied the 70 percent cap in 2032 (and 20 percent cap in 2027) in HD TRUCS; the 2019 CARB market assessment report's category 1 and 2 totals would be more appropriate to compare to our final adoption rates by regulatory grouping. We note that our 70 percent cap for MY 2032 is consistent with the 70% of Class 4-7 ZEVs with suitability scores of 1-2 and therefore the ZEV adoption rates in any subcategory will necessarily be below that level as well (see RIA Chapter 2.10, for the percentage of ZEVs in the modeled potential compliance pathway by regulatory grouping and MY). We also note that our HHD vocational and sleeper cab tractor adoption rates in the modeled compliance pathway do not reach 36 percent. While the day cab subcategory adoption rate reaches 40 percent in MY 2032, we note that CARB's final regulation order requires 40 percent for all tractors starting in MY 2032.

Energy Innovation's payback versus adoption rate curves by vehicle segment allowed for 100 percent adoption if the payback was negative, with which we disagree for the reasons stated above. Our cap level is within the commenter's suggested adoption rate of 55 percent to 70 percent for payback that is less than one year.

With respect to DTNA's comment that they are currently experiencing Class 8 BEV tractor uptake of less than 1% in California, despite additional regulatory drivers for fleet adoption, this is not consistent with what California is experiencing in the heavy-duty market. California found that 7.5% of the medium- and heavy-duty vehicle sales in MY 2022 (two years prior to the first year of ACT implementation) in California were ZEVs.[358]

In addition, see RIA Chapter 2.7 and section 2.4 of the RTC, for further discussion of our consideration of comments that informed the final numeric values of the caps.

After considering comments from EMA, TRALA and others relating to on-site charging power, we have updated our consideration of EVSE costs as described in RTC section 6.3.

Regarding the effect of the IRA, we discuss this topic and respond to comments in RTC Section 2.7, preamble Section II.E.4, and RIA Chapter 2.

Energy Innovation, regarding estimates of HD ZEV adoption that would occur in the absence of the Phase 3 rule (i.e., the baseline), see RTC Section 3.11.1. This includes comments related

[358] California Air Resources Board. "Advanced Clean Trucks Compliance and Incentives Update." Last accessed on March 18, 2024. Available online: https://ww2.arb.ca.gov/resources/documents/advanced-clean-trucks-compliance-and-incentives-update.

to inclusion of the following factors in the baseline: the IRA and its estimated impacts (see also RTC Section 2.7), the ACT rule.

Regarding the impact of compliance with ACT on compliance with the Phase 3 standards, we agree that manufacturers may sell fewer ZEVs in non-ACT states than ACT states as shown in RIA Chapter 4. However, as discussed in RTC Section 2.4, the final standards are based on our feasibility assessment as explained in preamble Section II, which assesses ZEV adoption across the entire United States and not in each individual state. Some states may experience above-average ZEV sales while others experience below-average ZEV sales, but our feasibility assessment stands when considering the United States market as a whole. The possibility of state-to-state differences in technology adoption is a fundamental characteristic of federal standards, such as the Phase 3 standards. See also RTC Section 10.2.2 regarding U.S.-directed production volume.

Regarding the many considerations mentioned by the State of California et al. (2), see RTC Section 2.7. Additionally, our feasibility assessment supporting the final standards is explained in preamble Section II and is independent of many of these factors (notably, those which are not enforceable). Our baseline and its consideration of these items is described in RIA Chapter 4 and RTC Section 3.11.1.

3.12 General Errors and Missing Information

Comments by Organizations

Organization: Truck and Engine Manufacturers Association (EMA)

a) Corrections

EMA identified five corrections that are needed in HD TRUCS and as a result, are incorporated into EMA HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

Annual BEV Electricity Cost in A3a_Cost worksheet – HD TRUCS calculates the annual cost of electricity based on the energy that is consumed by the vehicle from the batteries rather than from the electricity that is used to recharge the batteries. The latter includes the wall-to-battery loss factor for the charging process. The current formula in HD TRUCS underestimates the annual electricity cost by approximately 11%. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

Battery Width Limitation Factor in A4a_Adoption Rates (BEV) worksheet – The formula used for the 2027 and 2032 adoption rates includes an assessment of the battery width as calculated by HD TRUCS. The limitation on the width for a BEV is 8.5 feet per the Draft RIA (p. 234). The formula incorrectly uses 13 feet rather than 8.5 feet in assessing the viability of the needed battery space fitting within the allowable vehicle space. This error allows various tractors to be included as BEVs when, in fact, there is insufficient space for the required battery. Those vehicles should be treated as FCEVs instead. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 23 - 24]

Battery Length Calculation in 2_BEV Tech worksheet – EPA included an assessment of battery volume in the NPRM (see Draft RIA Section 2.4.2, p.166). The volume assessment drives the calculation of the width of the battery based on the battery volume that is determined for each vehicle type within HD TRUCS. The calculation divides the battery volume by the presumed battery height (110% of the frame rail height) and by the battery length (wheelbase) of each vehicle type to calculate a battery width. However, if this entire rectangle is used for batteries on a BEV, there will be no room for the front or rear tires, since the prescribed dimensions violate the space envelope required for the tires. EMA recommends that the battery length factor be reduced to allow for a more realistic volume requirement for the batteries in HD TRUCS. Specifically, EMA reduced the length by 26 inches for non-tractors to allow space for the front tire. The overlap with the rear tire may be able to go between the frame rails behind the axle, since trucks have more frame extended behind the rear axle(s). For Class 7 tractors, which are a 4x2 axle configuration, the length should be reduced by 26 inches for both the front and rear axle, for a total reduction of 52 inches. The after-frame on tractors is very short to provide clearance for the landing gear of a trailer, so there is no space behind the axle for additional batteries. On Class 8 tractors, which have a tandem rear axle (6x4), the battery length needs a reduction of 26 inches for the front axle and 52 inches for the rear axle. The wheelbase on 6x4 configurations is measured to the centerline of the two rear axles, which necessitates additional reductions over Class 7 tractors. These battery-length errors allow HD TRUCS to include various tractors as BEVs when, in fact, there is insufficient space for the required battery. Those vehicles should be treated as FCEVs instead. The space needed for the frame rails also needs to be considered. Each of the two rails are about 3.5 inches wide. EMA believes this is a less significant issue in the battery width limitation evaluation, so it is not included in the corrections to EMA HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 24]

Operation VMT (50%) in A1a_VMT_ID worksheet – Operation VMT (50th percentile) for many vehicles is calculated as the average of the 50th percentile data from NREL's fleetDNA data and NREL UCR's data. For six (6) vehicle types, the formula in HD TRUCS has an inconsistency versus other vehicle types, resulting in the average VMT being incorrectly calculated. Vehicle IDs 11 through 16 use the fleetDNA data 50th percentile along with the NREL UCR maximum daily mileage value to determine the daily average operation VMT value. This gives an inflated average daily VMT. This error increases the electricity cost and impacts other factors used in determining payback years and adoption rates. [EPA-HQ-OAR-2022-0985-2668-A1, p. 24]

Absolute Sizing VMT (90%) in A1a_VMT_ID worksheet – Absolute Sizing VMT (90th percentile) for many vehicles is calculated as the average of the 90th percentile data from NREL's fleetDNA data and NREL UCR's data. For six (6) vehicle types, the formula in HD TRUCS has an inconsistency versus other vehicle types, resulting in the average VMT being incorrectly calculated. Vehicle IDs 11 through 16 use the fleetDNA data 90th percentile along with a text cell to calculate the average mileage value for this data element. This gives an inflated average absolute sizing VMT. This error increases the battery size, battery weight, battery cost and impacts other factors used in determining payback years and adoption rates. [EPA-HQ-OAR-2022-0985-2668-A1, p. 25]

As stated earlier, all the above corrections are incorporated into the EMA HD TRUCS tool. [EPA-HQ-OAR-2022-0985-2668-A1, p. 25]

Adoption Rate and Stringency Calculations – The Draft RIA provided details on EPA's methodology for using the ascribed ZEV adoption rates for the 101 vehicle types to generate the adoption rates at the vehicle regulatory subcategory level, but EMA was unable to find a spreadsheet or tool in HD TRUCS or in the docket that actually performed those calculations.

Also, no tool or spreadsheet was found that carried out the conversion of ZEV adoption rates to the calculation of the GEM-based GHG stringencies. Therefore, EMA has included its version of those spreadsheets in EMA's version of HD TRUCS. Multiple new worksheets are involved in the EMA approach to replicating the EPA results on stringencies, and modifications to an existing worksheet were needed for the summation process. [EPA-HQ-OAR-2022-0985-2668-A1, p. 33]

EMA's summation of the 101 vehicle types into the regulatory subcategories matches all EPA values. The conversion to stringencies also is a 100% match for 2027 and 2032, while the interpolation for the intervening years are close but not exact. EPA has included special rules for incorporating Custom Chassis vehicles into the vocational stringencies. Although an outline of the process is in the Draft RIA, it was not found to be clear enough to allow EMA to replicate the EPA calculations. [EPA-HQ-OAR-2022-0985-2668-A1, p. 33]

EPA Summary and Response

Summary:

EMA stated that they identified five corrections or omissions in the NPRM version of HD TRUCS. These included: (1) the annual electricity cost is underestimated because charger and battery efficiency are not included in the formulas; (2) there is a formula error in the NPRM version of HD TRUCS for the maximum battery width; (3) EPA's assessment of packaging battery volume did not account for wheels and tires when determining the length of the battery; (4) incorrect calculation of the 90th percentile VMT on six HD TRUCS vehicle types; and (5) EMA stated that HD TRUCS did not include formulas for the aggregation of the 101 vehicles into regulatory subcategories, calculation of the proposed standards, nor the interpolation of model years between MY 2027 and MY 2032, though EMA acknowledges those calculations were described in the DRIA and that EMA was able to replicate the calculation of the standards for MY 2027 and MY 2032 and was able to come close to replicating the calculation for the intervening model years.

Response:

We appreciate EMA's thorough analysis of HD TRUCS which included some errors in our formulas and calculations. The NPRM version of HD TRUCS did include both the battery and charger efficiency in the annual electricity cost in A3a_Cost. These values were calculated earlier in the spreadsheet and were used to calculate the operating energy of a BEV on a daily basis. We have continued to use both the battery efficiency and charger efficiency to calculate the annual electricity cost for the final rule, though we have updated our methodology. For further detail on how the battery and charger efficiencies were used in the FRM for annual electricity cost, see RIA 2.8.8.1. The battery volume assessment (related to the battery width and length comments) has been updated in the final rule; please see Section 3.10.3 of this RTC for more information. EPA agrees with EMA that we had errors in the calculation of the 90th percentile VMT for six vehicles; therefore, in the FRM version of HD TRUCS we have rectified the error in the 90th percentile VMT formula for those six vehicles which had the effect of reducing their sizing VMT. For the final rule, in addition to describing the calculations in the RIA, we have also included in HD TRUCS all of the calculations for the standards for all model years.

4 BEV Technologies

4.1 Technology Readiness and Model Availability

4.1.1 Model Availability

Comments by Organizations

Organization: American Trucking Associations (ATA)

A significant point of frustration is the need for more specification options available for battery electric truck chassis. There is no such thing as a generic truck in the U.S. Heavy-duty vehicles produced for the U.S. market are highly customized to meet fleets' unique duty cycles and maximize ROI. Customizations can include nearly every critical vehicle component, such as its body, suspension, engine, transmission, and axles. ZEVs present unique economic and engineering challenges when integrated into an existing fleet. Because the ZEV market is nascent, customization options will not be available at scale under EPA's proposed adoption timelines. Specifications and customizations will continue to be important as fleets incorporate ZEVs into their operations. [EPA-HQ-OAR-2022-0985-1535-A1, p. 8]

While most battery electric vocational and short-haul vehicles follow a similar configuration and design, there are trade-offs on battery capacity, range, and wheelbase size, which can still greatly impact operations. One company invested in a startup partner to acquire a large number of highly customized electric delivery vans to meet its last-mile delivery needs, which are scheduled to be fully delivered in 2030. This level of customization is generally not available to all fleets purchasing vehicles, even in vocational and short-haul segments. Another company initially focused on electrifying last-mile vehicles but pursued another technological solution instead of ZEV because of the limited options. [EPA-HQ-OAR-2022-0985-1535-A1, p. 8-9]

Product availability

EPA's proposed and alternative adoption cases, Tables 1 and 2, assume OEM-announced product availability will be a major driver of the ZEV transition. However, product availability alone is insufficient to enable heavy-duty ZEVs at scale. In 2021, over 150 HD BEV models were available; but they accounted for less than 0.1 percent of Class 7 & 8 sales, which does not suggest an adoption rate that can accommodate the industry's needs from MY 2027 to 2032.10 ZEVs must meet a highly customized set of performance requirements and product specifications to scale. Said one fleet, "allow more time for unproven technologies to be real-world tested," which in the fleet context means—verify that ZEVs meet the current operational duty cycle vehicles are assigned to perform.

One truck leasing and rental company we spoke with noted that some light-duty commercial products are available for operations needing only 100 miles of range, but significantly fewer in heavier weight class applications requiring 200 miles or more. OEMs are currently developing and testing medium- and heavy-duty vehicles under varying specifications; however, options remain limited. For example, the introduction of electric power take-off systems is a recently available technology that utilizes an electric motor to power auxiliary equipment. [EPA-HQ-OAR-2022-0985-1535-A1, p. 8]

Organization: BorgWarner Inc.

BorgWarner sees strong growth in certain HD weight classes of the BEV market.

We see strong growth of BEVs in several commercial heavy-duty vehicle segments (CV). EPA's forecasts appear in line with industry experts for Class 2 through 6. BorgWarner recognizes that CV BEV forecasts are rapidly shifting. Industry forecasts increasingly expect more CV BEVs and consequently we believe that, even with adjustments, EPA is underestimating the level of ZEV penetration at certain weight classes. [EPA-HQ-OAR-2022-0985-1578-A1, p. 3]

Organization: CALSTART

The ZE-MHDV space is constantly changing, and the numbers of models increases as new OEMs enter the market as well as add additional models (Figure 1). For instance, Mack Trucks in the United States offered essentially one model at the beginning of 2023, the Electric LR product for refuse applications. However, at the recent ACT Expo, Mack launched two additional electric models, the Class 6 and Class 7 MD electric.8F9 [EPA-HQ-OAR-2022-0985-1656-A1, p. 6.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 6, for Figure 1]

9 https://electrek.co/2023/03/08/mack-trucks-first-medium-duty-electric-truck/

The number of models globally has grown by nearly 40 percent since 2021. As of June 2023, there were more than 840 total ZE-MHDV models worldwide, 444 of which were specifically MHD trucks and 128 specifically heavy-duty (Class 7–8) trucks. In the U.S. and Canada alone, there are nearly 210 models, 86 of which are MHD trucks and 37 specifically heavy-duty. Interestingly, while the total number of models is highest in China, the U.S. and Canada rank second and ahead of Europe in total models and lead the world in growth of OEMs appearing in the region (Figure 2). [EPA-HQ-OAR-2022-0985-1656-A1, pp. 6 - 7.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 7, for Figure 2]2023 ZET market update: While overall volumes remain low compared to the full on-road inventory, the rate of growth of ZET sales reflects the rapid growth of available models and vehicle capability. According to the May 2023 edition of CALSTART's Zeroing in on Zero-Emission Trucks report, the cumulative deployment of new ZETs (January 2017–December 2022) has now reached nearly 5,500 vehicles with more than 3,500 ZETs deployed in 2020 alone (Figure 4). The year-over-year sales growth shows strong and accelerating momentum for the technology, growing by 397 percent in 2021 and 163 percent in 2022. These numbers are for deployed vehicles and do not include the large backlog of orders for trucks that are yet to be delivered. [EPA-HQ-OAR-2022-0985-1656-A1, p. 8.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 9, for Figure 4]

As new vehicle models are steadily being introduced, so too are vehicle capabilities increasing. ZETI tracks range, energy storage, and payload and has seen significant increases year-over-year in all categories (Figure 3). For instance, in 2020, the longest-range trucks were at the 200-mile mark, and those with highest payload limited to 150 miles. In 2023, a full payload Class 8 battery-electric tractor has reached 500 miles of range, and the median range across the category is more than 150 miles. [EPA-HQ-OAR-2022-0985-1656-A1, p. 7.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 8, for Figure 3]

Interestingly, 59 percent of these deployed vehicles were in states that have adopted the ACT regulation, though regulatory requirements have not yet gone into effect in these states. Seven percent of the deployments were in states that have signed the Multi-State MOU for ZE-MHDVs, while a meaningful 34 percent were in the remaining states. These trends continued with the 2022 deployments: 44 percent were in ACT-adopting states; 10 percent were in MOU states that have yet to enact ACT; and 46 percent were in non-MOU states. The non-MOU states with the highest numbers of deployed ZETs include Texas, Florida, Michigan, New Hampshire, Illinois, Ohio, and Georgia. 10 [EPA-HQ-OAR-2022-0985-1656-A1, p. 9]

State of the Zero-Emission Industry

As the preamble and contextual portion of the EPA Phase 3 NPRM establishes very well, zero-emission technology for MHDVs has made significant strides since the Phase 2 rulemaking and is now a real option for deployment and rapid scaling. Indeed, ZEVs are the declared and primary strategy for the major original equipment manufacturers (OEMs) to reach their commitments to carbon neutrality by 2040. While some OEMs include a mix of fossil-free vehicles in the 2040 timeline, they are predominately planning on battery-electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs). [EPA-HQ-OAR-2022-0985-1656-A1, p. 6]

Zero-Emission Technology Inventory (ZETI) overview and projections: As part of its role supporting global governments, fleets, and industry in tracking the progress and momentum toward this goal, CALSTART and its Drive to Zero program operate and maintain the ZETI tool, which tracks existing and planned ZEV (BEV and FCEV) model offerings in all primary commercial vehicle classes (including cargo vans and shutles but not pickups). It currently tracks vehicle offerings across seven geographic regions (U.S.-Canada, Europe, China, India, Mexico, South America, and Oceania), 10 vehicle application classes, 63 OEMs, and hundreds of vehicle models through 2024. [EPA-HQ-OAR-2022-0985-1656-A1, p. 6]

Global industry impacts on the United States: The rapid pace of change in ZE-MHDV capability, production, and sales is part of a global trend with significant implications and benefits for the U.S. market. Most of the major truck makers in the United States are part of global OEM groups and as such are able to tap global engineering and supply chain assets and therefore enact more rapid technology transfer and product development. [EPA-HQ-OAR-2022-0985-1656-A1, p. 9]

As an example, Navistar and its International Trucks brand are part of the global Traton Group (Volkswagen Truck and Bus). Scania, a key brand of the group, has announced a long-haul bate ry-electric tractor for the 2024 model year capable of moving 80,000 pounds (40 tons) for four and a half hours, then recharging in 45 minutes.11 Scania has recently tested megawat charging standard (MCS) chargers from ABB and can already offer MCS-capable trucks. The plan is to introduce the next generation of MCS by late 2024.12 As part of the group, these common powertrain components are all available to Navistar International, which has signaled its own long-range bate ry-electric truck could be available in the United States as soon as 2025.13 [EPA-HQ-OAR-2022-0985-1656-A1, pp. 9 - 10]

11 https://www.scania.com/group/en/home/newsroom/news/2021/Scanias-electrifica..on-roadmap.html

12 https://new.abb.com/news/detail/103008/abb-e-mobility-and-scania-successfully-undertake-first-test-in-development-of-megawat-charging-system

13 https://www.forbes.com/sites/alanohnsman/2022/05/13/big-rigs-going-electric-as-navistar-cummins-daimler-rev-up-next-genera..on-trucks/?sh=19d47132419d

This is not an isolated example. Daimler Trucks, the global parent of Freightliner, Freightliner Custom Chassis, and Thomas Built Buses, among many others, recently unveiled its long-haul version of the E-Actros electric truck with an 80,000 pound range (40 tons) of 310 miles.14 Several major firms including Amazon and Rhenus have agreed to pilot the truck as it prepares for series production in 2024.15 As with other groups, the Freightliner E-Cascadia shares a common architecture and similar components with all Daimler ZETs including the E-Actros,16 and E-Actros long-haul capabilities could be expected in the U.S. market by 2025. [EPA-HQ-OAR-2022-0985-1656-A1, p. 10]

14 https://www.electrive.com/2022/09/20/daimler-truck-presents-eactros-longhaul-prototype/

15 https://www.ajot.com/news/db-schenker-goes-electric-for-the-long-haul

16 https://www.freightwaves.com/news/daimler-will-package-own-components-for-electric-trucks

Volvo has used a similar strategy to share a common electric powertrain and bate ry configuration among its European and North American truck models to reach market more quickly, sharing a common architecture.17 Volvo also recently added two new electric trucks to its North American Mack brand by procuring powertrains from SEA Electric under a five-year agreement for its MD6 and MD7 Class 6 and Class 7 vocational trucks.18 This partnership allows Volvo to more rapidly extend electric offerings into medium-duty truck segments. SEA Electric also provides powertrains to Hino Trucks in North America and converts multiple OEM trucks on its own in eight countries, including the United States, Canada, Australia, New Zealand, Indonesia, and India. [EPA-HQ-OAR-2022-0985-1656-A1, p. 10]

17 https://www.sae.org/news/2020/06/volvo-batery-electric-trucks

18 https://www.sea-electric.com/sea-electric-partners-with-mack-trucks/

PACCAR has used a similar approach in the near term to speed its production of electric products, partnering with both Meritor (now a part of Accelera by Cummins) and Dana to provide electric powertrains for its Kenworth and Peterbilt brands.19 20 Kenworth has also announced a partnership to use Toyota fuel cell assemblies and electric powertrains in its Class 8 T680 tractor.21 [EPA-HQ-OAR-2022-0985-1656-A1, p. 10]

19 https://www.meritor.com/en/meritor-today/news/2022/20220202B

20 https://kenworth.com/about-us/news/ces/

21 https://landline.media/kenworth-peterbilt-fcev-hydrogen-fuel-cell-trucks-coming-soon/

The ability to transfer technology from the light-duty (passenger car) realm to MHDVs is an additional factor that has enabled a much faster pace for commercial truck electrification. It can be seen in the Tesla Semi, which uses multiple passenger car motors to build up its truck system.22 General Motors (GM) and Ford have both rapidly entered the commercial electric vehicle space, Ford with the eTransit electric delivery van23 and GM with its “spinoff” BrightDrop electric van.24 This tech transfer capability is also spurring unusual partnerships that connect and leverage global capabilities. In late May 2023, Daimler Trucks and Toyota Motors agreed to merge their Mitsubishi Fuso and Hino Motors groups to produce future trucks and buses with a shared vision of how to achieve carbon neutrality. The goal of the merger was to focus on zero emissions and advanced capabilities (i.e., connected/autonomous and automated/shared/electric).24F25 [EPA-HQ-OAR-2022-0985-1656-A1, pp. 10 - 11]

22 https://www.teslarati.com/tesla-semi-production-specs-released/#:~:text=The%20Tesla%20Semi%20features%20a,installed%20on%20the%20rear%20axle.

23 https://www.fleet.ford.com/showroom/commercial-trucks/e-transit/2023/?gclid=CjwKCAjwhJukBhBPEiwAniIcNTksRJjRcigOZsYD4AFhvTIYbCtbb2tH8AtKItQICvMwv9cmmobk7RoCALoQAvD_BwE&searchid=15905657649|138026271971|1020273926068|&ef_id=CjwKCAjwhJukBhBPEiwAniIcNTksRJjRcigOZsYD4AFhvTIYbCtbb2tH8AtKItQICvMwv9cmmobk7RoCALoQAvD_BwE:G:s&s_kwcid=AL!2519!3!617879648806!e!!g!!ford%20e-transit!15905657649!138026271971&gclsrc=aw.ds

24 https://www.gobrightdrop.com/products/brightdrop-zevo?utm_source=google&utm_medium=paid&utm_term=zevo&utm_campaign=brand_awareness

25 https://www.carscoops.com/2023/05/toyota-and-daimler-to-merge-hino-and-fuso-truck-businesses-into-a-single-unit/

These observations illustrate that EPA needs to revise its assumption that ZET penetration rates into Class 8 long haul will be delayed until fuel cell platforms are at scale. EPA's assumption of the battery size and weight needed to enable Class 8 long haul and the minimum distances required specifically need to be revised. The reality is heavy regional transport and point-to-point priority corridor operation, a key part of the changing long-haul application, are fully capable with products already in the market or arriving in the U.S. market by 2025 and improving over the course of the proposed regulation. [EPA-HQ-OAR-2022-0985-1656-A1, p. 11]

The key takeaways are:

- The pace of the OEM strategy shift to electrification is staggering and accelerating.
- Year-over-year sales of zero-emission products are rapidly expanding at a non-linear pace spurred by a steadily growing portfolio of models from global and North American manufacturers.
- This portfolio includes expanding capabilities, including heavy-duty tractors capable of hundreds of miles of travel. TCO parity between battery-electric and diesel tractors could come by 2030 for most payloads.26
- European designers are balancing smaller battery loads with faster-charge opportunities that match driver break periods and will enable high-utilization freight movement on priority corridors. [EPA-HQ-OAR-2022-0985-1656-A1, p. 11]

26 https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf

Organization: MEMA

EPA recognizes ZEV deployment in commercial vehicle will have an added challenge compared to Light Duty due to the necessity for manufacturers to efficiently allocate capital expenditures (CAPEX) towards the highest market segment opportunities, and release BEV chassis according to resources available and prioritized business case. Therefore, EPA should expect that serial production of specialized vocational applications will take longer due to diffuse volume across many vehicle configurations. [EPA-HQ-OAR-2022-0985-1570-A1, p. 17]

Organization: California Air Resources Board (CARB)

C. Projected Technologies for Meeting Standards

1. ZE Technologies

Affected pages: 25961-25974

Although CARB staff generally concurs with U.S. EPA's assessment of ZE technologies, U.S. EPA's findings regarding BEV and FCEV technology may be conservative and underestimate the status of the ZEV market. As discussed extensively in the ACF regulation's rulemaking documents, ZE technologies are commercially available today, and the market is developing rapidly.62 As of October 2022, 148 ZE medium-duty vehicles (MDV) and HDV models are available to purchase, with 135 models having already reached customer hands. These vehicles are available in all weight classes and a variety of configurations. Today, these models are somewhat focused on higher volume applications, while more specialized applications are being demonstrated across a wide array of applications. [EPA-HQ-OAR-2022-0985-1591-A1, p.28]

62 CARB, Public Hearing to Consider the Proposed Advanced Clean Fleets Regulation Staff Report: Initial Statement of Reasons, 2022. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf

<u>EPA Summary and Response:</u>

<u>Summary:</u>

ATA was concerned about the currently available models of ZEVs and their ability to cover the diversity of the heavy-duty industry. They argued that vehicles need to be heavily customizable to be able to meet the specific needs of each fleet and that the ZEV industry is new, such that customization will not be broad enough during the timeframe of the rule to support the adoption rates set out in the proposed compliance pathway. ATA also expressed concern about the current rate of uptake of BEVs and how that is projected to the timeframe of the rule. They stated that of the 150 available BEV models, they accounted for less than 0.1 percent of class 7 and 8 vehicle sales and suggests that industry's needs will not be met between MY 2027 to 2032. ATA expressed concern over the lack of available ZEV models to choose from especially for MD and HD applications that require 200+ miles of range. Borg Warner expressed concerns about the estimated ZEV adoption at specific weight classes from classes 2 – 6. Borg Warner commented that EPA forecasts match industry expert forecasts, but that they believe we are underestimating ZEV penetration in LHD and MHD segments. CALSTART commented about the availability of ZEVs. Their comments indicated that the number of models available is increasing as is the number of OEMs entering the ZEV market. Their comment stated that the number of models available in the U.S and Canada is second only to China. CALSTART also discussed the number of sales of HD ZEVs and that the year over year growth in ZEV deployments is a strong indicator of accelerating momentum for ZEVs. CALSTART also talked about the increasing capabilities of ZEVs and how range, energy storage, and payload have all seen significant increases year over year. They also discussed where the sales of ZEVs are occuring, whether in states that have adopted the California ACT regulation, states that have signed the Multi-State MOU for ZE-MHDVs, or any of the remaining states. Their comment states that sales of ZEVs are split almost evenly between ACT states and non-MOU states indicating that the number of ZEVs deployed will increase in all states, not just in ACT states.

CALSTART also pointed out that most major truck manufacturers in the United States are part of global OEM groups and are therefore able to access to global engineering and supply chains which allow them to be more capable of rapid technology transfer and product development. MEMA expressed concern about the order in which different vehicle types would become electrified. Their comment argued that since manufacturers have limited budgets for product development, the vehicles that have the highest market segment and that benefit the most from GHG-saving technology will be the highest priority for electrification while specialized vocational applications will take longer to electrify since volumes are smaller and more vehicle customization is required. They further suggested that CO_2 standards should be set lower for high volume applications that require less specialization and operate in moderate environments and the standards for low volume highly specialized vehicles should be set higher to account for the differences in electrification priority from manufacturers.

Response:

ATA asserts that HDV applications are typically highly customized, and that this degree of customization is not (and, in their view, probably cannot be) fully reflected in either HD TRUCS or in OEM announcements about planned ZEV introductions. EPA understands that the market for battery electric trucks is still developing and that, at present, they account for a small fraction of the overall sales in the HD industry. Based on this information, we have changed the approach from the proposal to more gradually increase the stringency of the standards to address concerns about vehicle availability as well as infrastructure build out, particularly in the initial years of the Phase 3 standard. We have modified the stringency of the standards in those initial years from that proposed. These changes will allow manufacturers more lead time to ramp up production for MY2032 to meet the stringency of the final rule. We also note that the Phase 3 program includes compliance flexibilities, including changes from those proposed.

We agree with ATA that HDV applications are diverse. This fact, however, does not only pertain to ZEVs but also to ICE HD vehicles. That is to say, any HD vehicle emissions rule must be evaluated in light of the diverse uses of these vehicles. EPA has done so in this rule, as described in RIA Chapter 2 with our evaluation of 101 vehicle types in HD TRUCS. Among other things, we have carefully considered the suitability and lead-time for various vehicle types, and we have adopted feasible and appropriate standards for each regulatory subcategory supported by technology penetrations in each subcategory under the modeled potential compliance pathway. For instance, we are not establishing new Phase 3 standards for certain subcategories (e.g., HHD vocational vehicles and day cab tractors) until later years of the program; we are also leaving in place the Phase 2 standards for certain optional custom chassis vehicles. In addition, for all subcategories, our modeled potential compliance pathway includes ICE vehicles in all years of the program; as such, purchasers who require ICE vehicles to perform specific tasks (e.g., those with extreme daily VMT requirements) can continue to do so. We also note that, as discussed further in RIA Chapter 2.11, while our modeled potential compliance pathway includes HD ZEVs, we also assessed several additional example potential compliance pathways that support the feasibility of the standards relative to the reference case without the use of HD ZEVs . Manufacturers may choose to follow one of the pathways evaluated by EPA or may choose their own compliance strategy to meet the standards and may do so without HD ZEVs. We further address the diversity of the HDV market in RTC 4.1.2.

There are currently 22 class 6-8 straight truck BEVs available from 13 different manufacturers through the California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) program with battery ranges from 100-250 miles.[359] We expect additional models with ranges meeting or exceeding 200 miles to become available during the timeframe of our rule. A list of BEVs available through MY 2024 can be found in RIA Chapter 1.5.5.

Borg Warner suggested that the EPA underrepresented the number of ZEVs that would be present in the market during the timeframe of the rule. We are taking a balanced and measured approach to setting the final standards, which reflects consideration of the statutory and other relevant factors and uncertainties such as those concerning availability of infrastructure (distributive infrastructure buildout in particular). Compared to the proposed Phase 3 standards, in general, after further consideration of the lead times necessary for the standards (including both the vehicle development and the projected infrastructure needed to support the modeled potential compliance pathway that supports the feasibility of the standards), we are finalizing CO_2 emission standards for heavy-duty vehicles that, compared to the proposed standards, include less stringent standards for all vehicle categories in MYs 2027, 2028, 2029 and 2030 than those proposed. For further discussion on critical minerals, see Preamble Section II.D.2.ii and RTC section 17.2, and see RTC 7 (Distribution) and 7.1 for further discussion on infrastructure deployment. The standards we have set in MY2032 reflect EPA's consideration of Borg Warner's suggestion that we underrepresented LHD and MHD ZEVs in the modeled compliance pathway at proposal. Upon further analysis in HD TRUCS, we have found that the payback of LHD and MHD vehicles is quicker than projected in the proposal and have therefore increased standard stringency for the relevant subcategories to reflect that a more stringent standard is feasible at reasonable cost.

CALSTART commented that the availability and deployment of ZEVs has been increasing year over year and represents an increasing momentum in the deployment of ZEVs in the marketplace. They also commented that the performance of ZEVs has been increasing year over year and that the sales of ZEVs have been nationwide and not just in ACT states or MOU states. As discussed in the previous paragraph, we have tailored our phase-in approach of the final standards to allow for a more gradual ramp up compared to the proposed standards. See further responses regarding standard stringency in RTC 2.4. We appreciate the point CALSTART raised about truck manufacturers in the United States being part of global OEM groups which allows increased access to engineering and supply chain assets. Even though we expect OEM groups to share information and resources across their brands, we have no way of quantifying how this will affect the speed at which manufacturers will be able to produces ZEVs. Because of this, we have kept our analysis focused on inputs that are quantifiable in nature based on information received in comments on the proposal, research reviews, and stakeholder outreach.

MEMA commented that the order of vehicle electrification should be considered based on vehicle customization when setting the standards as well as the volume of each vehicle type and operating conditions. When setting standards for this rulemaking, we took a balanced and measured approach which considered the resources of manufacturers as well as infrastructure and decreased the level of the stringency of the standards in the early years of the Phase 3 program compared to the proposal, especially for the heavy heavy-duty vocational vehicles.

[359] https://californiahvip.org/vehicle-category/straight-truck/?size=247,261,230&t_type=378

Furthermore, as discussed in preamble Section II.F, we are not finalizing new emission standards for several of the optional custom chassis subcategories. This change allows more time for manufacturers to complete development of different ZEV models. . We set our standards based on best available data for inputs into HD TRUCS received from comments, literature review, and stakeholder outreach. We used a VMT weighted temperature distribution to represent miles traveled across the nation at different temperatures and modeled our vehicles accordingly rather than creating different standards based on zones of operation to create a cohesive program applied evenly across the country. We note further that a transitional flexibility introduced in Phase 3 allows compliance to be averaged across all of the HDV averaging sets, so that performance of the types of harder-to-optimize vocational vehicle applications can have their performance offset by any of the easier-to-optimize HDV applications.

4.1.2 Technology Readiness

Comments by Organizations

Organization: American Trucking Associations (ATA)

Performance is key to whether heavy-duty ZEVs meet a given duty cycle's range, performance, and battery capacity requirements. Drivers regularly run short and long-haul routes, often including regional and interstate journeys. For example, a carrier transporting perishable agricultural products to and from a West Coast port runs routes to inland destinations like Colorado, St. Louis, Reno, and California's Central Valley. This operation's range and battery performance needs differ significantly from shorter hauls primarily within ten miles of a point of origination. Battery weight is a crucial factor. A bulk agricultural hauler moving mixed commodities to and from a facility can easily come up against weight limits with added batteries. [EPA-HQ-OAR-2022-0985-1535-A1, p. 10]

In addition to range and battery capacity, other performance factors also play a role in heavy-duty ZEVs. Power output, acceleration, and overall vehicle performance are crucial to ensuring vehicles can meet the demands of their duty cycles, regardless of climate or topographical conditions. ZEVs must be capable of the same payload while climbing steep inclines, maintaining high speeds on highways, and handling challenging extreme temperatures in a way that compares favorably with ICEVs. [EPA-HQ-OAR-2022-0985-1535-A1, p. 10]

Organization: American Petroleum Institute (API)

d. Technical Feasibility

i. Vehicle readiness

1. Technology readiness

The proposed rule identified various HD ZEVs available in the marketplace or in production, as well as select manufacturer goals and commitments to producing HD ZEVs by a certain timeframe. However, given the nascent technology, there is significant uncertainty regarding EPA's expectation for rapid availability of ZEV powertrains. Further, it should be noted that these vehicles are small in number, some are not able to perform the work that a comparable

ICEV would perform (due to charging, range, and duty-cycle constraints), and all are for localized operations; long-haul ZEVs are in the pilot stage and have significant challenges. OEM goals and commitments, coupled with IRA/BIL funding may help to increase the availability of HD ZEVs; however, it will be extremely challenging to meet the proposal's implementation schedule. We have concerns that vehicles may not be available at the rates that EPA is projecting for the 2027-2032 timeframe. [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

Even with a fully stocked HD ZEV market, key barriers to entry include customer uptake, capital costs to purchase vehicles, and infrastructure readiness. [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

Organization: Daimler Trucks North America

EPA Request for Comment, Request #19: We request comment on our approach that focuses primarily on BEVs, which currently are more prevalent in the HD vehicle market, and whether there are additional vehicle types that should be evaluated as FCEVs along with BEVs.

- DTNA Response: DTNA agrees in principle with EPA's primary focus on BEVs at this time, as these vehicles are more prevalent in the market. EPA should not consider FCEVs until at least MY 2032, due to the current state of the technology and refueling infrastructure. EPA also should not project ZEV uptake for any vehicle types outside of the BEV and FCEV categories included in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

Organization: Manufacturers of Emission Controls Association (MECA)

Future BEV/FCEV Powertrain Efficiency Standards

Today, vehicle manufacturers are deploying the first generation of electric and fuel cell commercial vehicles. On the other hand, suppliers are already looking ahead and developing the next generation of advanced efficient powertrain components such as batteries, power electronics, transmissions, e-motors and integrated drive units. Technology innovation has strived for greater efficiency and power for the past 50 years of combustion engines and similarly, electric component suppliers continue to innovate electric technology. Some of these innovations will be revealed in the five funded projects under the DOE's SuperTruck III program. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 12 - 13.]

As such, it is important that EPA begins to consider ways to incentivize and reward more efficient vehicles just as it has for combustion engine technology. In the light-duty sector, where EVs have been around for much longer, we are already seeing significant differences in the energy efficiency of similarly sized vehicles. This is a result of some manufacturers deploying more advanced technology and investing in efficient powertrain integration which reduces the impact on the environment across the vehicle life-cycle from manufacturing to recycling and disposal. [EPA-HQ-OAR-2022-0985-1521-A1, p. 13.]

EPA Summary and Response:

Summary:

Several commenters alleged ongoing technical difficulties in ZEV performance reflecting their views of the current state of the market ("nascent" in a commenter's terminology). For example, EPA received a comment from ATA that raised concerns about the performance characteristics of ZEVs; the performance characteristics included power, range, payload, battery weight, acceleration, gradeability, maintaining highway speeds, and performance in extreme temperature. API described uncertainties surrounding ZEV technology and that long-haul vehicles are in pilot stage. On the other hand, MECA expressed that the first generation of ZEVs have already been deployed, and they also believe there will be efficiency improvements and that it is important to incentivize more efficient vehicles.

Response:

Both EPA and manufacturers[360] themselves project that by 2027 vehicle applications of ZEV technologies will be significantly more mature and suitable for performing work compared to a comparable ICE vehicle. EPA's assessment includes consideration of comments on the proposed rule, meetings with stakeholders, and our analysis using HD TRUCS discussed in detail in RIA Chapter 2. See also comments from Tesla citing an EDF report on the "rapidly declining costs of ZEV trucks and buses".[361] HD TRUCS is designed precisely to allow for analysis of each of the 101 applications considered there and whether each application can perform comparable work to its ICE vehicle equivalent, as noted more fully in the following paragraph.

In the analysis conducted for this rulemaking, EPA found that commercial BEVs and FCEVs have similar performance and durability characteristics to ICE vehicles in most instances. In performing our analysis for the modeled compliance pathway, we benchmarked ICE vehicle performance characteristics such as vehicle activity, payload capacity, acceleration from 0-30 mph and 0-60 mph, gradeability, and peak power during the regulatory test cycles. This information was used to size BEVs and FCEVs to determine the suitability of each technology for different commercial vehicle applications. These calculations were performed in HD TRUCS and can be found in RIA Chapter 2.

We carefully undertook this assessment, and note that we did not find that ZEVs would be suitable for all HDV applications during the timeframe of the Phase 3 standards. Reasons for this for certain applications include prohibitively large battery sizes to do comparable work on a single charge, issues of diminished payload, and for those applications (and portions of applications) that it is relevant to, the ability to operate in extreme weather conditions. For vehicle types that we considered not suitable for ZEVs during the timeframe of the Phase 3 standards in our analysis, as described in more detail in preamble Section II and RIA Chapter 2, we do not project use of ZEVs in our modeled potential compliance pathway for the final rule.

Our modeled potential compliance pathway supporting the feasibility of the final standards thus includes a mix of technology to meet the final standards, including BEVs, FCEVs, and ICE

[360] See, e.g., Miller, Neil. Memorandum to the Docket EPA-HQ_OAR-2022-0985. "Stakeholder Meeting Log". March 2024 for a complete list of stakeholder meetings.

[361] EDF, New Study Finds Rapidly Declining Costs for Zero-Emitting Freight Trucks and Buses (Feb. 10, 2022) Available online: https://www.edf.org/media/new-study-finds-rapidly-declining-costs-zero-emitting-freight-trucks-and-buses

vehicles. With respect to projected ZEV suitability, generally, vehicles with shorter range and stop and go type of operation are most suited for depot-charged BEVs while vehicles with higher VMT and constant speeds are more suitable for en-route charged BEVs and FCEVs. Current ZEV market offerings meet many ICE baseline performance metrics, and through our analysis we predict that future models will continue to meet or exceed ICE performance metrics.

4.2 Upfront ZEV Cost

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

Additionally, California's TCO assessment of six different vehicle types shows that, even before accounting for cost reductions that will likely come from the ZEV sales requirements in the states that have adopted ACT, BEVs and FCEVs will be cost-competitive with ICEVs as soon as 2025 thanks to the declining cost of batteries and fuel cell components.20 ACEEE supports EPA's consideration of ACF levels of ZEV penetration nation-wide to set appropriate targets in the final rule.

20 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appg.pdf

Organization: American Highway Users Alliance

Consistent with that recent testimony, ATA has advised the Highway Users that it estimates the cost of a new EV truck at $450,000, and the cost of a comparable new diesel truck at $165,000. [EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

Further, for truck operators that finance the acquisition of a new EV, the added interest cost will be significant and a factor in whether to make a purchase (not to mention that such higher costs will then be passed on to consumers).

Consistent with the information from the American Trucking Associations, above, ATD stated that truck costs are much higher for a new Class 8 electric truck than for its diesel counterpart. Importantly, ATD noted that new tax incentives, if available for a model, would represent just a 'fraction' of the cost differential between an EV model and a diesel counterpart.

Organization: American Petroleum Institute (API)

2. ZEV penetration/customer uptake and adoption rates

HD ZEVs are currently not available in sufficient quantities or at affordable levels to significantly displace ICEVs. Further, the cost to purchase a ZEV is currently prohibitive – not only is the purchase price currently higher than that of an ICEV, some fleet owners and operators are finding that HD ZEVs result in more work or trips needed to accomplish the same task as with an ICEV. This is largely due to battery range and charging, but can also be affected by temperature, road grade, and other factors. A study by ATA noted vehicle and fleet owner concerns with regard to total cost of ownership, despite IRA and BIL funding.13 14 [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

13 Advanced Clean Transportation (ACT) Expo 2023 Mainstage - Monday - 2023 State of Sustainable Fleets: https://vimeo.com/824774094.

14 Advanced Clean Transportation (ACT) Expo 2023 Keynote Address: https://vimeo.com/824772504.

Owners may choose to continue to use and extend the life of ICEVs, along with lower carbon fuels and/or other low carbon technologies, to avoid these issues. And at lower costs than those of ZEVs. [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

3. Capital cost to purchase vehicles

The average cost of a HD tractor is about $180,000, while the electric version of the same vehicle can be nearly $400,000. Expending this additional capital for a vehicle that may not meet the duty-cycle, is significantly heavier (and thus reduces the payload of the vehicle), and may require additional vehicles to achieve the same job, creates massive challenges that may not be able to be overcome. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 10 - 11.]

Organization: Banks, Ben

Electric trucks cost in excess of three times the amount we currently pay for a new Peterbilt day cab. Those additional expenses would be passed along in transportation expenses, astronomically impacting our already existing inflation issues related to supply chain constraints.

Organization: State of California et al. (2)

And similar patterns are observed in the supply chain for fuel-cell electric vehicles, an alternative vehicle technology that can be used to meet stringent GHG emission standards, especially for long-haul trucks.222 The technology for hydrogen-powered electric trucks is already available, with buy-in from industry,223 and costs associated with these vehicles are expected to fall.224 Moreover, businesses are investing in the manufacture of hydrogen to power these vehicles.225 [EPA-HQ-OAR-2022-0985-1588-A1, p.31]

222 Thomas Walker, Zero Emission Long-Haul Heavy-Duty Trucking, Clean Air Task Force (Mar. 13, 2023), Executive Summary, https://www.catf.us/resource/zero-emission-long-haul-heavy-duty-trucking/.

223 See, e.g., Press Release, Premiere: Volvo Trucks tests hydrogen-powered electric trucks on public roads, Volvo (May 8, 2023), https://www.volvotrucks.com/en-en/news-stories/press-releases/2023/may/volvo-trucks-tests-hydrogen-powered-electric-trucks-on-public-roads.html; Today's Trucking, AMTA orders Nikola Tre battery-electric, and hydrogen fuel cell trucks for demonstrations, AMTA (Apr. 25, 2023), https://www.trucknews.com/sustainability/amta-orders-nikola-tre-battery-electric-and-hydrogen-fuel-cell-trucks-for-demonstrations/1003174531/; Press Release, Amazon, Amazon adopts green hydrogen to help decarbonize its operations (Aug. 25, 2022), https://www.aboutamazon.com/news/sustainability/amazon-adopts-green-hydrogen-to-help-decarbonize-its-operations; Lewin Day, Toyota Gets OK From California to Sell Hydrogen-Electric Semi-Truck Powertrains (Apr. 24, 2023), https://www.thedrive.com/news/toyota-gets-ok-from-california-to-sell-hydrogen-electric-semi-truck-powertrains; Michelle Lewis, SEA Electric just added a hydrogen power option for electric trucks (April 28, 2023), https://electrek.co/2023/04/28/sea-electric-just-added-a-hydrogen-power-option-for-electric-trucks/.

224 IRENA, Making the breakthrough: Green hydrogen policies and technology costs, International Renewable Energy Agency (2021), Green hydrogen cost reduction (irena.org); Emily Beagle et al., Fueling the Transition: Accelerating Cost-Competitive Green Hydrogen, RMI.org (2021), https://rmi.org/insight/fueling-the-transition-accelerating-cost-competitive-green-hydrogen.

225 Rod Walton, Cummins starting up its first U.S. Hydrogen Electrolyzer Manufacturing site in the U.S., EnergyTech (Oct. 11, 2022), https://www.energytech.com/energy-efficiency/article/21252555/cummins-starting-up-first-us-hydrogen-electrolyzer-manfacturing-site-in-the-us; Airswift, 5 US Green hydrogen projects starting in 2023 (Feb. 7, 2023), https://www.airswift.com/blog/green-hydrogen-projects-usa; Kirsten Korosec, Bosch to invest $200M in US fuel cell production for electric commercial trucks, TechCrunch (Aug. 31, 2022); Press Release, Toyota to Assemble Fuel Cell Modules at Kentucky Plant in 2023, Toyota (Aug. 25, 2021), https://pressroom.toyota.com/toyota-to-assemble-fuel-cell-modules-at-kentucky-plant-in-2023/; U.S. National Clean Hydrogen Strategy and Roadmap, https://www.hydrogen.energy.gov/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.

Organization: Chevron

Chevron is concerned that the rapid increases in forecasted BEV sales rate are optimistic and may overstate the benefits of the proposals. The proposals may limit choices and increase costs for consumers, including those in economically disadvantaged groups and smaller businesses. A study by the American Transportation Research Institute (ATRI8) found zero tailpipe emission vehicle costs will be a strong barrier to entry and customer acceptance. While a new Class 8 diesel truck tractor may cost roughly $135,000 to $150,000, the purchase price of a new Class 8 BEV can be as much as $450,000. The same issue will likely impact the FCEV. Estimates for fuel cell truck costs range from $200,000 to $600,000 with 60 percent of the overall cost solely credited to the fuel cell propulsion system. [EPA-HQ-OAR-2022-0985-1552-A1,pp.6-7]

8 American Transportation Research Institute (ATRI). Understanding the CO2 Impacts of Zero-Emission Trucks. 2022. Available here: https://truckingresearch.org/wp-content/uploads/2022/05/ATRI-Environmental-Impacts-of-Zero-Emission-TrucksExec-Summary-5-2022.pdf

Organization: Lynden Incorporated

Electric trucks cost roughly three times as much as a diesel truck, the chargers themselves cost as much as a diesel truck and the electrical upgrades needed to power the chargers cost millions of dollars.

We are the leading bulk milk hauler in the Pacific Northwest, responsible for picking up 2 million gallons of milk per day on rural roads for dairy farms. Any disruption in reliability of service would be catastrophic to dairy farmers and the milk supply chain and any increase in operating costs will quite literally raise the price of a gallon of milk and other necessities for American families. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

Similarly, we provide transportation for most of the food, medicine, and other essential goods that reach Alaskan communities, including rural and Native Alaskan communities. This will exacerbate the inflationary impact on food prices that we have seen in the last few years for the people who can afford it least. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

Organization: NTEA - The Association for the Work Truck Industry

EPA NOx Rule

The EPA recently promulgated regulations that could add as much as $40,000 to the cost of a new truck. The regulations aim to further reduce NOx (nitrogen oxides) emissions from heavy duty engines. [EPA-HQ-OAR-2022-0985-1510-A1, p. 2]

Heavy duty truck emissions are already 98% cleaner than in 2010 and truck manufacturers are diligently working on the development of ZEV's (zero emission vehicles) that will eliminate tailpipe emissions. [EPA-HQ-OAR-2022-0985-1510-A1, p. 3]

Unintended Consequences

This proposal would once again increase the cost of a new truck. [EPA-HQ-OAR-2022-0985-1510-A1, p. 3]

As indicated, today's trucks that are already 98% cleaner than older trucks. Currently, more than 50% of the trucks operating are pre-2010. An old (pre-2010) truck emits some 30 times more emissions than today's engines. EPA should be incentivizing the sale of current trucks not making them more expensive and creating a disincentive to the replacement of old trucks. [EPA-HQ-OAR-2022-0985-1510-A1, p. 3]

Community Based Air Quality

Many localities that face significant air quality concerns are in and around areas of heavy truck traffic, such as ports, warehouses, terminals and urban areas. Because of the economic challenges in many of these places the trucks operating locally are often older. As mentioned, pre-2010 trucks emit significantly more tailpipe emissions than newer trucks. The best and fastest way to improve air quality in these areas is to replace the numerous older trucks with newer and cleaner ones. Unfortunately, regulations that make new trucks marginally cleaner but dramatically more expensive than existing post 2010 trucks will only serve to keep those much older (pre-2010) trucks in operation longer. [EPA-HQ-OAR-2022-0985-1510-A1, p. 3]

What is needed from these regulations are trucks that are affordable, durable and meet the customer's vocational needs. The regulations must not act as a financial barrier to cleaner trucks and ultimately ZEV's. Rather, federal regulations should focus on reducing the current high costs associated with new trucks and ZEV development while building the infrastructure needed to operate the next generation of work trucks. [EPA-HQ-OAR-2022-0985-1510-A1, p. 3]

Organization: Tesla, Inc. (Tesla)

Medium- and Heavy-Duty BEV Costs Are Rapidly Declining

Tesla agrees with the agency that the feasibility of BEV deployment in the medium and heavy-duty sector is more cost-competitive than ever.125 In addition to the marketplace announcements, regulatory environment, and federal fleet adoption driving significant electrification, cost-related issues will ensure that electrification of the heavy-duty sector occurs rapidly. As one analysis sums up, 'Electrification is also making inroads into heavier vehicles. In urban duty cycles, battery electric trucks of any size become the cheapest option for several use cases in the 2020s.'126 [EPA-HQ-OAR-2022-0985-1505-A1, p. 18]

125 88 Fed. Reg. at 25930.

126 BNEF, Electric Vehicle Outlook 2021 available at https://about.bnef.com/electric-vehicle-outlook/

Similarly, other studies find that when considering upfront purchase price alone, by 2027 electric freight trucks and buses will be less expensive than their combustion engine counterparts in almost all categories.127 As the agency finds, the new federal commercial vehicle purchase incentive enacted under the IRA – Section 45W – will further reduce upfront purchase costs up to $40,000 per vehicle.128 This incentive should drive down costs significantly more than many predicted. For example, Rhodium has modeled that by 2030, a modest 10% investment tax credit for medium- and heavy-duty BEVs and an excise tax exemption for such vehicles would drive BEVs to or below TCO parity with conventional vehicles in some smaller vehicle classes and reduce the gap in others.129 [EPA-HQ-OAR-2022-0985-1505-A1, p. 18]

127 EDF, New Study Finds Rapidly Declining Costs for Zero-Emitting Freight Trucks and Buses (Feb. 10, 2022) available at https://www.edf.org/media/new-study-finds-rapidly-declining-costs-zero-emitting-freight-trucks-and-buses

128 Id. at Section 13403.

129 Rhodium, Pathways to Build Back Better: Investing in Transportation Decarbonization (May 13, 2021) available at https://rhg.com/research/build-back-better-transportation/

Organization: Texas Public Policy Foundation (TPPF)

Electric trucks typically have a higher upfront purchase price compared to traditional diesel trucks. The HD Tailpipe Rule will effectively bar diesel trucks from sale, forcing trucking companies seeking to replace their fleet to take on more costs to do so. This will strain the financial resources of some companies, especially smaller ones. Shifting from diesel trucks to electric ones will also require adapting to new technologies and training drivers to effectively operate electric vehicles. This transition period will likely lead to disruptions in the supply chain and additional costs — both temporal and monetary — for trucking companies. [EPA-HQ-OAR-2022-0985-1488-A1, p. 5]

Finally, EPA should assess impacts to the national economy as a result of potentially accelerating ZEV freight transport that would cease to be reliable or functional outside of a geographically confined network of charging/fueling infrastructure and support systems. [EPA-HQ-OAR-2022-0985-1488-A1, p. 7]

Organization: Valero Energy Corporation

HD ZEVs are more expensive than their ICEV counterparts. The International Council on Clean Transportation's ("ICCT's") literature survey of purchase costs for zero-emission trucks found the cost to purchase new battery-electric tractor trucks ranged from $200,000 to $800,000, and similarly, the cost of new hydrogen fuel cell trucks ranged from $200,000 to $600,000.117,118 Even considering tax credits established under the Inflation Reduction Act for new commercial vehicles (26 U.S.C. 45W), there is still a significant cost difference between ICEV and their ZEV counterparts.

In addition, vehicle costs are often too high for the HD payback period (the length of time required for an investment to recover its upfront costs).119 Battery packs for HDVs must be specifically suited for high lifetime mileage, deeper discharges per cycle, overall ruggedness, resistance to temperature extremes, and for production at low sales volumes. These characteristics push costs for HDV battery packs toward the uppermost end of cost-range. The relatively high daily range needed by commercial vehicles results in battery costs that drive vehicle incremental costs as high as 50%–100% of the price of a conventional truck.120 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 25 - 26.]

117 ICCT Working Paper 2022-09, A Meta-Study of Purchase Costs for Zero-Emission Trucks, at 4 (February 2022) https://theicct.org/publication/purchase-cost-ze-trucks-feb22/.

118 Per CARB's own estimate, final capital costs for a hydrogen fuel cell Class 8, day cab tractor used in regional operation were $629,189 in 2018 compared with $134,000 for an analogous diesel vehicle. In 2024, CARB estimates that a hydrogen fuel cell tractor truck will cost $431,480 compared to $144,101 for a new diesel tractor. CARB, Appendix H: Draft Advanced Clean Trucks Total Cost of Ownership Discussion Document at 1 (October 22, 2019) https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/apph.pdf. Consistent with CARB's estimates, the ICCT recently forecast that composition costs for a hydrogen fuel cell tractor-truck in 2025 will exceed $400,000. CARB has also recognized that operating costs for a regional-hydrogen tractor in 2024 will exceed those for tractor trucks powered by diesel or battery electric. Sharpe, Ben & Basama, Hussein, ICCT Working Paper 2022-09, "A meta-study of purchase costs for zero-emission trucks" at 12 (February 2022), https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf.

119 U.S. DOE, Medium- and Heavy-Duty Vehicle Electrification: An Assessment of Technology and Knowledge Gaps, at 35 (December 2019), https://www.osti.gov/biblio/1615213.

120 Id. at 24.

Organization: Westport Fuel Systems

The EPA has asked for comments on the incremental vehicle cost and IRA incentives

The cost of compliance in the Phase 3 Rule is estimated at $6 billion for manufacturers after accounting for an estimated $3 billion from battery tax credits from the Inflation Reduction Act (IRA). Given the state of technologies in the heavy-duty class 8 sleeper cab segment, the incentives listed at in the IRA at $40,000 per "qualifying" ZEVs such as BEVs and FCEVs are not significant enough to warrant purchasing and will require matching funds from other jurisdictions. The incremental costs7 are suggested to be on average $15,0008 (including the IRA Advanced Manufacturing and Production Credit and the Qualified Commercial Clean Vehicle Credit) more for a ZEV MY 2032 sleeper cab compared to a conventional vehicle. These costs are expected to be recouped over 7 years or less in operational cost savings. Given the current costs of fuel cell vehicles in the class 8 category, these estimates seem at face value to be underestimated. Even if this figure is accurate, that leaves 75% of the market requiring alternative technology and fuel solutions (RNG, H2 combustion) or continue to operate diesel vehicles powered by ICE engines. [EPA-HQ-OAR-2022-0985-1567-A1, p. 11]

7 See Phase 3 Rule, page 25998 – Incremental costs include 2 IRA incentives, lower operating costs and calculated payback period

8 Proposed Standards to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles for Model Year 2027 and Beyond - Regulatory Announcement (EPA-420-F-23-011, April 2023)

The average incremental cost listed in the table below is very ambitious compared to current market pricing and payback periods. For comparison, the estimated cost of an H2 HPDI powered vehicle is likely to be closer to that of an LNG powered vehicle, which will have additional costs for fuel storage, compared to diesel vehicles. Current pricing for lighter duty FCEVs is orders of magnitude higher. [EPA-HQ-OAR-2022-0985-1567-A1, p. 11.] [See Docket Number EPA-HQ-OAR-2022-0985-1567-A1, page 11, for Table 3.]

EPA Summary and Response:

Summary:

EPA received comments from multiple stakeholders that were concerned that the initial purchase price of a ZEV was too high relative to its ICE counterpart to be economically feasible, regardless of payback period (AHUA, API, Ben Banks, Chevron, Lynden Inc., NTEA, Valero, TPPF). Various commenters pointed to large difference in current ZEV tractor prices versus the price of a comparable diesel vehicle. EPA received a comment from API that raised concerns about an additional cost for multiple trucks to make up for the payload loss due to battery weight in BEVs. EPA received comments from AHUA and Valero that the current tax incentives are not high enough to make up for the increase in initial purchase price from an ICEV to a ZEV (plus comments from many other entities, including EMA, that the federal excise tax would offset those IRA savings). AHUA also commented that any interest payments made on ZEVs would be much higher than for ICEVs due to the increased upfront cost. Lynden Inc. commented that the cost of upgrading infrastructure and the cost of battery chargers was too high to be economical. We received comments from Tesla saying that most freight trucks and buses would reach cost parity with ICEVs by 2027.[362] Tesla also cited a paper from Rhodium group that stated a 10% tax credit and excise tax exemption for BEVs would drive BEV TCO to parity with ICEVs in smaller vehicle classes and reduce the gap in others. ACEEE cited California's TCO assessment of six different vehicle types that they will be cost-competitive with ICE vehicles as soon as 2025 due to declining battery and fuel cell costs. Ben Banks commented that additional expenses for upfront purchase price would be passed on to consumers and impact inflation. TPPF and Chevron raised concerns about the impact of high initial purchase price on small companies, the cost of training drivers, as well as the impact of the rule on the national economy due to infrastructure concerns. NTEA commented that the increased cost of new trucks would decrease customer acceptance and slow fleet turnover keeping older higher emitting trucks on the road. They stated that this, in turn, would cause EJ concerns as these higher emitting trucks would remain in service rather than be replaced by cleaner vehicles.

Response:

First, the commenters sometimes conflate the separate issues of purchaser price and the various components of purchaser costs. In assessing payback in our modeled potential compliance pathway for both the proposal and the final rule (as well as TCO in the final rule), we consider cost to the purchaser, not merely the vehicle price. See RIA Chapters 2.7, 2.9 and 2.12. Purchaser price is generally equivalent to the upfront cost of the vehicle in our analysis; however, as we explain in preamble Section V we do not attempt to estimate how manufacturers will price their products. Purchaser costs in our analysis include that upfront vehicle cost as well as other upfront costs (e.g., EVSE upfront costs) and operating costs, which we analyze both in our HD TRUCS analysis (see RIA Chapter 2 for a full discussion) and for our program costs analysis (see RIA Chapter 3 for a full discussion). In RIA Chapter 2.7 and 2.12, we assessed payback and total cost of ownership with regard to such purchaser costs. We project the ZEV upfront vehicle purchaser cost to be similar to or lower than the price of comparable ICE vehicles for some vehicle types. See, e.g., RIA Chapter 2.9.2. See also various studies cited by

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[362] EDF, New Study Finds Rapidly Declining Costs for Zero-Emitting Freight Trucks and Buses (Feb. 10, 2022) Available at: https://www.edf.org/media/new-study-finds-rapidly-declining-costs-zero-emitting-freight-trucks-and-buses

EDF (summarized in RTC 2.4) projecting price parity for many HDV ZEV applications, in some cases, before Phase 3 even commences. Additionally, the upfront cost to a purchaser for many BEVs under the modeled potential compliance pathway would also include supporting depot charging infrastructure, namely the cost to purchase and install EVSE. Purchaser costs for ZEVs also include consideration of other operating costs. We also included consideration of tax credits, as applicable within these various purchaser costs.

Part of the basis for these commenters' assertions is pricing, but they are quoting current HD ZEV prices, which reflect the prices of primarily initial model years of HD ZEV vehicles. Some commenters document persuasively that these prices (in our analysis, in RIA Chapter 2, manufacturer costs and then correspondingly purchaser upfront vehicle costs) will come down sharply when production volumes increase and later iterations of ZEVs reflecting learning reach the market in the rule's time frame. The costs that we have used in the proposal and updated for the final rule analysis come from assessing the best projections currently available including DOE values as well as values received in comments from manufacturers and manufacturer trade organizations. See RIA Chapter 2.7 and Preamble Section II.E.6 for further discussion on payback and payback calculations used in the final rule. Also see RTC Section 19.5 for additional discussion on purchaser acceptance.

The commenters' assertion that higher purchase "price" (Valero, API, Chevron) and therefore interest payments (AHUA) of vehicles would by themselves dissuade purchases regardless of payback is not borne out in the literature. Similarly, Chevron raised concerns about the impact of high initial purchase price on small companies. In response to comments received on the proposal, we included financing costs as part of our TCO analysis to reflect that not all vehicles are purchased outright. See RIA Chapter 2.12. The results of our analysis show that costs for owning and operating a ZEV will be lower than a comparable ICE vehicle for all MY 2032 BEVs and FCEVs in our technology packages to support the modeled potential compliance pathway. In fact, all vehicles show several thousands of dollars in net TCO savings at the five-year point. As EPA has explained in this rulemaking and in previous rulemakings, even where initial purchase cost is higher, overall purchaser costs can be considered as non-constraining or supportive when those costs are recovered in a reasonable amount of time. See generally, 81 FR at 73621-22 (Phase 2 tractor standards) and 73719 (Phase 2 vocational vehicle standards). Long term payback or savings within the period of first ownership, and positive TCO in that period, can lead to decisions to purchase, which was also emphasized in many of the public comments. See Comments of ACEEE and Tesla as well as RIA Chapters 2.7 and 2.12.

The comment that some HD ZEVs will be less effective due to limited range and payload also reflects current (pre-2024) conditions for some vehicles. This is not reflective of the state of technology reasonably projected by EPA (and reflected in some manufacturers' comments) during the rule's timeframe. See, e.g., Tesla's comments that it has already introduced a tractor with a 500 mile range. See EPA-HQ-OAR-2022-0985-1505-A1, p.6. We analyze issues of payload capacity (see RIA Chapter 2.9.1 and RTC 4.3.2) and range (see RTC 4.3 below) during the rule's timeframe and find that most vehicles in HD TRUCS would incur a payload loss of less than 10% as shown in RIA Chapter 2.9.1.1 and that the vehicle types analyzed have a battery sized to perform one day's worth of work as detailed in RTC 4.3 below. See also our response to comments on payload in RTC section 3.10.1.

With respect to financial incentives in the IRA, EPA does not maintain that these offset all differences for all vehicle types in purchaser upfront cost, or overall costs. But they certainly partially defray those costs in instances where they do not offset all differences. As described in RIA Chapters 2.4.3.5, 2.5.2.3, and 2.6.2.1.2 EPA has appropriately considered that purchasers will make use of these incentives as applicable, (see also RIA Chapter 2.4.3.1 regarding battery costs and associated IRA tax credit for manufacturers). Therefore, our manufacturer and purchaser cost analyses, including payback analysis, for the modeled potential compliance pathway, reflect some utilization of the applicable tax credits. See RTC 2.7 and sources there cited.

With respect to federal excise tax, as explained in RIA Chapters 2.4 and 2.5, the final rule accounts for federal excise tax and state taxes in our costs analysis and continues to find payback and significant operational savings under the modeled potential compliance pathway.

With respect to whether the upfront purchase price would be passed by HD vehicle purchasers onto consumers, the final rule does not regulate how and whether any specific fleet operator passes costs to consumers. However, given the assessment of payback and operational savings, we expect that the rule will reduce the economic costs of HD vehicle fleets and the work they perform, such as the cost to transport goods via truck.

NTEA commented with respect to the possibility of delayed purchase of vehicles that comply with the standards due to their higher cost relative to owners continuing to use a current vehicle. As discussed in RIA Chapter 6.1.1, this is referred to as “low-buy,” a scenario in which there would be a decrease in HD vehicle sales after the regulation becomes effective. In a low-buy scenario, sales of HD vehicles would decrease in the months after the regulation becomes effective, compared to what would have happened in the absence of the regulation, due to purchasers either pre-buying or delaying a planned purchase. We expect low-buy, to the extent it might occur, to be mitigated under the same circumstances discussed in RIA Chapter. 6.1.1, including our payback analysis which shows that any increases in upfront incremental costs to purchasers will be offset through operational savings in relatively short periods of time (within a few years of ownership, and within the period of first ownership). We also note that low-buy, were it to occur, is a short-term phenomenon. With respect to possible purchaser anxiety over being unable to purchase an ICE vehicle after promulgation of the regulation, we note that these final standards do not mandate the production or purchase of any particular technology in vehicles, but rather require that the manufacturer comply with performance-based emission standards. As described in Preamble Section II.F, we modelled a potential compliance pathway to meet the standards with a diverse mix of ICE vehicle and ZEV technologies, and also assessed additional example potential compliance pathways to meet the standards that do not include increasing utilization of ZEV technologies relative to the reference case. In addition, the phasing-in of the standards will allow ample time for purchasers to make decisions about their vehicle of choice and the potential compliance pathway modeled for this rule reflects that the majority of vehicles will remain ICE vehicles, even in MY 2032. See further discussion in the preamble for the final rule.

EPA expects the costs of driver training for BEVs to be minimal because for the most part driving a BEV is very similar to driving an ICE vehicle. The driving methods that help improve the efficiency of ICE vehicles are the same as the driving methods to extend range of a BEV. The difference is in the refueling process, but recharging vehicles is conducted successfully by millions of EV drivers daily. Furthermore, the BEV driver benefits from quieter driving conditions, which should reduce driver fatigue. We also noted the persuasive comments of the Clean Air Task Force (pp. 71-72) documenting positive driver response to HD BEVs:

"ZEVs have many additional attributes that appeal to drivers and operators. RMI has recognized that "[a] truck is also an office," explaining that "[t]he operator has to be happy being in the cab, or else they just quit. Driver retention is a huge problem in trucking." But research by RMI and NACFE has made clear that "drivers love electric trucks." NACFE research sponsored by PepsiCo, Cummins, and Shell found that electric trucks are quieter ("no need to crank up the radio and drivers can hear what's going on around them"); offer better visibility and cleaner, simpler operation; have smoother torque; have superior air conditioning; and "d]riving in traffic seems easier and safer" Members of the trucking industry have made the following positive comments about HD ZEV operation:

- "They don't vibrate, they don't smell, they accelerate properly, so you're not constantly the slow one in traffic off a red light. Drivers don't come home at the end of the day and feel exhausted or feel like they've been operating a jackhammer for the past eight hours."
- "The truck is so quiet, everything is smooth. It gives you time to focus on what's going on around you. With the diesel trucks there's rattling, there's driver fatigue, things you don't even know are going on. But as soon as I got in the electric truck, I realized this is the way of the future."
- "EVs won't tow your boat? This beast will actually tow a bloody big boat, and a gross load of up 44 tonnes. And it will do so with ease. It will also do it in relative silence, with no crunching of gears, no loud braking, and no emissions . . . . These huge machines are remarkably simple to drive. First of all, they are quiet. If you are outside, the noise reduction is 50 per cent [sic]. If you are inside, the noise reduction is nearly one-third. That means a lot for the community, and for the well-being and working conditions of the driver."
- "I've had a positive experience and enjoyed driving the truck. It's a whole different experience and it's a step up . . . . Driving the electric truck is smooth, quiet and it doesn't shift, so it's smooth from the take off . . . . The only noise you hear is the little whine from the motors, the tires rolling down the road and your radio. You kind of get used to it after a while and have to get back in the diesel to really notice the difference again . . . . You're helping the environment and the electric is definitely smoother and quicker.
- "The guys love it, because it's like a Tesla. The truck is quiet."
- "I can't help but think that EVs may be a great way to attract the next generation of both drivers and technicians. The fact that EVs are 'clean' is a big plus; the fact that they are 'cool' might just be the boost we need to put the driver and technician shortages to bed."

(Citations omitted)

Comments concerning vehicle and upstream emissions are addressed in RTC 17.1 and Preamble Section II.G.

4.3 Range

4.3.1 General EV Range

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

To demonstrate that ACF is realistically achievable, California uses findings from their one-time fleet reporting requirement for ACT to highlight that most fleets of MDVs and HDVs can be serviced by ZEV models on the market today.18 The Initial Statement of Reasons (ISOR) issued by the Air Resources Board for the ACF regulation finds that the majority of trucks operating in California drive, on average, less than 100 miles a day and most of the ZEVs available today have batteries and energy storage systems big enough to satisfy those driving requirements.19 [EPA-HQ-OAR-2022-0985-1560-A1, pp. 6 - 7]

Organization: American Highway Users Alliance

Vehicle range is short. Vehicle range for one EV was reported at 150 miles, compared to 1,000 miles and up for a diesel vehicle; the shortage of public charging for EVs and other alternate fueled vehicles was also cited. [EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

Organization: American Trucking Associations (ATA)

One truck leasing and rental company we spoke with noted that some light-duty commercial products are available for operations needing only 100 miles of range, but significantly fewer in heavier weight class applications requiring 200 miles or more. OEMs are currently developing and testing medium- and heavy-duty vehicles under varying specifications; however, options remain limited. For example, the introduction of electric power take-off systems is a recently available technology that utilizes an electric motor to power auxiliary equipment. [EPA-HQ-OAR-2022-0985-1535-A1, p. 8]

Organization: Banks, Ben

Most of the freight we haul is international intermodal, with gross weight ranging from 70,000 to 90,000. With current electric truck capacity, we would have a service radius of 125 miles vs. a current radius of 250+ miles. Additional relay points would be required, and with the 50% reduction in service radius, we would need twice the number of trucks to service lanes that exist today.

Organization: Lynden Incorporated

An electric truck's range is 1/5th that of a diesel truck. This means additional fueling stops, additional driver time, and in many cases, additional trucks to do the job that a single diesel truck can do.

Even if the trucks were operationally feasible, they are not economically viable.

- Even with generous state and federal subsidies, our analysis shows an increase in operating costs of between $1 and $4 per mile with an electric truck. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

The additional cost associated with the capital investment, loss of payload, reduced range, and increased labor costs far exceeds any fuel savings that might be achieved with electric trucks, even with significant subsidies and especially for rural communities. These additional costs will be passed down to the consumer in the cost of delivered freight which will have a significant damaging inflationary impact on our customers, small businesses, individuals, and the overall economy. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

Recommendations:

- Consider the additional weight of emission reduction options and associated impact on payload on overall emissions. In other words, trucks that weigh more haul less freight and must make additional trips producing additional emissions to accomplish the job.
- Create exemptions for applications where ‘Zero-Emission Vehicles’ are not feasible, including extreme cold or hot weather, long-range routes, gravel roads, steep grade, rural communities, and high-horsepower heavy-haul applications. [EPA-HQ-OAR-2022-0985-1470-A1, p. 5]

Organization: Valero Energy Corporation

Current BEV technology is not suitable for long-haul trucks. Considering the present lithium-ion battery technology, to achieve a range of 600 miles, a battery pack on a long-haul truck would need to store 1,200 kilowatt-hours (kWh) of energy, weigh 6,300 kilograms (13,900 pounds), have a volume of 2,700 liters (95 cubic feet), and cost about $180,000.107 [EPA-HQ-OAR-2022-0985-1566-A2, p. 24]

107 Assumes a battery pack energy density of 170 Wh/kg. Burke, Andrew, Assessment of Requirements, Costs, and Benefits of Providing Charging Facilities for Battery-Electric Heavy-Duty Trucks at Safety Roadside Rest Areas: A Research Report from the National Center for Sustainable Transportation, at page I (Feb. 2022) https://ncst.ucdavis.edu/research-product/assessment-requirements-costs-and-benefits-providing-charging-facilities-battery.

At a range of 150 miles, a long-haul BEV truck would need to stop three times to recharge over a 600-mile day. Even if a network of 350-kilowatt (kW) fast-chargers was widely available, charging time would reduce a driver’s effective work day by over 2 hours, further requiring an increase in the number of trucks to maintain the pace and demand of freight services.109 [EPA-HQ-OAR-2022-0985-1566-A2, p. 24]

109 Based on the Volvo Class 8 Box truck, having a range of 150 miles and an energy capacity of 1.75 kWh/mi. Id at 3.

B. EPA has failed to adequately address critical on-road implications of requiring heavy-duty trucks to be zero emission.

EPA fails to adequately address critical on-road implications of the proposed rule, including the impact of decreased payload capacity and decreased range resulting in a significant increase in the number of trucks on the road, increased road wear and congestion, and the increased risk of crash-related fatalities to the motoring public. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 30 - 31]

1. EPA fails to address the impact of HD ZEV's lower payload capacities and decreased range resulting in a significant increase in the number of heavy-duty trucks on U.S. roadways.

As described in the Biden-Harris Administration Trucking Action Plan to Strengthen America's Trucking Workforce, 72 percent of goods in the U.S. are moved by truck, placing the industry at the center of critical supply chains and economic competitiveness.150 Heavy duty trucks are used in a wide variety of applications across the US economy, many of which operate on multi shift schedules and/or 24-7 operations. While today's fleet of heavy-duty vehicles can fuel up in as little as 15 minutes and can achieve as much as 1,200 miles on a single fueling event, current HD BEVs have a typical range of 150 to 380 miles, with the very largest battery systems touting 500-mile ranges, however these systems require 10 or more hours to recharge before being able to re-engage in the business of hauling freight.151 Moreover, the batteries powering HD-BEVs typically weigh 8,000 pounds per battery pack, with a typical configuration requiring at least two, if not four, packs to achieve the 150 to 380 mile ranges indicated above.152 Actual drive time aside, the reduced range coupled with the exorbitant recharge time required, results in an HD BEV requiring additional transit time of 3.3 to 1.3 days, depending on range, to cover the same 1,200 miles achieved in only 15 minute of refueling in an ICE heavy-duty truck. [EPA-HQ-OAR-2022-0985-1566-A2, p. 31]

150 The Biden-Harris Administration Trucking Plan to Strengthen America's Trucking Workforce, The White House (Dec. 16, 2021)

151 Verbal testimony of Andrew Boyle before the Unites States Senate Committee on Environment and Public Works Subcommittee on Clean Air, Climate, and Nuclear Safety, Hearing on "Cleaner Vehicles: Good for Consumers and Public Health", April 18, 2023

152 Id.

HD BEVs' decreased range (increased transit time due to charging) coupled with the decreased cargo capacity will result in significant increases (3:2 or even 2:1 increases154) in the number of HDVs required to be on the road to haul the same quantity of cargo, weakening our critical supply chains and economic competitiveness. The increase in number of trucks will burden the U.S. roadways and increase risks to all road users, including the commuting public who transit the nation's highways in LDVs. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 31 - 32]

154 ATA written statement of Andrew Boyle before the Unites States Senate Committee on Environment and Public Works Subcommittee on Clean Air, Climate, and Nuclear Safety, Hearing on "Cleaner Vehicles: Good for Consumers and Public Health", April 18, 2023, Page 4

Organization: Zero Emission Transportation Association (ZETA)

A common misconception is that range anxiety continues to pose a significant barrier to adoption across all vehicle classes. This concern is particularly acute for HDEV operators, as the average MHDV travels over 100 miles per day.117 Likewise, trucks with the longest routes drive a maximum of 600 miles but average closer to 300 miles per day.118 Figure 6 provides the average range of various vehicle classes; as many EV models have a similar range, the MHDV models currently available can meet up to 60% of operational needs.119 Trucks capable of traveling longer distances (370 miles) are being produced today and those with ranges greater than 620 miles are expected after 2023.120 [EPA-HQ-OAR-2022-0985-2429-A1, p. 28.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 28, for Figure 6]

117 "Medium- & Heavy-Duty Vehicles: Market structure, Environmental Impact, and EV Readiness," EDF, (July 2021) http://www.edf.org/sites/default/files/documents/EDFMHDVEVFeasibilityReport22jul21.pdf

118 Id.

119 Id.

120 How Zero-Emission Heavy-Duty Trucks Can Be Part of the Climate Solution," CALSTART, (May 2021) https://calstart.org/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-Climate-Solution.pdf

EPA Summary and Response:

Summary:

EPA received many comments about the range of electric vehicles. Two commenters expressed support for the ranges of current vehicles and the ability of current BEVs to meet the majority of operational needs: ACEEE commented that the average VMT in California is just over 100 miles, and that this mileage can be met by currently available BEVs. They also commented that the market for BEVs will only improve over time with additional models and more options for range. ZETA commented that the average MHDV travels over 100 miles per day and current BEVs can meet 60% of operational needs, and that BEVs with 370 miles of range already exist and BEVs with ranges in excess of 620 miles are expected after 2023.

EPA received comments from multiple stakeholders expressing concern about the range of current HD BEVs and how the range of these current BEV applications fail to match the range of corresponding ICEVs (AHUA, ATA, API, Chevron, Ben Banks, Lynden Inc, SD DANR, and Valero). AHUA raised a concern that range for one EV was reported at 150 miles when compared to a comparable diesel vehicle with a range of 1,000 miles. ATA was concerned about the availability of different models with 200 miles of range. API was concerned about additional trips or more work required due to limited battery range and long charging times which can be affected by ambient temperature and road grade among other factors. Chevron was concerned about the increased downtime for electric vehicles due to battery charging which is caused by limited range. They were also concerned about the effect of cold ambient temperatures having a negative impact on the rate of charge and vehicle range. They also stated that these factors contribute to reduced efficiency in the trucking industry requiring additional trucks, drivers, and trips to deliver the same amount of freight.

Ben Banks was concerned that current electric trucks would halve his service radius from 250+ miles to 125 miles and this would lead to double the relay points and double the number of trucks to continue their current operations. Lynden Inc. and Valero were concerned that the range of an electric truck range is significantly less than that of a comparable diesel truck which would require additional fueling stops, driver time, and additional trucks to complete the same amount of work as a diesel truck. The South Dakota Department of Agriculture and Natural Resources was also concerned with the range of electric trucks. They cited an unnamed study that purported EVs consistently do not achieve EPA range estimates. They also cited an unnamed report that claimed EV batteries will degrade between 10 and 40 percent over 10 years which leads to depth of discharge limitations further decreasing battery range. They expressed further concern over the effect of ambient weather conditions saying vehicle range can be reduced between 20 and 40 percent as well as reduce the reliability of EVs.

Response:

EPA appreciates the additional sources provided by ACEEE and ZETA on daily VMT that support that, even today, several vehicle applications are suitable for BEVs based on VMT and available models and that the operating range of the most recently released HD BEVs is higher than previous models.

EPA appreciates the comments that raised concern about the range of BEVs and the effects this could have on the trucking industry. We note that many of these comments referenced pre-2024 models which are not reflective of projected (and more recent) HDV applications. We note as well that the comments assume depot charging in all cases, reflecting EPA's proposal; however, in response to consideration of comments, as described in RIA Chapter 2, EPA is now including consideration of en route charging for certain applications with the highest daily VMT in the HD TRUCS analysis. In the analysis performed for this rulemaking on the payback of BEVs, for the majority of the vehicles, we sized the battery to meet the 90th percentile daily VMT. Further discussion on the 90th percentile VMT can be found in RIA Chapter 2.2.1.2.2. and Section 3.3.1 of the RTC. Battery sizing also accounts for the depth of discharge as well as battery degradation through the number of cycles each battery will see over 10 years (see Section 3 of the RTC responding to the issue of how our cycling metric reasonably accounts for battery degradation without needing battery replacement under the HD TRUCS analysis.)

For the longest range day cabs and sleeper cabs that are assessed using public charging, on days when these vehicles are required to travel longer distances, we find that less than 30 minutes of mid-day charging at 1 MW is sufficient to meet the HD TRUCS 90th percentile VMT assuming vehicles start the day with a full battery. For further discussion on en-route charging, see RIA Chapter 2.6.3 and Section 3.4.3 of the RTC. For further discussion on slip seating see our response in section 4.3.3 below.

Since issuance of the NPRM, EPA has completed further analysis on the effects of payload caused by a change in powertrain weight between a BEV and ICE vehicle.[363] This analysis was undertaken to show that under the modeled potential compliance pathway impacts on payload are minimal and will not require additional trips for a BEV to complete the same amount of work as ICE vehicles. For a comprehensive discussion on this topic see RIA Chapter 2.9.1.1.

We address comments regarding the effects of ambient weather conditions in section 4.3.2 below.

[363] See Landgraf, Michael. Memorandum to docket EPA-HQ-OAR-2022-0985. "HD GHG Phase 3 Rule BEV Payload Analysis". February 29, 2024.

4.3.2 Effects of Ambient Temperature on Range

Comments by Organizations

Organization: American Petroleum Institute (API)

HD ZEVs are currently not available in sufficient quantities or at affordable levels to significantly displace ICEVs. Further, the cost to purchase a ZEV is currently prohibitive – not only is the purchase price currently higher than that of an ICEV, some fleet owners and operators are finding that HD ZEVs result in more work or trips needed to accomplish the same task as with an ICEV. This is largely due to battery range and charging, but can also be affected by temperature, road grade, and other factors. A study by ATA noted vehicle and fleet owner concerns with regard to total cost of ownership, despite IRA and BIL funding.13 14 [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

Organization: Chevron

Trucking utilization is also affected by the increased downtime required for recharging battery electric vehicles. A BEV truck may be idle for several hours while recharging the batteries and may have to recharge more frequently due to range limitations. Cold ambient temperatures can also affect the rate of charge and available range. All of these factors will have a negative impact on efficiency, requiring more trucks, drivers, and trips to deliver the same quantity of cargo. [EPA-HQ-OAR-2022-0985-1552-A1, p.5]

Organization: Lynden Incorporated

Lynden operates in some of the harshest conditions in Alaska and the Pacific Northwest where reliability is a safety issue for both drivers and customers who depend on delivery of critical goods and services. [EPA-HQ-OAR-2022-0985-1470-A1, p. 2]

For example, a routine Lynden route between Fairbanks and Prudhoe Bay, Alaska traverses the Dalton Highway: a 414-mile-long treacherous, mostly gravel road, with grades of more than 12%, limited resources and only three fuel stops. A truck running out of battery in minus 50 degrees Fahrenheit on this route is not an option. The extreme temperatures combined with auxiliary heating needs, would reduce the range by at least 30%2, increase charging time, and diminish battery life3. To provide electric charging facilities in these remote, off-grid conditions would prove completely unrealistic and would require diesel generators to produce the electricity – a process that is far less efficient than a diesel-powered truck. [EPA-HQ-OAR-2022-0985-1470-A1, p. 2]

2 Study: Winter & Cold Weather EV Range Loss in 7,000 Cars (December 2022). https://www.recurrentauto.com/research/winter-ev-range-loss

3 Extreme temperatures affect Electric Truck Batteries. (April 2019). https://www.ttnews.com/articles/extreme-temps-affect-electric-truck-batteries

Organization: Morales, Jorge

How will these EVs retain charge in extreme climate States or when traveling through multiple different climates on one trip? Have you ever used a battery charged device in the extreme cold winter of North Dakota or Minnesota? Or tried to start anything outside when there is a Polar Vortex reaching through the entire Midwest? It's quite challenging for batteries to retain charge during extreme cold or heat. When that happens, how will Evs allow people to get to work? Sounds like people living paycheck to paycheck will no longer have the means to reliably get to work if they don't have access to a garage. I understand its not requiring people in the blink of an eye to purchase EVs, however these are the unintended consequences and the concerns that are not being addressed while EPA/individual States/certain political administrations push a hot button item to "look good". [EPA-HQ-OAR-2022-0985-1691.html, p. 1]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

Further, ambient temperatures can influence the battery performance of electric vehicles. In northern states, fleets that operate in cold weather conditions will have to account for slowed chemical and physical reactions in truck batteries, leading to significantly longer charging times and a temporary reduction in range.13 [EPA-HQ-OAR-2022-0985-1603-A1, p. 6]

13 See AMERICAN TRANSPORTATION RESEARCH INSTITUTE, 'Understanding the CO2 Impacts of Zero-Emission Trucks,' (May 3, 2022) available at https://truckingresearch.org/2022/05/understanding-the-co2-impacts-of-zero-emission-trucks/. Evs lose significant range in cold weather and Consumer Reports has found that driving short trips with frequent stops in cold weather can reduce EV range by as much as 50 percent. See also Jeff S. Bartlett and Gabe Shenhar, Consumer Reports, 'How Temperature Affects Electric Vehicle Range' (Aug. 22, 2022) available at https://www.consumerreports.org/cars/hybrids-evs/how-temperature-affects-electric-vehicle-range-a4873569949/.

Organization: South Dakota Department of Agriculture and Natural Resources (DANR)

Electric Vehicle Battery and Range Limitations

South Dakota is a large state with significant driving distance between many of our communities. Although several new electrical vehicles indicate they have a 200 mile or greater range (note – it is 224 miles one way from Pierre to Sioux Falls), a recent study shows electric vehicles (Evs) do not consistently achieve EPA' s range estimates. In addition, all batteries degrade over time. Reports indicate EV vehicle batteries will degrade between 10 and 40 percent over a 10-year life span. To maintain the battery's life, manufactures recommend batteries are not frequently depleted below 10 percent capacity or charged above 90 percent capacity. This means that an electrical vehicle should be limited to 80 percent of its capacity range to maintain the battery's life. In addition, cold, hot, and windy weather conditions may reduce an EV vehicle's range between 20 to 40 percent and may further impact the reliability of EV. South Dakota is known to have cold and windy winters and hot and windy summers, which, with current EV ranges, batteries conditions, and availability of charging stations, makes widespread use of EV s impractical in South Dakota. [EPA-HQ-OAR-2022-0985-1639-A2, p. 2]

Public Safety

This past year South Dakota had a long, harsh winter. During the previous two winters the South Dakota Department of Transportation (DOT) maintenance crews covered about 1.4 million miles and used about 540,000 gallons of diesel fuel. This past winter, DOT totaled 3.2 million miles, used about one million gallons of fuel, and clocked approximately 178,000 man-hours to keep our roads safe. DANR is concerned the proposed emissions standards and push to heavy-duty vehicle EV use could significantly limit DOT's and South Dakota municipalities' ability to keep our roads safe during winter conditions. [EPA-HQ-OAR-2022-0985-1639-A2, p. 2]

Organization: The Sulphur Institute (TSI)

One last area we would like to address is that many refineries and gas plants are located in areas not well suited for electric vehicles, especially in states that are rural, are at high altitude, or both. Long distance travel and extreme temperature ranges can significantly impact EV range and the ability of the sulphur truck fleets to access refineries for sulphur loading and transport. [EPA-HQ-OAR-2022-0985-1624-A1, p. 2]

Organization: Valero Energy Corporation

Extreme climate conditions have been shown to significantly reduce the battery range and efficiency of BEVs.122 In the proposal, EPA acknowledges that "[c]old temperatures, in particular, can result in reduced mobility of the lithium ions in the liquid electrolyte inside the battery; for the driver, this may mean lower range." Further, battery thermal management is also necessary "during hot ambient temperatures to keep the battery from overheating."123 In fact, a yearlong study conducted by the Gunnison County Electric Association using a Chevrolet Bolt found that at temperatures of 1 to 32 degrees Fahrenheit, the Bolt performed at only 80% of the EPA estimated average battery range; at -8 degrees Fahrenheit, the Bolt performed at only 37% of the EPA estimated average battery range.124 Although this study examined a smaller batter used in light-duty vehicle, the results at minimum suggest that the cold-weather performance of larger batteries used in heavy-duty vehicles warrants further study. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 27]

122 See Jon Witt, Winter & Cold Weather EV Range Loss in 7,000 Cars; RECURRENT, Dec. 12, 2022, https://www.recurrentauto.com/research/winter-ev-range-loss; see also 20 popular Evs tested in Norwegian winter conditions, NORWEGIAN AUTOMOBILE FEDERATION, Mar. 12, 2020, https://www.naf.no/elbil/aktuelt/elbiltest/ev-winter-range-test-2020/.

123 EPA's HD Phase 3 GHG Proposal at 25961.

124 See https://energynews.us/2019/08/12/in-colorado-electric-vehicle-ambitions-meet-extreme-peaks-and-weather/.

EPA Summary and Response:

Summary:

Several commenters were concerned about the effects of extreme weather conditions on battery range due to temperature and environmental effects such as elevation and high wind. These commenters also raised the issue of effect on batteries of HVAC systems used for cabin heating (API, Chevron, Jorge Morales, Lynden Inc., NACS, SD DANR, TSI, and Valero Energy

Corp). They asserted that the already limited range of BEVs would also be impacted by the low number of chargers in remote locations.

Response:

As EPA noted at proposal, temperature can have an influence on the performance of the battery. DRIA at 29. We acknowledge concerns about the effects of low temperatures on battery range, including due to the additional use of heaters, as well as the effect of low temperatures on charging speed. In the analysis performed for the NPRM using HD TRUCS, we took into account the mileage weighted ambient temperature for commercial vehicles in the United States and used these values to estimate the additional energy required to condition both the cabin and batteries of each vehicle in HD TRUCS. This method accounts for the temperature variation vehicle miles traveled for heavy duty vehicles; while some miles are traveled in the 30 F and below or 80 F and above, most vehicle miles traveled for heavy duty vehicles are in the milder temperatures, following a bell-curve shape. Energy consumption from HVAC systems follows the inverse shape, where highest consumption occurs at the higher and lower temperatures. Temperature-weighting over the nation accounts for the higher energy consumption from high and low ambient temperature as well as the limited miles traveled in those climate extremities. This methodology did not include the effects of windy weather on the energy consumption of ZEVs. Based on the literature that we reviewed and comments we received, no data was found on the effects of wind on the range of ZEVs so this effect was not a part of our analysis.

This method of analysis is maintained for the FRM with an adjustment for HVAC use and battery conditioning in higher temperatures. While the energy consumption calculated in HD TRUCS differs from the value estimated for the extremes of heating and cooling, it represents the majority of vehicles on the road today. We expect that fleets operating in the extremes of the of the United States, whether it be temperature, altitude, or remoteness, will adopt ZEVs more slowly than most areas of the country where the extremes are more moderate, and our modeled potential compliance pathway includes ICE vehicles for all subcategories in all model years. Furthermore, as explained in preamble Section II.F.1, the composition of the overall HD on-road fleet in future years with the final rule under our modeled potential compliance pathway and accounting for ZEVs in the reference case, is projected to include the following:

- In 2027: 1 percent of the on-road fleet are ZEVs
- In 2032: 7 percent of the on-road fleet are ZEVs
- In 2040: 22 percent of the on-road fleet are ZEVs

This leaves a significant portion of the HD fleet as ICE vehicles. Under this analysis, there would be ample opportunities for ICE vehicles to be utilized in those certain areas with temperature and environmental extremes. See RIA chapter 2.4.1.1.1 (effects of HVAC) and 2.4.1.1.2 (effects of temperature generally).

We disagree with the comment regarding high altitudes having a negative effect on ZEVs. ZEVs provide multiple benefits compared to ICE vehicles at high elevations. ZEVs do not require combustion for tractive power so they maintain full power at any elevation. When transporting commodities from high elevation to low elevation, ZEVs can take advantage of regenerative braking systems while transporting goods from the refineries and use that energy while returning to the original or different location with potentially no load.

4.3.3 Hours of Service and Slip-Seating

Comments by Organizations

Organization: Banks, Ben

We currently operate 320 day cab tractors in the southeast, with 434 drivers. So, we 'slip-seat' trucks, assigning a day shift and night shift driver in many trucks. With BEV's, we would need down time to charge, so we would need to purchase an additional 114 trucks to provide a tractor for every driver.

Organization: Hill Bros. Inc.

Subject: Battery powered trucks will not work for expedited team freight

1. Surface transportation truck lanes that require team operations due to time constraints cannot wait for battery charging. [EPA-HQ-OAR-2022-0985-1461-A1, p. 1]

Organization: Valero Energy Corporation

EPA's proposed HD GHG Phase 3 rule will not only require an increase in the number of trucks to accommodate HD EV charging, but an increase in the number of truck drivers as well in order to comply with federal hours-of-service regulations. The United States Department of Transportation's Federal Motor Carrier Safety Administration ("FMCSA") regulates the number of hours commercial drivers may drive and work per day and week. According to the 11-hour driving limit, a property-carrying driver may drive a maximum of 11 hours after 10 consecutive hours off duty.110 And per the 14-hour rule, a property-carrying driver may not drive beyond the 14th consecutive hour after coming on duty, following 10 consecutive hours off duty.111 Given the time intensity of EV charging, additional drivers will be needed to ensure HD fleets' charging needs are satisfied while complying with the applicable hours-of-service regulations. For independent operators, the time spent charging will directly impact their revenues. [EPA-HQ-OAR-2022-0985-1566-A2, p. 24]

110 See https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations.

111 Id.

EPA Summary and Response:

Summary:

A few commenters stated that the need for long haul BEVs to recharge could significantly reduce range available when slip-seating. (Ben Banks and Hills Bros. Inc.) Ben Banks also commented that his company would have to purchase additional trucks to be able to provide a tractor for every driver in their operation to allow for operation with vehicles that perform both day and night shift operation. Valero also expressed concerns about how the time to charge electric vehicles would interfere with hours of service regulations and reduce driving time which would necessitate additional trucks and drivers to perform the same amount of work as ICE vehicles.

Response:

Three commenters challenged EPA's assumption at proposal that tractor daily range for a single shift is inherently limited by the need for drivers to operate a specified number of hours. See DRIA at 117. Two commenters noted that drivers can "slip-seat" – that is, a second driver takes the place of the first so that the vehicle can operate more or less continuously. We note that in our analysis for the proposal, we predicted that the first adopters of HD ZEVs would be single shift operations and generally be able return to base for depot charging. DRIA at 209. However, in response to comments, in developing a potential compliance pathway for tractors for the final rule, EPA is now projecting en route charging for certain applications with the highest daily VMT, including long-haul tractors.

Specifically, we have assumed that certain BEV tractors would use en-route charging. In our analysis in HD TRUCS, we have calculated the amount of time it would take to charge these vehicles, and with less than 30 minutes of charge time, would be able to increase their operational range to the 90th percentile daily VMT. For the longest range day cabs and sleeper cabs, on days when these vehicles are required to travel longer distances, we find that less than 30 minutes of mid-day charging at 1 MW is sufficient to meet the HD TRUCS 90th percentile VMT. The cost of en route charging infrastructure has been included in our analysis by using a higher electricity price for en route charging than for depot charging. See RIA Chapters 2.2.1.2.2, 2.4.2.2, and 2.6.3.

For fleets that utilize slip seating and are unable to meet their daily operational requirements with ZEVs even with en-route charging as outlined in the previous paragraph, we expect that they will continue to operate ICE vehicles. Commenters did not provide data on the number of fleets that use slip seating, and it is our understanding that only a portion of fleets, specifically a portion of tractors, use this type of operational model. To reflect this our modeled compliance pathway is based on a mix of ZEV and ICE vehicles, and we project in this technology package that the majority of sleeper cabs and day cabs will remain ICE vehicles. In MY 2027, the modeled pathway projects that 5% of day cabs will be ZEVs while the Phase 2 standards for sleeper cabs will be unchanged until MY 2030 when the Phase 3 standards will take effect. We project that ZEV technology will have matured by MY2032 and project 40% day cabs and 25% of sleeper cabs will be ZEVs under the modeled potential compliance pathway. We consequently have not included a cost for lost operating time where slip seating is utilized. Furthermore, as explained in preamble Section II.F.1, the composition of the overall HD on-road fleet in future years with the final rule under our modeled potential compliance pathway and accounting for ZEVs in the reference case, is projected to include the following:

- In 2027: 1 percent of the on-road fleet are ZEVs
- In 2032: 7 percent of the on-road fleet are ZEVs
- In 2040: 22 percent of the on-road fleet are ZEVs

This leaves a significant portion of the new HDV fleet as ICE vehicles, even without taking into account the overwhelming percentage of HD ICE vehicles in the current on-highway heavy duty fleet.

For a response to additional vehicles being required to perform the same amount of work as comparable ICE vehicles, see RTC 4.3.1.

4.3.4 Alternative Battery Chemistry

Comments by Organizations

Organization: Moving Forward Network (MFN) et al.

11.1.3.2. Technological advancements resulting in decreased mineral demand can also further decrease battery costs

In addition to the substitution of lithium discussed above, advanced lithium-ion batteries, such as solid-state or lithium-air batteries, could decrease the amount of lithium required to provide the same kWh and miles. Innovation will increase battery specific energy and energy density, therefore reducing the amount of materials needed as well as battery cost. [EPA-HQ-OAR-2022-0985-1608-A1, p. 93]

Solid-state battery startups such as QuantumScape 196 are already partnering with automakers to ensure the technology is suitable for EVs. Quantumscape has partnered with Ford and BMW and begun shipping their batteries for trial in 2022. 197 Solid-state batteries have increased specific energy, with Quantumscape reporting their Li-Metal NMC batteries having up to 400 Wh/kg or 1,100 Wh/L depending on the anode. This increase is graphically represented in Figure 25 below, which was produced by QuantumScape. [EPA-HQ-OAR-2022-0985-1608-A1, p. 93.] [See Figure 25 Energy Density Improvements as Projected by QuantumScape located on p. 94 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

196 QuantumScape. Delivering on the promise of solid-state technology. (2023). https://www.quantumscape.com/technology/

197 Steve Hanley. Solid Power & QuantumScape Begin Shipping Solid-State Batteries For Trials. CleanTechnica. (2022). https://cleantechnica.com/2022/12/22/solid-power-quantumscape-begin-shipping-solid-state-batteries-for-trials/

198 Ding, Y., Cano, Z.P., Yu, A. et al. Automotive Li-Ion Batteries: Current Status and Future Perspectives. Electrochem. Energ. Rev. 2, 1–28 (2019). https://doi.org/10.1007/s41918-018-0022-z

199 Yang, Xiaofei, et al. “Recent advances and perspectives on thin electrolytes for high-energy-density solid-state lithium batteries.” Energy & Environmental Science 14.2 (2021). p. 643-671.

Sodium-ion batteries are also making their way to the market and providing an alternative to lithium minerals and potentially reducing future lithium demand. CATL, the world’s largest EV battery maker, invested in the technology in 2021 200 and in China the batteries go on sale later this year in the Chery iCAR. Globally there are 20 sodium battery factories under construction or planned around the world, demonstrating the uptake of this technology. 201 [EPA-HQ-OAR-2022-0985-1608-A1, p. 94]

200 Magdalena Petrova. Here’s why sodium-ion batteries are shaping up to be a big technology breakthrough. CNBC. (2023). https://www.cnbc.com/2023/05/10/sodium-ion-batteries-shaping-up-to-be-big-technology-breakthrough.html#:~:text=The%20technology%20is%20now%20getting,supply%20chain%20by%20this%20year.

201 Steve Hanley. The Sodium-Ion Battery Is Coming To Production Cars This Year. CleanTechnica. (2023). https://cleantechnica.com/2023/04/22/the-sodium-ion-battery-is-coming-to-production-cars-this-year/

Organization: Volvo Group

iii. Alternative chemistries

As battery manufacturing and recycling ramps up, so too does the development of innovative alternative battery chemistries that will transform the range, durability, and cost of HDEVs. One chemistry with particular promise is that of lithium iron phosphate (LFP) batteries, touted for its potential application in MHD contexts.111 LFP batteries do not require nickel or cobalt, reducing cost, and reportedly generate 15% less emissions during manufacturing.112 Importantly, LFP batteries have twice as many charge cycles in their useful vehicle life.113 [EPA-HQ-OAR-2022-0985-2429-A1, p. 27]

111 "Driving Sustainability with Evolving Battery Chemistries," Chris Nevers, accessed May 18, 2023 https://www.zeta2030.org/insights/driving-sustainability-with-evolving-battery-chemistries

112 Id.

113 Id.

Another potentially promising technology is sodium-ion batteries. In April 2023, Contemporary Amperex Technology Co. Limited (CATL)—the world's largest battery producer—said its first sodium-ion battery would power electric vehicles built by Chinese brand Chery.114 Because they substitute lithium for sodium, sodium-ion batteries tend to be cheaper and may have significant applications for lower-range EVs. However, their commercial viability will likely be determined by lithium prices going forward. [EPA-HQ-OAR-2022-0985-2429-A1, p. 27]

114 "What If Your Tesla Could Run on Sodium?" Wall Street Journal, (April 19, 2023) accessed May 17, 2023 https://www.wsj.com/articles/what-if-your-tesla-could-run-on-sodium-3c18df30

The Department of Energy's SLAC National Accelerator Laboratory115 and Stanford University recently announced the launch of a new joint battery center at SLAC.116 It will bring together the resources and expertise of the national lab, the university, and Silicon Valley to accelerate the deployment of batteries and other energy storage solutions. [EPA-HQ-OAR-2022-0985-2429-A1, p. 28]

115 "SLAC National Accelerator Laboratory," DOE Office of Enterprise Assessments, accessed May 17, 2023 https://www.energy.gov/ea/slac-national-accelerator-laboratory

116 "New Battery Center Launches In USA," CleanTechnica, (April 13, 2023) https://cleantechnica.com/2023/04/13/new-battery-center-launches-in-usa/

iv. Range and durability

In the LDV segment, a recent study found that a majority of EVs retain at least 90 percent of their original range capacity left even after driving more than 100,000 miles—a testament to battery durability.122 While HDVs operate under different duty cycles and applications, there is good reason to believe advances in LDV battery technologies and durabilities will extend into other vehicle classes. CATL—recently announced a new "condensed" battery with 500 Wh/kg. CATL expects to start mass production of the model in 2023,123 and such an increase in battery capacity will benefit HDEVs in an outsized way. Bloomberg recently reported that the average range for a U.S. EV in the U.S. has quadrupled since 2011. In 2022, it stood at 291 miles and today is a third higher than the global average.124 Policies such as EPA's emissions standards are critical to helping maintain the U.S.'s position as a global leader. [EPA-HQ-OAR-2022-0985-2429-A1, p. 29.]

122 "New Study: How Long Do Electric Car Batteries Last?" Recurrent Auto, (March 27, 2023) https://www.recurrentauto.com/research/how-long-do-ev-batteries-last

123 "World's largest battery maker announces major breakthrough in energy density," TheDriven, (April 21, 2023) https://thedriven.io/2023/04/21/worlds-largest-battery-maker-announces-major-breakthrough-in-battery-density

124 "US Electric Cars Set Record With Almost 300-Mile Average Range," Bloomberg, (March 9, 2023) https://www.bloomberg.com/news/articles/2023-03-09/average-range-for-us-electric-cars-reached-a-record-291-miles#xj4y7vzkg

EPA Summary and Response:

Summary:

At least two commenters, including MFN and Volvo Group, noted other battery chemistries including lithium iron phosphate, sodium-ion and a new "condensed" battery will improve the range of electric vehicles, lower cost, increase durability and reduce critical minerals required for battery production.

Response:

We agree with the commenters that battery chemistry and technology will continue to improve from today's reported values. This could have positive implications not only for specific energy and energy density, but for critical mineral utilization as well, since some of these chemistries are less dependent on minerals currently evaluated as critical. See Preamble Section II.D.2.ii.c and RTC 17.2. The final rule projects a 50/50 mix of nickel-based (NMC) and iron-phosphate based (LFP) battery chemistries for 2027–2032 to analyze cost, specific energy, and energy density as parameters for demonstrating reasonableness and feasibility, since both chemistries are widely used for transportation applications today. We recognize that future chemistries under development, such as sodium-ion, may prove advantageous to the existing, commercial-scale chemistries we considered, so they may result in improvements to cost, specific energy, and energy density beyond what we anticipate in this final rule.

4.3.5 Towing Capacity

Comments by Organizations

Organization: Morales, Jorge

Have you researched towing capacity of EVs? How are people supposed to be expected to transport horses, cows, sheep, etc. What would take an 8hr drive towing would almost triple the drive due to needing to stop and recharge. You're unintentionally driving the economy backwards to local markets only, because the EVs don't have long enough battery charge to sustain long distance driving. Or will we all be required to bring back up batteries while driving? [EPA-HQ-OAR-2022-0985-1691.html, p. 1]

EPA Summary and Response:

Summary:

Jorge Morales expressed concern over the range of a BEV when towing and how that will affect the trucking industry.

Response:

First, we note that Class 2b and 3 complete pickups and vans are not included in this Phase 3 rulemaking. In the analysis for HD vehicle at issue in this rule, each vehicle had an assumed payload that corresponds to the value used in the GEM 2 compliance tool and can be found in the Tables in RIA Chapter 2.2.2.1.1. These values were used in the proposal and have been retained for the final rule. The vehicles covered in this rule are engine certified vehicles from class 2b-3 through class 8. Since we used the GEM values for payload, we model tractors towing trailers. The payload used for these vehicles includes additional mass from the curb weight of the vehicle to simulate commercial use. For example, LHD vehicles have an assumed mass of 16,000 pounds. This is about 8,000 pounds more than a typical Class 4 dual rear wheeled pickup truck that has a curb weight of about 8,000 pounds.[364] This could reflect, for instance, the vehicle towing a significant load nearing 8,000 pounds. As long as the combined weight of the vehicle, trailer, and cargo is at or below the assumed mass of the vehicle modeled for the rule, the vehicle should perform as well as or better than the modeled vehicle with respect to energy consumption. The assumptions we used in our analysis for daily VMT will not be the same for every fleet or operator. Most vehicles were sized to accommodate the 90th percentile VMT based on the datasets we used. See RIA Chapter 2.2.1.2 for more information on how the VMT was calculated for each vehicle type. Since we did not take into account every possibility for daily range, our modeled potential compliance pathway projects that ICE vehicles will still be sold during the timeframe of the rule, including at a rate of 40% for LHD vehicles in MY 2032.

4.4 Intentionally Left Blank

4.5 Intentionally Left Blank

4.6 Vehicle Weight

Comments by Organizations

Organization: Bradbury, Steven G.

Increasing highway infrastructure costs. Similarly, the cost of increased wear and tear on highway infrastructure, including the cost of increased frequency of required repairs, should also be recognized in the proposals. If, as EPA envisions, EVs were to comprise more than half of new light-duty vehicle sales, and if a large percentage of new medium- and heavy-duty trucks were battery powered, that would have a definite negative impact on highway infrastructure. The batteries in EVs are heavy, and, as a consequence, EVs tend to be considerably heavier than comparably sized ICE vehicles. The greater weight of EVs would cause faster wear and tear on

[364] https://www.ford.com/trucks/super-duty/models/f450-xlt/

highways if the number of EVs on the road were to increase significantly. [EPA-HQ-OAR-2022-0985-2427-A2, p. 19]

Organization: Clean Air Task Force et al.

While batteries add weight to vehicles, that incremental weight is unlikely to meaningfully affect HD BEVs' safety performance or their impact on roads and road safety infrastructure. Heavy-duty vehicles, no matter their powertrain type, are just that: heavy. Weight-related safety issues are universal to all heavy-duty vehicles. And federal interstate highway laws already prohibit BEVs from weighing more than 2,000 pounds in excess of comparable vehicles, capping their maximum weight at 82,000 pounds (compared to 80,000 pounds for combustion vehicles).257 As heavy-duty BEVs come onto the market in increasing numbers, federal, state, and local authorities can further modify vehicle weight and other road safety standards as appropriate. Furthermore, anticipated developments in solid state batteries258 and other weight-reducing technologies259 hold promise for achieving future reductions in BEV weight. [EPA-HQ-OAR-2022-0985-1640-A1, p. 60]

257 23 U.S.C. § 127(s).

258 *See generally* Sebastian Blanco, *The Future of Solid-State Batteries*, J.D. Power (Apr. 3, 2023), https://www.jdpower.com/cars/shopping-guides/the-future-of-solid-state-batteries; Chris Teague, *What You Need To Know About Solid-State Batteries*, Autoweek, https://www.autoweek.com/news/technology/a36189339/solid-state-batteries/ (last visited June 15, 2023).

259 *See generally* Michael Bull, *Mass Reduction and Performance of PEV and PHEV Vehicles* (undated), https://www-esv.nhtsa.dot.gov/Proceedings/22/files/22ESV-000346.pdf; Stanley, *How Electric Vehicle*

Light-weighting is Changing the Automotive Industry, https://www.stanleyengineeredfastening.com/en/News%20and%20Stories/How%20Electric%20Vehicle%20Light-weighting%20is%20Changing%20the%20Automotive%20Industry (last visited June 15, 2023).

Organization: Owner-Operator Independent Drivers Association (OOIDA)

OOIDA has consistently opposed increases to federal truck size and weight standards. The U.S. Department of Transportation (DOT) has long studied the impact of various longer and heavier truck configurations on interstate and U.S. highways and found that the additional cost of damage to both roads and bridges would require billions of dollars in new federal spending. As BEV development evolves, we are learning that battery components can be much heavier than traditional combustion engine parts. Federal regulations limit CMVs to 80,000 pounds; we've seen reports that truck batteries can weigh up to 16,000 pounds. For example, the Freightliner eCascadia electric semi-truck, which was released in 2022, weighs up to 4,000 pounds more than a regular diesel truck.7 On the other hand, permitting higher weight allowances would shift freight from other modes onto American highways, worsening congestion rather than helping to alleviate it. DOT has also found thousands of bridges on our Interstate system that would be overstressed by heavier CMVs, causing damage to many spans that are already considered structurally deficient or functionally obsolete. [EPA-HQ-OAR-2022-0985-1632-A1, p. 4]

Organization: Volvo Group

The frame rail packaging not only impacts the trailer gap, but also our ability to protect for bodybuilders' 'clean back of cab' requirements. While the NPRM expects us to move away from carbon-based products, the electrification of multi-purpose vehicles and refuse trucks classified in the urban subcategory complicates our ability to close the immense power gap required to drive the bodybuilder functions. Additional battery packs take away from customer payload while simultaneously creating new concerns around front axle loading to ensure we meet federal bridge laws. Some body builders have started to incorporate batteries into the body to power all the hydraulic features, but this is not yet available for all applications within the multipurpose and urban subcategories. [EPA-HQ-OAR-2022-0985-1606-A1, p. 13]

Similarly, as we look to develop concepts for hydrogen fuel cells and/or internal combustion engines (ICE), we will face similar space constraints associated with battery electric vehicles. Heavier weights on the front axle will need to be balanced with limits to customer payload to ensure bridge law compliance. In this case the weight studies are focused on the hydrogen fuel tank assemblies and the structure required to mount and protect the tanks in the event of an accident. With the utmost interest in the safety of our drivers and the surrounding environment, we must ensure designs can pass the standard frontal crash test. This requires simulation efforts to ensure all hydrogen is evacuated and properly vented within a fraction of a second upon front impact. [EPA-HQ-OAR-2022-0985-1606-A1, p. 13]

Organization: Truck Renting and Leasing Association (TRALA)

With respect to infrastructure concerns, the American Society of Civil Engineers' (ASCE) 2021 Infrastructure Report Card gave the nation's roads a 'D' grade and its bridges a 'C' grade.22 Roads and bridges need continual repair, rebuilding, and investment. Added vehicle weights and the high torque rates of ZEVs has the potential to accelerate the degradation of our nation's road networks. TRALA requests further analysis be undertaken to ensure that the increased use of all on-road ZEVs will not result in any detrimental impacts and unanticipated costs related to maintaining our nation's existing highway infrastructure. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 15-16]

EPA Summary and Response:

Summary:

Several commenters raised concerns about the weight of BEVs. A number of commenters maintain that the battery packs needed for heavy-duty applications invariably add considerable weight, and that these heavier vehicles (in comparison to their ICE counterparts) will necessarily damage highways and bridges at a rate greater than comparable ICE vehicles. (OOIDA, citing a Department of Transportation study without identifying it, Steven Bradbury). Other commenters disputed this, pointing to a maximum weight differential of 2,000 lbs. for the heaviest applications, plus the financial incentive of BEV OEMs to reduce vehicle weight. (CATF.)

Several commenters expressed concerns over the increased tare weight of ZEVs. The concern was that the additional weight of the vehicles themselves and the torque from the electric motors would increase the rate of deterioration of the nation's roads and bridges.

Certain commenters further maintained that added weight of BEVs adversely affect front axles, with one commenter raising the issue that added weight from the BEV powertrain could exceed (or pose the potential of exceeding) gross axle ratings and therefore could potentially violate federal bridge standards. (Volvo) TRALA commented about the impact of the additional torque that ZEVs produce at low motor speeds. The commenter stated that the additional torque will accelerate roadway deterioration.

Response:

In response to comments concerning the increased tare weight of ZEVs, we note that in our analysis for this rule, we have targeted ZEVs to perform the same amount of work in a single shift as comparable ICE vehicles. To this point, not all vehicles in our analysis increased in tare weight due to the daily VMT requirements of the vehicles we analyzed. See the results of our payload analysis which calculates the difference in weight between ICE vehicles and BEVs in RIA Chapter 2.9.1.1. What we have concluded from our analysis is that the tare weight of vehicles analyzed in HD TRUCS can be both higher or lower than a comparable ICE vehicle depending on the application and the daily VMT. Most trucks on the road contain some amount of freight which increases the weight of the vehicle above the tare weight. Because most trucks do not drive at their tare weight and not all BEVs have a higher tare weight than comparable ICE vehicles, we can infer that BEVs would not significantly increase the deterioration rate of our country's roads and bridges and, as shown in the response in section 4.3.1 above, we do not generally anticipate additional trips will be required for BEVs to perform the same work as comparable ICE vehicles. As also discussed in RIA Chapter 2.9, we also note that there is a 2000 pound upper bound on the amount a BEV vehicle's maximum gross weight can exceed that of an ICE vehicle. This is a small relative increase as a percent of the HD vehicle, as HD vehicles are already heavy. See 23 USC section 127(s). Issues of the relation of weight to payload are addressed in RIA Chapter 2.9.1.

In response to the comment alleging that the higher torque of electric motors over diesel engines would deteriorate roadways at a higher rate, we acknowledge that electric motors generally have more torque than diesel engines at low rpm which allows electric vehicles to accelerate more quickly, especially when loaded, providing a benefit to the vehicle operator. Diesel engines, moreover, can also have more or less torque depending on their specifications. In addition, the electric motors are computer controlled and the amount of torque delivered to the road can be tailored by software to match that of existing ICE vehicles. The final rule does not regulate the manufacturer's decisions regarding how they choose to control electric motor torque. It is up to the manufacturer to decide how much torque is applied by BEVs and by what rate.[365] We lack data to reasonably estimate how different manufacturers will control electric motor torque, and commenters raising this concern did not provide any such data. Therefore, it would not be practical for the EPA to estimate roadway deterioration due to the torque of electric motors.

In response to the comment asserting that the increased front axle weight due to batteries would necessitate payload reduction to comply with federal bridge laws, we disagree with Volvo that the federal bridge laws will be a concern, Chapter 1.5.3 of the RIA describes the different configurations of current BEVs. The elimination of the combustion engine and fuel system will likely reduce the amount of weight on the front axle and many existing designs for BEVs show the addition of battery pack spread along the ladder frame, again reducing weight on the front axle. In addition, Chapter 1.5.5 of the RIA includes a comprehensive list of 180 HD BEV models expected to be on the market by 2024, ranging from class 3-8 as well as many of the vehicle

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[365] Dorsch, C., Wang, X. & Küçükay, F. Objective Rating of the Launch Behavior of Conventional, Hybrid and Electric Vehicles. *Automot. Innov.* **4**, 70–80 (2021). Available online: https://doi.org/10.1007/s42154-020-00131-z

types covered in HD TRUCS. This shows that there are BEVs available in the near future that meet federal bridge laws, and we expect this trend to continue through the timeframe of the rule.

EPA appreciates and agrees with the comment from CATF stating that laws already exist that limit the additional mass that ZEVs can weigh over comparable ICE vehicles. See 23 USC 127(s) noted above. HD trucks are limited by manufacturer GVWR rather than their tare weight and so will not weigh significantly more than ICE vehicles while loaded, meaning that any effect on infrastructure will be insignificant. Responses pertaining to payload concerns can be found in RTC 3.10.1 and RIA Chapter 2.9.1.

4.7 Recycling and Environmental Issues

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

EPA asserts that the United States will be able to bolster supply significantly by recycling minerals from spent batteries that enter the domestic market. See 88 Fed. Reg. at 25,968–69. That hope is also misplaced, especially given the proposed rule's compressed timeline. Electric-vehicle batteries cannot be recycled until they are retired. According to the International Energy Agency, based on "the dates of expected retirement of EV fleets and their battery chemistry compositions," recycled minerals will be able to supply less than 1 percent of projected global demand for lithium, less than 1 percent of global projected demand for nickel, and only 2 percent of global projected demand for cobalt by 2030. Global Supply Chains at 60. And even if those numbers increase over time, many steps will need to be taken before American companies can effectively enter the recycling space. That includes establishing "protocol or industry best practices" on how to collect and transport spent batteries to a recycling center, navigating the "increasingly complex disassembly" process, and entering earlier phases of the manufacturing cycle where the recycled materials can actually be used. White House Report at 106, 109–11. "[W]ithout critical material refining and processing and battery manufacturing capacity, the captured materials from recycling end-of-life batteries will be exported for processing at foreign facilities and re-imported in the form of processed or manufactured products." Id. at 111. [EPA-HQ-OAR-2022-0985-1660-A1, p. 41]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

Another critical aspect of the Proposed Rule not comprehensively considered is that recycling of the battery and related electrical components of BEV is in a state of infancy and poses unique materials handling and safety challenges. EPA should consider the environmental profiles of both BEVs and ICEVs in light of the production, operation, and disposal of the vehicle (its useful life). The following list provides just some of the electric battery disposal-related issues that are likely to impact the environment and need to be addressed by EPA in the Proposed Rule: [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

Battery packs could contribute 250,000 metric tons of waste to landfills for every 1 million retired BEVs.103 [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

103 Kelleher Environmental, "Research Study on Reuse and Recycling of Batteries Employed in Electric Vehicles: The Technical, Environmental, Economic, Energy and Cost Implications of Reusing and

Recycling EV Batteries", (September 2019) available at https://www.api.org/oil-and-natural-gas/wells-toconsumer/fuels-and-refining/fuels/vehicle-technology-studies.

Less than five percent of lithium-ion batteries, the most common batteries used in BEVs, are currently being recycled "due in part to the complex technology of the batteries and cost of such recycling."104 [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

104 Gavin Harper, Roberto Sommerville, et al., NATURE, "Recycling lithium-ion batteries from electric vehicles" (Jan. 21, 2020) available at https://www.nature.com/articles/s41586-019-1682-5.

Economies of scale will play a major role in improving the economic viability of recycling. Currently, cost is the main bottleneck. Increasing collection and sorting rates is a critical starting point.105 [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

105 IEA Report 2022.

The cathode is where the majority of the material value in a lithium-ion battery is concentrated. Currently, there are numerous cathode chemistries being deployed. Each of these chemistries needs to be known, and then the appropriate method of recycling identified, which poses a challenge, as batteries pass through a global supply chain and all materials are not well tracked. [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

Lithium can be recovered from existing lithium-ion recycling practices but is not economical at current lithium prices. [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

Benchmark forecasts suggest that near-term recyclers are likely to use scrap material from the increasing number of gigafactories coming online versus used electric vehicle batteries. Scrap is anticipated to account for 78 percent of recyclable materials in 2025.106 [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

106 Benchmark Minerals Intelligence, "Battery production scrap to be main source of recyclable material this decade" (Sept. 5, 2022) available at https://source.benchmarkminerals.com/article/battery-production-scrap-to-be-main-source-of-recyclable-material-this-decade.

In 2022, Benchmark expected over 30 gigawatt hours of process scrap to be available for recycling, growing ten-fold across the next decade. Loss rates vary by region and tend to be higher in earlier years of a gigafactory.107 [EPA-HQ-OAR-2022-0985-1659-A2, p. 28]

107 Id.

EV batteries are high-cycle batteries and are made to function for approximately 10 years for a light-duty vehicle, and a shorter time for medium- and heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

EV batteries lose approximately 3 percent of their charging capacity and associated range per year of operation. These percentages likely are higher for higher mileage utilization for typical heavy-duty vehicles. EPA has not made any effort to account for battery degradation, and associated reductions in charging efficiency, charging capacity, customer impacts and accelerated battery replacement and costs. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

Many 'spent' EV batteries still have 70-80 percent of their capacity left, which is more than enough to be repurposed into other uses such as energy storage and other lower-cycle applications.108 This will extend the time that batteries and raw materials remain in use and therefore increase the demand for virgin critical minerals. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

108 Engel, H., Hertzke, P., & Siccardo, G. (2019, April). Second-life EV batteries: The newest value pool in Energy Storage. McKinsey Center for Future Mobility. https://www.mckinsey.com/~/media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/Second%20life%20EV%20batteries%20The%20newest%20value%20pool%20in%20energy%20storage/Second-life-EV-batteries-The-newest-value-pool-in-energy-storage.pdf

Clear guidance on repackaging, certification, standardization, and warranty liability of spent EV batteries would be needed to overcome safety and regulatory challenges reuse poses at scale.109 [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

109 IEA Report 2022.

Recycling BEV batteries to recover high-value metals has not been proven to a commercial scale. The majority of analysts are aligned that recycling will not become an integral supplier of raw materials until the 2030's, and at that point, it only will provide approximately 20 percent of demand.110 [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

110 Benchmark Minerals Intelligence, supra at n. 105.

Acknowledging the fire risks posed by lithium-ion batteries, EPA has recently stated that ZEV batteries should be handled as hazardous waste in accordance with RCRA universal waste requirements, further driving up the cost of such recycling efforts and limiting the facilities qualified to manage used batteries.111 [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

111 Letter from Carolyn Hoskinson, Director, EPA Office of Resource Conservation and Recovery, "Lithium Battery Recycling Regulatory Status and Frequently Asked Questions," (May 24, 2023).

EPA must, therefore, conduct a full lifecycle analysis to compare all environmental impacts caused by the proposal. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

Organization: American Petroleum Institute (API)

V. Recycling of batteries and related electrical components is in its infancy.

Another critical aspect to be considered with this proposal is that recycling of the battery and related electrical components of BEVs are in a state of infancy and poses unique materials handling and safety challenges. The environmental profiles of both BEVs and ICEVs should be considered in light of the production, operation, and disposal of the vehicle (its useful life). Electric battery disposal-related issues are likely to impact the environment and need to be addressed in EPA's proposal:

- Battery packs could contribute 250,000 metric tons of waste to landfills for every 1 million retired BEVs.44
- Less than five percent of lithium-ion batteries, the most common batteries used in BEVs, are currently being recycled "due in part to the complex technology of the batteries and cost of such recycling."45
- Economies of scale will play a major role in improving the economic viability of recycling, which currently cost is the main bottleneck. Increasing collection and sorting rates is a critical starting point.46

- The cathode is where the majority of the material value in a Lithium-ion battery is concentrated. Currently, there are numerous cathode chemistries being deployed. Each of these chemistries needs to be known, and then the appropriate method of recycling identified, which poses a challenge, as batteries pass through a global supply chain and all materials are not well tracked.
- Lithium can be recovered from existing Lithium-ion recycling practices, but it is not economical at current lithium prices. Cobalt, one of the highest supply risk materials for BEV in the short- and medium-term, is currently being profitably recovered.
- Benchmark forecasts near-term recyclers are likely to use scrap material from the increasing number of gigafactories coming online versus used electric vehicle batteries. Scrap material is anticipated to account for 78 percent of recyclable materials in 202547
- In 2022, Benchmark expected over 30 gigawatt hours of process scrap to be available for recycling, growing ten-fold across the next decade. Loss rates vary by region, and tend to be higher in earlier years of a gigafactory.48
- EV batteries are high-cycle batteries and are made to function for approximately 10 years, shorter time for a mid-duty vehicle.
- Many ‘spent’ EV batteries still have 70-80 percent of their capacity left, which is more than enough to be repurposed into other uses such as energy storage and other lower-cycle applications.49 This will extend the time that batteries and raw materials remain in use.
- Repurposing used EV batteries could generate significant value and help bring down the cost of residential and utility-scale energy storage to bring forth further penetration of renewable power to electricity grids. Initial trials are underway.50
- Clear guidance on repackaging, certification, standardization, and warranty liability of spent EV batteries would be needed to overcome safety and regulatory challenges reuse poses at scale.51
- Recycling BEV batteries to recover high-value metals has not been proven at commercial scale. The majority of analysts are aligned that recycling will not become an integral supplier of raw materials until the 2030s, and at that point, only will provide approximately 20 percent of demand.52 [EPA-HQ-OAR-2022-0985-1617-A1, pp. 27 - 29]

44 Kelleher Environmental, “Research Study on Reuse and Recycling of Batteries Employed in Electric Vehicles: The Technical, Environmental, Economic, Energy and Cost Implications of Reusing and Recycling EV Batteries,” September 2019 (Kelleher Environmental Study). See https://www.api.org/oil-and-natural-gas/wellstoconsumer/fuels-and-refining/fuels/vehicle-technology-studies.

45 Harper, G., Sommerville, R., Kendrick, E. et al. Publisher Correction: “Recycling lithium-ion batteries from electric vehicles.” Nature 578, E20 (2020). https://doi.org/10.1038/s41586-019-1862-3.

46 “The Role of Critical Minerals in Clean Energy Transitions”, International Energy Agency World Energy Outlook Special Report: https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.

47 BMI: https://source.benchmarkminerals.com/article/battery-production-scrap-to-be-main-source-of-recyclable-material-this-decade, (See Chart 8).

48 BMI: https://source.benchmarkminerals.com/article/battery-production-scrap-to-be-main-source-of-recyclable-material-this-decade.

49 Engel, H., Hertzke, P., & Siccardo, G. (2019, April). Second-life EV batteries: The newest value pool in Energy Storage. McKinsey Center for Future Mobility. https://www.mckinsey.com/~/media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/Second%20life%20EV%20batteries%20The%20newest%20value%20pool%20in%20energy%20storage/Second-life-EV-batteries-The-newest-value-pool-in-energy-storage.pdf.

50 "The Role of Critical Minerals in Clean Energy Transitions", International Energy Agency World Energy Outlook Special Report: https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.

51 Ibid.

52 BMI: https://source.benchmarkminerals.com/article/battery-production-scrap-to-be-main-source-of-recyclable-material-this-decade.

Organization: California Air Resources Board (CARB)

The recycling of lithium-ion batteries is also increasing to ensure that minerals are recovered and reused instead of discarded.83 Batteries that power vehicles will be recycled at recycling facilities, where they will be transformed into valuable scrap commodities like cobalt, copper, nickel, and lithium carbonate, which can then be used to produce another battery more efficiently. Battery recycling can also reduce the demand for virgin materials used in the production of new batteries. Circularity has the potential to contribute to an 8 to 44 percent reduction in the global resource use associated with lithium-ion batteries in 2050.84 On average, Redwood Materials can recover greater than 95 percent of the critical battery elements in an end-of-life battery (including lithium, nickel, cobalt, manganese, and copper), and then use those metals to manufacture anode and cathode components domestically for U.S. battery cell manufacturers.85 U.S. EPA could support battery materials recycling through battery pack labelling of battery chemistry and charge capacity. [EPA-HQ-OAR-2022-0985-1591-A1, p.32-33]

83 Redwood Materials, Inc. California Electric Vehicle & Hybrid Battery Recycling Program. 2022 (web link: https://www.redwoodmaterials.com/california-recycling-program, last accessed August 2022).

84 Kosai, S.; Takata, U.; Yamasue, E. Global Resource Circularity for Lithium-Ion Batteries up to 2050: Traction and Stationary Use. Mining. 449–462. June 30, 2022 (web link: https://doi.org/10.3390/mining2030024, last accessed August 2022).

85 U.S. DoE. Loan Programs Office. February 9, 2023. Press Release announcing a conditional loan commitment of $2 billion to Redwood Materials for the construction and expansion of a battery materials campus in McCarran, Nevada, February 9, 2023 (web link: https://www.energy.gov/lpo/articles/lpo-offers-conditional-commitment-redwood-materials-producecritical-electric-vehicle, last accessed February 2022).

Organization: Delek US Holdings, Inc.

d. BEVs cannot be recycled at the same level of ICE-powered vehicles.

EPA asserts that "minerals become part of the vehicle and have the potential to be recovered and recycled."40 This not only ignores the recycling capabilities of lead-acid batteries used in ICE HDs, but also the limited capabilities to recycle lithium-ion batteries. The Proposed Rule once again relies on vague predictions of the future to support its unrealistic standards. For example, EPA asserts that a "growing number of private companies are entering the battery recycling market," "manufacturers are already reaching agreements to use these recycled materials for domestic battery manufacturing," and that "Panasonic has contracted with Redwood Materials Inc. to supply domestically processed cathode material."41 But this is hardly sufficient to support EPA's proposal to entirely overhaul the ICE HD market in as few as four–seven years. [EPA-HQ-OAR-2022-0985-1561-A1, p. 9]

40 Proposed Rule at 25,969.

41 Id.

In reality, only five percent of lithium-ion batteries for BEVs are currently recycled.42 In contrast, 99% of lead-acid batteries are currently recycled.43 Despite recognizing the novel nature of lithium-ion battery recycling (as well as other critical minerals used for ZEVs),44 EPA's analysis falls short in examining the broader impacts of its proposal—on energy independence, national security, and emissions of criteria pollutants. [EPA-HQ-OAR-2022-0985-1561-A1, p. 9]

42 Robert Rapier, FORBES, "Environmental Implications of Lead-Acid and Lithium-Ion Batteries" (Jan. 19, 2020) available at https://www.forbes.com/sites/rrapier/2020/01/19/environmental-implications-of-lead-acid-and-lithium-ion-batteries/?sh=67ec3fe57bf5.

43 Id.

44 Proposed Rule at 26,969.

Organization: MEMA

Recommendation: Battery recycling and disposal costs should be added to EPA's analysis as part of a sustainable BEV deployment to better address scarcity of critical minerals, provide a more resilient domestic supply chain, and over time reduce the added carbon impact of battery manufacturing and associated multi-national logistics. 7 [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

Organization: Moving Forward Network (MFN) et al.

11.1.2. Recycled content can provide additional domestic mineral supply

The current oil-dependent system not only impacts the climate and health of the U.S. population, it also requires continual drilling, production, and importing of fuel. This is in stark contrast to the use of materials needed for electrified transportation, which can be continually recycled to produce the next generation of more efficient vehicles. This results in the continued growth of U.S. material stock even when importing minerals not mined domestically. As the Proposed Rule states, in 2050, 25 to 50 percent of lithium EV material demand can be met with recycled content. 184 This finding has been highly studied and documented by additional academics to the two listed in the report (Sun et al., 2022; Ziemann et al., 2018), including findings by Xu et al. 185 and Dunn et al. 186 Xu et al. demonstrate the material demand, which could be met by retiring and recycled supply, is highly impacted by innovation and advancing energy density. As batteries become more advanced and energy-dense, either through innovation of chemistries used (e.g., the progress made in NMC), or through different chemistries (e.g., lithium-sulfur or lithium-air batteries), the mineral demand decreases to meet the same energy storage needs. This means that a high percentage of material demand can be met with the retiring supply of less material-efficient and lower density batteries, as is demonstrated in Figure 22 below. 187 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 87 - 88.] [See Figure 22 Closed-loop recycling potential of battery materials in a STEP scenario located on p. 88 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

184 Sun et al. Surging lithium price will not impede the electric vehicle boom. Joule. doi:10.1016/j.joule. 2022.06.028 (https://dx.doi.org/10.1016/j.joule.2022.06.028); Ziemann et al. Modeling the potential impact of lithium recycling from EV batteries on lithium demand: a dynamic MFA approach. Resour. Conserv. Recycl. V. 133. (2018). p. 76–85. https://doi.org/10.1016/j.resconrec.2018.01.031.

185 Xu, C., Dai, Q., Gaines, L. et al. Future material demand for automotive lithium-based batteries. Commun Materials. V.1. No. 99. (2020). https://doi.org/10.1038/s43246-020-00095-x

186 Jessica Dunn, Margaret Slattery, Alissa Kendall, Hanjiro Ambrose, and Shuhan Shen. Circularity of Lithium-Ion Battery Materials in Electric Vehicles. Environmental Science & Technology. V. 55. No.8. (2021). p. 5189-5198. DOI: 10.1021/acs.est.0c07030

187 Xu, C., Dai, Q., Gaines, L. et al. Future material demand for automotive lithium-based batteries. Commun Materials. V.1. No. 99. (2020). https://doi.org/10.1038/s43246-020-00095-x

Dunn et al. 188 demonstrate that the choice of cathode materials can also highly increase potential circularity. Figure 23 below shows that a future with high lithium-iron-phosphate (LFP) market concentration can significantly increase the amount of lithium, cobalt, manganese, and nickel demand met with recycled content. [EPA-HQ-OAR-2022-0985-1608-A1, p. 88.] [See Figure 23 Circularity potential of materials as additional years are added to battery lifespan located on p. 89 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

188 Jessica Dunn, Margaret Slattery, Alissa Kendall, Hanjiro Ambrose, and Shuhan Shen. Circularity of Lithium-Ion Battery Materials in Electric Vehicles. Environmental Science & Technology. V. 55. No.8. (2021). p. 5189-5198. DOI: 10.1021/acs.est.0c07030

189 Id.

The recycled content also varies based on the collection rate and the material recovery rate. There is potential for high material recovery due to the 95 percent recovery rate of lithium, nickel, cobalt, and manganese by commercial-scale hydrometallurgical recyclers in the U.S. such as Lithion, Redwood Materials, Licycle, and Cirba Solutions. In addition, direct cathode recycling, which can recover a cathode without breaking it down into separate materials, is under development by several startups as well as the National Lab research group, ReCell. Direct recycling currently has a recovery rate of 40% for lithium, but increasing the lithium recovery rate is a priority area for ongoing research. 190 The Argonne National Lab model, BatPaC, lists the following recovery rates shown in Table 8. 191 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 89 - 90.] [See Table 8 Recovery Rates of Battery Materials from Different Recycling Processes located on p. 90 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

190 Kendall, A., Slattery, M., Dunn, J. Lithium-ion car battery recycling advisory group report. (2022). https://calepa.ca.gov/lithium-ion-car-battery-recycling-advisory-group/

191 Argonne National Laboratory. BatPaC: battery manufacturing cost estimation. (2022). https://www.anl.gov/partnerships/batpac-battery-manufacturing-cost-estimation

Recycling facilities are operational and under development in the US. Table 9 from Atlas Public Policy attempts to capture all these developments. 192 [EPA-HQ-OAR-2022-0985-1608-A1, p. 90.] [See Table 9 EV Battery Recycling Facilities in the U.S. located on p. 91 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

192 Atlas Public Policy. The EV Transition: Key Market and Supply Chain Enablers. (2022). https://atlaspolicy.com/the-ev-transition-key-market-and-supply-chain-enablers/

Appropriately representing higher specific energies that align with today's technologies and forecasts also has implications for vehicle range and weight. Batteries with higher specific energies can provide the same amount of power while weighing less than batteries with lower specific energies. This means that vehicles with more efficient batteries can travel farther with the same amount of energy because the battery significantly impacts the weight, and therefore, efficiency of BEVs. Lower battery weight has additional implications for heavy-duty BEVs by allowing for additional freight per trip since the battery would contribute less weight towards the total vehicle weight allowance. [EPA-HQ-OAR-2022-0985-1608-A1, p. 101]

11.1.3.4. Design for disassembly

Battery design parameters discussed in the Proposed Rule include "considerations related to cost and performance including specific energy and power, energy density, temperature impact, durability, and safety." 220 A key design parameter not included in this is the design for disassembly (Dfd), also referred to as design for recycling or design for reuse. Dfd is the factoring in of the end of life into the design of the vehicle, meaning that the battery is designed to be taken apart so that cells and modules can be refurbished, reused, or replaced, or so that the battery can be more efficiently and safely disassembled for recycling. 221 This disassembly is typically a difficult, lengthy, and therefore expensive process because Dfd is not included in the design phase. 222 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 101 - 102]

220 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). NPRM, 2.i Battery Design Parameters, pg 112. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

221 Kendall, A., Slattery, M., Dunn, J. Lithium-ion car battery recycling advisory group report. (2022). https://calepa.ca.gov/lithium-ion-car-battery-recycling-advisory-group/

222 Baazouzi S, Rist FP, Weeber M, Birke KP. Optimization of Disassembly Strategies for Electric Vehicle Batteries. Batteries. V. 7. No.4. (2021). p. 74. https://doi.org/10.3390/batteries7040074

As reuse and recycling become more prevalent and policies begin to require it, we expect that Dfd will also be more common. If Dfd occurs, it is assumed that more reuse, refurbishment, and replacement will occur. As a result, batteries will have a longer lifespan and the amount of new batteries necessary for electrification will be reduced. 223 The disassembly of a battery from a vehicle and down to the cell level currently represents approximately a third of light duty vehicle recycling costs. 224 If Dfd occurs, these recycling costs will also lessen, therefore leading to more prevalent recycling and more availability of recycled supply. [EPA-HQ-OAR-2022-0985-1608-A1, p. 102]

223 Koroma MS, Costa D, Philippot M, Cardellini G, Hosen MS, Coosemans T, Messagie M. Life cycle assessment of battery electric vehicles: Implications of future electricity mix and different battery end-of-life management. Sci Total Environ. V. 20. (2022). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9171403/

224 Jessica Dunn, Alissa Kendall, Margaret Slattery. Electric vehicle lithium-ion battery recycled content standards for the US – targets, costs, and environmental impacts. Resources, Conservation and Recyclin. V. 185 No. 106488. (2022). p. 0921-3449. https://doi.org/10.1016/j.resconrec.2022.106488

Organization: State of California et al. (2)

Spurred both by public incentives, and “business opportunity” presented by “the need for increased domestic production capacity,” private industry is also taking steps to increase domestic supply of critical minerals.214 As of March 2023, “at least $45 billion in private-sector investment has been announced across the U.S. clean vehicle and battery supply chain.”215 This includes “new and expanded commercial-scale domestic facilities to process lithium, graphite and other battery materials, manufacture components, and demonstrate new approaches, including manufacturing components from recycled materials.”216 Companies, such as Volkswagen of America, Audi, and Toyota, have committed to developing recycling programs for end-of-life EV battery packs, which will recover more than 95 percent of the metals found in existing batteries.217 These efforts aim to “create a circular supply chain for EV batteries in the United States that will eventually reduce the cost of batteries and offset the need for mining precious metals.”218 Particularly taking into consideration these investments in recycling programs, there are sufficient mineral resources to meet industry needs, both now and in the future.219 [EPA-HQ-OAR-2022-0985-1588-A1, p.30]

214 88 Fed. Reg. at 25,962.

215 U.S. Department of the Treasury, Treasury Releases Proposed Guidance on New Clean Vehicle Credit to Lower Costs for Consumers, Build U.S. Industrial Base, Strengthen Supply Chains (March 31, 2023), https://home.treasury.gov/news/press-releases/jy1379.

216 U.S. Department of Energy, Bipartisan Infrastructure Law Battery Materials Processing and Battery Manufacturing & Recycling Funding Opportunity Announcement (Oct. 19, 2022), https://www.energy.gov/sites/default/files/2022-10/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets%20-%201_2.pdf; Jason Hidalgo, Tesla to build $3.6 billion battery, electric semi truck manufacturing facility in Northern Nevada, Reno Gazette Journal (Jan. 24, 2023), https://www.rgj.com/story/news/money/business/2023/01/24/tesla-to-build-3-6b-battery-electric-nevada-semi-truck-manufacturing-facility/69837346007/; Press Release, Proterra Announces EV Battery Factory in South Carolina as Demand for Commercial Electric Vehicles Grows, Proterra (Dec. 14, 2021), https://www.proterra.com/press-release/proterra-sc-battery-factory/; Lion Electric, Lion Electric Inaugurates its Battery Manufacturing Factory for Medium and Heavy-Duty Vehicles, prnewswire.com (April 17, 2023), https://www.prnewswire.com/news-releases/lion-electric-inaugurates-its-battery-manufacturing-factory-for-medium-and-heavy-duty-vehicles-301799083.html.

217 Kirsten Korosec, Volkswagen, Audi tap Redwood Materials to recycle old EV batteries in US, TechCrunch.com (July 12, 2022), https://techcrunch.com/2022/07/12/redwood-materials-volkswagen-audi-ev-battery-recycling/; Rebecca Bellan, Redwood Materials partners with Toyota to recycle batteries in US, TechCrunch.com (June 21, 2022), https://techcrunch.com/2022/06/21/redwood-materials-partners-with-toyota-to-recycle-batteries-in-us/.

218 Id. (Redwood Materials).

219 Jessica Dunn, Are There Enough Materials to Manufacture All the Electric Vehicles Needed (Nov. 15, 2022), https://blog.ucsusa.org/jessica-dunn/are-there-enough-materials-to-manufacture-all-the-electric-vehicles-needed/.

Organization: Tesla, Inc. (Tesla)

EPA should also consider that recycling of battery material will play a vital role in alleviating some pressure on the need to develop new critical mineral resources. To that end, Tesla seeks to reduce its reliance on primary mined materials and contribute to a more positive environmental footprint through battery and cell recycling – including ensuring that none of our batteries (manufacturing scrap or fleet returns) go to landfills and deploying equipment to recycle 100% of on-site generated manufacturing scrap across manufacturing facilities. In comparison to BEV batteries, it should also be noted the energy source for ICE vehicles – fossil fuels used in combustion – is not recyclable. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 33-34]

Organization: Truck Renting and Leasing Association (TRALA)

If sourcing concerns are addressed, questions persist regarding disposal of used batteries and its environmental impact. Nearly all lead batteries are recycled.9 In contrast, the U.S. Department of Energy estimates that less than 5% of lithium-ion batteries are collected and recycled.10 This low rate of recycling furthers dependence on imported critical minerals and raises additional lifecycle impact concerns for our members who have comprehensive programs to divert waste from landfills and recycle/reuse most other vehicle waste streams. [EPA-HQ-OAR-2022-0985-1577-A1, p. 6]

9 Durable Goods: Product-Specific Data | US EPA.

10 112306-battery-recycling-brochure-June-20192-web150.pdf (energy.gov).

Organization: Zero Emission Transportation Association (ZETA)

ii. Recycling

A key element of meeting the coming demand for EV batteries and critical minerals will be recycling existing batteries at their end-of-life (EOL). As shown in Figure 5, North American battery recycling capacity is growing rapidly. Available EOL battery feedstocks are projected to increase in tandem as EVs on the road today approach the end of their useful life. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 24 - 25.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 25, for Figure 5]

In recognition of the potential solutions that battery recycling can provide, the Bipartisan Infrastructure Law requires EPA to develop battery recycling best practices and battery labeling guidelines by September 30, 2026. Congress allocated $10 million and $15 million to each issue respectively.101 While there will likely be more work needed, potentially through voluntary consensus standards bodies, a framework is beginning to take shape to ensure increased recycling capacity is built out in the coming years. [EPA-HQ-OAR-2022-0985-2429-A1, p. 25]

101 Public Law 117-58

The global market for EV battery recycling alone is estimated to reach $17.1 billion by 2030.102 By 2025, Benchmark Minerals Intelligence forecasts that scrap will account for 78% of the pool of recyclable materials.103 This growth is largely driven by the growing number of EVs approaching EOL. The volume of EOL batteries from EVs and large storage applications is less than 2 GWh today but could reach 100 GWh by 2030 and 1.3 TWh by 2040.104 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 25 - 26]

102 "Battery Recycling Market Size, Share & Trends Analysis Report By Chemistry (Lithium-ion, Lead Acid, Nickel), By Application (Transportation, Industrial), By Region (Europe, Asia Pacific, North America), And Segment Forecasts, 2023 - 2030, Grand View Research, (April 2023) https://www.grandviewresearch.com/industry-analysis/battery-recycling-

market?utm_source=prnewswire&utm_medium=referral&utm_campaign=CMFE_10-April-23&utm_term=battery_recycling_market&utm_content=rd

103 "Benchmark Minerals: Battery production scrap will be the main source of recyclable material this decade," (September 16, 2022) https://chargedevs.com/newswire/benchmark-minerals-battery-production-scrap-will-be-the-main-source-of-recyclable-material-this-decade/

104 "The Role of Critical Minerals in Clean Energy Transitions - Reliable supply of minerals," IEA, (2021) https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/reliable-supply-of-minerals

Below is a list of recently-announced investments in EV battery recycling, all of which will help support the transition to an electrified transportation sector:

- In October 2022, ZETA member Princeton NuEnergy Inc. (PNE) opened a new 500 t/a plant capable of direct recycling lithium-ion consumer electronics and EV batteries with its strategic partner, Wistron GreenTech in McKinney, Texas.105 This end-to-end facility ingests end of life batteries fully separating copper, aluminum, plastics, electrolyte, cathode and anode materials. Cathode materials are cleaned by surface etching with low-temperature plasma (LPAS™) and reformed into new cathode materials equivalent to OEM specifications that can be directly reused in battery production. The factory will be certified and commissioned in 2023.
- In April 2023, PNE launched a US Department of Energy $12MM R&D grant to expand and enhance PNE's battery recycling production processes through 'up-cycling' of legacy spent cathode chemistries into newer formulations, scaling processes for direct recycling of anode materials, and enhancing recycling/reuse of all other battery components.106
- In April 2023, ZETA member Redwood Materials announced a pair of partnerships to collect EOL battery feedstocks. Rad Power Bikes will provide Redwood with e-bike batteries when they reach the end of their lifespan.107 Redwood and Volkswagen of America expanded their partnership to collect more EOL batteries from consumer electronics.108 Both announcements come following a historic announcement of a $2 billion conditional loan from the Department of Energy to support Redwood's McCarran, NV recycling facility.109 At full production capacity, the McCarran project's anode copper foil and cathode active material output is anticipated to support the production of more than 1 million EVs per year.
- In May 2023, ZETA member Li-Cycle announced a partnership with Glencore to build a battery recycling hub in Portovesme, Italy, with construction expected to commence between late 2026 and early 2 Once completed, the Portovesme Hub is expected to have a processing capacity of up to 50,000 to 70,000 tons of black mass annually, or the equivalent of up to 36 GWh of lithium-ion batteries.110 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 26 - 27]

105 "Update: Princeton NuEnergy launches end-to-end LIB recycling production line," RecyclingToday, (October 25, 2022) https://www.recyclingtoday.com/news/princeton-nuenergy-launching-end-to-end-lib-recycling-production-line/

106 "Princeton Nuenergy teams up with scientists to improve its LIBs recycling technology," RecyclingToday, (April 3, 2023) https://recyclingtoday.com/news/princeton-nuenergy-teams-up-with-scientists-aided-by-doe-grant/

107 “Rad Power Bikes links up with Redwood Materials for e-bike battery recycling,” Verge, (April 24, 2023) https://www.theverge.com/2023/4/24/23695767/rad-power-bikes-redwood-materials-ebike-battery-recycle

108 “VW and Redwood want to turn your old laptops into EV batteries,” TechCrunch+, (April 4, 2023) accessed May 17, 2023 https://techcrunch.com/2023/04/04/vw-and-redwood-want-to-turn-your-old-laptops-into-ev-batteries/

109 “LPO Offers Conditional Commitment to Redwood Materials to Produce Critical Electric Vehicle Battery Components From Recycled Materials,” Department of Energy, (February 9, 2023) https://www.energy.gov/lpo/articles/lpo-offers-conditional-commitment-redwood-materials-produce-critical-electricvehicle

110 “Li-Cycle and Glencore unveil plans for recycling hub in Italy,” Reuters, (May 9, 2023) https://www.reuters.com/business/sustainable-business/li-cycle-glencore-unveil-plans-recycling-hub-italy-2023-05-09/

There is also a substantial effort to construct new copper recycling facilities, which often require different sources of feedstocks beyond EOL batteries, as demand for copper is expected to increase with increased deployment of EVs. A complete list of existing recycling projects can be found in Appendix Figure A.2. [EPA-HQ-OAR-2022-0985-2429-A1, p. 27.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 58, for Figure A.2]

EPA Summary and Response:

Summary:

Some commenters stated that recycling will not be a substantial source of critical materials in the near term due to lack of available supply of spent batteries (e.g. too few batteries, batteries being repurposed rather than scrapped), difficulties posed by a wide variety of cathode types (the source of the recoverable metals), and sorting difficulties. The commenters stated that the result of these issues is that lithium and other critical metal recycling from spent Li-ion batteries has not yet been demonstrated at commercial scale and is presently uneconomic and might remain so past MY 2032. (Chamber of Commerce, API (although API notes that it is presently economic to recover cobalt). Chevron questions the technical feasibility of recovering metals other than lithium.

Commenters including AFPM, API, Delek and TRALA indicated that only 5% of lithium-ion batteries are recycled today, compared to 99% of lead acid batteries. Furthermore, commenters say it will be a long time until the transportation batteries reach their end-of-life (10 years+) and it will take time for there to be a sufficient supply of spent lithium-ion batteries for these to be a major source of recycling supply.

American Fuel and Petroleum Manufacturers and API noted that most of the recoverable metals are found in the cathode, but that there are so many different cathode chemistries that sorting and analytic difficulties impede the viability of the recycling process.

Some commenters (Valero, AFPM, API) contend that EPA has ignored safety issues posed by management and disposal of spent lithium-ion batteries. In addition, they state that mining of raw critical materials poses environmental risks, and has led to degradation and worker abuses, such as in mining of cobalt in the Democratic Republic of the Congo.

Response:

For our response on recycling lithium-ion batteries and associated l issues relating to their management (including applicable EPA regulatory standards), see Preamble II.D.2.ii.c and RTC 17.2. The issue is also addressed (in less detail) in the following section 4.8.

4.8 Safety

Comments by Organizations

Organization: American Bus Association

We also note from the current unified agenda published by the Administration (https://www.reginfo.gov/public/do/eAgendaMain), that standards are not yet fully formed for safe hydrogen battery technology and are still under development (RIN 2127-AM40). Similarly, safety standards are still being developed and adopted for heavy-duty electric batteries as well (RIN 2127-AM43). Between a lack of safe or reliable technology development or operational standards, a lack of existing infrastructure, unreliable projections for future infrastructure, it seems prudent to delay a selection of any particular low or zero-emission technology strategy and any fleet requirements or projections should be set aside. [EPA-HQ-OAR-2022-0985-1634-A1, p. 3]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

d. Serious Safety Concerns Remain Unresolved

Finally, battery-electric and fuel-cell vehicles implicate significant, well-documented safety concerns that could materially impede deployment of heavy-duty electric vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, p. 50]

To begin, spontaneous fires involving battery-electric vehicles have been reported across the country, and major manufacturers have reported battery defects and issued recalls due to fire-related risks. See Joce Sterman et al., Ignition: Spontaneous Electric Vehicle Fires Prompt Recalls, But Some Owners Stalled Waiting on Repairs, WBTV (Sept. 26, 2022), https://tinyurl.com/bddjbbw6. In addition, the National Transportation Safety Board conducted an investigation of electric-vehicle crashes and found that, "[i]n each case, emergency responders faced safety risks related to electric shock, thermal runaway, battery ignition and reignition, and stranded energy." Safety Risks to Emergency Responders from Lithium-Ion Battery Fires in Electric Vehicles, Nat'l Transp. Safety Bd. (Nov. 13, 2020), https://tinyurl.com/4b9bw869. Electric vehicles also are frequently heavier than conventional vehicles, and their greater weight could exacerbate injuries in the case of an accident. See Raul Arbelaez, As Heavy EVs Proliferate, Their Weight May Be a Drag on Safety, Ins. Inst. for Highway Safety (Mar. 9, 2023), https://tinyurl.com/txwb5wtn. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 50 - 51]

EPA must consider these safety concerns as part of its feasibility analysis. See Sierra Club v. EPA, 325 F.3d 374, 378 (D.C. Cir. 2003) ("The statute also intends the agency to consider many factors other than pure technological capability, such as costs, lead time, safety, noise and energy."). But in the proposed rule, it simply brushed them aside. With respect to battery-electric vehicles, the agency merely stated that "standards have already been developed by the industry and are in place for manufacturers to use today to develop current and future products." 88 Fed. Reg. at 25,962; see also Draft RIA at 36–39. Those existing "standards" provide little assurance given the safety problems that have arisen already, and the likely increase in similar incidents if use of electric vehicles substantially increases, as the proposed rule not only anticipates but affirmatively intends. And with respect to fuel-cell vehicles, the agency notes only that "[h]ydrogen has been handled, used, stored, and moved in industrial settings for more than 50 years," and that there are "established methods," "federal oversight and regulation," and "standards" in place to ensure safe use. 88 Fed. Reg. at 25,972; Draft RIA at 75–76. These existing protocols, like those for battery-electric vehicles, are plainly inadequate in light of the documented disasters that have occurred in the United States and elsewhere. Even EPA acknowledges that "[a]s hydrogen demand increases, additional codes and standards at all levels of government are likely going to be needed to accommodate heavy-duty FCEVs and fueling station development." Draft RIA at 76. Those codes and standards must be established and proven effective before the agency adopts a rule that would require manufacturers to produce, and consumers to use, fuel-cell vehicles, not after. EPA cannot—and should not—put the American public in danger to advance its agenda on electric vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 52 - 53.]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

Notably, EPA does not consider that ZEVs—particularly BEVs—are heavier than equivalent ICEVs and, therefore, may result in more severe accidents given the additional mass of the battery. As recognized by National Highway Transportation Safety Authority ("NHTSA") Administrator Ann Carlson, "[b]igger is safer if you don't look at the communities surrounding you and you don't look at the other vehicles on the road . . . [i]t actually turns out to be a very complex interaction."50 Yet EPA has not considered this interaction, on safety directly or the associated increase in insurance costs,51 which is all the more critical to the Proposed Rule as commercial trucks are involved in 13 percent of all fatal crashes on U.S. roadways and these trucks will be heavier and faster under the Proposed Rule.52 [EPA-HQ-OAR-2022-0985-1659-A2, p. 14]

50 Reuters, "U.S. NTSB chair raises safety concerns about heavy electric vehicles," David Shepardson (January 11, 2023) available at https://www.reuters.com/business/autos-transportation/us-ntsb-chair-raises-safety-concerns-about-heavy-electric-vehicles-2023-01-11/.

51 Jason Metz & Michelle Megna, Electric Car Insurance: Why It Costs More (Jan. 4, 2023), https://www.forbes.com/advisor/car-insurance/electric-vehicle/ (explaining that electric vehicles are costlier to insure)

52 U.S. DOT, Federal Motor Carrier Safety Administration, "2020 Pocket Guide to Large Truck and Bus Statistics," available at https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/2020-10/FMCSA%20Pocket%20Guide%202020-v8-FINAL-10-29-2020.pdf.

The greater prevalence of heavy-duty batteries will also pose additional risks to first and second responders as battery fires burn hotter and longer than similar fires in ICEVs. As documented by the National Transportation Safety Board, these responders face two major risks: (1) shock from damaged high-voltage electrical components and (2) battery reignition after initial fire suppression due to uncontrolled increases in temperature and pressure retained in the battery.53 Moreover, insufficient information exists from manufacturers on procedures for mitigating the risks of stranded energy to emergency responders. Additionally, storing an EV with a damaged high-voltage lithium-ion battery inside the recommended 50-foot-radius clear area may be infeasible at tow or storage yards.54 And beyond safety concerns, fighting a battery fire demands 30–40 times more water than a fire from an ICEVs.55 The Proposed Rule fails to even acknowledge these issues. [EPA-HQ-OAR-2022-0985-1659-A2, p. 14]

53 NTSB, “Risk to Emergency Responders from High-Voltage, Lithium-Ion Battery Fires Addressed in Safety Report,” (Jan. 13, 2021), available at https://www.ntsb.gov/news/press-releases/Pages/NR20210113.aspx. (See also Watch This Severe Electric Car Fire And Explosion At A Charging Station (insideevs.com)).

54 Id.

55 Fire Technology, “A Review of Battery Fires in Electric Vehicles,” Peiui Sun, et. al, (2020) available at https://maritimesafetyinnovationlab.org/wp-content/uploads/2021/12/Academic-A-review-of-battery-fires-in-electric-vehicles-2020.pdf; Independent, “Tesla in fireball crash needs 40 times the water as regular car to put out flames, says fire crew,” Graeme Massie, (August 12, 2021), available at https://www.independent.co.uk/climate-change/tesla-crash-driver-arrested-fire-b1901603.html.

Organization: American Highway Users Alliance

Concerns of Truck Dealers

The American Truck Dealers Division (ATD) of the National Automobile Dealers Association also presented testimony at EPA’s May 3 public hearing on the proposed rule. Key points presented include the following.[EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

Repair and servicing of the EV was reported as costly because ‘danger’ in servicing the EV requires two technicians rather than one. [EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

Organization: Arizona State Legislature

The proposed rule is arbitrary and capricious because it fails to consider safety issues. [EPA-HQ-OAR-2022-0985-1621-A1, p. 24]

EPA understands that when acting under Section 202(a) it should consider relevant factors such as impacts on safety. 88 Fed. Reg. 25,949. EPA devotes just two paragraphs of the preamble to assessing the safety of heavy-duty battery electric vehicles, which largely consist of summarizing general design standards. Id. at 25,962. EPA devotes only one paragraph to address the safety risks posed by hydrogen in fuel-cell electric vehicles. Id. at 25,972. [EPA-HQ-OAR-2022-0985-1621-A1, p. 24]

EPA’s preamble does not consider or respond to serious safety issues presented by electric trucks. The National Transportation Safety Board has warned that ‘[f]ires in electric vehicles powered by high-voltage lithium-ion batteries pose the risk of electric shock to emergency responders from exposure to the high-voltage components of a damaged lithium-ion battery.’30 The National Transportation Safety Board also found that ‘[t]hermal runaway and multiple battery reignitions after initial fire suppression are safety risks in high-voltage lithium-ion battery fires.’31 [EPA-HQ-OAR-2022-0985-1621-A1, p. 24]

30 National Transportation Safety Board, Safety Risks to Emergency Responders from Lithium-Ion Battery Fires in Electric Vehicles, NTSB/SR-20/01, Nov. 13, 2020, viii, available at https://www.ntsb.gov/safety/safetystudies/Documents/SR2001.pdf.

31 Id. at 63.

EPA's draft regulatory impact analysis hints at this fire risk. EPA notes that first responders need 'large amounts of water'—2,600 gallons for a 600-pound lithium-ion battery—'to cool the batteries and eliminate the risk of fire.' Draft Regulatory Impact Analysis, 38. EPA also suggests that fire remains a risk days after a crash: 'Safe storage of crashed vehicles is critical as internal battery failure reactions may occur days after the crash and reignite.' Id. EPA recommends standard maintenance and safety training to mitigate these risks. Id. EPA does not estimate the cost or timetable for the safety training or the potential cost from fires and other damage. [EPA-HQ-OAR-2022-0985-1621-A1, p. 25]

Increased weight is another safety concern. The head of the National Transportation Safety Board has expressed concern about the increased weight of electric vehicles: 'I'm concerned about the increased risk of severe injury and death for all road users from heavier curb weights and increasing size, power, and performance of vehicles on our roads, including electric vehicles.'33 The executive director of the Center for Auto Safety warned, 'These bigger, heavier batteries are going to cause more damage. It's a simple matter of mass and speed.'34 [EPA-HQ-OAR-2022-0985-1621-A1, p. 25]

33 NTSB head warns of risks posed by heavy electric vehicles colliding with lighter cars, THE ASSOCIATED PRESS, Jan. 11, 2023, available at https://www.npr.org/2023/01/11/1148483758/ntsb-heavy-electric-vehicles-safety-risks.

34 Id.

Heavier electric trucks increase the risk of fatal crashes. A 2011 study by the National Bureau of Economic Research found that 'a 1,000-pound increase in striking vehicle weight raises the probability of a fatality in the struck vehicle by 47%.'35 Converting this increased fatality risks into external costs, 'total external costs of vehicle weight from fatalities alone are estimated at $93 billion per year.'36 A study by the University of California – Davis estimated that by 2030, heavyduty long haul trucks will have 5,328 extra pounds of weight.37 EPA does not estimate the cost from the increased fatalities or more severe injuries from crashes caused by electric trucks. [EPA-HQ-OAR-2022-0985-1621-A1, p. 25]

35 Michael Anderson and Maximilian Auffhammer, Pounds That Kill: The External Costs of Vehicle Weight, National Bureau of Economic Research Working Paper 17170, June 2011, 3, available at https://www.nber.org/system/files/working_papers/w17170/w17170.pdf.

36 Id.

37 John Harvey et al., Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges, University of California – Davis Institute of Transportation Studies, Nov. 2020, 10, available at https://aboutblaw.com/Xa7.

EPA's failure to adequately consider safety issues is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 25]

The proposed rule is arbitrary and capricious because it fails to adequately consider weight limit issues. [EPA-HQ-OAR-2022-0985-1621-A1, p. 26]

EPA acknowledges that commenters on a previous proposal raised concerns about 'the weight impact of batteries.' 88 Fed. Reg. 25,955. EPA does not identify what those concerns were, however. EPA implicitly acknowledges that the weight of electric batteries limits payload capacity. Id. at 25,969 (‘This allows FCEVs to perform periods of service between fueling events that batteries currently cannot achieve without affecting vehicle weight and limiting payload capacity.’). EPA later acknowledges that ‘heavy-duty vehicles are sensitive to increases in vehicle weight and carrying volume.’ Id. at 25,978. EPA found that extra battery weight in ‘coach buses and tractors that travel long distances could have an impact on operations of these vehicles as [battery electric vehicles].’ Id. If battery weight impacted payload capacity by more than 30%, then EPA assessed fuel cell technology instead. Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 26]

Organization: Bradbury, Steven G.

- Increasing the costs and burdens of first responders. There is no mention in EPA’s NPRMs or in the accompanying DRIAs of the impact these rules would have on first responders. If EVs come to comprise a greatly increased percentage of the nation’s auto fleet, as EPA’s proposals are intended to achieve, state and local first responders will inevitably incur significantly higher costs and burdens in the form of specialized fire-suppression chemicals and equipment and additional hazardous response training requirements. Lithium-ion battery fires are a common occurrence with EVs, and these fires generate intense heat and toxic fluoride gas emissions, making them more difficult to extinguish than conventional vehicle fires and increasing the costs and management challenges of maintaining effective first responder capabilities.56 [EPA-HQ-OAR-2022-0985-2427-A2, pp. 19-20]

56 See Fredrik Larsson, et al., “Toxic fluoride gas emissions from lithium-ion battery fires,” Scientific Reports, Nature, August 30, 2017, https://www.nature.com/articles/s41598-017-09784-z (corrected March 22, 2018) (also available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5577247/).

Organization: California Air Resources Board (CARB)

Regarding the safety of ZEV technologies, CARB staff is not aware of any studies indicating ZEVs are more dangerous than ICE vehicles. To the contrary, the data available suggests for LDVs, ZEVs are significantly less likely to catch on fire than gasoline-powered vehicles or hybrids.79 Per the data, ZEVs catch fire at a rate of 25.1 instances per 100,000 ZEVs sold versus 1,529 instances per 100,000 gasoline vehicles and 3,474 instances per 100,000 hybrid vehicles. Manufacturers have a strong incentive to produce safe vehicles, and ZEVs are no different in this regard. [EPA-HQ-OAR-2022-0985-1591-A1, p.31]

79 Autoinsuranceez: Gas vs. Electric Car Fires [2023 Findings], November 11, 2022. https://www.autoinsuranceez.com/gas-vs-electric-car-fires/

Organization: Clean Air Task Force et al.

d. BEV safety should not be a constraining factor in this rulemaking.

We agree with EPA’s assessment that “HD BEVs can be designed to maintain safety.” 88 Fed. Reg. at 25962. While some have put forward misguided arguments about the safety of BEVs as a reason for EPA to set weak standards in this rulemaking, those claims miss the mark for many reasons. BEVs have been on the road in appreciable numbers for more than a decade already, and BEV sales will continue to grow due to market forces alone. Original equipment manufacturers (OEMs), trade and professional associations, and safety authorities at all levels have long been studying, planning for, and responding to BEV safety matters.252 With or without the Phase 3 rulemaking, the number of BEVs will continue to grow, and safety research, planning, and design efforts will continue apace. Thus, safety should not act as a constraining factor in this rulemaking. [EPA-HQ-OAR-2022-0985-1640-A1, p. 59]

252 Indeed, these efforts began more than a decade ago. For example, in 2010, the National Fire Protection Association and SAE International hosted a summit on EV safety standards. Am. Nat'l Standards Inst. (ANSI), U.S. National Electric Vehicle Safety Standards Summit Report Released (Jan. 5, 2011), https://www.ansi.org/news/standards-news/all-news/2011/01/us-national-electric-vehicle-safety-standards-summit-report-released-05. And in 2011, ANSI convened a workshop on behalf of the U.S. DOE "to consider current and future U.S. domestic, regional, and international standards, codes, and conformity assessment activities needed to facilitate the introduction and widespread deployment of grid-connected electric vehicles." ANSI, ANSI Workshop: Standards and Codes for Electric Drive Vehicles (Apr. 5-6, 2011),
https://share.ansi.org/Shared%20Documents/Meetings%20and%20Events/EDV%20Workshop/EDVSponsorship.pdf

As EPA notes, numerous standards and codes govern BEV safety. 88 Fed. Reg. at 25962; DRIA Ch. 1.5.2. BEVs must meet the same federal safety requirements and undergo the same safety testing as combustion vehicles.253 In the light-duty sector (where BEVs have been on the road in greater numbers and for a longer period of time), evidence shows that BEVs "are at least as safe" as combustion vehicles in terms of crashworthiness test performance, while "injury claims are substantially less frequent" for BEVs than for combustion vehicles.254 And on some safety metrics, BEVs perform substantially better than combustion vehicles. Due to their battery architecture, for example, BEVs typically have a lower center of gravity than combustion vehicles, which increases stability and reduces the risk of rollovers255 (the cause of up to 35 percent of accident deaths).256 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 59 - 60]

253 DOE, Maintenance and Safety of Electric Vehicles, Alternative Fuels Data Center, https://afdc.energy.gov/vehicles/electric_maintenance.html (last visited June 15, 2023).

254 Insurance Inst. for Highway Safety, With More Electric Vehicles Comes More Proof of Safety (Apr. 22, 2021), https://www.iihs.org/news/detail/with-more-electric-vehicles-comes-more-proof-of-safety.

255 DOE, Maintenance and Safety of Electric Vehicles.

256 CleanTechnica, The EV Safety Advantage 4 (2018), https://cleantechnica.com/files/2018/07/CleanTechnica-EV-Safety-Advantage-Report.pdf.

257 23 U.S.C. § 127(s).

258 See generally Sebastian Blanco, The Future of Solid-State Batteries, J.D. Power (Apr. 3, 2023), https://www.jdpower.com/cars/shopping-guides/the-future-of-solid-state-batteries; Chris Teague, What You Need To Know About Solid-State Batteries, Autoweek, https://www.autoweek.com/news/technology/a36189339/solid-state-batteries/ (last visited June 15, 2023).

259 See generally Michael Bull, Mass Reduction and Performance of PEV and PHEV Vehicles (undated), https://www-esv.nhtsa.dot.gov/Proceedings/22/files/22ESV-000346.pdf; Stanley, How Electric Vehicle Light-weighting is Changing the Automotive Industry, https://www.stanleyengineeredfastening.com/en/News%20and%20Stories/How%20Electric%20Vehicle%20Light-weighting%20is%20Changing%20the%20Automotive%20Industry (last visited June 15, 2023).

Fire risk and emergency response can also be managed effectively. BEVs are significantly less likely to catch fire than combustion vehicles in the first place.260 While BEVs can behave differently in fires than combustion vehicles, emergency responders have been gaining experience in BEV fire response as the number of BEVs on the road has grown. Numerous agencies and associations, including the National Transportation Safety Board,261 National Highway Traffic Safety Administration,262 and National Fire Protection Association,263 have established fire safety and emergency response recommendations for BEVs. The National Fire Protection Association and other organizations offer BEV fire response trainings,264 as do OEMs, which also produce emergency response guides for their vehicles.265 Volvo Trucks has even released an augmented reality safety app that allows first responders "to observe the scene of the emergency through an iPad or tablet camera, and which will then overlay graphics and instructions that enable … a full, detailed view of where potentially dangerous components are located, as well as the steps required to make them safe."266 The National Institute for Automotive Service has also developed safety-related standards and a testing and certification program for automotive technicians who service BEVs.267 Expected future use of solid state batteries will further reduce BEV fire risk.268 Other research efforts have identified battery designs that can improve thermal management,269 as well as improved methods of extinguishing battery fires.270 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 60 - 61]

260 See Rachel Bodine, Gas vs. Electric Car Fires [2023 Findings], AutoinsuranceEZ (Nov. 11, 2022), https://www.autoinsuranceez.com/gas-vs-electric-car-fires/ (calculating rate of car fires using National Transportation Safety Board data).

261 See, e.g., NTSB, Risks to Emergency Responders from High-Voltage, Lithium-Ion Battery Fires Addressed in Safety Report (Jan. 13, 2021), https://www.ntsb.gov/news/press-releases/Pages/NR20210113.aspx.

262 See, e.g., NHTSA, Interim Guidance for Electric and Hybrid-Electric Vehicles Equipped With High Voltage Batteries (2012), https://www.nhtsa.gov/sites/nhtsa.gov/files/interimguide_emergencyresponse_012012_v3.pdf.

263 See, e.g., R. Thomas Long Jr., et al., Best Practices for Emergency Response to Incidents Involving Electric Vehicles Battery Hazards: A Report on Full-Scale Testing Results (2013), https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Electrical/EV-BatteriesPart-1.ashx.

264 See generally Nat'l Fire Protection Ass'n, Training that Helps Keep You Protected, https://www.nfpa.org/EV (last visited June 15, 2023).

265 DOE, Maintenance and Safety of Electric Vehicles.

266 Volvo Trucks, World's first AR safety app for electric trucks launched by Volvo (May 30, 2023), https://www.volvotrucks.com/en-en/news-stories/stories/2023/may/volvo-launches-worlds-first-ar-safety-app-for-electric-trucks.html.

267 FleetMaintenance, ASE unveils new EV standards, testing, and certification (May 4, 2023), https://www.fleetmaintenance.com/equipment/safety-and-technology/article/53059346/national-institute-for-automotive-service-excellence-ase-ase-unveils-new-ev-standards-testing-and-certification.

268 Blanco, at 3; Teague, at 5.

269 See generally Chuanbo Yang et al., Compressible battery foams to prevent cascading thermal runaway in Li-ion pouch batteries, J. Power Sources, Sept. 1, 2022, https://doi.org/10.1016/j.jpowsour.2022.231666.

270 See, e.g., Int'l Ass'n Fire & Rescue Services, New revolutionary method tested extinguishes lithium-Ion EV fires in ten minutes with minimal water use (Mar. 22, 2023), https://www.ctif.org/news/new-revolutionary-method-extinguishes-lithium-ion-ev-fires-ten-minutes-minimal-water.

In sum, the public and private sectors have been working diligently to address BEV safety considerations, and those efforts will continue as the number of BEVs on the road grows. Heavy-duty BEVs can be designed and operated safely and EPA is correct in not treating safety as a constraining factor in this rulemaking. [EPA-HQ-OAR-2022-0985-1640-A1, p. 61]

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #13: We request comment on our assessment that HD BEVs can be designed to maintain safety.

- DTNA Response: Based upon DTNA's extensive experience in ZEV product development, there is no question that HD BEVs can be designed to maintain safety. [EPA-HQ-OAR-2022-0985-1555-A1, p. 160]

Organization: Owner-Operator Independent Drivers Association (OOIDA)

BEV fires are another safety concern. Lithium-battery fires can be unpredictable, difficult to extinguish, and can inflict a tragic toll. According to experts, BEV fires require different firefighting techniques. The biggest difference is that an BEV fire cannot be put out with the type of firefighting foam used to smother other fires. Instead, the battery must be cooled to stop the fire and end thermal runaway.8 Currently, there is insufficient training for consumers, first responders, and certainly professional truck drivers about how to protect themselves and the public should a fire occur. BEV fires involving commercial vehicles could be particularly dangerous given the weight of the batteries and/or if the fire occurs on or near highway infrastructure. [EPA-HQ-OAR-2022-0985-1632-A1, p. 4]

8 https://www.usatoday.com/story/money/cars/2022/10/26/electric-vehicle-fires-florida-flooding-what-happened/10553207002/

Organization: The Sulphur Institute (TSI)

One key concern not addressed in this NPRM and one from TSI, is how refineries and gas plants will adapt, or can adapt, to having electric vehicles operate "inside the fence line" (i.e., is it safe to operate an electric battery or hydrogen vehicle in such a highly flammable environment). The National Transportation Safety Board has documented (2) the safety risks to emergency responders from lithium-ion battery fires. While occurrence of a fire may be low, there could be catastrophic consequences of such an incident inside a refinery, for example. To date, TSI has not seen a process hazard analysis (PHA) conducted in accordance with EPA's risk management plan (RMP) or OHSA's process safety management (PSM) standards that supports the use of EV or hydrogen vehicles in a highly flammable environment. TSI encourages the EPA to engage energy industry stakeholders to research and conclude if it is safe to operate these vehicles in refineries before a mandate from this NPRM takes effect. [EPA-HQ-OAR-2022-0985-1624-A1, pp. 1 - 2]

(2) NTSB Safety Report NTSB/SR-20/01 PB2020-101011 Safety Risks to Emergency Responders from Lithium-Ion Battery Fires in Electric Vehicles

Organization: Truck Renting and Leasing Association (TRALA)

Safety Concerns

Safety advocates have raised concerns over the increased weight of ZEVs. The National Transportation Safety Board (NTSB) has also expressed concern about the safety risks that heavy EVs pose if they collide with lighter vehicles.14 Little research has been done on the safety risks of increasing vehicle weights and the interfacing between lighter vehicles with heavier trucks. In 2011, the National Bureau of Economic Research published a paper that said being hit by a vehicle with an added 1,000 pounds increases by 47% the probability of being killed in a crash.15 [EPA-HQ-OAR-2022-0985-1577-A1, p. 12]

14 'NTSB head warns of risks posed by heavy electric vehicles colliding with lighter cars,' The Associated Press (January 11, 2023).

15 'Why the 'significant' weight of electric vehicles is sparking new safety fears,' Global News (April 12, 2023).

Increased weight is not the only issue of concern for safety advocates. ZEVs also afford drivers unprecedented engine power and acceleration if not governed. [EPA-HQ-OAR-2022-0985-1577-A1, p. 12]

ZEVs may also increase road congestion as more vehicles may be needed to fulfill hauling needs due to reductions in drive times (See Hours-of-Service discussion below) and reduced payloads resulting from the thousands of pounds of added weight to trucks from ZEV technologies (See Weight Exemption discussion below). More truck-to-car interactions will increase the potential for more highway accidents. [EPA-HQ-OAR-2022-0985-1577-A1, p. 12]

The national shortage of truck parking spaces has reached historic levels. The increasing number of trucks parked on the shoulders of highways, in retail parking lots, and along on- and off-ramps are the consequence of inadequate rest areas for truckers. Parked trucks in undesignated or unauthorized areas jeopardize the safety for both drivers and the public alike. (See Truck Parking discussion below). Unless the nation's truck parking shortage is addressed, ZEVs stand to potentially exacerbate the current situation. [EPA-HQ-OAR-2022-0985-1577-A1, p. 12]

Emergency responders anticipate the need to prepare for fires in crashes and incidents from lithium-ion battery-powered trucks. EVs present new challenges for first responders and safety concerns from energy stored in battery packs. Proper EV towing is critical and the ignition/reignition of fires several weeks into BEVs being stored in tow yards needs to be carefully monitored and assessed. While much experience is being gained from incidences involving light-duty vehicles, the same cannot be said for EV vehicles at the other end of the spectrum. [EPA-HQ-OAR-2022-0985-1577-A1, p. 12]

Organization: Valero Energy Corporation

Conversely, EPA should consider whether the increased costs resulting from the proposed rule cause shippers to turn to rail. Rural communities with limited highway access are already experiencing unreasonable delays for emergency responders to reach patients due to extremely long trains that may take hours to clear; in some cases, these delays have resulted in fatalities.155 [EPA-HQ-OAR-2022-0985-1566-A2, p. 32]

155 https://www.washingtonpost.com/nation/interactive/2023/long-trains-block-intersections-paramedics/

2. EPA fails to consider threats to human health and safety created by transition to heavy-duty ZEV.

The proposed rule fails to address the real-world safety implications of increasing the number of heavy-duty trucks on America's roadways by as much as 33 to 50 percent. In fact, the head of the National Transportation Safety Board recently warned that the heavier weight of electric vehicles poses increased risk of severe injury or death to passengers in lighter vehicles.156 While her comments were centered on the multi-thousand pound weight differential between battery electric LDVs and their much lighter conventional ICE LDV counterparts, the HDV proposal carries the same risk, but at a much higher HDV to LDV weight differential of tens of thousands of pounds, compounded by the need to increase the sheer number of HDV on U.S. roadways to meet EPA's proposed standards and the cargo demands of the country. In work performed by the National Bureau of Economic Research, Pounds that Kill: The External Cost of Vehicle Weight, showed that "controlling for own-vehicle weight, being hit by a vehicle that is 1,000 pounds heavier results in a 47% increase in the baseline fatality probability."157 EPA's proposal fails to account for the resulting increase in the number of heavier heavy-duty vehicles on U.S. roads and the associated increase in risk of fatalities. [EPA-HQ-OAR-2022-0985-1566-A2, p. 32]

156 See Id.

157 National Bureau of Economic Research, Pounds That Kill: The external costs of Vehicle Weight, June 2011

Further, EPA's proposal lacks coordination with the National Transportation Safety Board and the U.S. Department of Transportation (DOT) to address safety issues created directly from EPA's proposed rule. "The DOT has a responsibility to research and ensure vehicle and roadway design and safety standards meet the challenges and demands of our future transportation system. This Administration continues to push policies that will result in more BEVs on our roadways, but has failed to plan from a safety and infrastructure perspective. The sequence of proposals is misguided; vehicle and roadway design and safety standards should have been under development and deployed well before the EPA proposed a rule to force consumer adoption of heavier EVs. This type of research and development, including vehicle, roadway lifespan, and guardrail and work zone safety equipment testing all will require years to undertake. If these proposals move forward without the appropriate safeguards in place, backed by sound science, the vehicle and infrastructure investments being made today may miss the mark on safety and longevity in the years to come."158 [EPA-HQ-OAR-2022-0985-1566-A2, p. 32]

158 Letter from the United States Senate to EPA Administrator, May 25, 2023

Moreover, EPA fails to address the increase in fire hazards posed by lithium-ion batteries. On May 24, 2023, EPA's Office of Resource Conservation and Recovery issued a memo clarifying applicability of the Resource Conservation and Recovery Act ("RCRA") universal waste and recycling requirements to lithium-ion batteries, stating that these batteries "are likely hazardous waste at end of life."159 A FAQ appended to the memorandum stated that "Given the number of fires from lithium batteries, EPA is evaluating universal waste battery management standards."160 Until this analysis is complete and any necessary regulatory changes are made, these risks likely will remain. Further, since RCRA does not apply to products that are in use and have not been deemed a waste, any standard EPA may develop to mitigate risks from used batteries will not apply to batteries that are in use or have not yet been deemed a waste. EPA therefore should, but to date has not, consider the increased fire hazard presented by additional heavy-duty vehicles with large batteries. [EPA-HQ-OAR-2022-0985-1566-A2, p. 33]

159 "Lithium Battery Recycling Regulatory Status and Frequently Asked Questions," Carolyn Hoskinson, EPA Office of Resource Conservation and Recovery, May 24, 2023.

160 Id. at p. 7.

Organization: Volvo Group

Packaging Challenges

The proposed rulemaking requests comment on stringency adjustments based on the suitability of electrification/alternative fuels for various duty cycles. The Volvo Group would presumably register vehicles among 16 of the 101 vehicle categories listed. As we shift our platforms toward more CO2-neutral products, greater packaging challenges will drive new initiatives to ensure we remain compliant with the Code of Federal Regulations (CFR) and Federal Motor Vehicle Safety Standards (FMVSS). [EPA-HQ-OAR-2022-0985-1606-A1, p. 12]

EPA Summary and Response:

EPA discusses the issue of BEV safety considerations extensively in RIA Chapter 1.5.2. In addition to the detailed discussion there, we add the following summary of comments and response thereto.

Summary:

The American Highway Users Alliance claims that EV servicing danger drives the need for two technicians rather than one. NADA-ATD shared that dealerships would require workplace safety and emergency response training to safely work with and around high voltage systems.

The Arizona State Legislature asserted that the "proposed rule is arbitrary and capricious because it fails to consider safety issues," and continues that EPA's discussion of safety issues in the preamble was cursory, even as it acknowledged and also stated that EPA is obliged to consider safety issues "under Section 202 (a)." The Clean Fuel Development Coalition asserts (in a footnote) that "the proposal also arbitrarily ignores the underdeveloped industry standards and safety protocols that exist today for heavy-duty BEVs and FCEVs that it must consider under Section 202(a)(4)(A) that specifically prohibits the use of an emission control device, system or element of design that will cause or contribute to an unreasonable risk to public health, welfare, or safety."

The Arizona State Legislature also stated that the preamble to the proposed rule failed to "consider or respond to serious safety issues presented by electric trucks." The commenter quotes materials from the National Transportation Safety Board which warn that "'[f]ires in electric vehicles powered by high-voltage lithium-ion batteries pose the risk of electric shock to emergency responders from exposure to the high-voltage components of a damaged lithium-ion battery".' and that "'[t]hermal runaway and multiple battery reignitions after initial fire suppression are safety risks in high-voltage lithium-ion battery fires."' Other commenters raising similar concerns were AmFree, AFPM, Steven Bradbury, DTNA, Owner Operator Independent Drivers Ass'n (OOIDA), TRALA, and Valero. DTNA also commented that there is insufficient training on fire protection for first responders and HD BEV users. CARB shared LD data showing that the ZEV rate of fire occurrence is much lower than that of gasoline vehicles. The Clean Air Task Force shared the same fire incidence trend. They also noted the many agencies that provide fire and emergency response recommendations and training. NADA commented that some dealers were educating first responders on proper battery safety when responding to crashes. Steven Bradbury and the Arizona State Legislature shared concern that first responders would have higher operational costs. Also concerning fire risk, TSI raised concern with HD BEV operating "within the fence line" of a refinery.

The American Free Enterprise arm of the Chamber of Commerce maintains that "existing 'standards' provide little assurance given the safety problems that have arisen already, and the likely increase in similar incidents if use of electric vehicles substantially increases, as the proposed rule not only anticipates but affirmatively intends." Similarly, The American Bus Association and Valero claim that there is currently insufficient safe operational standards. Volvo shared that they would have packaging challenges to meet existing Code of Federal Regulations (CFR) and Federal Motor Vehicle Safety Standards (FMVSS) that would drive initiatives to remain compliant.

The Arizona State Legislature, as well as AmFree, TRALA, National Ass'n of Chemical Distributors, AFPM, and Valero, claim that there will be increased fatalities resulting from crashes between HD BEVs and lighter weight ICE vehicles due to the extra weight attributable to the battery. Some of these comments cited a 2011 study for the proposition that "'a 1,000-pound increase in striking vehicle weight raises the probability of a fatality in the struck vehicle by 47%.'" The Arizona legislature comment states that EPA should monetize these additional fatalities as a cost of the rule. AFPM adds that the increased speed of the BEV will be a safety issue while TRALA suggests a risk due to ZEV providing "unprecedented engine power and acceleration."

Valero indicates states that spent lithium-ion batteries are hazardous wastes under federal law and that their recycling and other management could therefore pose risks for which EPA has failed to adequately account.

Commenters like Valero and TRALA maintained that BEVs would lead to additional traffic congestion due to a 33 to 50% increase in HD trucks. Certain commenters (including Valero, National Ass'n of Chemical Distributors and the Sulphur institute) maintained that ZEVs would contribute to increased traffic, the assumption being that due to limited range, more trips would be required. TRALA expanded the concern of additional trucks to theorize that parking could become such an issue that it would cause safety concerns. TRALA also shared that the increased power of HD BEVs could cause safety concerns.

Valero maintains that EPA failed to coordinate with relevant federal safety agencies in issuing its proposed rule.

<u>Response:</u>

EPA's assessment at proposal was that HD BEV systems must be, and are, designed "to always maintain safe operation." 88 FR at 25962. EPA reiterates that conclusion here. As EPA explained at proposal, and as noted by certain commenters, there are industry codes and standards for the safe design and operation of HD BEVs. The operation of BEV extends to service as well as to emergency response. In addition, HD BEVs are subject to, and necessarily comply with, the same federal safety standards and the same safety testing as ICE heavy-duty vehicles. Commenters challenging the safety of HD BEVs failed to address the existence of these protocols and federal standards.

For HD BEVs to uphold battery/electrical safety during and after a crash, they are designed to maintain high voltage isolation, prevent leakage of electrolyte and volatile gases, maintain internal battery integrity, and withstand external fire that could come from the BEV or other vehicle(s) involved in a crash. The internal battery integrity is important to prevent fire risk from developing within the battery over time. Standards driving design and process for optimizing crash and post-crash safety have been completed by IEC and ISO as well as:

- National Highway Traffic Safety Administration (NHTSA) FMVSS 305, electrolyte spillage and electrical shock protection
- NHTSA DOT HS 812 789, post-crash stranded energy tools and procedures
- SAE J1766, crash integrity testing
- SAE J2990, first and second responder recommended practice

Moreover, empirical evidence from the light-duty sector (where BEVs have been on the road in greater numbers and for a longer period of time), shows that BEVs “are at least as safe” as combustion vehicles in terms of crashworthiness test performance, and “injury claims are substantially less frequent” for BEVs than for combustion vehicles.[366] On some safety metrics, BEVs perform substantially better than ICE vehicles. Due to their battery architecture, for example, BEVs typically have a lower center of gravity than combustion vehicles, which increases stability and reduces the risk of rollovers (the cause of up to 35 percent of accident deaths).[367]

Similarly, the record for NHTSA’s 2023 proposal to revise Corporate Average Fuel Economy standards for all light passenger vehicles includes estimates of the safety impacts of EV weight and found that, “Change in vehicle mass affects the prevalence of injuries and fatalities on roadways. Increases in vehicle mass might confer additional safety to vehicle occupants while also reducing safety for pedestrians, cyclists, and other vulnerable road users, as well as for road users with lower mass vehicles.” But this light passenger vehicle Preliminary RIA goes on to say, “Across all alternatives, mass changes relative to the baseline result in small reductions in overall fatalities, injuries, and property damage. These results may seem counterintuitive given the agency’s previous analyses. This outcome amounts to noise around zero.”[368]

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[366] See Insurance Inst. for Highway Safety, “With More Electric Vehicles Comes More Proof of Safety” (Apr. 22, 2021), https://www.iihs.org/news/detail/with-more-electric-vehicles-comes-more-proof-of-safety.
[367] DOE, “Maintenance and Safety of Electric Vehicles,” https://afdc.energy.gov/vehicles/electric_maintenance.html.
[368] US Department of Transportation, National Highway Traffic Safety Administration. “Preliminary Regulatory Impact Analysis. Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years

Fire risk and emergency response can also be managed effectively. There is evidence (discussed more fully below) that EVs are less likely to catch fire than internal combustion engine vehicles. Although BEVs can behave differently in fires than ICE vehicles, emergency responders have been gaining experience in BEV fire response as the number of BEVs on the road has grown, and there are protocols and guidance at the federal and private levels in support of first responders. See individual response below.

In sum, the public and private sectors have been working diligently to address BEV safety considerations, and those efforts will continue as the number of BEVs on the road grows. Heavy-duty BEVs can be, and are designed and operated safely and EPA, after study and consideration, is therefore not considering safety as a constraining factor in this rulemaking.

In regards to the comment that ZEVs would need two technicians rather than one, requiring two technicians for BEV servicing should not be and is not the preferred or even acceptable safety methodology for BEV. The two-technician proposal suggests one should be an observer. Observing and reacting to an accident after harm is done is much less desirable than preventing the accident altogether. Creating service procedures that require two technicians is not acceptable safety practice and is not seen in service procedure articles.[369] Per these articles, safety is accomplished with proper personnel protective equipment (PPE) and proper procedures, many of which involve deactivating or disconnecting high voltage systems. Proper PPE procedures, and training are all currently required for ICEV just as they are for BEV. Also consistent in the literature is the expectation that BEV will require less maintenance.[370]

Comments that EPA failed to properly consider issues of safety in regards to ZEVs are unfounded. Issues of safety are certainly proper for EPA to consider under section 202(a)(1) and (2), and EPA has done so since the inception of its motor vehicle emission control programs. See, e.g., 81 FR at 73512/2 (Oct. 25, 2016). CAA Section 202(a)(4) indeed mandates EPA to consider whether emission control devices, systems, or design elements pose an “unreasonable risk to public … safety.” EPA also considers issues of safety when determining whether to issue a vehicle a certificate of conformity. See section 206(a)(3)(A). EPA thus discussed and assessed potential safety issues associated with BEV and FCEV at length in the DRIA as well as in the proposed rule preamble, noting potential safety issues and means of securely managing those issues. See DRIA at pp. 37-39 (BEVs), 69 (depot charger installation), and 74-76 (FCEVs). See also RIA Chapter 1.5.2 and 1.7.4. Nor does EPA consider the multiple binding federal safety standards, and industry protocols to be ineffective. The commenters’ claim that EPA arbitrarily failed to consider safety issues is consequently incorrect.

Commenters are also incorrect in their assertion that the EPA did not consider the potential risk of fires in electric vehicles. First, as the commenter Arizona State legislature acknowledges, EPA did discuss these issues in the DRIA. DRIA at 38. EPA stated, and reiterates, that large

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2027 and Beyond and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030 and Beyond. July, 2023. Available online: https://www.nhtsa.gov/sites/nhtsa.gov/files/2023-08/NHTSA-2127-AM55-PRIA-tag.pdf

[369] https://www.vehicleservicepros.com/collision-repair/on-the-shop-floor/article/21232411/powering-up-safety-basics-ev-repai
https://www.fleetmaintenance.com/equipment/battery-and-electrical/article/21231765/preparing-for-bev-maintenance-and-safety-training

[370] https://afdc.energy.gov/vehicles/electric_maintenance.html

amounts of water can be needed to put out fires which may result from large batteries, and that first responders can and should be trained to deal with fires of electrical origin (as they are trained to deal with fires from other chemical, ignitable, or flammable origins). Empirical studies in fact indicate that fire rates from BEVs are lower than fire rates from ICEs or hybrid vehicles. While some aspects of suppressing BEV fires may increase first responder costs, lower fire incidence will keep operational costs down. See AutoinsuranceEZ: Gas vs. Electric Car Fires [2024 Findings], Dec. 19, 2023 (rate of fires from BEV light duty vehicles is one-and-a-half to over two orders of magnitude less than rate for gasoline or hybrid vehicles). Fire-related recalls for BEVs are likewise considerably lower than for their ICE or hybrid counterparts. Id. The same source and AFPM note, as EPA did at proposal, that battery fires are of a different character, can pose different and more difficult challenges to extinguish, and the vehicles may have stranded electrical power, such that first responder training is desirable. Numerous agencies and associations, including the National Transportation Safety Board, National Highway Traffic Safety Administration, and National Fire Protection Association, have established fire safety and emergency response recommendations for BEVs. See Rachel Bodine, Gas vs. Electric Car Fires [2023 Findings], AutoinsuranceEZ (Nov. 11, 2022), https://www.autoinsuranceez.com/gas-vs-electric-car-fires/ (calculating rate of car fires using National Transportation Safety Board data); see, e.g., NTSB, Risks to Emergency Responders from High-Voltage, Lithium-Ion Battery Fires Addressed in Safety Report (Jan. 13, 2021)[371]. See also Comments of Clean Air Task Force, summarizing additional actions of public and private entities regarding emergency preparedness. Although these data are from light duty vehicles, EPA's assessment is that it is appropriate to give weight to them in its consideration of battery safety issues (and, in addition, we note the absence of data from HD BEV applications).

Although HD BEVs are seen as safe with respect to fire risk, operation within a refinery as posed by TSI could be a special case. EPA does not claim to have the knowledge to address refinery risk and safe operating procedures. As not all HD vehicles are projected to be ZEVs in EPA's modeled potential compliance pathway, refineries, like other purchasers, will have choices regarding what vehicle type is best for their special circumstances.

EPA thus has considered the issue of HD and FCEV battery fire safety, and accounted for potential risks and means to mitigate them.

As noted above, BEV fire rates have been historically less than for ICE and hybrid vehicle types. And many of the "standards" (commenter's air quotes) are the same federally applicable safety standards to which ICE vehicles likewise are subject. EPA thus does not accept the commenters' contention that existing standards serve as no guarantee of safety. RIN: 2127-AM43 adds safety requirements for propulsion batteries in electric-powered vehicles and extends the applicability of FMVSS No. 305 to heavy vehicles (vehicles with a gross vehicle weight rating greater than 10,000 pounds) to align the standard with global technical regulation (GTR) No. 20, Electric vehicle safety. The proposed additional FCEV requirements (RIN: 2127-AM40) align with those specified in global technical regulation (GTR) No. 13, Hydrogen and fuel cell vehicles. Both AM40 and AM43 are planned for publication in early 2024. EPA notes further that the heavy-duty manufacturing industry is investing enormous amounts of capital into

[371] https://www.ntsb.gov/news/press-releases/Pages/NR20210113.aspx.; see 262 See, e.g., NHTSA, Interim Guidance for Electric and Hybrid-Electric Vehicles Equipped With High Voltage Batteries (2012), https://www.nhtsa.gov/sites/nhtsa.gov/files/interimguide_emergencyresponse_012012_v3.pdf.

developing and marketing HD BEVs, and it is obviously in their interest that these vehicles be safe in operation. See Comments of Daimler at 160 stating unequivocally that HD BEVs do not pose a safety risk, as well as Volvo's comment that it adheres strictly to all applicable safety standards in designing its HD BEVs.

The comments claiming increased fatalities due to crashes between HD BEVs and lighter weight ICE vehicles due to extra weight are overstated given that the weight of Class 8 BEVs is capped by law at 82,000 lbs, which is only 2,000 pounds (2.5%) more than the maximum weight of a Class 8 ICE vehicle. See, e.g., Comments of Clean Air Task Force at 60; 23 USC section 127s. For other weight classes, the vehicle weight is restricted to the same maximum GVWR for BEV and ICE. In addition, our HD TRUCS analysis took a close look at weight and payload (as further described in RIA Chapter 2.9.1), and there are a number of applications (per HD TRUCS) where the optimized vehicle weight is less than that of the comparable ICE vehicle. Also, per our HD TRUCS analysis, almost 50% of the 101 vehicle types studied had a 2% or less weight gain for BEVs versus a comparable ICE vehicle. We also note that this final rule does not mandate use of ZEVs. The modeled potential compliance pathway is but one example of how manufacturers may choose to meet the standards at reasonable cost within the lead time afforded. See generally our responses in RTC section 2.1 above. As such, certain applications for vehicle types requiring the largest batteries and possibly increasing weight the most will be the most expensive and least likely to improve TCO and the correspondingly manufacturers are most likely to use ICEVs for those applications as a compliance strategy. Moreover, there is every incentive for OEMs to reduce weight of BEV vehicles in order to improve BEV efficiency and vehicle range. Llighter weight battery alternatives are readily available and battery weight can decrease as specific energy increases as expected by ANL/DOE[372]. DRIA at 40; see generally Sebastian Blanco, The Future of Solid-State Batteries, J.D. Power (Apr. 3, 2023).[373] Finally, the comment by AFPM that the HD BEV will have increased speed is not substantiated nor is there reason to think (TRALA) that the acceleration performance of ZEV is a safety concern. Vehicle speeds are governed on our roadways and there is no reason for BEV to be moving faster.

EPA disagrees with the commenter's assertion that spent lithium-ion batteries pose risks that the EPA has not accounted for. The fact that spent lithium-ion batteries may be hazardous wastes is a factor favoring their safe management, not the reverse. As the commenter indicated, most lithium-ion batteries are likely to be hazardous waste when discarded due to potential ignitability (D001) and reactivity (D003) characteristics, which are two of four hazardous waste characteristics that identify any given waste as hazardous. See 40 CFR Part 261 subpart C. Persons who generate wastes that are defined as hazardous under Resource Conservation and Recovery Act (RCRA) are referred to as "hazardous waste generators." While EPA has determined that most lithium-ion batteries on the market today are likely to be hazardous waste when they are disposed of, it is the responsibility of the generators (persons who generate wastes) to make an accurate hazardous waste determination per 40 CFR 262.11. If the battery is a hazardous waste, then the battery must be managed properly from point of generation to point of final disposition under various EPA regulations implementing subtitle C of RCRA.

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[372] https://publications.anl.gov/anlpubs/2024/01/187177.pdf. Cost Analysis and Projections for U.S.-Manufactured Automotive Lithium-ion Batteries

[373] https://www.jdpower.com/cars/shopping-guides/the-future-of-solid-state-batteries; Chris Teague, What You Need To Know About Solid-State Batteries, Autoweek, https://www.autoweek.com/news/technology/a36189339/solid-state-batteries/ (last visited June 15, 2023).

Spent electric vehicle batteries are likely to be recycled, as the commenter seems to acknowledge. See RTC 17.2. Safe recycling of hazardous waste batteries is encouraged under the RCRA hazardous waste regulations. Hazardous waste batteries of all chemistries may be managed under the Universal Waste battery regulations found in 40 CFR Part 273. These regulations are designed to encourage resource recovery while ensuring adequate protection of human health and the environment. See 60 FR at 25501-02 (May 11, 1995). Requirements for battery handlers (defined in 40 CFR section 273.9) include but are not limited to: notification to EPA and obtaining an EPA identification number, labeling of containers of batteries, employee training, limits on battery accumulation time, plus recordkeeping and record retention. Ultimately the universal waste batteries must go to a destination facility that has a RCRA subtitle C permit if it stores batteries that are hazardous waste, or otherwise satisfies conditions set out in 40 CFR section 261.6(c) for certain recyclers. These regulatory provisions are intended ensure proper management at end-of-life for lithium-ion batteries. In addition, EPA has further clarified how hazardous lithium batteries are regulated when recycled at end of life in the memorandum from Carolyn Hoskinson, Director, Office of Resource Conservation and Recovery, “Lithium Battery Recycling Regulatory Status and Frequently Asked Questions” (EPA Office of Land and Emergency Management, May 24, 2023) (cited by the commenter). Should hazardous waste batteries be disposed rather than recycled, their management is comprehensively regulated from point of generation to point of final disposition under the RCRA subtitle C regulations (40 CFR Parts 261-265 and 267). Among the requirements are a prohibition on land disposal of the batteries until they are pretreated so as to minimize any threats to human health and the environment posed by their land disposal. RCRA section 3004 (m) and 40 CFR Part 267 (treatment standards).

In addition, the Department of Transportation regulates end-of-life batteries under its Hazardous Material Regulations. Manufacturers are required to meet requirements related to altitude, thermal test, overcharge, and shock. Upon passing this test, batteries can be transported but are subject to additional safety requirements, such as being placed in outer packaging that can resist atmospheric pressure, loadings, and shocks that typically occur during transportation. See generally 49 CFR Parts 171-180 generally and 49 CFR section 173.185 for hazardous material regulation for lithium batteries.

EPA consequently does not accept the commenter’s assertion that EPA is unaware of potential issues relating to management of spent lithium-ion batteries, or that management of these batteries poses risks for which EPA has not accounted for in this rulemaking.

EPA’s responses to issues of BEV range and payload are found at RTC Section 4.4, RIA Chapter 2.9.1, and sources there cited. For the reasons there stated, EPA does not accept the premise that traffic congestion or parking problems will increase as a result of the final standards. Moreover, as stated previously, this final rule is not a ZEV mandate, and considers ZEVs in one modeled potential compliance pathway for meeting the standards to support the feasibility of the final standards. Other methods of compliance are available. See, e.g., preamble Section II.F.4; see also our responses in RTC section 2.1. Under our modeled potential compliance pathway, fleet owners are not expected to utilize BEVs, nor manufacturers to produce them, for applications (to the extent there are any) that would require more than one HD ZEV to replace a comparable ICE vehicle. As explained throughout this response, EPA does not accept the assertion that HD BEV power will cause safety concerns. Moreover, RMI notes in its comments that HD drivers have commented that "driving in traffic seems easier and safer" in a BEV due to superior torque, better visibility, and smoother ride.

EPA has a long history of coordinating safety issues with the National Highway Traffic Safety Administration (NHTSA) and did so prior to the proposal and throughout the rulemaking process for the final rule here. See Memorandum from Michael Landgraf "Summary of NHTSA Safety Communications During LD and HD GHG Rulemaking" (February 14, 2024). EPA has also met extensively with the Joint Office of Energy and Transportation, of which NHTSA is a member, throughout this entire rulemaking process. Information included by EPA in EPA's rulemaking record on pending NHTSA rulemakings pertaining to BEVs and FCEVs, as well as documentation of existing NHTSA research pertaining to electrified vehicles, is a product of that consultation.

4.9 BEV Mounting Systems and Tires

Comments by Organizations

Organization: Lynden Incorporated

Batteries and electric motors on rubber mountings are not robust enough to handle the impact of gravel roads, which would make transporting critical supplies and supporting the remote Alaskan and rural agricultural communities in the Pacific Northwest unreliable, if not impossible. [EPA-HQ-OAR-2022-0985-1470-A1, p. 2]

Organization: Truck Renting and Leasing Association (TRALA)

Tires, tubes, liners, and valves for truck businesses are the number one repair and maintenance expense comprising 43% of all such costs. 13 (See Figure 3). [Refer to Figure 3 on p. 11 of docket number EPA-HQ-OAR-2022-0985-1577-A1] ZEV tires will cost even more as the added weight and extra torque of a ZEV will cause greater and quicker tire wear. It also remains unclear whether the new generation of tires for ZEVs will maintain the same tire and casing integrity for retread purposes – a must for today's truck maintenance shops and a key strategy for maximizing tire recovery and reuse. TRALA asks EPA to address increased ZEV tire costs and performance in the final rule. [EPA-HQ-OAR-2022-0985-1577-A1, p. 10]

> 13 'Transportation Fleets Lowering Tire Costs Through Data, Business Intelligence and Lifecycle Management,' Waste Advantage Magazine (November 30, 2019).

Organization: U.S. Tire Manufacturers Association (USTMA)

Additionally, as electric commercial vehicles continue to be introduced into the marketplace, their heavier weight and negative impact on tire wear merits careful consideration. Ensuring tires can handle the increased load of the vehicle can mitigate any unintended consequences impacting driver safety and tire performance. [EPA-HQ-OAR-2022-0985-1635-A1, p. 4]

EPA Summary and Response:

Summary:

EPA received a comment from Lynden Inc. that the mounting systems for electric motors and batteries are not robust enough for extended use on gravel roads and this makes delivering critical supplies in harsh conditions unreliable.

TRALA and USTMA expressed concern over tire performance due to heavier weight EVs and the potential for increased tire wear. TRALA suggested that EPA should consider the cost of any increased maintenance for tires and USTMA noted a need for tires to "handle the increase load" to ensure driver safety.

Response:

We expect that manufacturers will build ZEVs to meet or exceed the reliability requirements of manufacturers' current ICE vehicle portfolio. Moreover, as noted above when considering similar comments regarding ZEV suitability for operation in extreme weather conditions, we expect that fleets operating in extreme conditions (be it ambient temperature or unpaved highways) will adopt ZEVs more slowly than in less harsh areas and, as explained further in our response in RTC Section 4.3.2, there would be ample opportunities under these standards for ICE vehicles to be utilized in those conditions.

We do not have data to suggest tires are underperforming for current EV customers in the heavy-duty sector as explained in Section 13 of RTC. Furthermore, heavy-duty vehicles, regardless of their propulsion technology or tare weight, are limited by their gross vehicle weight rating (GVWR) and tire manufacturers currently offer a wide selection of tires for the entire range of weights legally permissible for heavy-duty vehicles. We expect tire manufacturers will continue to research vehicle trends and design tires that meet the durability and performance needs of their customers. Commenters did not provide data or references from which we could update our analysis for the final rule. See Section 13 of this RTC document, for a description of how heavy-duty vehicle tire wear was factored into our emission impacts analysis for this rule.

4.10 Fuel Operated Heaters

Comments by Organizations

Organization: California Air Resources Board (CARB)

d. Fuel Operated Heaters

Affected page: DRIA 43

In the DRIA, U.S. EPA suggests fuel operated heaters (FOH) may be needed in ZEV applications to provide for cabin heating in extreme cold temperatures, or where a reduction in driving range is unacceptable. [EPA-HQ-OAR-2022-0985-1591-A1, p.38]

FOHs use diesel or gasoline fuel to provide heat and have associated criteria pollutant as well as GHG emissions. They are widely used in HDVs with ICEs to provide cab heating during idling and for pre-heating the engine block during cold start in cold ambient conditions. As a result, since 2008, CARB has been regulating emissions from FOHs installed in HDVs equipped with aftertreatment systems such that emissions from FOHs do not exceed emissions from idling diesel fueled HDVs equipped with aftertreatment systems.115 [EPA-HQ-OAR-2022-0985-1591-A1, p..38]

115 Title 13, California Code of Regulations, section 2485.

Recent studies raise concern about FOH emissions. One study has shown that PM emissions from unregulated FOHs can be up to a thousand times higher than the particulate emissions of idling gasoline vehicles.116 Another study of 64 buses across eight types and five FOH manufacturers reports that FOHs exceeded Euro VI standards for PM on 11 percent of units tested and particle number standards for 54 percent of units tested.117 The same study found higher emitter examples without correlation between high CO and high PM that may suggest multiple mechanisms for creating high emissions conditions. A report on FOH emissions measurement methods reports their observation of PM emissions that appeared driven by cold combustion chamber conditions which are often and recurrently associated with the start of each “fired” period in the on/off duty-cycle of the FOH.118 This can cause emissions rates to be uncorrelated with average FOH power drawn, but instead affected by vehicle/FOH implementation details affecting cycling event frequency that determines the number of start of firing emissions bursts. These results indicate that the use of FOHs in otherwise HD ZEVs can have a significant impact on air quality and would significantly undermine the emissions benefits expected from these vehicles. The high values reported for in-use unregulated FOHs contrast with emissions data submitted for CARB certification of FOHs and some recently reported emissions data U.S. EPA has received from FOH manufacturers. These high levels together with anecdotal reports of frequent required FOH maintenance and user reported run-to-failure maintenance practices119 raise questions about in-use emissions durability, the ability of the FOH industry to self-policy in the absence of U.S. EPA emissions standards and enforcement, and the variability of emissions rates across manufacturers and FOH models. [EPA-HQ-OAR-2022-0985-1591-A1, pp.38-39]

116 Karjalainen, Panu, M. Nikka, M. Olin, S. Martikainen, A. Rostedt, A. Arffman, gand S. Mikkonen. 2021. “Fuel-Operated Auxiliary Heaters are a Major Additional Source of Vehicular Particulate Emissions in Cold Regions” Atmosphere 2021, 12(9), 1105. https://doi.org/10.3390/atmos12091105

117 Measurement of emissions from diesel fired heaters, January - March 2021. https://cleanbusplatform.eu/storage/files/measurement-of-emissions-from-diesel-heaters-ti-2021-1143767-1.pdf

118 Energies | Free Full-Text | Testing Method for Electric Bus Auxiliary Heater Emissions, 2023. https://www.mdpi.com/1996-1073/16/8/3578

119 Measurement of emissions from diesel fired heaters, January - March 2021. https://cleanbusplatform.eu/storage/files/measurement-of-emissions-from-diesel-heaters-ti-2021-1143767-1.pdf

School buses are often cited as an example in support of FOHs as a ‘cost effective’ means to extend battery range. CARB staff point out that PM “self-pollution” is a documented serious issue with conventional diesel buses.120,121,122,123 U.S. EPA has recognized school buses as a target sector for turnover to ZE technologies and Congress has allocated an additional $5 billion for direct funding incentives to replace existing school buses with ZE and low emission models to reduce the exposure to harmful pollutants experienced by school children.124 The addition of FOHs to otherwise ZE school buses would be anticipated to be subject to these same cabin penetrating exhaust re-entrainment physical processes delivering PM and any other FOH exhaust pollutants to the passengers, counteracting the purpose of the program. The discussion above of FOH emission rate issues further underscores the potential harms from such an ill-conceived configuration. [EPA-HQ-OAR-2022-0985-1591-A1, p.39]

120 Full article: Measuring In-Cabin School Bus Tailpipe and Crankcase PM2.5: A New Dual Tracer Method. https://www.tandfonline.com/doi/full/10.3155/1047-3289.61.5.494

121 Characterizing The Range Of Children's Pollutant Exposure During School Bus Commutes. https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/00-322.pdf

122 Emissions From School Buses Increase Pollution Levels Inside the Bus. https://www.edf.org/sites/default/files/5342_School_bus_pollution_studies.pdf

123 A Multi-City Investigation of the Effectiveness of Retrofit Emissions Controls in Reducing Exposures to Particulate Matter in School Buses. https://www.catf.us/wp-content/uploads/2019/02/CATF_Pub_School_Bus_Particulate_Matter_Study.pdf

124 U.S. EPA's Clean School Bus Program. https://www.epa.gov/cleanschoolbus

As discussed in the NPRM and DRIA, alternative technologies such as positive temperature coefficient electric resistance heater or a full heat pump system can be used to provide cabin heating. A wide array of technologies are available to reduce the vehicle heating load, thus lessening the perceived need for FOHs. Passive means of heating load reduction include design choices for passenger compartment insulation, battery pack insulation and vehicle glazing, as well as active means including shore power pre-heat, and directing heat more efficiently to the occupants via the use of heated seats, steering wheels, interior surfaces and floors.125,126 The energy cost of the remaining heat delivery itself can be reduced using heat pumps that have become increasingly capable at low temperatures. CO2 based R744 heat pump systems maintain efficiency as low as -20 degrees Celsius.127 Already 60 percent of German electric buses are equipped with heat pumps.128 Most major mobile air conditioning (A/C) system suppliers already have a passenger bus heat pump offering, with the low temperature capable R744 systems being quite common among them.129,130,131,132,133 A number of these commercial vehicle oriented heat pump systems already simultaneously incorporate both outside air heat sourcing and liquid coolant heat sourcing to flexibly optimize integration with the powertrain thermal management and maximize waste heat recovery for use in cabin heating. [EPA-HQ-OAR-2022-0985-1591-A1, pp.39-40]

125 Letenda announces its first order for electric buses in the United States. https://www.prnewswire.com/news-releases/letenda-announces-its-first-order-for-electric-buses-in-theunited-states-301619434.html

126 Ford test proves efficiency of surface heaters in BEVs. https://www.electrive.com/2023/02/22/ford-test-proves-efficiency-of-surface-heaters-in-bevs/

127 CO2 Heat Pump Found to Outperform Electric Heaters in Electric Buses. https://r744.com/co2-heat-pumps-found-to-outperform-electric-heaters-in-electric-buses/

128 Konvekta supplies 60% of German e-buses with CO2 technology. https://www.sustainable-bus.com/components/konvekta-german-e-buses/

129 Guchen's Novel Bus Heating and Air-Conditioning System. https://www.guchen.com/company-news/guchen-bus-ac-innovative-design-with-integrated-heatpump.html

130 Siberian-HP. https://www.mcc-hvac.com/wp-content/uploads/2018/01/Siberian-HP.pdf

131 Bus & Coach Thermal Management: Eberspächer. https://www.eberspaecher.com/en/press/media-service/pictures/air-conditioning-systems/bus-coachthermal-management

132 Valeo Thermal Bus. https://www.valeo-thermalbus.com/eu_en/Products/Air-Conditioning/Buses-over-12-m/REVO-E

133 Thermo King Unveils New Bus HVAC Heat Pump with Natural Refrigerant - Thermo King. https://europe.thermoking.com/mediaroom/thermo-king-unveils-new-bus-hvac-heat-pump-with-naturalrefrigerant

While CARB does not ban FOHs and has emissions standards for FOHs installed on diesel HDVs set 18 years ago,134 CARB also has since taken actions that have had a limiting effect on certain types of FOH deployment in California. For example, CARB's ICT regulation does not recognize FOH equipped buses as ZE buses for credit toward transit agencies obligations.135 On the incentive side, CARB's Implementation Manual for the HVIP states its Zero Emission Vehicle definition "means a vehicle that itself produces no emissions of pollutants (including carbon dioxide, carbon monoxide, hydrocarbons, oxides of nitrogen (NOx), and particulates) when stationary or operating" in determining funding amounts for purchase vouchers.136 [EPA-HQ-OAR-2022-0985-1591-A1, pp.40-41]

134 CARB Board Book October 20, 2005. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2005/102005/start.pdf

135 ICT Clean Final Reg. Order. https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf

136 HVIP-FY21-22-Implementation-Manual, March 15, 2022. https://californiahvip.org/wp-content/uploads/2022/03/HVIP-FY21-22-Implementation-Manual-03.15.22.pdf

Therefore, CARB staff believes that FOH use in HD ZEVs is not justified. To mitigate the driving range reduction in extreme cold temperatures, a combination of the above technologies and sizing batteries to meet anticipated remaining loads could be used to meet the need for cab and battery heating. FCEVs as well could both utilize waste heat137,138 as well as size hydrogen storage to account for the remaining heat energy that may be needed for cabin heating. [EPA-HQ-OAR-2022-0985-1591-A1, p.41]

137 New Approach To Increasing The Range And Comfort In Fuel Cell-Powered Rail Transport. https://fuelcellsworks.com/news/new-approach-to-increasing-the-range-and-comfort-in-fuel-cellpowered-rail-transport/

138 Technical-note---bus-cold-weather-operation. https://www.ballard.com/docs/default-source/motive-modules-documents/technical-note---bus-coldweather-operation---final.pdf?sfvrsn=4&sfvrsn=4

CARB staff regards as overly optimistic the U.S. EPA's expectation that buyer preferences and OEM sustainability goals will make "unlikely FOH will be the primary solution for cabin heat." That stated expectation does not appear to be borne out in the current North American market. FOHs are typically chosen as a 'least expensive option' to lower the purchase cost of vehicles. There are perverse motivations to bid the lowest purchase cost vehicle to capture solicitations even if the resulting vehicle increases operating costs, GHG and criteria emissions. If the ready option remains FOH, there is little motivation to design additional insulation, direct heat delivery, heat pumps and install sufficient energy storage all at a first cost premium over a competitor's FOH upfitted off-the-shelf vehicle. Especially so long as public solicitations remain "least cost" driven—the better designed and integrated vehicle would go unpurchased without a much more sophisticated solicitation spec that values emissions and TCO considerations. U.S.

EPA has the jurisdiction, technical ability and responsibility for FOHs which should not be punted to myriad purchasing entities in the vain hope that each might reach the same sustainability conclusion in each of their series of procurement decisions to avoid a cheaper/dirtier tradeoff merely on the basis of sustainability goals. CARB staff is already aware of industry floated ideas pushing for allowing FOHs to emit higher than the 18 year old CARB standard due to high emissions of current offerings at higher power ratings, as well as proposing ‘workaround’ strategies to effectively double or triple the existing CARB FOH standard by dividing a vehicle’s FOH demand across multiple separate FOH units each with an individual CARB certification. These dubious suggestions seem diametrically opposite of an industry on the verge of abandoning FOHs as a primary means of cabin heat as U.S. EPA statements in the DRIA appear to suggest. [EPA-HQ-OAR-2022-0985-1591-A1, p.41]

CARB staff recommends that U.S. EPA carefully evaluate the emission rates of in-use FOHs including continued collaboration with and incorporation of data from ongoing studies of in-use FOHs underway in neighboring jurisdictions. CARB staff recommends U.S. EPA evaluate the ZE alternatives to FOHs and encourage these alternatives use in lieu of FOHs everywhere possible. CARB staff recommends U.S. EPA to restrict the use of FOHs in HD ZEVs for heating from being the default approach to passenger space heating on electrified vehicles and only allow their use in those narrow range of applications U.S. EPA may deem them actually necessary, since combustion FOHs undermine the purpose of the Phase 3 GHG regulation and confound U.S. EPA’s other efforts to control direct and regional exposure to criteria pollutant emissions. U.S. EPA could also consider issuing requirements that FOHs not be used above the ambient temperatures that necessitate their use in well system integrated ZE vehicles. CARB staff further recommends U.S. EPA act on their own existing efforts to quantify the harmful criteria pollutant and GHG emissions from FOHs by setting stringent emissions standards regulating FOH emissions. CARB staff recommends that U.S. EPA clearly define their FOH standard as also applying to the vehicle level, i.e., that stacking multiple units to game the FOH standard is not appropriate. [EPA-HQ-OAR-2022-0985-1591-A1, p.42]

Organization: ROUSH CleanTech

OMISSIONS OBSERVED IN PROPOSED RULE

We believe that the EPA proposed rule fails to address a significant regulatory gap related to national deployment of heavy-duty BEV/FCEV’s, specifically, the anticipated widespread use of fuel-fired heaters in buses and other large cabin vehicles in the Midwest and northern states. EPA touches on this problem a bit in the discussion of battery sizing and energy use in Section II. The Basma study cited on page 160 is excellent, but by design it only focused on Paris, France, and thus assumed a minimum temperature of -10C (14ºF), which is a far warmer minimum temperature than is found in large parts of the US. Moreover, the proposed dual heat pump system becomes ineffective as temperatures drop, resulting in significantly worse heat energy requirements. In practice, if BEV/FCEV deployment is desired, the buses must be able to support their routes every day—we don’t think it is acceptable to ever cancel school because the buses were only designed for 90th percentile use. Practically, these buses will have to be equipped with a supplementary heating device (typically, a fuel-fired heater, as has been used to supplement diesel engine heat output for years). We suggest that EPA should include specific guidance in the Phase 3 rule allowing the use of manufacturer-installed fuel systems and heaters, including requirements and guidance for refueling, evaporative, and tailpipe emissions, as well as a method for accounting for the carbon emissions expected over the vehicle life. We believe existing vehicle refueling and evaporative standards are sufficient, but tailpipe standards would need to be defined. This will help ensure that these systems are certified, subject to emissions warranties, and integrated into the vehicle, and that gross polluting systems are not used in the aftermarket. We believe that anticipating and including this key enabling technology in the rule will prove highly valuable, especially as a contributing basis for future rules that are likely to focus more on the efficiency and climate impact of BEV's and FCEV's (where the small carbon emissions from a fuel-fired heater are likely far less than the carbon emissions associated with excessive battery sizing). [EPA-HQ-OAR-2022-0985-1655-A1, p.5]

EPA Summary and Response:

Summary:

EPA received two comments that expressed concern about the use of Fuel Operated Heaters (FOH) and the lack of federal regulation on them. Both commenters suggested ways to regulate FOHs and were concerned that the use of FOHs would be more widespread than was predicted in the proposal. (Roush and CARB)

Response:

EPA did not propose to include standards or requirements for FOHs in the NPRM and therefore is not taking final action to address emissions from FOHs in the FRM. We understand that our current 40 CFR part 1037 regulations address FOH in the context of extended-idle only (see 40 CFR 1037.520(j)(4)). EPA understands that FOHs are emitters of both GHG and non-GHG pollutants and we intend to further assess the level of potential emissions from FOHs and may address them in a future rulemaking. We note that non-GHG emission standards for HD vehicles are outside the scope of this current rulemaking. We also note that EPA incentive and grant programs are outside the scope of this current rulemaking.

We note further that these types of heating devices are already in operation on HDVs (including in existing HD ICE vehicles) to aid in cabin heating and engine block warming in low ambient temperature operating conditions, and to heat cabins during overnight hoteling. In our assessment for BEVs, we were able to size the battery with extreme temperature (very hot or very cold) considerations. For discussion on the temperature effects on battery sizing and how this phenomenon was taken into account in our analysis, see RTC 3. We recognize that the temperatures used for our assessment are temperature-vehicle mile weighted, therefore the battery size may not be feasible at extreme temperatures. However, the limited number of vehicle miles traveled indicates that these miles are driven less compared to more moderate temperatures. Therefore, while there will be occasions of high energy consumptions from the battery for HVAC and battery conditioning purpose, the batteries are as oversized for durability, depth of discharge, and high daily milage vehicles. We also recognize that there is limited number of studies available to understand the prevalence and impact of emissions from FOH. We are aware that studies are being conducted on FOHs, especially with respect to FOHs as supplemental heat in ZEVs, and this data may inform our future analysis.[374]

We also recognize that there may be conditions where these conservative approaches for battery sizing are still not sufficient for some applications, therefore we limited ZEV technology

[374] Pettinen, R., Anttila, J., et al. "Testing Method for Electric Bus Auxiliary Heater Emissions." Energies, 2023.

adoption to 70% adoption in MY 2032 and we therefore expect ICE vehicles to continue to meet the needs of such applications under the modeled potential compliance pathway. See RIA Chapter 2.7 for further discussion. We stand by our assertions that FOHs will likely only be used in environments with extremely low temperatures or where a reduction in driving range is unacceptable, and that adoption of this technology will likely be kept to a minimum because FOHs do not meet the sustainability goals of fleets and OEMs.

5 FCEV Technologies

Comments by Organizations:

Organization: Manufacturers of Emission Controls Association (MECA)

Future BEV/FCEV Powertrain Efficiency Standards

Today, vehicle manufacturers are deploying the first generation of electric and fuel cell commercial vehicles. On the other hand, suppliers are already looking ahead and developing the next generation of advanced efficient powertrain components such as batteries, power electronics, transmissions, e-motors and integrated drive units. Technology innovation has strived for greater efficiency and power for the past 50 years of combustion engines and similarly, electric component suppliers continue to innovate electric technology. Some of these innovations will be revealed in the five funded projects under the DOE's SuperTruck III program. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 12 - 13.]

As such, it is important that EPA begins to consider ways to incentivize and reward more efficient vehicles just as it has for combustion engine technology. In the light-duty sector, where EVs have been around for much longer, we are already seeing significant differences in the energy efficiency of similarly sized vehicles. This is a result of some manufacturers deploying more advanced technology and investing in efficient powertrain integration which reduces the impact on the environment across the vehicle life-cycle from manufacturing to recycling and disposal. [EPA-HQ-OAR-2022-0985-1521-A1, p. 13.]

Organization: Truck Renting and Leasing Association (TRALA)

Securing National Weight Exemptions for BEVs and FCEVs Will be Difficult

Battery electric or fuel cell trucks will incur a substantial weight penalty that can put truck gross vehicle weights over their allotted federal limits. Roughly 10-15% of truckloads hit their maximum federal weight limits due to the types of payloads they carry. Federal legislation passed in 2019 allows a 2,000-pound weight exemption for battery powered heavy-duty trucks. The problem is the additional battery weight for a Class 8 BEV could add up to16,000 pounds depending on the battery configuration. This is one of the primary reasons why Class 8 trucks will rely upon the development and advancement of Fuel Cell Electric Vehicles (FCEVs). Fuel cell vehicles will also experience additional weight issues but not to the extent of BEVs. OEMs estimate the additional weight of an FCEV compared to a comparable ICE vehicle will be somewhere in the range of 8,000 pounds. The longer the vehicle range the more battery cells or fuel cell modules required which in turn has a direct correlation to overall added vehicle weight. [EPA-HQ-OAR-2022-0985-1577-A1, p. 15.]

Federal legislation was introduced in May to secure a 2,000-pound weight exemption for hydrogen-powered trucks. However, a 2,000-pound weight allowance for either BEVs or FCEVs is a mere drop in the bucket. Federal legislation to acquire additional weight exemptions to offset added ZEV technology weight will be extremely difficult given strong opposition from select industry, safety, and infrastructure interests. [EPA-HQ-OAR-2022-0985-1577-A1, p. 15.]

With respect to infrastructure concerns, the American Society of Civil Engineers' (ASCE) 2021 Infrastructure Report Card gave the nation's roads a 'D' grade and its bridges a 'C' grade.22 Roads and bridges need continual repair, rebuilding, and investment. Added vehicle weights and the high torque rates of ZEVs has the potential to accelerate the degradation of our nation's road networks. TRALA requests further analysis be undertaken to ensure that the increased use of all on-road ZEVs will not result in any detrimental impacts and unanticipated costs related to maintaining our nation's existing highway infrastructure. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 15-16]

EPA Summary and Response:

Summary:

MEMA acknowledged that the first generation of FCEVs are being deployed and that next generation components are under development, including through DOE's SuperTruck 3 program. They called for incentives for the use of more energy-efficient ZEVs, as EPA has done for ICE vehicles.

TRALA, on the other hand, commented on weight penalties associated with BEV and FCEV technology. They said that weight is one reason why Class 8 trucks may be FCEVs—because a FCEV has about half the weight penalty of a BEV. They stressed that impact of the additional weight of ZEVs on road networks should be further analyzed, asserting that it has the potential to accelerate the degradation of our nation's road networks.

Response:

Please also refer to the additional summary and response to the same comments in RTC Section 4.1.2 (MEMA) and Sections 4.6 and 3.10.1 (TRALA).

With respect to FCEV weight concerns, we recognize that the weight of hydrogen tanks is a mass driver—the more tanks onboard a FCEV to store fuel for longer ranges, the heavier the vehicle. However, we did not find a compelling reason to evaluate the weight of FCEVs in HD TRUCS, as our review of existing literature did not identify weight as a potential constraint.

Basma et. al relied on a teardown analysis by Ricardo to evaluate truck weights. They found a similar payload capacity for HD FCEVs relative to diesel counterparts for current (2022) and future (2035) technologies.[375,376] Also, DOE conducted preliminary analysis to determine the payload capacity of Class 8 long-haul FCEVs relative to a comparable diesel truck and determined there is no loss in payload capacity, even without factoring in exemptions available for alternative fuels and engines.[377,378] RIA Chapter 2.9.1 explains how FCEVs were included in the modeled potential compliance pathway for limited vehicle applications where the volume or

375 Basma, et. al. "White Paper: Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States". The International Council on Clean Transportation. April 2023. Available online: https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf.

376 Ricardo. "E-Truck Virtual Teardown Study: Final Report". ICCT. June 11, 2021. Available online: https://theicct.org/wp-content/uploads/2022/01/Final-Report-eTruck-Virtual-Teardown-Public-Version.pdf.

377 The analysis is specific to trucks using hybrid platforms with 175- and 275-kW fuel cell systems.

378 U.S. Department of Energy. "The #H2IQ Hour. Today's Topic: Heavy-Duty Vehicle Decarbonization". September 21, 2023. Available online: https://www.energy.gov/sites/default/files/2023-10/h2iqhour-09212023.pdf.

weight of a BEV battery may adversely impact payload for a BEV, given that payload concerns associated with larger and heavier batteries are more notable in the literature.

In general, if a ZEV resulted in a battery that was too large or heavy, it was not included in the modeled potential compliance pathway for that vehicle application's technology package because of its potential impact on payload. Thus, we did not find a need to evaluate potential impacts of added vehicle weights on road degradation.

5.1 FCEV Technology Readiness

Comments by Organizations:

Organization: American Petroleum Institute (API)

While still in the early stages of development and prove out, hydrogen-based vehicles (FCEVs and H2-ICE) are a promising technology that many stakeholders are considering. API members are engaged in hydrogen projects to support development of hydrogen focused technology. Companies are partnering with HD OEMs to explore commercial business opportunities to build demand for commercial vehicles and industrial applications powered by hydrogen. Demonstration projects target hard-to-abate applications like rail and marine, with a goal to develop viable large-scale businesses and advance a thriving hydrogen economy. [EPA-HQ-OAR-2022-0985-1617-A1, p. 8.]

As noted by the American Trucking Associations (ATA), in testimony before the U.S. Senate Committee on Environment and Public Works8:

When battery electric vehicles are not the answer, federal support should refrain from playing favorites, and instead assist in the buildout of alternative fuel facilities. Proposals for hydrogen infrastructure for trucks need to ensure that the infrastructure is in place where that technology best fits in supply chains. Where lifecycle emissions can be reduced by deploying renewable diesel and renewable natural gas, those fuel stocks need to be available for trucking. [EPA-HQ-OAR-2022-0985-1617-A1, p. 8.]

8 U.S. Senate Committee on Environment and Public Works, hearing on "The Future of Low Carbon Transportation Fuels and Considerations for a National Clean Fuels Program", February 15, 2023 (https://www.epw.senate.gov/public/index.cfm/2023/2/the-future-of-low-carbon-transportation-fuels-and-considerations-for-a-national-clean-fuels-program).

d. Technical Feasibility

i. Vehicle readiness

1. Technology readiness

The proposed rule identified various HD ZEVs available in the marketplace or in production, as well as select manufacturer goals and commitments to producing HD ZEVs by a certain timeframe. However, given the nascent technology, there is significant uncertainty regarding EPA's expectation for rapid availability of ZEV powertrains. Further, it should be noted that these vehicles are small in number, some are not able to perform the work that a comparable ICEV would perform (due to charging, range, and duty-cycle constraints), and all are for localized operations; long-haul ZEVs are in the pilot stage and have significant challenges. OEM goals and commitments, coupled with IRA/BIL funding may help to increase the availability of HD ZEVs; however, it will be extremely challenging to meet the proposal's implementation schedule. We have concerns that vehicles may not be available at the rates that EPA is projecting for the 2027-2032 timeframe. [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

Even with a fully stocked HD ZEV market, key barriers to entry include customer uptake, capital costs to purchase vehicles, and infrastructure readiness. [EPA-HQ-OAR-2022-0985-1617-A1, p. 10.]

Organization: California Air Resources Board (CARB)

Currently, there are a number of MD and HD FCEVs being demonstrated in the class 6 and 8 weight classes.63,64,65,66,67 Class 8 fuel cell tractors produced by Hyzon Motors, Hyundai, and Nikola are currently commercially available with warranty and service support, as evidenced by CARB eligibility determinations for the Hybrid and Zero- Emission Truck and Bus Voucher Incentive Project (HVIP) catalog.68 Several other manufacturers including Volvo, Cummins with Daimler, Daimler, Paccar, Hino with Toyota, Isuzu with Honda, Navistar with GM, Navistar's fellow Traton company Scania with Cummins, and Quantron are in the process of developing class 8 fuel cell trucks or have announced plans and partnerships to do so.69,70,71,72,73,74,75,76,77 [EPA-HQ-OAR-2022-0985-1591-A1, pp.29-30]

63 CARB, LCTI: NorCAL Zero-Emission Regional and Drayage Operations with Fuel Cell Electric Trucks, 2022 (web link: https://ww2.arb.ca.gov/lcti-norcal-zero-emission-regional-and-drayage-operations-fuel-cell-electrictrucks last accessed August 2022).

64 CARB, LCTI: Fast-Track Fuel Cell Truck, 2022 (web link: https://ww2.arb.ca.gov/lcti-fast-track-fuel-celltruck last accessed August 2022).

65 CARB, LCTI: Fuel Cell Hybrid Electric Delivery Van Deployment, 2022 (web link: https://ww2.arb.ca.gov/lcti-fuel-cell-hybrid-electric-delivery-van-deployment last accessed August 2022).

66 CARB, LCTI: Next Generation Fuel Cell Delivery Van Deployment, 2022 (web link: https://ww2.arb.ca.gov/lcti-next-generation-fuel-cell-delivery-van-deployment last accessed August 2022).

67 CARB, LCTI: Port of Los Angeles "Shore to Store" Project, 2022 (web link: https://ww2.arb.ca.gov/lcti-port-los-angeles-shore-store-project last accessed August 2022).

68 California HVIP, Incentives for Clean Trucks and Bus, 2022 (web link: https://californiahvip.org last accessed August 2022).

69 PACCAR and Toyota Expand Hydrogen Fuel Cell Truck Collaboration to Include Commercialization, May 2, 2023. https://www.paccar.com/news/current-news/2023/paccar-and-toyota-expand-hydrogen-fuel-cell-truckcollaboration-to-include-commercialization/

70 Daimler Truck North America and Cummins Collaborate to drive Hydrogen Fuel Cell Trucks forward in North America, May 11, 2022. https://www.cummins.com/news/releases/2022/05/11/daimler-truck-north-america-and-cumminscollaborate-drive-hydrogen-fuel

71 Volvo Group, The Volvo Group and Daimler Truck form Joint Venture for Large Production of Fuel Cells, 2020 (web link: https://www.volvogroup.com/en/news-and-media/news/2020/apr/news-3640568.html, last accessed August 4, 2022).

72 Development milestone: Daimler Truck tests fuel-cell truck with liquid hydrogen, June 27, 2022. https://media.daimlertruck.com/marsMediaSite/en/instance/ko/Development-milestone-Daimler-Trucktests-fuel-cell-truck-with-liquid-hydrogen.xhtml?oid=51975637

73 Isuzu Selects Honda as Partner to Develop and Supply Fuel Cell System for its Fuel Cell-Powered Heavy-duty Truck Scheduled to be Launched in 2027, May 15, 2023. https://global.honda/newsroom/news/2023/c230515aeng.html

74 Trucks.com, Hino Debuts XL8 Fuel Cell Heavy-Duty Truck Prototype, 2021 (website: https://www.trucks.com/2021/08/31/hino-xl8-fuel-cell-truck-prototype/ last accessed August 2022)

75 Navistar Collaborates with General Motors And OneH2 To Launch Hydrogen Truck Ecosystem, January 27, 2021. https://www.prnewswire.com/news-releases/navistar-collaborates-with-general-motors-and-oneh2-tolaunch-hydrogen-truck-ecosystem-301216246.html

76 Scania to deliver fuel cell trucks to Switzerland, November 8, 2022. https://www.scania.com/group/en/home/newsroom/news/2022/scania-to-deliver-fuel-cell-trucks-toswitzerland.html

77 Quantron US Receives Order for 500 Class 8 Hydrogen Fuel Cell Powered Trucks, October 12, 2022. https://fuelcellsworks.com/news/quantron-us-receives-order-for-500-class-8-hydrogen-fuel-cellpowered-trucks/

CARB staff has received detailed fleet and vehicle usage information from nearly 2,000 fleets representing 400,000 vehicles in California. Based on data collected, 90 percent of non-tractor vehicles travel below 150 miles per day, and 60 percent of day cab tractors travel below 200 miles per day, indicating typical operation of a large fraction of non-tractor vehicles and day cab tractors can be readily electrified with the existing range performance of vehicles available on the market today.78 This data is presented in more detail in Figure 1. [EPA-HQ-OAR-2022-0985-1591-A1,p.30] [Figure 1 can be found on pg. 31 of docket number EPA-HQ-OAR-2022-0985-1591-A1]

78 CARB Large Entity Fleet Reporting: Statewide Aggregated Data. https://ww2.arb.ca.gov/sites/default/files/2022-02/Large_Entity_Reporting_Aggregated_Data_ADA.pdf

Organization: Clean Air Task Force et al.

a. EPA’s projected penetration of FCEVs into fleets is conservative.

EPA’s proposal does not consider the availability of FCEV technology for fleets until MY 2030. 88 Fed. Reg. at 25973. EPA cites the need for “additional lead time to allow manufacturers to design, develop, and manufacture HD FCEV models.” Id. Yet the FCEV market is expected to grow rapidly over the next several years, heralded by several announcements that, in aggregate, support a growing FCEV fleet before 2030. Given the many announced plans to incorporate FCEVs into fleets earlier than 2030, EPA should consider even modest inclusion of FCEVs in its technology packages starting in MY 2027 and should tighten its overall standards accordingly. [EPA-HQ-OAR-2022-0985-1640-A1, p. 62]

First, FCEVs have already been successfully deployed as transit buses. For example, a long-running FCEV deployment program in the Alameda-Contra Costa Transit District (AC Transit) has shown that FCEV transit buses meet durability, reliability, and performance requirements, making them well-positioned for accelerated deployment in transit fleets. A report released in December of last year shows that during the January–June 2022 period, a total of 122,721 miles were covered by fuel cell buses within the AC Transit service area.272 This number nearly matched the diesel and hybrid bus workload (146,788 miles). During the most recent month in the report, June 2022, the newest FCEVs achieved the second highest uptime at 89 percent, coming in just behind the 96 percent uptime achieved by the diesel drivetrain. Looking at the manufacturing date of the earliest fuel cell buses (2010), recent uptime, and total miles driven, FCEVs are already a viable drivetrain for this transit bus fleet in 2023. [EPA-HQ-OAR-2022-0985-1640-A1, p. 62]

272 Jimmy Chen et al., AC Transit & Stanford Pecourt Inst. for Energy, Zero Emission Transit Bus Technology Analysis 10 fig. 7, 14 fig. 15 (2022), https://www.actransit.org/sites/default/files/2023-01/0430-22%20Report-ZEBTA%20v4_FNL_012423.pdf

There are other examples of hydrogen fuel cell transit bus adoption as well. In California, thirteen transit agencies have committed to initiate or expand fuel cell bus deployments with a goal of deploying at least 1,000 fuel cell electric buses. Known as the "1,000 Bus Initiative,"273 the program looks to establish a market to help commercialize FCEV technology for the entire transit industry. The Center for Transportation and the Environment is heavily involved in this effort and is also looking to aid with the deployment of thousands of Class 8 fuel cell trucks and supporting infrastructure as part of hydrogen hub development in the state.274 [EPA-HQ-OAR-2022-0985-1640-A1, p. 62]

273 Kate Mason, CTE Supports ARCHES: California Hydrogen Hub, Ctr. for Transp. & Env't (May 15, 2023), https://cte.tv/cte-supports-arches-california-hydrogen-hub/

274 Id.

In addition to growing adoption of FCEV transit buses, there are a number of examples of recent announcements for FCEV heavy-duty trucks. The Alberta Motor Transport Association is set to receive two Nikola trucks as part of its Hydrogen Commercial Vehicle Demonstrations Project.275 There will be one BEV and FCEV delivered, with the goal of validating these trucks on real-world load and duty cycles. In a press release, Nikola Energy president Carey Mendes announced "plans for 300 metric-tons of hydrogen supply, with 60 hydrogen stations planned for across North America by 2026." [EPA-HQ-OAR-2022-0985-1640-A1, p. 63]

275 Today's Trucking, AMTA orders Nikola Tre battery-electric, and hydrogen fuel cell trucks for demonstrations, AMTA, Truck News (Apr. 25, 2023), https://www.trucknews.com/sustainability/amta-orders-nikola-tre-battery-electric-and-hydrogen-fuel-cell-trucks-fordemonstrations/1003174531/.

Furthermore, in December 2022, Houston, Air Liquide, Hyzon Motors, and the TALKE Group began a demonstration of a hydrogen fuel cell electric truck in the Port of Houston.276 The article outlining this demonstration notes the importance of having the option of hydrogen as it allows for an acceleration toward clean fuel, especially for heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1640-A1, p. 63]

276 Air Liquide, Air Liquide fuels first hydrogen fuel cell truck demonstration at Port of Houston (Jan. 12, 2023), https://usa.airliquide.com/hyzon-port-of-houston.

In early May 2023, Hyundai Motor Company premiered its new XCIENT fuel cell tractor for commercial Class 8 vehicles at the Advanced Clean Transportation Expo.277 The vehicle is capable of over 450 miles of range when fully loaded, making it ideal for long-haul operations. Ken Ramirez, Executive Vice President and Head of Global Commercial Vehicle and Hydrogen Fuel Cell Business at Hyundai Motor, said, "We firmly believe that hydrogen is one of the most powerful and pragmatic solutions for achieving our vision of 'Progress for Humanity' with emission-free mobility as a fundamental pillar for a sustainable society." [EPA-HQ-OAR-2022-0985-1640-A1, p. 63]

277 Hyundai Motor Co., Hyundai Motor Premieres Commercialized Model of Its XCIENT Fuel Cell Tractor and Vision for Hydrogen Mobility in US, PR Newswire (May 2, 2023), https://www.prnewswire.com/news-releases/hyundai-motor-premieres-commercialized-model-of-its-xcient-fuel-cell-tractor-and-vision-for-hydrogen-mobility-in-us-301812728.html.

In late May 2023, Volvo Trucks, working together with Daimler Truck, reported successes they have seen testing FCEVs in arctic conditions.278 “Trucks are operating seven days a week and in all types of weather,” said Helena Alsiö, VP of powertrain product management at Volvo Trucks. “The harsh conditions on public roads in northern Sweden, with ice, wind, and lots of snow, make an ideal testing environment. I am pleased to say that the tests are going well.” Volvo is looking to have hydrogen fuel cell trucks in production for long-haul freight applications later this decade. [EPA-HQ-OAR-2022-0985-1640-A1, p. 63]

278 Josh Fisher, Volvo finding fuel cell success in Arctic conditions, Fleet Owner (May 30, 2023), https://www.fleetowner.com/emissions-efficiency/article/21266721/volvo-testing-fuel-cell-tech-in-arctic-conditions.

At the ACT Expo transportation conference in 2023, several other OEMs announced plans for expansion of their FCEV offerings.279 Kenworth and Peterbilt are now planning to offer fuel cell trucks in 2025. Kenworth is of particular note, as it collaborated with Toyota on a successful demonstration pilot in the Port of Los Angeles involving 10 FCEVs. Now that the project has ended, Kenworth is planning to introduce a commercial T680 FCEV that will travel more than 450 miles between fill-ups. Kevin Baney, Kenworth general manager stated, “With quick refueling, this broadens our zero-emission product offering to include round-the-clock operations in regional haul and demonstrates FCEV potential for long haul.” [EPA-HQ-OAR-2022-0985-1640-A1, pp. 63 - 64]

279 Alan Adler, ACT Expo a coming of age for hydrogen-powered trucking, Freight Waves (May 3, 2023), https://www.freightwaves.com/news/act-expo-a-coming-of-age-for-hydrogen-powered-trucking.

Finally, announcements of HDV FCEVs sales well before 2030 continue to pour in. For example, Performance Food Group announced in June 2023 that it agreed to buy at least five FCEV trucks from Hyzon Motors, and that it “could be up to 50.”280 The first five trucks “are expected to be delivered in 2023 and 2024.” Parker Meeks, Hyzon’s chief executive officer, noted of the agreement of Performance Food Group: “This agreement for up to 50 hydrogen-powered trucks demonstrates how Hyzon intends to build customer familiarity with a new technology as the hydrogen infrastructure accelerates.”281 [EPA-HQ-OAR-2022-0985-1640-A1, p. 64]

280 Truckinginfo, Performance Food Group Plans to Buy Hyzon Fuel Cell Trucks (June 9, 2023), https://www.truckinginfo.com/10200499/performance-food-group-to-purchase-hyzon-fuel-cell-trucks.

281 Id.

These recent FCEV-related announcements and demonstrations show the early successes of the drivetrain, both for heavy-duty trucks and transit buses. In addition, the enthusiastic statements from those in the industry show that there is a real push from relevant OEMs to get the technology ready to provide another zero-emission technology option, alongside BEVs. Based on these examples, we expect continued growth in FCEV technology for the HDV market before MY 2030. Rather than underestimating the presence of FCEVs in fleets (again, EPA incorporates no FCEVs into technology packages until MY 2030), EPA’s standards should go beyond what is already occurring in the industry. [EPA-HQ-OAR-2022-0985-1640-A1, p. 64]

In addition to on-the-ground announcements that suggest short-term FCEV market growth, recently released studies model the growth of the FCEV market over a longer time frame. One such report published by the University of California at Davis in April 2023 ("the UC Davis report") projects the number of FCEVs that will be on the road by 2030.282 The report is focused exclusively on California, but given that California is currently the only state with a functioning hydrogen economy, using the rich data sets from that state is one of the best ways to project future growth nationwide. The three paragraphs below focus on the HDV-related sections, but the report is comprehensive, modeling multiple end use sectors and providing a detailed analysis of renewable electricity systems in a hydrogen-oriented context. [EPA-HQ-OAR-2022-0985-1640-A1, p. 64]

282 Lewis Fulton et al., UC Davis, Inst. Transp. Stud. (ITS), California Hydrogen Analysis Project: The Future Role of Hydrogen in a Carbon-Neutral California: Final Synthesis Modeling Report, at fig. 19 (2023), https://escholarship.org/uc/item/27m7g841. See also id. at Executive Summary figs. 5, 19, 45.

The UC Davis report takes advantage of three tools. Two are in-house tools from UC Davis, GOOD (Grid Optimized Operation and Dispatch Model)283 and STIEVE (Spatial Transportation Infrastructure, Energy, Vehicle and Emissions).284 In addition, the study uses a tool from the NREL, known as SERA (Scenario Evaluation and Regionalization Analysis).285 STIEVE was used to project potential FCEV sales, stocks, hydrogen demand, and the number of hydrogen stations, sizes, and locations out to 2050. GOOD is an economic dispatch electric grid model that was used to model the electricity system with higher renewable penetration and with electrolytic hydrogen production. Lastly, SERA is a hydrogen supply chain model that was used to optimize the siting of hydrogen supply locations to meet future demand and to estimate cost along the supply chain, resulting in hydrogen prices at the pump. All three tools were calibrated with California data, some of which were from prior surveys and analyses.286 The result of the UC Davis report's modeling was a characterization of a growing hydrogen system, starting today and projecting out to 2050, for the state of California. These results include a "base" and "high" projection for FCEV penetration, in terms of stocks, which is depicted in Figure 19 of the report. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 64 - 65]

283 See generally Alan Jenn, ITS, Plug-in electric vehicles and the electricity grid (2020), https://www.dvrpc.org/energyclimate/alternativefuelvehicles/evchargingsummit/pdf/17-alan-jenn.pdf

284 Tri D. Acharya et al., ITS, New UC Davis Model Shows Promise in Identifying Optimal Locations of Hydrogen Refueling Stations for Medium- and Heavy-Duty Trucks in California (2021), https://escholarship.org/uc/item/2qw8464c.

285 Mark Chung, NREL, SERA: Scenario Evaluation and Regionalization Analysis Model, https://www.nrel.gov/hydrogen/sera-model.html (last visited June 6, 2023).

286 Jeffrey Reed et al., UC Irvine Advanced Power & Energy Program, Roadmap for the Deployment and Buildout of Renewable Hydrogen Production Plants in California (2020), https://efiling.energy.ca.gov/getdocument.aspx?tn=233292; Sarah E. Baker et al., Lawrence Livermore Nat'l Lab'y, Getting to Neutral: Options for Negative Carbon Emissions in California (2020), https://doi.org/10.2172/1597217; CARB, Hydrogen Station Self-Sufficiency Report (2021), https://ww2.arb.ca.gov/sites/default/files/2021-10/hydrogen_self_sufficiency_report.pdf.

For purposes of these comments, we have extrapolated the California hydrogen market growth projections to the rest of the country, differentiating among states that have adopted the ACT Rule287 under Section 177 of the Clean Air Act ("Other ACT States"), states that have yet to adopt the ACT but have adopted other California vehicle regulations ("Non-ACT Section 177

States), states that have signed on to the NESCAUM multi-state MOU, and state-specific heavy duty vehicle registration numbers288 from the U.S. Department of Transportation (see Table 6). The specific assumptions used for the nationwide FCEV penetration analysis are shown in the table below in terms of a fraction of FCEV adoption relative to California in 2030. Note that the UC Davis report assumes 100 percent ZEV sales by 2040 in California, a standard that is more stringent than ACT. While this is reasonable for California considering other recently passed regulations like the ACF, it is more aggressive than regulations other states have adopted to date. For this reason, "Other ACT States" are assumed to move more slowly than California in the table below. In addition, the FCEV penetration analysis was scaled by the number of registered trucks and buses in each state relative to California. [EPA-HQ-OAR-2022-0985-1640-A1, p. 65.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 65-66, for Table 6]

287 CARB, States that have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act, (Aug. 19, 2019), https://ww2.arb.ca.gov/sites/default/files/2019-03/177-states.pdf.

288 Highway Statistics 2021, U.S. DOT (Mar. 2023), https://www.fhwa.dot.gov/policyinformation/statistics/2021/mv1.cfm.

For HDVs, this calculation results in a "base" scenario where 29,927 FCEVs are on the road nationwide by 2030 and a "high" scenario where 87,783 FCEV are part of U.S. fleets. This is a small percentage of overall stocks across the country (roughly 0.2–0.6 percent); however, it represents a notable increase compared to today and shows that FCEVs are likely to benefit from rapid market growth, signaled by the announcements and company pledges described earlier and backed by this modeling, such that we will likely see tens of thousands of HDVs with FCEV technology on the road by 2030. FCEV technology is viable, and widespread availability is expected before 2030 due to baseline market forces, IRA incentives, and state regulations alone. As a result, EPA should incorporate FCEVs into its technology packages beginning in MY 2027 and strengthen its proposed rule accordingly. [EPA-HQ-OAR-2022-0985-1640-A1, p. 66]

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #15: We request comment on our assessment and data to support our assessment of FCEV technology for the final rule.

- DTNA Response: FCEV technologies are one part of the roadmap to reducing GHG emissions, and DTNA is actively involved in developing this technology. FCEV technology has not, however, matured sufficiently for EPA to predict its price, range, or operational characteristics. Most importantly, there is little basis for accurately projecting infrastructure availability for FCEVs in MY 2030+. DTNA discusses this issue in more detail in Section II.B.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 160-161]

EPA Request for Comment, Request #19: We request comment on our approach that focuses primarily on BEVs, which currently are more prevalent in the HD vehicle market, and whether there are additional vehicle types that should be evaluated as FCEVs along with BEVs.

- DTNA Response: DTNA agrees in principle with EPA's primary focus on BEVs at this time, as these vehicles are more prevalent in the market. EPA should not consider FCEVs until at least MY 2032, due to the current state of the technology and refueling infrastructure. EPA also should not project ZEV uptake for any vehicle types outside of

> the BEV and FCEV categories included in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

Organization: Lubrizol Corporation (Lubrizol)

Lubrizol believes that vehicle owners and fleets in the heavy-duty vehicle sector will use a range of fuels and technologies to meet their future operational and environmental needs. Thus, we are pleased to see EPA acknowledge that it expects to see Original Engine Manufacturers ("OEMs") use an array of technologies to meet the requirements of the Final Rule. Lubrizol strongly encourages EPA to promulgate a Final Rule that will advance all three strategies highlighted in the Biden administration's Transportation Decarbonization Blueprint (the "Blueprint"), i.e., Sustainable Liquid Fuels ("SLFs"), Battery-Electric Vehicles ("BEVs"), and Hydrogen.2 While there is exciting progress being made to develop heavy-duty engines and vehicles that will operate on electricity and hydrogen, the majority of new heavy-duty vehicles will continue to use internal combustion engines ("ICE") for many years to come. This will be especially true in the heavier vehicle classes in the heavy-duty vehicle market.3 [EPA-HQ-OAR-2022-0985-1651-A2, p. 2.]

> 2 The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation (the "Blueprint"). Accessed on June 11, 2023 at The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation | Department of Energy. See, e.g., page 5, Figure B and similar references elsewhere in the Blueprint.

> 3 Lubrizol notes that, even in California and the other states that adopt California's Advanced Clean Transportation ("ACT") rule (collectively, the "ACT States"), most new trucks sold in 2035 will still be ICE vehicles fueled by petroleum diesel fuel, absent any further changes in state or federal fuel policy. More specifically, manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines will be required to sell zero-emission trucks as an increasing percentage of their annual sales in the ACT States from 2024 to 2035. By 2035, zero-emission truck/chassis sales will need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales in the ACT States.

Organization: Valero Energy Corporation

E. ZEVs are not fit for purpose as HDVs.

EPA's presumptions regarding consumer acceptance of ZEVs overlook these vehicles' unsuitability for the purpose of long-haul freight transport. Factors EPA has not fully considered that are material to HD ZEV feasibility include, among other things: reduced payload capacity; battery weight requirements; range; impacts to trucking industry jobs; charging/re-fueling infrastructure availability; the rate of infrastructure buildout; permitting challenges; upstream environmental impacts inherent to ZEV production; upfront ZEV costs; the HD payback period; electricity price projections; and battery efficiency in different climate conditions. [EPA-HQ-OAR-2022-0985-1566-A2, p. 23.]

Regarding "fitness for purpose," while ZEVs may provide options to help reduce GHG emissions, neither BEV nor FCEV technology is compatible with the full range of use, duty and demand required by the HD transportation sector, and therefore neither one is suitable to replace the ICEV and adequately serve the nation's freight and transit needs. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 23 - 24.]

Current FCEV technology facilitates larger and heavier vehicles due to its higher energy storage capacity than BEVs, and it offers drivers a refueling experience much like conventional vehicles, with the fuel tank capable of being refilled in a matter of minutes. However, adoption of the technology and particularly commitment to developing fueling infrastructure has been limited within the U.S.—currently the nation has 72 active public and private FCEV hydrogen fueling stations, with all but one of these being located in California.112 [EPA-HQ-OAR-2022-0985-1566-A2, p. 25]

112 U.S. DOE Alternative Fuels Data Center, Hydrogen Fueling Station Locations, https://afdc.energy.gov/fuels/hydrogen_locations.html#/analyze?region=US-CA&fuel=HY&country=US, accessed March 21, 2023.

EPA Summary and Response:

Summary:

The commenters offered a range of opinions about the readiness of FCEV technology. Most commenters agreed that hydrogen-based technologies are promising and offer business opportunity. API pointed to American Trucking Association testimony that expressed concern about considering only hydrogen for sectors where BEVs are not the answer—stating that there may be other renewable fuel options that can limit lifecycle emissions, and Federal support should focus on ensuring that alternative fuel infrastructure and feedstocks are available where a given technology or fuel fits best.

At least two commenters support EPA's assertion that FCEVs are technologically feasible now. Both CARB and CATF listed several examples of FCEV demonstrations, announcements and partnerships, and active transit bus and truck deployments that demonstrate early success and market growth potential. CARB noted that three OEMs are producing Class 8 fuel cell trucks in California. CATF cited OEM plans to expand FCEV offerings before 2030. CATF said that additional lead time for FCEVs is not necessary, and that EPA's projected adoption rates are too conservative. They extrapolated the results of a UC Davis study that projected the number of FCEVs on the road in 2030 to the rest of the country and found there could be a notable increase in FCEV stocks nationwide compared to today. To strengthen the proposed rule, they believe that EPA should incorporate FCEV adoption into technology packages beginning in MY 2027 (and include a corresponding increase in stringency in the standards).

At least three commenters were less optimistic about FCEV readiness in the timeframe of the rule. Daimler agreed that BEV technologies are more prevalent now, which justifies the rule's current focus on BEVs in the technology packages for the modeled potential compliance pathway. They contend that FCEV technology is still nascent and should not be considered until at least MY 2032 due to the current state of the technology and infrastructure readiness. Daimler stated that the number of FCEVs in the marketplace is small. They say that long-haul ZEVs still have significant challenges, and they are hesitant to make projections about future FCEV-related costs or characteristics. Lubrizol believes that most vehicles will continue to use internal combustion engines for years to come, particularly in heavier use cases. Valero stated that while the technology can work, adoption has been limited in the U.S. and there has not been sufficient commitment to developing refueling infrastructure. They question the "fitness" of ZEV technologies to meet the full range of needs in the HD transportation sector.

Response:

As described in the preamble and RIA, we continue to find that FCEV technologies can be ready for select vehicle applications in early market volumes by MY 2030. We used the HD TRUCS tool (see RIA Chapter 2) as part of our analysis to evaluate numerous operational characteristics and costs to estimate HD technology feasibility and suitability, and the analysis for the final rule shows that a diverse range of HD vehicle technologies, including but not limited to BEV and FCEV technologies, are feasible and may be used to comply with the final standards to reduce GHG emissions. This flexibility in the nature of performance-based standards offers opportunity to identify where each technology fits best so that emissions can be reduced efficiently and effectively.

With respect to FCEV technologies specifically, our analysis evaluates FCEV technology costs considering early market volumes that correspond to our adoption rates that include roughly 10,000 HD FCEVs by MY 2032. This approach is reasonable because FCEV component costs tend to vary based on manufacturing volumes, as described further in RTC Section 3.4.3.

We agree with commenters who noted that HD FCEV demonstrations and deployments are underway today, suggesting there is sufficient lead time to develop the necessary technologies for the MY 2030 to MY 2032 timeframe. As indicated in RIA Chapter 1.7.5 and 1.7.6, for example, Nikola produced 42 Class 8 FCEVs in 2023.[379] They have a production capacity in their Arizona facility of 2400 BEV or FCEV trucks, with about 200 HD FCEVs on order.[380] Meanwhile, Toyota is starting to develop 160 kW fuel cell modules for Class 8 trucks. They have business offers to support the production of about 100,000 fuel cell systems in 2030, including about 35 percent for heavy-duty trucks.[381,382] And there are projects under DOE's SuperTruck 3 program through 2028 to further develop Class 8 FCEV technologies. Fleets are already purchasing HD FCEVs such as Performance Food Group, for example, who received four Class 8 FCEVs at a facility in Fontana, CA, in February 2024.[383]

Though some FCEV models may be available by MY 2027, as suggested by CATF, we are also balancing other factors like timing to accommodate initial hydrogen infrastructure buildout for HD FCEVs. Likewise, we do not believe that it is necessary to wait until MY 2032, as Daimler asserts, to project utilization of FCEV technologies for select vehicle applications in early market volumes in our HD TRUCS analysis, given that the hydrogen market is heavily incentivized to make initial progress on clean hydrogen production starting by MY 2030. Please see preamble Section II and RIA Chapter 2 for more discussion on our inclusion of FCEV

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[379] Nikola Corporation. "Successful Launch: Nikola Produces 42, Wholesales 35 Hydrogen Fuel Cell Electric Trucks for Customers in U.S. and Canada in 2023". PR Newswire: January 4, 2024. Available online: https://www.prnewswire.com/news-releases/successful-launch-nikola-produces-42-wholesales-35-hydrogen-fuel-cell-electric-trucks-for-customers-in-us-and-canada-in-2023-302026028.html.

[380] Nikola Corporation. "Nikola Corporation Reports Second Quarter 2023 Results" PR Newswire: August 4, 2023. Available online: https://www.prnewswire.com/news-releases/nikola-corporation-reports-second-quarter-2023-results-301893419.html.

[381] Ismail, Adam. "Toyota's Going All In On Hydrogen Fuel-Cell Trucks in Kentucky". Jalopnik: July 11, 2023. Available online: https://jalopnik.com/toyotas-going-all-in-on-hydrogen-fuel-cell-trucks-in-ke-1850626040.

[382] If one assumes that there are roughly three fuel cell systems per truck, then this implies there could be enough fuel cell production to supply more than 10,000 trucks in 2030.

[383] Brasher, Jade. "Hyzon helps fleet cover its bases before implementing hydrogen fuel cell EVs". FleetOwner. February 8, 2024. Available online: https://www.fleetowner.com/emissions-efficiency/article/21282331/hyzon-helps-fleet-cover-its-bases-before-implementing-hydrogen-fuel-cell-evs.

technology for select vehicle applications in early market volumes starting in MY 2030 in our HD TRUCS analysis. Hydrogen infrastructure readiness and lead time are addressed in RTC Section 8.

Please see RTC Section 9 for a discussion about the use of other alternative fuels. We emphasize that this final rule does not require use of any particular technology or technology mix, and the final standards are performance-based standards. We include FCEVs in a modeled potential compliance pathway to support the feasibility of the final standards, but there are numerous potential compliance pathways for the final standards, including ones that do not include FCEVs or ZEVs (see preamble Section II.F for further discussion and additional example potential compliance pathways, as well as RIA Chapter 2.11). See RTC Section 2 for additional response to comments on the final standards and the final standards' stringency.

5.2 FCEV & Hydrogen Safety

Comments by Organizations:

Organization: American Bus Association

We also note from the current unified agenda published by the Administration (https://www.reginfo.gov/public/do/eAgendaMain), that standards are not yet fully formed for safe hydrogen battery technology and are still under development (RIN 2127-AM40). Similarly, safety standards are still being developed and adopted for heavy-duty electric batteries as well (RIN 2127-AM43). Between a lack of safe or reliable technology development or operational standards, a lack of existing infrastructure, unreliable projections for future infrastructure, it seems prudent to delay a selection of any particular low or zero-emission technology strategy and any fleet requirements or projections should be set aside. [EPA-HQ-OAR-2022-0985-1634-A1, p. 3]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

In addition, the hydrogen used in fuel-cell vehicles presents serious safety risks. As EPA acknowledges, hydrogen molecules are small and "challenging to contain," which means that "[e]ven with properly designed systems, small leaks are common." Draft RIA at 75. Leaks, in turn, lead to dangerous—even fatal—accidents. If hydrogen escapes, "it can form a combustible mixture with air," and ultimately, an "explosion[]." Id.; see also Hao Li et al., Safety of Hydrogen Storage and Transportation, 8 Energy Reports 6258, 6259 (May 2022) ("Hydrogen can easily cause material failure, which in turn can lead to leakage. Hydrogen leakage is followed by a mixture of air in a certain space to form a gas cloud; if it encounters an ignition source at this time, hydrogen cloud explosions easily occur. Even without ignition sources, high-pressure hydrogen leakage may cause spontaneous combustion and explosion."). This risk is greater with hydrogen than with "other common fuels" because hydrogen has a "much greater" flammability range and "will ignite more easily." Draft RIA at 75. And to make matters worse, "[h]ydrogen is colorless, odorless, and tasteless," so detecting leaked hydrogen—and therefore the risk of an explosion—"is difficult." Id. [EPA-HQ-OAR-2022-0985-1660-A1, p. 51]

The inherent danger of hydrogen has already resulted in catastrophic accidents. In 2019, "there were several hydrogen explosions in Norway, the United States and South Korea." Li et al., Safety of Hydrogen Storage, supra, at 6259. In Norway, an "assembly error" involving a hydrogen tank caused an explosion at a fueling station near Oslo, injuring three people. Norway Fines Nel Units $3 Million over 2019 Blast at Hydrogen Fuel Station, Reuters (Feb. 16, 2021), https://tinyurl.com/3twp99k4. In the United States, leaking hydrogen at a silicone products plant led to a "massive explosion and fire that fatally injured four workers and seriously injured another." CSB Releases AB Specialty Silicones Factual Update, U.S. Chem. Safety Bd. (Dec. 18, 2019), https://tinyurl.com/yc4pyz4c. The Chemical Safety Board reported that "[t]he force from the explosion was felt up to 20 miles away in neighboring communities and damaged surrounding businesses." Id. The same year, there was also an explosion at a chemical plant in Santa Clara, California, that "shook buildings and residents at least five miles away" and resulted in evacuations and shelter-in- place orders for residents and businesses in the area. Luz Pena, Hydrogen Explosion Shakes Santa Clara Neighborhood, ABC7 NEWS (June 2, 2019), https://tinyurl.com/mr3r3yxe. The explosion injured two plant employees and caused "extensive damage." Report on the June 2019 Hydrogen Explosion and Fire Incident in Santa Clara, California, H2 Hydrogen Safety Panel, at 7 (June 2021), https://tinyurl.com/yeyu28bj. In South Korea, a hydrogen storage tank at a government research project exploded, "destroy[ing] a complex about half the size of a soccer field, killing two and injuring six." Hyunjoo Jin & Jane Chung, Hydrogen Hurdles: A Deadly Blast Hampers South Korea's Big Fuel Cell Car Bet, Reuters (Sept. 24, 2019), https://tinyurl.com/yx93d5c9. "One victim was blown away by pressure and then killed after being hit by rock." Id. (internal quotation marks omitted). And just this year, there have already been two road accidents in the United States involving the transportation of hydrogen. Agnete Klevstrand, "Explosion After Explosion," Hydrogen Insight (Feb. 7, 2023), https://tinyurl.com/ypea2at8. In one of the accidents, a pickup and trailer, belonging to a domestic hydrogen fuel manufacturer and distributor, collided with a passenger vehicle, caught fire, and led to a "wave of explosions" that sent "balls of flames" ten meters into the air. Id. (internal quotation marks omitted). A witness reported that there was "[e]xplosion after explosion after explosion and it just didn't stop." Id. (internal quotation marks omitted). "The two occupants of the truck and the driver of the Toyota were taken to [the] hospital with minor injuries" and "traffic lights and utility lines were damaged by the flames." Id. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 51 - 52]

EPA must consider these safety concerns as part of its feasibility analysis. See Sierra Club v. EPA, 325 F.3d 374, 378 (D.C. Cir. 2003) ("The statute also intends the agency to consider many factors other than pure technological capability, such as costs, lead time, safety, noise and energy."). But in the proposed rule, it simply brushed them aside. With respect to battery-electric vehicles, the agency merely stated that "standards have already been developed by the industry and are in place for manufacturers to use today to develop current and future products." 88 Fed. Reg. at 25,962; see also Draft RIA at 36–39. Those existing "standards" provide little assurance given the safety problems that have arisen already, and the likely increase in similar incidents if use of electric vehicles substantially increases, as the proposed rule not only anticipates but affirmatively intends. And with respect to fuel-cell vehicles, the agency notes only that "[h]ydrogen has been handled, used, stored, and moved in industrial settings for more than 50 years," and that there are "established methods," "federal oversight and regulation," and "standards" in place to ensure safe use. 88 Fed. Reg. at 25,972; Draft RIA at 75–76. These existing protocols, like those for battery-electric vehicles, are plainly inadequate in light of the documented disasters that have occurred in the United States and elsewhere. Even EPA acknowledges that "[a]s hydrogen demand increases, additional codes and standards at all levels of government are likely going to be needed to accommodate heavy-duty FCEVs and fueling station development." Draft RIA at 76. Those codes and standards must be established and proven effective before the agency adopts a rule that would require manufacturers to produce, and consumers to use, fuel-cell vehicles, not after. EPA cannot—and should not—put the American public in danger to advance its agenda on electric vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 52 - 53.]

Organization: American Trucking Associations (ATA)

EPA further notes that hydrogen-related fuel cell vehicles carry additional risks that can be mitigated through:30

- proper no/low leak designs for infrastructure, hydrogen fill equipment, vehicle connectors, and vehicle storage and supply;
- ambient hydrogen concentration monitoring and alarm;
- hydrogen pressure monitoring in the vehicle and infrastructure to indicate leaks;
- proper ventilation in and around hydrogen fueling equipment and fuel cell vehicles;
- vehicle controls to ensure the vehicle cannot be driven while fueling equipment is attached; and
- vehicle controls that isolate hydrogen storage in the case of an accident. [EPA-HQ-OAR-2022-0985-1535-A1, p. 20-21]

30 Ibid, pg. 76

Fleets will need to expand existing technician safety training and education to manage these potential risks. Maintenance facilities upgrades will also be needed to accommodate BEV and FCEV vehicles. For example, because hydrogen is lighter than air, shop ventilation and monitoring will be needed for fleets servicing FCEVs. For BEVs, isolating high-voltage service bays has been mentioned as a potential maintenance strategy. Fleets are in the initial stages of understanding how to adapt existing maintenance shops to accommodate BEVs and/or FCEVs. As many fleets conduct in-house maintenance on their vehicles, EPA should further investigate the proposed rule's impact on maintenance practices and facilities. [EPA-HQ-OAR-2022-0985-1535-A1, p. 21]

Organization: Arizona State Legislature

EPA does not estimate the cost or timetable for the safety training or the potential cost from fires and other damage.

The risk is greater for hydrogen-powered vehicles. EPA recommends flame detectors since hydrogen flames are "almost invisible"; ventilation for vehicles stored indoors or under a roof to avoid hydrogen accumulation; safety training for first responders to turning the vehicle off or physically interrupting the power supply; and storage in "an isolated area" after a crash. *Id.* at 74-75. One study simulating a vehicle's hydrogen tank explosion in an underground parking garage and road tunnel found fatality distances from 1-3.2 meters and 3-9.5 meters, respectively, depending on the size of the tank.32 Again, EPA does not estimate the cost or timetable for the safety training or the potential cost from fires, explosions, and other damage. [EPA-HQ-OAR-2022-0985-1621-A1, p. 25]

32 Jinouk Park et al., Study on the Explosion of the Hydrogen Fuel Tank of Fuel Cell Electric Vehicles in Semi-Enclosed Spaces, ENERGIES 2023 16(1), 241 (Dec. 2022), available at https://www.mdpi.com/1996-1073/16/1/241; see also Shaoqi Cui et al., Analysis of the fire hazard and leakage explosion simulation of hydrogen fuel cell vehicles, 41 THERMAL SCIENCE AND ENGINEERING PROGRESS 101754 (June 2023).

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #17: We request comment on our assessment that HD FCEVs can be designed to maintain safety.

- DTNA Response: Based upon DTNA's extensive experience in ZEV product development, there is no question that HD FCEVs can be designed to maintain safety. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Summary and Response:

Summary:

Comments were received on the safety of FCEVs and hydrogen. American Bus Association shared concern that there are planned additional federal safety standards yet unpromulgated and stated that FCEV implementation should not happen until such standards exist. The American Trucking Association noted that training will need to be expanded to manage risks and facilities will need to be upgraded to maintain HD FCEVs. The Arizona State Legislature commented that the fire and damage risk is greater with hydrogen powered vehicles than with BEV. They discussed explosion risk in enclosed areas such as underground parking garages and tunnels. Arizona State Legislature stated that EPA should estimate the costs and timing for safety training and the potential costs of fires and explosions. AmFree expressed concern about "serious safety risks" and said that leaks are common due to the nature of a hydrogen molecule and are difficult to detect. They cited several examples of accidents: two accidents were tank explosions, one at a fueling station in Oslo; two massive explosions at industrial facilities; and two incidents related to road accidents involving the transportation of hydrogen. AmFree insisted that EPA must consider safety concerns as part of its feasibility analysis. They asserted that existing codes and standards are inadequate and must be established and proven effective before the Phase 3 rule drives the use of FCEVs.

Daimler, a manufacturer working to develop FCEVs, stated that there is no question that the technology can be designed to maintain safety.

Response:

EPA is required to consider safety when establishing motor vehicle emission standards. CAA section 202(a)(4). EPA has done so, as further described in Preamble II.D.3.iv and RIA Chapter 1.7.4. EPA found at proposal that HD FCEV systems must be, and are, designed to always maintain safe operation. EPA reiterates that conclusion here. See RIC Chapter 1.7.4. As EPA explained there, and as noted by DTNA, there are industry codes and standards for the safe design and operation of HD FCEVs. The Hydrogen Industry Panel on Codes, International Code Council, and National Fire Protection Association work together to develop stringent standards for hydrogen systems and fuel cells.[384] The FCEV codes and standards extend to service as well as emergency response. In addition, HD FCEVs are subject to, and necessarily comply with, the same federal safety standards and the same safety testing as ICE heavy-duty vehicles. Commenters challenging the safety of HD FCEVs failed to address the existence of these protocols and federal standards. EPA does not consider the multiple binding federal safety standards, and industry protocols to be ineffective and considers them to support the conclusion that HD FCEV can be utilized safely. When considering safety for the NPRM, EPA coordinated with the National Highway Traffic Safety Administration (NHTSA) on safety regarding comments and updates for the final rulemaking.[385]

This is not to say that there is no room for further investigation and potential strengthening of safety measures. The concern with hydrogen transport in tunnels, for example, is in the process of additional evaluation. In the interim, safety is maintained by existing restrictions. For example, DOT Federal Highway Administration (FHWA)'s Technical Manual for Road Tunnels states, "Road tunnels, especially those in urban areas, often have cargo restrictions. These may include hazardous materials, flammable gases and liquids, and over-height or wide vehicles. Provisions should be made in the approaches to the tunnels for detection and removal of such vehicles."[386] DOE/Sandia National Laboratories is working with other authorities to evaluate safety in tunnels, as described further in RIA Chapter 1.7.4. Additionally, FCEVs including their storage systems, like ICE vehicles, are required to meet the Federal Motor Vehicle Safety Standards (FMVSS) for crash safety so that the systems will maintain their integrity after the specified crash conditions.

Most if not all fuels, due to their nature of transporting energy, can do harm or be unsafe if not handled properly. Although hydrogen incidents (not with FCEVs) were noted in AmFree's comment, it is important to note that there has not been a FCEV accident due to leaking hydrogen.[387] Although smaller in output than a HD FCEV, the Toyota Mirai has similar components. Retail US sales started in late 2015. When compared to other fuels, hydrogen is nontoxic and lighter than air, so it quickly disperses upwards unlike gas vapors that stay at ground level, and has a lower radiant heat so surrounding material is less likely to ignite.[388] Thus, we reasonably have taken into consideration that further steps are being taken and by 2030 these processes will have moved forward to continue to ensure safety in operation.

Two commenters noted additional training needs. One stated that EPA should estimate the cost and timing for safety training and the potential costs of fires and explosions. Safety training

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[384] Tae, Christian. "Hydrogen Safety: Let's Clear the Air". NRDC. January 14, 2021. Available online: https://www.nrdc.org/bio/christian-tae/hydrogen-safety-lets-clear-air.

[385] Landgraf, Michael. Memorandum to Docket EPA-HQ-OAR-2022-0985. Summary of NHTSA Safety Communications During LD and HD GHG Rulemaking. February 14, 2024.

[386] U.S. Department of Transportation, Federal Highway Administration. "Technical Manual: Design and Construction of Road Tunnels—Civil Elements". December 2009. Available online: https://www.fhwa.dot.gov/bridge/tunnel/pubs/nhi09010/tunnel_manual.pdf.

[387] CARB. "Hydrogen Fuel Cell Electric Vehicle 101: Learn the Basics of Hydrogen Fuel Cell Electric Vehicles, Including How Fueling Works, the Benefits, and the Limitations". Available online: https://ww2.arb.ca.gov/our-work/programs/truckstop-resources/zev-truckstop/zev-101/hydrogen-fuel-cell-electric-vehicle-101#:~:text=Hydrogen%20fuel%20cell%20electric%20vehicles%20are%20safe.,fire%2C%20and%20is%20less%20explosiv.

[388] Tae, Christian. "Expert Blog. Hydrogen Safety: Let's Clear the Air". NRDC. January 14, 2021. Available online: https://www.nrdc.org/bio/christian-tae/hydrogen-safety-lets-clear-air.

occurs for a variety of reasons for all HD vehicle types. A review of possible safety training for technicians and mechanics as well as safety training for first responders shows appropriate training to be eight hours or less.[389,390] This time is seen as appropriate for ongoing training required of technicians, mechanics, and first responders and does not merit the addition of costs in our analysis. As noted in RIA 2.3.4, after consideration of comments stating that ZEV technicians may initially require additional training, EPA has phased in the ZEV maintenance and repair scaling factors to address this potential transition period. One commenter also noted a potential need to upgrade maintenance facilities to accommodate FCEVs. Please refer to RTC Section 3.7 for a response to comments such as this one regarding maintenance and repair.

We do not agree that costs associated with unfortunate accidents such as fires or explosions are a necessary consideration for our analysis.

5.3 H2 Storage Tank Packaging

Comments by Organizations:

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #16: We request comment and data related to packaging space availability associated with FCEVs and projections for the development and application of liquid hydrogen in the HD transportation sector over the next decade.

- DTNA Response: To enable FCEV range comparable to that of a conventional vehicle today, HD transportation must rely on liquid hydrogen due to the volume required to achieve the desired ~500 mile range. There is no liquid hydrogen infrastructure suitable for HD vehicles (HDVs) today, and very little suitable gaseous hydrogen infrastructure available. It is unclear how much infrastructure will be developed over the next decade. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Summary and Response:

Summary:

DTNA believes that onboard liquid hydrogen is required for long-range HD FCEVs (e.g., to achieve a desired ~500-mile range). They note that little gaseous hydrogen infrastructure is suitable for HD FCEVs today, and no liquid hydrogen infrastructure, and they point to uncertainty about infrastructure development over the next decade.

Response:

Please see RTC Section 8 for more response to comments about hydrogen infrastructure. We note that, regarding uncertainty about infrastructure development over the next decade, this rule offers some degree of certainty, as it provides a signal supporting industry development of the technology and supporting infrastructure for manufacturers utilizing this technology to comply.

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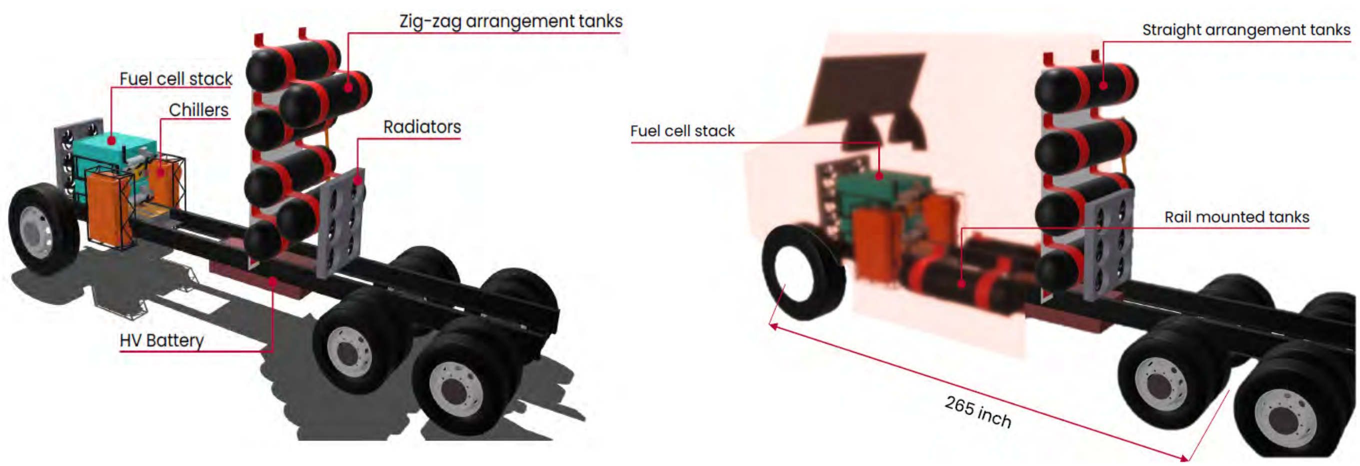
[389] AIChE Institute for Learning & Innovation. “Fundamental Hydrogen Safety Credential”. Available online: https://www.aiche.org/ili/academy/courses/elp200/fundamental-hydrogen-safety-credential.

[390] Redwood Coast Energy Authority. “FCEV Resources for Emergency Responders”. Available online: https://redwoodenergy.org/fcev-resources-for-emergency-responders/.

As DTNA suggests, liquid hydrogen technology may prove beneficial in the longer-term. However, gaseous hydrogen is predominantly used today, including for light-duty vehicles, forklifts, and buses. As explained in RIA Chapter 1.7.3, the readiness of liquid storage and refueling technologies is still relatively low compared to compressed gas technologies, so onboard liquid storage tanks are not included as part of the technology package under the modeled potential compliance pathway that supports our rule.

For the final rule, we contracted FEV to independently conduct a packaging analysis for Class 8 long-haul FCEVs that store 700-bar gaseous hydrogen onboard to see if space would be sufficient to accommodate hydrogen fuel for longer-range travel. EPA conducted an external peer review of the final FEV report.[391] FEV found ways to package six hydrogen tanks (77 kg of hydrogen) to deliver up to a 500-mile range with a sleeper cab using a common 265-inch wheelbase. All of the tanks could be at the back of the cab in a zig-zag arrangement and the batteries inside the frame rails, or four of the tanks could be behind the cab with two tanks mounted to the outside of the frame rails under the cab and the batteries inside the frame rails.

Figure 1 FEV High-Level FCEV Packaging Concept[392]



The FEV analysis was based on the use of high-power lithium titanium oxide (LTO) batteries, which are long-lasting cells that are currently more expensive than the FCEV battery estimates in the rule. Lithium iron phosphate (LFP) batteries could be used instead of LTOs but would require a battery pack with higher energy capacity. LFPs have a lower c-rate rating (i.e., a slower charge or discharge rate) compared to LTOs: LFPs are expected to have 3C c-rate whereas LTOs have a 10C c-rate.[393]. However, one could accomplish similar power output during discharge or power input from regenerative braking using either a smaller LTO or a larger LFP battery. Since we limit our motor power output to 400 kW for tractors, we find LFP batteries sufficient to capture the required regenerative braking. The volumetric energy density of a LFP battery pack

[391] FEV Consulting. "Heavy Duty Commercial Vehicles Class 4 to 8: Technology and Cost Evaluation for Electrified Powertrains—Final Report". Prepared for EPA. March 2024.
[392] FEV's CAD images are based on volumetric energy density of key powertrain components. All engineering aspects of feasibility were not verified.
[393] Toshiba. "High-power type cells". Available online: https://www.global.toshiba/ww/products-solutions/battery/scib/product/cell/high-power.html.

is about 1.8 times higher than a LTO pack, so the packaging study with LTO packs can be used as a surrogate for the LFP pack.[394] In addition, the analysts found that batteries can be packaged along the side rails, which could provide two or three times the packaging volume for the battery pack, as shown in Figure 2.

Figure 2 FEV High-Level FCEV Packaging Concept[395]

The potential to store six onboard hydrogen storage tanks would allow a long-haul tractor to meet a daily operational VMT requirement of at least 420 miles. Daimler shared data based on 18 days of telematics data from their fleet, and they identified a 90th percentile VMT of 484 miles for Class 8 day cabs and 724 miles for Class 8 sleeper cabs. If a HD FCEV refuels once en-route, then it could cover a 90th percentile VMT requirement of at least as far as 724 miles in a day. A refueling event during the day should not be an unreasonable burden, given that refueling times are as short as 20 minutes or less and are considered a key benefit of HD FCEVs.[396]

Based on our review of the literature for the NPRM and after consideration of the comments received and additional information, our assessment is that most HD vehicles have sufficient physical space to package hydrogen storage tanks onboard.[397] This remains the case for long-haul sleeper cabs if they refuel en-route. See also RIA Chapter 2.9.1.2.

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[394] Figure 1 shows that a 58 kWh LTO battery could fit between the rails. This means that a 110 kWh LFP battery could also fit between the rails.

[395] FEV's CAD images are based on volumetric energy density of key powertrain components. All engineering aspects of feasibility were not verified.

[396] U.S. Department of Energy. "The #H2IQ Hour". September 21, 2023. Available online: https://www.energy.gov/sites/default/files/2023-10/h2iqhour-09212023.pdf.

[397] Kast, James et. al. "Designing hydrogen fuel cell electric trucks in a diverse medium and heavy duty market". Research in Transportation Economics: Volume 70. October 2018. Available online: https://www.sciencedirect.com/science/article/pii/S0739885916301639.

6 Electric Charging Infrastructure

6.1 Charging Infrastructure Availability

Comments by Organizations

Organization: Advanced Energy United

IV. Conclusion

By providing a predictable business and regulatory environment, EPA's proposed vehicle rules can help not only decarbonize US transportation, but also bolster a critical segment of the American economy: automakers. EVs present a critical lifeline for the U.S. automotive industry, as total car sales have declined since 2017. As industry analysts have noted, "[EVs] are the only growth area in the automotive market."12 The EPA's rule can simultaneously sustain this growth and accelerate EV adoption, revitalizing automakers and creating good paying, high-skilled jobs in the process. As such, EPA's proposed rules complement key parts of the Inflation Reduction Act (IRA) - namely the 30D and 45W tax credits that incentivize the purchase of electric vehicles, and the host of industry incentives, such as the manufacturing tax credit (45X) that support the buildout of a domestic EV industry. [EPA-HQ-OAR-2022-0985-1652-A2, p. 6]

12 Carreon, A. (5 May, 2023). The EV Battery Supply Chain Explained. Rocky Mountain Institute. https://rmi.org/the-ev-battery-supply-chain-explained/

However, it is crucial to build the EVSE infrastructure to meet this changing automotive landscape. Simply put, consumers and businesses can only take advantage of the 30D and 45W tax credits if the infrastructure is there to satisfy demand. Ensuring this infrastructure buildout will enable effective implementation of the EPA's rule and accelerate the transition to 100% electrified transportation. Fortunately, the IRA's companion legislation – the Infrastructure Investment and Jobs Act (IIJA) - can help in this effort. IIJA included $7.5 billion in funding as a part of the National Electric Vehicle Infrastructure (NEVI) formula program, which provides states with resources to deploy charging stations. The pieces are in place to make the transition from the internal combustion engine to EVs, we just need to put them together. [EPA-HQ-OAR-2022-0985-1652-A2, p. 6]

Organization: Alliance for Vehicle Efficiency (AVE)

We are concerned that the lack of charging and refueling infrastructure will undermine ZEV adoption by fleet owners. In support of the Proposal, EPA states that it expects most BEV heavy-duty trucks to travel an estimated daily range of about 200 miles, allowing fleet owners to rely on private charging infrastructure and not depend on public charging stations. [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

Meanwhile, the IRA does not provide fleet owners with any incentives to install charging stations. The timeline for publicly-available stations along major interstate corridors, typically used by heavy-duty trucks, is unclear. In other words, fleet owners investing in BEV trucks will also need to assume the cost of charging on their own or risk that public charging will be available in the future. As a result, it will be challenging for fleet owners to use BEV trucks for longer haul transport. [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

A recent study by the Environmental Defense Fund, found:

"…when including the cost of charging infrastructure, only one of the five fleets [in the State of New Jersey] was able to maintain fuel cost savings. Without financial support for private fleet infrastructure, these additional costs make it difficult to break even for most use cases. This is especially true for smaller fleets. Fleets of less than 10 trucks are particularly vulnerable to charging infrastructure costs and will require greater support to realize fuel cost savings." 19 [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

19 https://blogs.edf.org/energyexchange/2022/10/14/charging-infrastructure-is-key-for-new-jersey-fleets-to-electrify/

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Charging Infrastructure. If the proposed rule were adopted, commercial fleets in many segments of the heavy-duty industry would need access to a "robust and accessible network of highway stations that provides on-route fast-charging." Electric Highways at 1; Sam Pournazeri, Criteria to Consider When Siting EV Charging Infrastructure for Medium- and Heavy-Duty Vehicles, ICF (Apr. 28, 2022), https://tinyurl.com/4z7k6z29 ("Criteria for EV Charging"). Vehicles that travel long distances or carry heavy loads, such as long-haul trucks and transit buses, need to charge during their shift or on the way to their next location. See Draft RIA at 63; Medium- and Heavy-Duty Vehicle Electrification at 11. And almost half of all heavy-duty vehicles are purchased by independent owner-operators "who will be more likely to recharge on route than install an expensive charging station at home." Medium- and Heavy-Duty Vehicle Electrification at 11. To date, however, "little attention has been paid to how and where these trucks will charge their batteries, and it's no small problem." Emily Ayshford, Calculating the Cost of E-Trucking, Univ. of Chi. Off. of Sci., Innovation, Nat'l Lab'ys & Glob. Initiatives, https://tinyurl.com/yckmpkd5 ("Calculating the Cost of ETrucking"). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 42 - 43]

According to the Department of Energy, today there are only approximately 54,000 public charging stations nationwide, offering just under 140,000 ports. See Dep't of Energy, Alternative Fuels Data Ctr., Alternative Fueling Station Counts by State (Public), https://tinyurl.com/385e5nk2 ("Alternative Fueling Station Counts – Public") (last accessed June 14, 2023).5 The available data do not identify how many of those stations can accommodate heavy-duty vehicles, but when taking into account charging speed, interoperability, and site design, the number appears to be miniscule. [EPA-HQ-OAR-2022-0985-1660-A1, p. 43]

5 There are also approximately 3,700 private en-route stations. See Dep't of Energy, Alternative Fuels Data Ctr., Alternative Fueling Station Counts by State (Private), https://tinyurl.com/4xc8jfcs (last accessed June 14, 2023). They are not generally accessible to the public.

Charging stations can offer up to three kinds of equipment, all of which provide different ranges and speeds. Level 1 charging provides approximately five miles of range per hour; Level 2 charging provides approximately 25 miles of range per hour; and "direct-current" or "DC" fast charging provides approximately 100 to 200 or more miles of range per thirty minutes. See Dep't of Energy, Alternative Fuels Data Ctr., Developing Infrastructure to Charge Electric Vehicles, https://tinyurl.com/3buv474m ("Developing Infrastructure"); see also Draft RIA at 61. Unless a heavy-duty vehicle can stop for overnight charging, its operator will typically need DC fast charging to stay on schedule. See Dep't of Energy, Alternative Fuels Data Ctr., Electric Vehicles for Fleets, https://tinyurl.com/msv8va9d ("All-electric vehicles that drive more than 100 miles in a day may require DCFC for in-shift recharging."); Marie Rajon Bernard et al., Deploying Charging Infrastructure to Support an Accelerated Transition to Zero-Emission Vehicles, ZEV Transition Council, at 6 (Sept. 2022) ("Deploying Charging Infrastructure"). But only a small fraction of public charging stations offer that capability. Nationwide, there are a mere 7,406 stations with DC fast charging ports. See Dep't of Energy, Alternative Fuels Data Ctr., Alternative Fueling Station Locator, https://tinyurl.com/4xjsc3x6 (last accessed June 14, 2023). That amounts to roughly 14 percent of public stations. Id. [EPA-HQ-OAR-2022-0985-1660-A1, p. 43]

Even among that small group of stations, there are three different types of DC fast charging connectors (the equipment that is "plugged into a vehicle"). Developing Infrastructure. As EPA acknowledges, that "may limit the EVSE ports and stations a particular vehicle may use," which in turn "may pose a challenge for . . . drivers who may need to travel longer distances to find a station with the right connector type." Draft RIA at 68. And "[p]hysical connectors are only one aspect of interoperability." Id. at 69. There are also "[c]ommunication protocols between the network and chargers and between the charger and vehicle [that] facilitate the flow of key information important for charging and billing." Id. Without standardization, heavy-duty vehicle operators may pull up to a DC fast charging port only to realize that they cannot use it. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 43 - 44]

Finally, even if a station has charging capabilities and equipment compatible with a particular heavy-duty vehicle, the site design may not be able to accommodate that vehicle's size. Many stations are constructed with light-duty passenger cars in mind, and as a result, will not have enough space for large vehicles to enter and exit, high enough canopies or roofs, or long enough charging cords. See Draft RIA at 63. [EPA-HQ-OAR-2022-0985-1660-A1, p. 44]

Given these numerous obstacles, recent studies conclude that public charging stations for heavy-duty vehicles today are scarce at best or even practically nonexistent. See Medium- and Heavy-Duty Vehicle Electrification at 19 ("Public charging stations set up for MHEDVs, however, are scarce today."); Deploying Charging Infrastructure at 6 ("There is essentially no public charging infrastructure in place for HDVs right now."). [EPA-HQ-OAR-2022-0985-1660-A1, p. 44]

Both the lack of adequate charging infrastructure and potential electric-vehicle owners' concerns about whether adequate stations would be available where and when needed have already impeded the uptake of heavy-duty electric vehicles. The American Trucking Associations, for example, recently explained in a Senate hearing that, "[w]ithout the required infrastructure, motor carriers cannot properly plan and invest in battery-electric trucks." A Heavy Dose of Reality. The president of one transportation service in Pennsylvania submitted a comment in this rulemaking to emphasize that "[t]he infrastructure required to support the widespread adoption of charging of EV Coaches is nonexistent." John Bailey, President of Bailey Coach, Dkt. No. EPA-HQ-OAR- 2022-0985 (May 2023). And Volvo Group North America testified that customers have delayed and even canceled electric truck purchases in California "because of delayed infrastructure." Volvo Grp. N. Am., Dkt. No. EPA-HQOAR-

2022-0985 (May 2, 2023). According to that manufacturer, its customer base "will not purchase zero emission trucks unless both the vehicles and the fuels are cost-effective and readily available so as not to negatively impact their business operations." Id. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 44 - 45]

These concerns show that the Nation's charging infrastructure must substantially improve before fleet owners would consider replacing their conventional vehicles with electric ones. EPA does not attempt to estimate the number of new public charging stations that would be needed, but available studies— including some that the agency discusses—suggest that this would be an enormous endeavor. Atlas Public Policy, for example, projects that there would need to be between $100 and $166 billion in cumulative infrastructure investments to support a 2030 fleet of over one million battery-electric heavy-duty vehicles and begin building infrastructure for future years. See Draft RIA at 67. That estimate includes $30 billion for depot charging ports, "with most of the remaining investment supporting on-road charging." Id. Attaining even a fraction of that investment is likely impossible under the proposed rule's compressed timeline. [EPA-HQ-OAR-2022-0985-1660-A1, p. 45]

EPA concludes otherwise based primarily on the availability of tax incentives, federal funding, and plans that manufacturers, charging network providers, and energy companies have announced. See 88 Fed. Reg. at 25,933. But the agency overstates the contribution that each of those sources will make. First, the tax incentive that the agency relies on—called the "Alternative Fuel Refueling Property Credit"—provides a credit of up to 30 percent of the cost of charging equipment, but only when the charging equipment is located within low-income or non-urban area census tracts, and only up to $100,000. See Draft RIA at 19–20, 65. Considering that "installing one charging site [that] could supply 100 e-trucks at a time . . . could run costs higher than $21 million," this $100,000 credit will provide little incentive to construct charging stations throughout the country. Calculating the Cost of E-Trucking. [EPA-HQ-OAR-2022-0985-1660-A1, p. 45]

Second, although the Bipartisan Infrastructure Law ("BIL") provides $7.5 billion in federal funding to build out a national network for charging infrastructure, jurisdictions are "not required" to use any of that money "to build stations specifically for heavy-duty vehicles." 88 Fed. Reg. at 25,930, 25,944; Draft RIA at 16, 65. And even if all of those funds were used for heavy-duty charging infrastructure, it still would not be enough. As explained above, developing sufficient charging infrastructure will cost tens of billions of dollars. Indeed, one study found that the BIL funding would not even cover the cost of the infrastructure needed in California alone, which only has "15% of the U.S. MD/HD vehicle market." Criteria for EV Charging ("In California alone, which has 15% of the U.S. MD/HD vehicle market, there will be a need for more than 157,000 DCFCs by 2030 to support the upcoming wave of electric MD/HD vehicles. According to our estimates, such a network of charging infrastructure could cost more than $15 billion over the next 10 years. That is twice the amount of funding the federal government allocated through the [BIL]."). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 45 - 46]

Third, the private investments that EPA identifies are small, and their effects are uncertain. According to the agency, there has been "over a billion dollars for recently announced projects to support electric truck or other commercial vehicle charging in the United States and Europe." 88 Fed. Reg. at 25,934. The source it cites shows that almost half that amount is entirely for Europe. See Zero-Emission Vehicles Factbook. And the domestic projects that the agency discusses are so preliminary that it is unclear how many stations they will actually provide. For example, EPA asserts that Daimler Truck North America is partnering with NextEra Energy Resources and Blackrock Renewable Power to invest $650 million in a nationwide charging network for commercial vehicles. 88 Fed. Reg. at 25,934; Draft RIA at 65. But less than two months ago, the companies had only announced the name of their joint venture and unveiled renderings of the site layout. See Introducing Greenlane: Daimler Truck North America, NextEra Energy Resources and BlackRock Forge Ahead with Public Charging Infrastructure Joint Venture, NextEra Energy (Apr. 28, 2023), https://tinyurl.com/ms2xm43k. It remains to be seen how many charging stations they will be able to construct by the time the proposed rule takes effect. EPA also states that "Volvo Group and Pilot recently announced their intent to offer public charging for medium- and heavy-duty BEVs at over 750 Pilot and Flying J North American truck stops and travel plazas." 88 Fed. Reg. at 25,934; Draft RIA at 65. But those companies have not announced a plan to construct "over 750" public charging stations; instead, the companies announced a plan to install stations "at selected Pilot and Flying J travel centers across the U.S." Volvo and Pilot Company Partner to Build a National Public Heavy Duty Charging Network, Volvo Trucks USA (Nov. 15, 2022), https://tinyurl.com/hcfw35cp (emphasis added). Here too, it is not yet clear how many stations these companies will develop. And finally, many of the other projects EPA points to are based solely in California, see Draft RIA at 65–66, which already has the most public charging stations in the country, see Alternative Fueling Station Counts – Public. [EPA-HQ-OAR-2022-0985-1660-A1, p. 46]

In sum, the Nation's charging infrastructure cannot even support the existing, small customer base for heavy-duty electric vehicles. The number of available stations would need to increase exponentially to service the hundreds of thousands of new electric vehicles that EPA anticipates will be sold—and that would need to be in use to achieve EPA's proposed emission standards. The agency has not provided a reasonable basis for assuming that such an expansion is possible, let alone plausible, within less than a decade. [EPA-HQ-OAR-2022-0985-1660-A1, p. 47]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

While a significant percentage of the charging installations deployed today are Level 2 EVSEs, dual charging installations to enable the flexibility of light-duty as well as medium-duty and HDV charging will become increasingly important. Direct current fast charging equipment ("DCFCs") will enable broader market coverage, even for LDVs used in applications where they cannot sit for 6 hours and charge during off-peak, lower-cost electricity periods. As utility companies gear up to provide infrastructure installations, EPA should not minimize the impact of supply chain shortages/strains on the cost of materials necessary for installing supporting charging infrastructure in the short time ahead to 2032. Beyond EVSE chargers, the cost of grid upgrade projects needed to support the incremental electricity demand growth from transportation is not insignificant and can be quite variable. A particular case study of Southern California illustrated in IOPscience notes: "the total cost of these upgrades will be at least $1 billion and potentially more than $10 billion." These costs need to be taken into consideration with expected demand growth, within detailed rate base calculations, and in concert with appliance upgrade costs to fully understand their ultimate impacts on annual ratepayer expenditures." 81 We agree with and support the Proposed Rule's acknowledgement that "a recent study found power needs as low as 200 kW could trigger a requirement to install a distribution transformer." Other anecdotal evidence discussed within an RMI report highlights the expensive mistakes that can emerge from insufficient planning and engagement in details.82 Demand charges can be particularly punishing, and in some cases make or break the business case for transition from ICEVs to BEVs, particularly for fleets and vehicles that require DCFC charging. Other considerations for high-reliability use cases should include provisional back-up power system considerations, which likely depend upon back-up generators or expensive stationary energy storage batteries. Absent comprehensive understanding of the dynamics between increased ZEV use and charging infrastructure needs, vehicle manufacturers—as well as consumers—are left in a vulnerable position. Regardless of whether manufacturers even could comply with the Proposed Rule, they would likely be left in a position where there is no consumer demand, and fleet turnover declines because the infrastructure necessary to support the new ZEVs is either at capacity or nonexistent. Indeed, at least one study to date has concluded that, upon ZEVs becoming the norm in California, it could push the total demand for electricity beyond the existing capacity of the state's grid—turning ZEVs into zero electricity vehicles.83 Even more important, meeting the demand in California would likely require construction of new power plants, or electricity purchases from neighboring states—further adding to the infrastructure needs with increased transmission and distribution capabilities.84 Or, in the short term, electricity may come from generators, in which case it makes more sense to leave the ICE in the truck rather than beside it. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 22 - 23]

81 Salma Elmallah et al., IOP SCIENCE, "Can distribution grid infrastructure accommodate residential electrification and electric vehicle adoption in Northern California?" (Nov. 9, 2022) available at https://iopscience.iop.org/article/10.1088/2634-4505/ac949c

82 Alessandra R. Carreon, et al., RMI, "Increasing Equitable EV Access and Charging" (2022) available at https://rmi.org/insight/increasing-equitable-ev-access-charging/.

83 Beth Daley, THE CONVERSATION, "Switching to electric vehicles could save the US billions, but timing is everything" (Dec. 4, 2018), available at https://theconversation.com/switching-to-electric-vehicles-could-save-the-us-billions-but-timing-is-everything-106227.

84 Id.

Despite the potential for increased demands on domestic energy generation and generation capacity,85 EPA offers little to no support that these demands will be sufficiently met. Similarly, EPA's draft Regulatory Impact Analysis86 provides little to no analysis regarding the costs associated with meeting these increased infrastructure and energy generation/capacity needs beyond the flawed reliance on various legislative actions, such as the BIL and IRA.87 Consequently, EPA is pushing a technology at a pace that cannot be adopted within the timeframe of its own proposal. [EPA-HQ-OAR-2022-0985-1659-A2, p. 23]

85 See, e.g., U.S. DRIVE, "Summary Report on EVs at Scale and the U.S. Electric Power System" (Nov. 2019), available at https://www.energy.gov/eere/vehicles/articles/summary-report-evs-scale-and-us-electric-power-system-2019 (summarizing impacts of light-duty vehicles on energy generation and generation capacity alone and acknowledging several potential challenges without including analysis of medium- and heavy-duty ZEVs).

86 DRIA at 15–17, 20–21.

87 See, e.g., Salma Elmallah et al., Can distribution grid infrastructure accommodate residential electrification and electric vehicle adoption in Northern California? (Nov. 9, 2022), available at https://iopscience.iop.org/article/10.1088/2634-4505/ac949c (projecting upgrades needed solely for the PG&E service area in Northern California, which serves 4.8 million electricity customers and is subject to

aggressive targets for both EV adoption and electrification of residential space and water heating will add at least $1 billion and potentially $10 billion to PG&E’s rate base).

Organization: American Trucking Associations (ATA)

5. Infrastructure Will Be a Key Driver Towards the Adoption of ZEV Technology

EPA recognizes that infrastructure availability will be a key enabler to adopting ZEVs. The agency’s proposed GHG 3 regulation includes BEV and FCEV vehicles, each with different infrastructure requirements and investment costs. While EPA estimates the additional cost of providing electrical infrastructure to charge BEVs, this does not ensure that infrastructure is available or suitable for most heavy-duty applications. Without adequate infrastructure, increasing percentages of ZEV sales, both BEVs and FCEVs, will be unachievable, and the industry will not hit the annual milestone targets in EPA’s ZEV adoption table. [EPA-HQ-OAR-2022-0985-1535-A1, p. 15]

EPA cites the Department of Energy’s Alternative Fuels Data Center Station Locator for providing the number of chargers available for publicly and privately held locations to justify the expansion of battery electric vehicles throughout the United States. The agency acknowledges that the station counts of over 53,000 are not broken out by light- or heavy-duty capable charging capacities or site configurations. In our discussions with fleets, ATA is aware that a small number of heavy-duty accessible public charging stations are available nationwide. EPA cites the federal funds available to states to support the construction of charging networks under the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA), but the programs included in the legislation do not robustly support commercial vehicle electrification. [EPA-HQ-OAR-2022-0985-1535-A1, p. 15]

The National Electric Vehicle Infrastructure (NEVI) grant program, included in IIJA, provides federal funds to states to begin to build a nationwide charging network to support transportation electrification in all highway segments. The authorizing legislation qualified medium duty commercial charging as eligible projects, but initial guidance from the Federal Highway Administration (FHWA) in February 2022 discouraged states from providing truck charging capacity and did not require specific design requirements that would co-locate medium- and heavy-duty charging infrastructure support. ATA commented on the NEVI program and pushed FHWA to provide funds to immediately support commercial-scale electrification projects.19 We were pleased to see the agency issue new guidance clarifying the eligibility of medium- and heavy-duty charging infrastructure, but unfortunately, ATA is unaware of any state directing their NEVI state block grant funds toward it. California, Oregon, and Washington provided a competitive grant submission to fund a portion of their joint I-5 charging network, which would include heavy-duty charging stations and are awaiting an award announcement. [EPA-HQ-OAR-2022-0985-1535-A1, p. 15]

19 American Trucking Associations, Comments on the National Electric Vehicle Infrastructure Formula Program, FHWA-2022-0008-0339, August 23, 2022

Organization: BorgWarner Inc.

BorgWarner appreciates the Administration’s support for EV charging and hydrogen infrastructure.

BorgWarner applauds the Administration's support for EV charging and hydrogen infrastructure. More infrastructure support is needed, however, for the HD, MD, and other commercial vehicles to help these segment's shift to an electrified and hydrogen-powered future. We urge federal agencies to align resources and goals to leverage the shared endeavors to decarbonize the transportation sector. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4.]

A key factor for expanding infrastructure is private sector charging support. Fleet owners will need to not only bear higher costs for new ZEV vehicles, but also the charging and refueling equipment as well. More support for these commercial facilities is crucial. Many products are available to help fleet owners navigate this transition and we hope more federal and state incentives will be forthcoming. BorgWarner is currently working with customers to install needed charging stations. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4.]

Organization: California Air Resources Board (CARB)

The NPRM provides several excellent examples of times the nation has adapted to new electrical load including the adoption of A/C and the rapid growth of data centers. The implementation of fleet charging infrastructure is much the same and, it should be noted, not expected to happen overnight. The phase in schedule proposed by U.S. EPA provides ample time for fleets and utilities to plan for and implement charging solutions that meet truck electrification needs. [EPA-HQ-OAR-2022-0985-1591-A1, p.45]

The NPRM requests comment on time considerations for all levels of HD charging infrastructure, including Level 2 up to 350-kilowatt direct current fast charger (DCFC) systems. NPRM states that 2027 provides adequate timing to establish initial levels of depot charging with the expectation that charging capacity will grow over the remainder of the decade. With current CEC MD/HD infrastructure projects, staff are seeing projects take about two to three years from inception to operations. Equipment shipping delays have made up a significant portion of the delays. Those can be expected to improve over time, and, in any event, even with permitting process requirements in California, there is sufficient time to meet U.S. EPA's 2027 and beyond timeframe. With planning, the lead times identified here should be sufficient to support the stringency of the proposed standard and more stringent alternative i.e., values that would reflect the level of ZEV adoption in CARB's ACT regulation. A number of truck OEMs and private companies are already working to provide both depot charging solutions as well as corridor infrastructure solutions. Daimler is leading the Greenlane $650 million investment in West Coast, Southeast Coast and Texas corridors.149 Volvo has a truck-stop agreement150 and is also working on a dealership-based California corridor.151 Hyundai is working to establish a San Pedro ports to Texas southwest hydrogen corridor.152 TerraWatt is working on a similar fast charging network along I-10 from California to Texas.153 Nikola has an agreement with Voltera to build 50 hydrogen stations.154 Voltera,155 Zeem,156 Electrify America,157 Forum Mobility,158 WattEV,159 and TerraWatt160 among others are developing depot charging projects. Private companies dependent on transportation services have announced both electrification plans as well as vehicle and infrastructure projects moving them toward those goals. USPS has announced 66,000 BEV delivery vehicles by 2028 with all electric purchases from 2026 and an initial order of 14,000 chargers.161,162 Walmart has announced its own network of DCFCs aimed at lighter vehicles,163 an order of 4,500 delivery vehicles164 and a fleetwide 100 percent electrification.165 Amazon has ordered 100,000 BEV delivery vehicles166 with "thousands" of chargers already installed167 including reports of sizable charging depot installations.168,169 Amazon is backing class 8 drayage truck charging depots170,171 and has ordered 329 BEV terminal tractors.172 FedEx has committed to ZE delivery vehicles reaching 50 percent by 2025 and 100 percent by 2030 with a 100 percent ZE full delivery fleet by 2040.173,174 UPS has a 10,000 BEV delivery vehicle order175 and has participated in showcasing innovative charging technologies. DHL Supply Chain has cancelled further orders of diesel terminal tractors, ordered 50 BEV terminal tractors toward a 100 percent ZE fleet by 2025 and ordered BEV semi tractors on their way to a 30 percent ZE on-road fleet by 2030.176 [EPA-HQ-OAR-2022-0985-1591-A1, pp.45-48]

149 Introducing Greenlane: Daimler Truck North America, NextEra Energy Resources and BlackRock Forge Ahead with Public Charging Infrastructure Joint Venture, April 28, 2023. https://www.prnewswire.com/news-releases/introducing-greenlane-daimler-truck-north-americanextera-energy-resources-and-blackrock-forge-ahead-with-public-charging-infrastructure-joint-venture-301811101.html

150 Pilot Company and Volvo Group Partner to Build Charging Network for Medium- and Heavy-Duty Electric Trucks, November 15, 2022. https://www.prnewswire.com/news-releases/pilot-company-and-volvo-group-partner-to-build-chargingnetwork-for-medium--and-heavy-duty-electric-trucks-301678542.html

151 Volvo Trucks Constructing California Electrified Charging Corridor for Medium- and Heavy-Duty Electric Vehicles, July 14, 2022. https://www.volvotrucks.us/news-and-stories/press-releases/2022/july/constructing-california-electrifiedcharging-corridor-for-medium-and-heavy-duty-electric-vehicles/

152 Transport Topics: New Mexico to be Part of ‘Clean Freight Corridor’, September 26, 2022. https://www.ttnews.com/articles/new-mexico-be-part-clean-freight-corridor

153 Business Wire: TeraWatt Developing I-10 Electric Corridor, the First Network of Electric Heavy-Duty Charging Centers, October 20, 2022. https://www.businesswire.com/news/home/20221020005252/en/TeraWatt-Developing-I-10-Electric-Corridor-the-First-Network-of-Electric-Heavy-Duty-Charging-Centers

154 Nikola Partners With Voltera To Build Up To 50 Stations For Hydrogen Trucks, May 2, 2023. https://www.forbes.com/sites/alanohnsman/2023/05/02/nikola-partners-with-voltera-to-build-up-to-50-stations-for-hydrogen-trucks/?sh=6ce0eea8fb0d

155 EV Truck Charging Station Garden City https://www.savannahnow.com/story/news/2023/05/29/ev-truck-charging-station-gardencity/70254024007/

156 Zeem Solutions Launches First Electric Vehicle Transportation-As-A-Service Depot, March 30, 2022. https://zeemsolutions.com/zeem-solutions-launches-first-electric-vehicle-transportation-as-a-servicedepot/

157 Electrify America: Business Solutions, last accessed June 13, 2023. https://www.electrifyamerica.com/business-solutions/

158 East Bay Community Energy and Forum Mobility Announce Innovative Financing for First of Its Kind Electric Truck Charging Depot in Livermore, June 13, 2023. https://www.prnewswire.com/news-releases/east-bay-community-energy-and-forum-mobility-announceinnovative-financing-for-first-of-its-kind-electric-truck-charging-depot-in-livermore-301849030.html

159 WattEV Breaks Ground on 21st Century Truck Stop, December 16, 2021. https://www.wattev.com/post/wattev-breaks-ground-on-21st-century-truck-stop

160 Terawatt Infrastructure, Ideas: TeraWatt Raises Over $1 Billion to Scale Commercial EV Charging Centers Across America, September 13, 2022. https://terawattinfrastructure.com/ideas/terawatt-raises-over-1-billion/161 USPS Intends To Deploy Over 66,000 Electric Vehicles by 2028, Making One of the Largest

Electric Vehicle Fleets in the Nation, December 20, 2022. https://www.prnewswire.com/news-releases/usps-intends-to-deploy-over-66-000-electric-vehicles-by-2028--making-one-of-the-largest-electric-vehicle-fleets-in-the-nation-301707407.html

162 USPS Moves Forward with Awards to Modernize and Electrify the Nation's Largest Federal Fleet - Newsroom - About.usps.com, February 28, 2023. https://about.usps.com/newsroom/national-releases/2023/0228-usps-moves-forward-with-awards-tomodernize-and-electrify-nations-largest-federal-fleet.htm

163 Leading the Charge: Walmart Announces Plan To Expand Electric Vehicle Charging Network, April 6, 2023. https://corporate.walmart.com/newsroom/2023/04/06/leading-the-charge-walmart-announces-plan-toexpand-electric-vehicle-charging-network

164 Walmart To Purchase 4,500 Canoo Electric Delivery Vehicles To Be Used for Last Mile Deliveries in Support of Its Growing eCommerce Business, July 12, 2022. https://corporate.walmart.com/newsroom/2022/07/12/walmart-to-purchase-4-500-canoo-electricdelivery-vehicles-to-be-used-for-last-mile-deliveries-in-support-of-its-growing-ecommerce-business

165 Greenbiz: Walmart drives toward zero-emission goal for its entire fleet by 2040, September 23, 2020. https://www.greenbiz.com/article/walmart-drives-toward-zero-emission-goal-its-entire-fleet-2040

166 The Verge: Amazon says it has 'over a thousand' Rivian electric vans making deliveries in the US, November 7, 2022. https://www.theverge.com/2022/11/7/23443995/amazon-rivian-electric-delivery-van-fleet-ev

167 Amazons-Custom-Electric-Delivery-Vehicles-from-Rivian-Start-Rolling-Out-Across-the-U.S, July 21, 2022. https://press.aboutamazon.com/2022/7/amazons-custom-electric-delivery-vehicles-from-rivian-startrolling-out-across-the-u-s

168 Journal Times: Amazon prepares to go electric in a big way with delivery vans at Racine County hub, June 28, 2022. https://journaltimes.com/news/local/amazon-prepares-to-go-electric-in-a-big-way-withdelivery-vans-at-racine-county/article_a89d3c0e-f342-11ec-823f-0f3f5e4a7dea.html

169 Dallas News: Amazon begins installing charging stations in North Texas for electric delivery fleet, May 10, 2022. https://www.dallasnews.com/business/energy/2022/05/10/amazon-begins-installing-charging-stationsin-north-texas-for-electric-delivery-fleet/

170 AJOT: Backed by Amazon & CBRE, Forum Mobility is building harbor truck charging stations in California, April 4, 2023. https://www.ajot.com/insights/full/ai-backed-by-amazon-cbre-forum-mobility-is-building-harbor-truckcharging-stations-in-california

171 AJOT: Backed by Amazon & CBRE, Forum Mobility is building harbor truck charging stations in California, April 4, 2023. https://www.ajot.com/insights/full/ai-backed-by-amazon-cbre-forum-mobility-is-building-harbor-truckcharging-stations-in-california

172 GAUSSIN Group receives an order from AMAZON for 329 electric yard tractors, December 14, 2022. https://www.gaussin.com/news/gaussin-group-receives-an-order-from-amazon-for-329-electric-yardtractors

173 UPS: Electrifying our future, May 23, 2022. https://about.ups.com/us/en/social-impact/environment/sustainable-services/electric-vehicles---aboutups.html

174 The Buzz EV News: BrightDrop produces 150 electric delivery vans for FedEx Fleet, August 10, 2022. https://www.thebuzzevnews.com/brightdrop-electric-vans-fedex/

175 UPS: UPS and DP World delivering world firsts, October 4, 2021. https://about.ups.com/us/en/our-stories/innovation-driven/delivering-world-firsts.html

176 DHL Supply Chain Advances Sustainability Efforts With 50 Electric Yard Trucks, May 1, 2023. https://www.dhl.com/us-en/home/press/press-archive/2023/dhl-supply-chain-advances-

sustainabilityefforts-with-50-electric-yardtrucks.html#:~:text=The%20company%20is%20also%20looking,of%20its%20fleet%20by%202030

Organization: CALSTART

Infrastructure Considerations

One of the major concerns EPA cites as possibly limiting faster ZE-MHDV adoption is the pace of electric charging and hydrogen fueling infrastructure moving to the scale required. Specifically, EPA raises concerns about fleets being able to install sufficient charging at their depots to meet their deployment rate and asks for comment. We believe the approach EPA takes to address infrastructure seriously limits the assumed penetration of key vehicle segments, including regional tractors and an initial percentage of long-haul operations. Addressing these assumptions is critical. [EPA-HQ-OAR-2022-0985-1656-A1, p. 16]

In terms of infrastructure needed and the availability to meet this faster rate, several studies have investigated the ability to meet the pace of change needed. ICCT performed a strong analysis that looked at infrastructure needed to meet a national ACT-based timeline. 35 CALSTART has also performed an infrastructure needs assessment based on the Drive to Zero market penetration projections (which exceed ACT). This assessment has been structured to build on and further detail the implementation roadmap Drive to Zero developed to reach 100 percent ZE-MHDVs by 2040. The 2040 roadmap's core strategy breaks up the activity needed to reach full sales penetration into six overlapping stages, with smart infrastructure phasing as a critical enabling component of five of the stages (Figure 8).35F36 [EPA-HQ-OAR-2022-0985-1656-A1, pp. 16 - 17.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 17, for Figure 8]

35 https://theicct.org/publication/infrastructure-deployment-mhdv-may23/

36 https://globaldrivetozero.org/publication/global-roadmap-for-reaching-100-zero-emission-medium-and-heavy-duty-vehicles-by-2040/

Phased approach: Building the next level of implementation detail into this strategy, the infrastructure needs assessment illustrates that infrastructure, while a near-term challenge, will not be the limiting factor on meeting steeper penetration rates. This is due to the unique phased and geographically targeted way infrastructure is most likely to deploy. Indeed, CALSTART's findings show the network benefits of this clustered and phased rollout, which matches ZE-MHDV penetration volumes with first-launch regions, will create charging network efficiencies in deployment volume and utilization that can support more ZE-MHDVs than EPA's approach assumes.37 [EPA-HQ-OAR-2022-0985-1656-A1, p. 18.]

37 Phasing In U.S. Charging Infrastructure, CALSTART, June 2023

The analysis considers that deployment will first occur where it makes sense, not everywhere.38 That is, priority areas will be a focus of most private investment in the near term, and prioritization will inform the coordination of several of the factors critical in reducing lead times for the installation of infrastructure, developing the grid, and making costs more predictable. [EPA-HQ-OAR-2022-0985-1656-A1, p. 18.]

38 https://nacfe.org/research/electric-trucks/#electric-trucks-where-they-make-sensehigh-poten..al-regions-for-electric-truck-deployments

The assessment first identified the critical metrics to determine where focused and phased infrastructure clusters will first grow. This is based on four primary priority factors in Table 1: [EPA-HQ-OAR-2022-0985-1656-A1, p. 19.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, page 19, for Table 1]

These priorities—generally acknowledged by industry as important and serving as a framework where infrastructure development has been coordinated—identify and generate the needs and opportunity "heatmap" matching the first deployment locations satisfying vehicle use needs, infrastructure capability, and investment profiles. By assigning vehicle penetration pacing to these regions, the assessment generated required charger volumes and power levels and projected how they would grow over the ramp-up period to create the hubs, corridors, and networks that can match faster penetration timing. These locations deeply align with where project development, placement, investment, and industry transition toward zero-emission freight movement is already underway. [EPA-HQ-OAR-2022-0985-1656-A1, p. 19]

The analysis does not consider deployment as a uniform process, where charging infrastructure is used irrespective of its general priority for fleets. Rather, it considers utilization in terms of the deployment prioritization of each location, which would introduce effects of the clustering of investment and the acceleration of infrastructure availability (Figures 9–11). Areas identified as priorities for rapid and concentrated deployment can focus investment and shift forward in time. There are multiple co-benefits to not treating deployment as spatially uniform and linearly increasing with a relatively simple vehicle penetration. This infrastructure has the potential to be utilized more in the near term and possibly more efficiently overall than if deployed sporadically. [EPA-HQ-OAR-2022-0985-1656-A1, p. 19.] [See Docket Number EPA-HQ-OAR-2022-0985-1656-A1, pages 20-21, for Figures 9-11]

Phased infrastructure deployment exceeds EPA penetration rate needs: This stage-based, phased implementation model matches a much faster rate of ZE-MHDV penetration than either the EPA preferred option or even the ACT-aligned option. It matches a pace closer to that set by the Advanced Clean Fleet (ACF) rule combined with ACT, and specifically aligns with the pace needed to match 100 percent sales by 2040. What it clearly illustrates is that the implementation of national infrastructure deployment will occur at a regionally differentiated rate where priority geographies support the earlier use of vehicles and installation of infrastructure ecosystems. Notably, the locations in CALSTART's assessment and ICCT's analysis show very strong regional alignment on timing and rate. [EPA-HQ-OAR-2022-0985-1656-A1, p. 21]

Among other considerations, the assessment factors in charger utilization as a consideration, whereas the EPA assessment limits its assumptions primarily to one charger per vehicle and a charging rate limited to an assumed duty-cycle. This limitation has serious implications for restricting capabilities—such as longer-haul operations—that do not match the assumptions. [EPA-HQ-OAR-2022-0985-1656-A1, p. 21]

For example, by assuming that certain bat ery pack sizing and associated weight penalties are needed to achieve EPA's definition of long haul, EPA then projects that no long haul is possible until much later in the rule timeline. However, by adjusting bat ery sizing to the opportunities for using regional charging hubs and early corridor charge locations, critical segments of priority long-haul operations can be achieved much earlier than is assumed. This is a critical—and we believe unintended—flaw. These assumptions do not match the real-world plans already underway for depots by several carriers, manufacturers, and infrastructure service providers. The prioritization of key areas reflects real-world strategy and coordinated investment trends by major industries around high-potential regions. [EPA-HQ-OAR-2022-0985-1656-A1, p. 21]

Highly instructive announcements have been made by major companies increasing the electrification of their facilities/operational territories or signaling investments in targeted areas. Corridor investment examples include:

- Blackrock, Daimler, and NextEra have announced GreenLane, a $650 million joint venture to build out key corridors breaking ground this year.39
- TeraWatt announced that it would use $1 billion in seed funding to build charging stations from Los Angeles to Texas.40
- BP Pulse has made commitments and investments of over $1 billion to move toward its goal of installing and operating 100,000 sites globally.
- Voltera has committed several billions to developing sites in the United States.41 [EPA-HQ-OAR-2022-0985-1656-A1, pp. 21 - 22]

39 https://newsroom.nexteraenergy.com/news-releases?item=123840

40 https://terawattinfrastructure.com/ideas/i-10-electric-corridor/

41 https://www.globenewswire.com/news-release/2022/08/09/2495043/0/en/Voltera-Launches-as-Turnkey-Charging-Infrastructure-Solution-for-Companies-Operating-EVs-With-Plans-for-Multibillion-Dollar-Investment.html

Recent state and federal government funding has also assisted, and many industry players are leveraging the funding to realize the next stage in their charging infrastructure buildout strategy. [EPA-HQ-OAR-2022-0985-1656-A1, p. 22]

This strategy also aligns broadly with utility strategies for investments to support charging infrastructure. Research shows that efficiencies within energy infrastructure investment beyond the site are possible in areas where playbooks are created and new service processes emerge. The models developed by Lawrence Berkeley National Lab for the California Energy Commission's Charging Infrastructure Assessment shows remarkably different overall load profiles given deployment scenarios in which managed charging takes place at sites, or in which charging takes place in short distance travel patterns that can be operationally coordinated for opportunity charging.42 Other studies by NREL show that managed charging can even create, at the grid scale, megawatt-scale resources using aggregated electric vehicle behavior.43 Managed load profiles are reflected in our analysis. We assume the overall load profile on the utility can change drastically if deployment supports these trips clusters, leading to possible charge management scenarios and also larger grid management opportunities. [EPA-HQ-OAR-2022-0985-1656-A1, p. 22]

42 https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127

43 https://www.nrel.gov/docs/fy22osti/83404.pdf

The major takeaway from the prioritization of areas is twofold:

- First, by shifting investment into priority regions, more ZE-MHDVs can be supported earlier and more economically.

- Second, by prioritizing key areas and regions, those areas come to be integrated and can realize connected utilization efficiencies. Relatedly, this provides an opportunity to streamline workforce development (e.g., engineers, construction), utility make-ready programs, etc., which have the potential to reduce costs. [EPA-HQ-OAR-2022-0985-1656-A1, p. 22]

This overall network effect and its benefits are fully missing from the EPA assumptions, which primarily consist of linear, one-to-one vehicle to charger relationships and therefore limits pacing and efficiency. [EPA-HQ-OAR-2022-0985-1656-A1, p. 22]

Organization: Clean Air Task Force et al.

b. Charging and grid infrastructure is capable of supporting HD BEVs in volumes aligned with and in excess of EPA's proposed standards.

Deployment of BEVs is well underway across the U.S. and is already requiring the electric power sector to make plans to reliably and safely integrate these vehicles. The electric power industry is well situated to maintain safe and reliable service that can power an increasing deployment of HD BEVs; utilities, aided significantly through investments from the BIL and IRA, are making important upgrades to the system to integrate higher penetrations of BEVs. Additional third party private investments and public investments are also already committed to building a robust HD BEV charging network. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45.]

When considering infrastructure buildout, it is important to remember that HD ZEVs will enter the total on-road HD fleet gradually and in volumes that pale in comparison to in-use HD combustion vehicles. Modeling using HD TRUCS and MOVeS3.R3188 shows that EPA's proposal, if finalized, would likely result in ZEVs comprising just 1 percent of the total on-road HD fleet by 2027, gradually reaching 8 percent in 2032 and 23 percent in 2040. See Table 4, infra. In other words, a relatively small portion of the HD fleet will be tapping into charging and grid infrastructure over the next decade, and even by 2040, HD ZEVs would comprise less than a quarter of the on-road fleet under this proposal. Infrastructure needs for HD ZEVs will accordingly grow gradually over time. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45. See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 45-46, for Table 4.]

> 188 HD TRUCS was used to develop ZEV adoption rates (by vehicle classification). MOVES3.R3 was used to translate HD TRUCS-derived ZEV adoption rates to ZEV sales and in-use curves.

For the final rule, we urge EPA to model how the Phase 3 standards will likely affect the composition of the entire on-road HD fleet, not just HD ZEVs' share of new sales. That information would better help the Agency and the public consider infrastructure issues related to this rulemaking. [EPA-HQ-OAR-2022-0985-1640-A1, p. 46.]

i. Economic theory and historical precedent show that infrastructure buildout will occur at the pace and scale needed to support vehicle electrification.

EPA should reject arguments that the buildout of charging and grid infrastructure cannot occur at the pace and scale needed to support expanded vehicle electrification, which are unreasonably pessimistic and inconsistent with both economic theory and historical precedent. These arguments rely on the classic "chicken-and-egg" scenario said to be presented by ZEV sales and charging infrastructure, where each side of the market waits for the other. But EPA need not and should not wait for infrastructure to fully mature before finalizing strong Phase 3 standards. Instead, EPA's standards themselves will send a strong signal to the market to undertake the infrastructure investments needed to accommodate a gradual rise in vehicle electrification,189 such that increased ZEV sales and infrastructure buildout will occur in relative tandem and reinforce each other. As one analyst sums it up: "The chicken-and-egg conundrum is being solved. Investments in the space and the adoption of EVs [a]re happening much faster than many analysts expected, and this is also accelerating the build-out of the charging network."190 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 46 - 47.]

189 Environmental regulation itself, of course, can lead to technology innovation and market development. See generally Jaegul Lee et al., Forcing Technological Change: A Case of Automobile Emissions Control Technology Development in the US, 30 Technovation 249 (2010); Margaret R. Taylor, Edward S. Rubin, & David A. Hounshell, Regulation as the Mother of Innovation: The Case of SO2 Control, 27 Law & Policy 348 (2005); James Lents et al., Chapter II: The regulation of automobile emission: A case study, in Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers (Marika Tatsutani & Praveen Amar eds., 2000) https://www.nescaum.org/documents/rpt000906mercury_innovative-technology.pdf.

190 Gabriela Herculano, Chicken-and-Egg Problem: EV Adoption and Buildout of Charging Networks, Nasdaq (Apr. 18, 2022), https://www.nasdaq.com/articles/chicken-and-egg-problem%3A-ev-adoption-and-buildout-of-charging-networks.

The economic literature on indirect network effects and two-sided markets shows that an increase in BEV sales—a likely effect of the Phase 3 standards, particularly if they are strengthened in the final rule—can be expected to stimulate associated infrastructure development. In a study on flex-fuel vehicles fueled by E85 (85 percent ethanol), Corts (2010) found that growth in sales of flex-fuel vehicles due to government fleet acquisition programs led to an increase in the number of retail E85 stations.191 That relationship held true across all six Midwestern states analyzed, despite differences in those states' E85 subsidies and tax credits.192 The author concluded that the results "confirm the basic validity" of the theory underlying government fleet purchase requirements: that increasing the "base of alternative fuel vehicles can spur the development of a retail alternative fuel distribution infrastructure."193 [EPA-HQ-OAR-2022-0985-1640-A1, p. 47.]

191 Kenneth S. Corts, Building out alternative fuel retail infrastructure: Government fleet spillovers in E85, 59 J. Env't Econ. & Mgmt. 219, 219-20 (2009).

192 Id.

193 Id. at 231.

Recent economic research has confirmed this relationship in the context of ZEVs and charging infrastructure specifically. An influential study by Li et al. (2017) found that "EV demand and charging station deployment give rise to feedback loops" and that "subsidizing either side of the market will result in an increase in both EV sales and charging stations."194 Similarly, Springel (2021) found "evidence of positive feedback effects on both sides of the market, suggesting that cumulative EV sales affect charging station entry and that public charging availability has an impact on consumers' vehicle choice."195 The BIL and IRA subsidize both sides of the market, offering significant incentives for both HD ZEV purchases and the construction of charging infrastructure. Economic theory therefore supports the proposition that strengthened Phase 3 standards, particularly in combination with the BIL and

IRA's large financial incentives, will facilitate expansion of charging and grid infrastructure.196 [EPA-HQ-OAR-2022-0985-1640-A1, p. 47.]

194 Shanjun Li et al., The market for electric vehicles: indirect network effects and policy design, 4 J. Ass'n Env't. & Resources Econ. 89, 128 (2017).

195 Katalin Springel, Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives, 13 Am. Econ. J.: Econ. Pol'y 393, 426 (2021).

196 See id. at 394 (noting that "the presence of positive feedback amplifies the impact of both types of subsidies"), 415 ("positive feedback loops between the charging station network and total all-electric vehicle sales amplify the impact of both types of subsidy").

Economic theory has in fact played out in Norway, where ZEV sales and infrastructure both expanded rapidly over the span of about a decade. There, the "path to charging point saturation started by stimulating more demand for EVs."197 In other words, Norway did not wait for infrastructure to fully mature before beginning its transition to cleaner cars. Rather, rising ZEV sales themselves "helped trigger a spike in demand for charging stations."198 [EPA-HQ-OAR-2022-0985-1640-A1, p. 48.]

197 Whitney Bauck, How Norway Became the World's Electric Car Capital, Nexus Media News (Mar. 7, 2023), https://nexusmedianews.com/how-norway-became-the-worlds-electric-car-capital/.

198 McKinsey & Co, What Norway's Experience Reveals About the EV Charging Market 3 (2023), https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/what-norways-experience-reveals-about-the-ev-charging-market#/.

The concept that charging infrastructure will adequately scale up over time also finds support in an analogous historical example: the buildout of roads and gasoline refueling infrastructure in the early 20th century to serve the United States' growing fleet of automobiles. The country's exponential growth in automobile sales—first exceeding 1,000 in 1899 and growing to 1 million by 1916199—preceded the establishment of an extensive network of both suitable roads200 and filling stations.201 Instead, the buildout of road and refueling infrastructure unfolded over long time horizons and in a variety of ways, adapting to the needs of the automobile fleet as it changed and grew. Paving and other road improvement efforts began on a small scale in cities, where automobiles were initially concentrated; efforts to improve rural roads and construct highways happened a decade or more later, as motorists began to expand their driving beyond cities.202 Similarly, in the case of refueling infrastructure, a network of modern filling stations did not spring up until well after automobiles had grown in popularity.203 Before that, refueling needs were met through varied and dispersed "non-station" methods such as cans of gasoline sold at general stores, barrels at repair garages, mobile fuel carts, curb pumps, and home refueling pumps, which emerged at various times as the demand for gasoline increased.204 Road and refueling infrastructure therefore exhibited a "long-term, adaptive and portfolio approach"205 that, over the span of several decades, satisfied the shifting needs of the growing ranks of automobile owners. [EPA-HQ-OAR-2022-0985-1640-A1, p. 48

199 Roads, Encyclopedia.com (May 29, 2018), https://www.encyclopedia.com/science-and-technology/technology/technology-terms-and-concepts/roads.

200 See id. (noting that around 1904, "[o]nly a few hundred miles of roads in the entire country were suitable for motor vehicles"); see also F.W. Geels, The Dynamics of Transitions in Socio-technical Systems: A Multi-level Analysis of the Transition Pathway from Horse-drawn Carriages to Automobiles (1860–1930), 17 Tech. Analysis & Strategic Mgmt. 445, 460, 467-68 (2005) (discussing the gradual

expansion and improvement of road infrastructure in the 1910s and 1920s to accommodate growth in and changes to automobile travel).

201 Marc W. Melaina, Turn of the century refueling: A review of innovations in early gasoline refueling methods and analogies for hydrogen, 35 Energy Pol'y 4919, 4922 (2007) (noting that "the takeoff period for gasoline stations occurred between 1915 and 1925, but exponential growth in vehicles began around 1910, so the rise of gasoline filling stations followed rather than preceded the rise of gasoline vehicles").

202 Geels, at 467-68.

203 Melaina, at 4922.

204 Id. at 4924-27.

205 Id. at 4932 (discussing refueling infrastructure).

That approach holds important lessons for this rulemaking. As detailed above, the introduction of HD ZEVs into the total on-road fleet will occur gradually and, for the first decade or more, in relatively low volumes. As explored in a recent white paper by ICCT,206 successfully meeting the needs of this gradually expanding fleet of heavy-duty ZEVs will not require the overnight nationwide buildout of infrastructure that some have misleadingly claimed. Instead, economic theory and historical precedent show that growth in heavy-duty ZEV sales and infrastructure buildout will occur in relative tandem, with infrastructure responding over time commensurate with the evolving needs of the ZEV fleet. And in finalizing its Phase 3 standards, EPA will send a strong market signal that will facilitate infrastructure development at the pace and scale needed to support compliance with the standards. As explained in the sections below, the nation's infrastructure is already well-positioned to adapt to increased vehicle electrification. EPA must reject unfounded chicken-and-egg arguments questioning whether infrastructure will respond to rising demand. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 48 - 49

206 See generally Pierre-Louis Ragon et al., ICCT, Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States (2023), https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf.

iii. Charging infrastructure development is in line with needs to support higher deployment of HD BEVs.

EPA also correctly identifies that there has been "rapid growth in the broader market for charging infrastructure serving cars or other electric vehicles." 88 Fed. Reg. at 25934. New charging infrastructure announcements are occurring every week, showing the public and private sectors' commitment to building out infrastructure to support vehicle electrification. An analysis of announced but not yet deployed charging infrastructure investments compiled by Atlas Public Policy found that over $29.5 billion of funding has been committed specifically to medium- and heavy-duty vehicle charging, with another $4.3 billion available to medium- and heavy-duty vehicle charging as well as light-duty vehicle charging (see Table 5).232 These totals include public sector (e.g., Charging and Fueling Infrastructure Discretionary Grant funding, state funding commitments, and modeled estimates of 26 U.S. Code § 30C tax credit payments), private sector (e.g., automaker and charging service provider), and utility program investments. [EPA-HQ-OAR-2022-0985-1640-A1, p. 55.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 55-56, for Table 5]

232 Atlas Pub. Pol'y, Announced EV Infrastructure Funding (June 15, 2023).

These totals are likely a significant underestimate of total investment, particularly of private sector commitments. A few recent announcements on investments and technological advancements include:

- Daimler, NextEra, and BlackRock announced the Greenlane joint venture to design, develop, install, and operate a US-wide, BEV public charging and hydrogen fueling network for medium- and heavy-duty BEVs and hydrogen FCEVs.233
- DOE announced the award of $7.4 million to seven projects to develop medium and HD BEV charging and hydrogen corridor infrastructure plans that will benefit millions of drivers across 23 states.234
- Cummins and Heliox announced a deal to bring two innovative fleet charging solutions to market.235
- Scania successfully tested a megawatt charging system from ABB E-Mobility with a next-generation electric truck; ABB intends to launch the next version of that charging technology in late 2024 or early 2025.236 [EPA-HQ-OAR-2022-0985-1640-A1, p. 56]

233 Michelle Lewis, Daimler just announced a $650M US-wide EV charging network for trucks, electrek (Apr. 27, 2023), https://electrek.co/2023/04/27/daimler-just-announced-a-650m-us-wide-ev-charging-network-for-trucks/.

234 DOE, Biden-Harris Administration Announces Funding for Zero-Emission Medium- and Heavy-Duty Vehicle Corridors, Expansion of EV Charging in Underserved Communities (Feb. 15, 2023), https://www.energy.gov/articles/biden-harris-administration-announces-funding-zero-emission-medium-and-heavy-duty-vehicle.

235 Cummins, Inc., Cummins and Heliox to Partner On Electric Vehicle Charging Solutions for Fleet Customers, Cummins Newsroom (May 16, 2023), https://www.cummins.com/news/releases/2023/05/16/cummins-and-heliox-partner-electric-vehicle-charging-solutions-fleet.

236 Nora Manthey, Scania tests ABB's megawatt charging system for next-gen electric trucks, Electrive (May 10, 2023), https://www.electrive.com/2023/05/10/scania-tests-abbs-megawatt-charging-system-for-next-gen-electric-trucks/.

Even more private sector announcements and investments should be expected, as private sector actors often do not announce their investment plans and are especially unlikely to do so if they are investing in depot charging (as opposed to public charging), which will constitute a large proportion of heavy-duty charging. Nevertheless, the scale of these announced investments reflects a strong and growing deployment of public and private charging infrastructure that, even in advance of the finalization of the Phase 3 standards, has begun to set the stage for a robust charging network. Additional analyses have emphasized the growing momentum in infrastructure deployment; for example, an International Energy Agency report noted "there has been a substantial upswing in investment in EV charging infrastructure, which has doubled in 2022 compared to the previous year."237 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 56 - 57]

237 IEA, World Energy Investment 2023, at 50 (2023), https://iea.blob.core.windows.net/assets/54a781e5-05ab-4d43-bb7f-752c27495680/WorldEnergyInvestment2023.pd.

Organization: Clean Fuels Development Coalition (CFDC) et al.

F. There will not be enough charging infrastructure to persuade skeptical consumers to adopt battery electric vehicles in the numbers EPA projects.

Another reason the proposal is not feasible is a dearth of charging infrastructure. The proposal acknowledges that a lack of charging infrastructure is one of the "top barriers" customers identify to fleet electrification. 88 Fed. Reg. 25,943. This is unlikely to change anytime soon. [EPA-HQ-OAR-2022-0985-1585-A1, p. 26]

Currently, the general electric vehicle charging infrastructure is "inadequate and plagued with non-functioning stations." Dan Zukowski, EV charging infrastructure is "inadequate and plagued with non-functioning stations": J.D. Power, SmartCitiesDive (Feb. 22, 2023), https://www.smartcitiesdive.com/news/ev-charginginfrastructure- inadequate-non-functioning-stations/643148/. An on-going study by J.D. Power found that charge point unreliability has increased 50% from 2021 to January 2023, from 14% to 21%. Id. This unreliability has led to high rates of dissatisfaction with public charging stations among electric vehicle owners. Id. This dissatisfaction is worse in states with higher numbers of electric vehicles and in large cities with high-density housing. Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 27]

This is likely to get worse. While light-duty electric vehicle sales are increasing rapidly, "the rate of EV adoption is growing at a rate that is almost double that of charger installation growth rates" and "the construction of new charging stations is not keeping up with the demand." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 27]

And if the US electric vehicle charging infrastructure is already not enough for the rapidly increasing number of electric cars being bought and used, it is woefully inadequate for heavy-duty vehicles. Heavy-duty vehicles require much larger and more powerful chargers than their light-duty cousins. This is because heavy-duty vehicles need more power and need to receive it faster than a light-duty vehicle to meet rigorous commercial on-road operating schedules. The majority of nonresidential electric passenger vehicle charging stations have fast charging at around 150 kWs. To charge fast enough, a large heavy-duty vehicle would need nearly 1,000 kW. One recent study from the electricity and gas utility National Grid projects that by 2030, the typical passenger plaza along a highway will demand as much power— with all the wiring, transformer, and substation upgrades that requires—as a sports arena during its busiest times. Electric Highways Study, National Grid (2022), https://www.nationalgrid.com/us/EVhighway. By 2035, a single larger truck stop charging station could need to provide 19 megawatts of peak power, roughly what a small town uses. Id. And by 2045, that kind of truck stop may require 30 megawatts of capacity, approaching the peak usage of a large industrial plant. Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 27]

Heavy-duty electric vehicle charging stations also need more physical space. Because heavy-duty trucks are large and because electric charging takes longer than refilling with liquid fuel, truck recharging stations will need to be expanded and undergo enormous grid-interconnection processes just so trucks can recharge. [EPA-HQ-OAR-2022-0985-1585-A1, p. 27]

Many heavy-duty electric vehicle manufacturers point to the lack of charging infrastructure as the single biggest limiting factor in deploying electric heavy-duty vehicles. "Daimler, the leading US heavy-duty truck manufacturer, unveiled the Class 8 Freightliner eCascadia, its first fully electric semi-truck, in May of 2022. Its current production capacity is around 2000 trucks per year and it wouldn't be hard to double that number to 4000, [CEO John] O'Leary said in a recent media briefing…. But there are only around 100 electric trucks out on the streets." Bianca Giacobone, Electric Semi-Trucks Are Ready to Be Deployed, But There Aren't Near Enough Plugs to Charge Them, Business Insider (Feb. 4, 2023), https://www.businessinsider.com/electric-trucks-charging-infrastructure-truckingmanufacturer-daimler-ecascadia-2023-2. “Overwhelmingly, infrastructure is slowing us down in terms of EV deployment,” O’Leary explained. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 27 - 28]

The proposal appears to be aware of this fact. Indeed, heavy-duty charging infrastructure is so comically small that the DRIA must point out the obscure fraction of level two chargers with an arrow. See DRIA at 64. [EPA-HQ-OAR-2022-0985-1585-A1, p. 28. See DRIA Chart, Private Fleet EVSE Ports, on page 28 of docket number EPA-HQ-OAR-2022-0985-1585-A1.]

The proposal suggests that if enough money is thrown at the problem, it will go away. 88 Fed. Reg. 25,943. The proposal explains that it expects the BIL to “help build out a national network of EV charging” because it provides “$2.5 billion in discretionary grant programs for charging and fueling infrastructure along designated alternative fuel corridors and in communities (Section 11401) and $5 billion for the National Electric Vehicle Infrastructure (NEVI) Formula Program (under Division J, Title VIII).” Id. at 25,943–94. But these funds are “not required” to be used to “build stations specifically for heavy-duty vehicles.” Id. And in any event, it is not only money that is a problem. “Siting, permitting, construction delays – all that means current lead times [for charging stations] are measured in years, not weeks or months.” John G. Smith, Broad EV rollouts constrained by infrastructure challenges: Daimler Truck CEO, Trucknews.com (Jan 31, 2023), https://www.trucknews.com/sustainability/broad-ev-rollouts-constrained-by-infrastructure-challenges-daimler-truck-ceo/1003172321/. The proposal provides no evidence that this will change anytime soon. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 28 - 29]

Organization: Colorado Department of Transportation et al.

- With respect to EPA’s request for comment on charging infrastructure availability, our state is working hard to analyze, plan for, and fund needed charging infrastructure by leveraging federal, state, and utility resources. Last month, the Colorado Energy Office launched its first round of grants for medium- and heavy-duty fleet vehicle charging, a program that it expects to grow over time. [EPA-HQ-OAR-2022-0985-1530-A1, p. 2]

Organization: Consolidated Edison, Inc. (Con Edison)

Con Edison supports advancing EV charging infrastructure buildout today while planning proactively to meet the fast ramp in future customer needs to achieve emissions reduction targets. [EPA-HQ-OAR-2022-0985-1661-A1, p.4]

Organization: Daimler Truck North America LLC (DTNA)

Electrical infrastructure buildout pace is a barrier to significant ZEV adoption that should be factored in to Phase 3 CO2 standard levels.

The pace of electrical infrastructure buildout remains the biggest barrier for customer adoption of HD BEVs and poses the greatest threat to successful implementation of the Proposed Rule. As EPA observes, BEV infrastructure is critically important for the success of increasing development and adoption of BEV technologies.108 DTNA thus appreciates the opportunity to respond to EPA’s request for comment on the concerns that have already been expressed to EPA regarding the slow growth of ZEV charging and refueling infrastructure. This Proposed Rule is unique in that compliance will rely heavily on the development of infrastructure that manufacturers have no control over, and providers are not obligated to expand infrastructure to support the scope and timing of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

108 See Proposed Rule, 88 Fed. Reg. at 26,000.

DTNA—in partnership with Portland General Electric—is proud to have built the first-of-its-kind public charging island for commercial ZEVs in Portland, Oregon. In addition, DTNA's expert eConsulting team is dedicated to supporting fleets on all aspects of the ZEV transition, including site design and interfacing with utilities. Therefore, DTNA is uniquely positioned to offer insight into the challenges associated with commercial ZEV infrastructure development. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

DTNA has concerns about EPA's treatment of electric infrastructure in the Proposed Rule, and the Agency's assumptions that all suitable vehicle applications and willing customer adopters will have charging infrastructure available, or that such infrastructure can be made available within the timeframes that EPA assumes and at the costs projected in HD TRUCS. In this section, DTNA highlights the unique challenges with HD charging infrastructure (especially with respect to electricity transmission and distribution); explains why EPA significantly underestimates infrastructure costs; discusses specific timing challenges; and highlights case studies from its customer fleets. Finally, DTNA concludes by recommending that EPA use an electric infrastructure scalar to ensure that infrastructure development pace is adequately factored in to EPA's adoption rate projections, as discussed in more detail on Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

EPA projects that modest increases in electric power generation will be required to support the Proposed Rule. Specifically, the Agency estimates that Proposed Rule requirements would increase HD BEV electric power end use by 0.1% over 2021 levels in 2027, increasing to 2.8% over 2021 levels in 2055.109 EPA notes, however, that these figures do not include the electricity increase required to produce hydrogen.110 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 45-46]

109 Id. at 25,983; DRIA at 430, Table 6-1.

110 See DRIA at 431 (noting that EPA's projected electricity consumption increases attributable to the Proposed Rule do 'not include changes in electricity generation to produce hydrogen').

EPA's figures appear to underestimate the increase in electric power generation that will be required to support implementation of the Proposed Rule. As discussed below, according to the Company's calculations, 45 gigawatts of installed charging capacity will be required to support the vehicle volumes in the Proposed Rule from 2027 - 2032. Based on EIA's estimate that there was 1,143,757 megawatts (MW) of total utility-scale electricity generating capacity in the United States at the end of 2021,111 Proposed Rule implementation will require a 3.9% increase in domestic generation capacity (over the 2021 level) by 2032, conflicting with EPA's projection that only a 2.8% increase will be required by 2055. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46]

111 See U.S. Energy Information Administration, 'Electricity explained: Electricity generation, capacity, and sales in the United States,' https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacityand-sales.php.

Further, DTNA is concerned that EIA's commercial vehicle forecast does not align with EPA's ZEV market projections in the Proposed Rule. EIA's AEO 2022 commercial vehicle projections are summarized in Table 15 below. EIA projects zero commercial vehicle BEV sales through 2050, and minimal FCEV penetration up to 1,600 vehicles per year per category. It is critical that federal agencies are aligned on these commercial vehicle projections and communicate them clearly to the electric utility industry. Given the misalignment with EIA on ZEV uptake rates, it is likely that EPA underestimates the electricity generation increase needed to support HD BEVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46] [Refer to Table 15 on p. 46 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

EPA points to the adoption of residential air conditioners and growth of power-intensive data centers as historical evidence of the electric utility industry's ability to deliver additional power to customers.113 Residential air conditioners provide a reasonable comparison for light-duty vehicle electricity demand levels, as they represent a relatively low load that is evenly distributed across utility service territories. The electricity demands associated with medium- and heavy-duty electrification will, however, be fundamentally different and must be treated as such. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46]

113 See Proposed Rule, 88 Fed. Reg. at 25,983.

Unlike light-duty vehicles, most HD ZEVs cannot charge using existing 120-volt and 240-volt AC electrical infrastructure, and they require dedicated DC infrastructure. HD ZEVs are also disproportionally located in concentrated urban areas, creating highly localized grid capacity addition needs in constrained spaces (see Figure 3 below, showing heat maps of potential future loads). [EPA-HQ-OAR-2022-0985-1555-A1, p. 47] [Refer to Figure 3 on p. 47 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Power-intensive data centers and server farms were rapidly constructed across the United States in the last 20 years and were largely greenfield projects that had the flexibility to be sited where grid capacity was available or could be made available relatively easily. By contrast, the commercial transportation industry is already entrenched and invested in existing logistics facilities. Most of these are located in or around high density urban population centers, often clustered tightly together, where grid capacity is not available, and the process of acquiring land and rights-of-way for upgrades is complex. The use of data centers and server farms as anecdotal examples of electric utility adaptability suggests that EPA is significantly underestimating the demand presented by commercial transportation charging infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 47]

DTNA generally agrees with EPA's assertion that scale-up of electric power generation is not likely to significantly limit the development of BEV electric vehicle charging infrastructure. Rather, the challenge for medium- and heavy-duty charging lies in distribution of that power. As ICCT observed in a recent white paper on near-term medium- and heavy-duty ZEV infrastructure development, 'Most uncertainties regarding infrastructure buildout concern the capacity of distribution systems to bring that energy to the right place in a timely manner and accommodate the highly localized power requirements of [medium- and heavy-duty vehicle] charging.'114 Accordingly, DTNA recommends that EPA engage with electric utilities and their trade associations to further understand the unique challenges that HD ZEVs charging will pose for distribution systems, and how those factors should be accounted for in this rulemaking. [EPA-HQ-OAR-2022-0985-1555-A1, p. 47]

114 See ICCT, ‘Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States (May 2023) at 1, https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf (ICCT ZEV Infrastructure White Paper).

Finally, as described in more detail in Sections I.B.3 and II.C. of these comments, EPA should incorporate a scalar to be used in its calculations of appropriate CO2 standard stringency levels, designed (and regularly updated) to reflect actual installed capacity of HD-accessible charging equipment. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

EPA Request for Comment, Request #5: EPA requests comment on this concern, both in the Phase 3 rulemaking process, and in consideration of whether EPA should consider undertaking any future actions related to the Phase 3 standards, if finalized, with respect to the future growth of the charging and refueling infrastructure for ZEVs.

- DTNA Response: EPA should factor in heavy-duty (HD) infrastructure availability by applying an infrastructure scalar to its projected ZEV adoption rates, as discussed in Section II.C of DTNA’s comments on the Proposed Rule. DTNA also encourages EPA to pursue the supporting policies outlined in Section I.B.4. of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 159]

EPA Request for Comment, Request #6: EPA requests comment on what, if any, additional information and data EPA should consider collecting and monitoring during the implementation of the Phase 3 standards; we also request comment on whether there are additional stakeholders EPA should work with during implementation of the Phase 3 standards, if finalized, and what measures EPA should consider to help ensure success of the Phase 3 program, including with respect to the important issues of refueling and charging infrastructure for ZEVs.

- DTNA Response: EPA should collect data on available HD ZEV refueling infrastructure to inform stringency increases throughout implementation of the Phase 3 program, including hydrogen fueling stations and installed HD-accessible electric vehicle supply equipment (EVSE) capacity. DTNA also encourages EPA to work proactively with electric utilities to drive the buildout of HD ZEV support infrastructure, and to pursue the supporting policies set forth in Section I.B.4 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p.159]

EPA Request for Comment, Request #77: We request comment on data and methods that could be used to estimate the effect of this action on the HD BEV vehicle charging infrastructure industry.

- DTNA Response: HD BEV vehicle charging infrastructure in the U.S. is inadequate to support the ZEV adoption rates that EPA projects as the basis for the CO2 emission standards in the Proposed Rule. Infrastructure is the most significant limiting factor for HD ZEV adoption. DTNA discusses this issue in detail in Section II.B.3 of its comments and proposes a mechanism for adjusting the stringency of the rule to account for the lack of adequate infrastructure in Section II.C.2. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 172-173]

Organization: Edison Electric Institute (EEI)

Electric Company Policies and Programs Can Help Reduce Capital and Operational Costs for Fleet Electrification Customers.

Many EEI members over the last decade have sought regulatory approval from their state regulatory commissions to accelerate transportation electrification by reducing customer barriers to adoption. As of March 2023, and as mentioned supra, electric transportation filings from 62 electric companies in 35 states and Washington, D.C. have totaled more than $4.2 billion. The majority of these investments support the deployment of EV charging infrastructure at customer locations, and a significant portion is targeted to fleet customers. These programs can help reduce the cost that the customer would otherwise pay for the installation of EV charging infrastructure, which is a commonly cited barrier to EV charging infrastructure deployment.25 Further, electric companies can work with fleet customers to help manage their EV charging to occur at non-peak times. This can reduce operational costs for the fleet customer and improve utilization of the electric system, which puts downward pressure on rates for all customers.26 [EPA-HQ-OAR-2022-0985-1509-A2, pp. 16-17]

25 An oft cited barrier to adoption for some customers is the low utilization of EV charging stations. Traditional electric rates for commercial customers include a demand component designed to recover the fixed costs of delivery electricity. With low utilization (such as a public EV charging station or some fleet charging use cases), the effective electric price can be higher than a customer with the same demand but higher utilization. Many electric companies offer or are exploring commercial rates or other programs that reduce some of the demand charge exposure for these low utilization customers. See Cappers, et al., A Snapshot of EV-Specific Rate Designs Among U.S. Investor-Owned Electric Utilities, https://emp.lbl.gov/publications/snapshot-ev-specific-rate-designs.

26 See, e.g., Metz, et al., Distribution System Investments to Enable Medium- and Heavy-Duty Vehicle Electrification – A Case Study of New York, https://www.edf.org/media/worth-investment-report-finds-utilities-fleet-owners-consumers-benefit-when-utilities-cover.

Organization: Electrification Coalition (EC)

We suggest the EPA work collaboratively with the National Labs and the DOE on solutions that speed the installation of EV charging infrastructure, such as with the utility pre-planning for HD charging infrastructure, the energization process and permitting process. [EPA-HQ-OAR-2022-0985-1558-A1, p. 11]

The EPA specifically requests comments on the concerns from HD vehicle manufacturers over slow growth in HD EV charging infrastructure deployment, and asks whether EPA should consider undertaking any future actions related to Phase 3 standards with respect to the future growth of HD EV charging infrastructure.32 While not necessarily in the jurisdiction of EPA, the agency should nonetheless work collaboratively with the National Labs and DOE on solutions that will ensure a timely installation of HD EV charging infrastructure. [EPA-HQ-OAR-2022-0985-1558-A1, p. 11]

32 See page 25934 of the Environmental Protection Agency’s (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

The private sector has begun making investments in expanding public and en-route charging for HD vehicles. For example, TeraWatt Infrastructure announced that it will be developing a network of charging centers for HD trucks along the I-10 corridor between the ports of Long Beach and Los Angeles, California and El Paso, Texas. Additionally, The Volvo Group and Pilot Company announced that they have signed a Letter of Intent to build a 'national, public charging network' for heavy duty trucks across the U.S. at Pilot and Flying J travel centers. These stations will be available for all brands of electric heavy-duty trucks. [EPA-HQ-OAR-2022-0985-1558-A1, p. 13]

Organization: Energy Innovation

IV. THE COMBINED IMPACT OF FEDERAL, STATE, AND PRIVATE INVESTMENTS ON INFRASTRUCTURE DEPLOYMENT WILL HELP MEET THE NEEDS OF AN INCREASINGLY ELECTRIFIED HDV FLEET OVER THE NEXT DECADE.

The EPA notes that "[u]ncertainty about ZEV technology, charging infrastructure technology and availability for BEVs, or hydrogen refueling infrastructure for FCEVs, may affect ZEV adoption rates. As ZEVs become increasingly more affordable and ubiquitous, we expect uncertainty related to these technologies will diminish over time."42 We concur with this assessment and recognize that vehicle adoption must occur apace with infrastructure deployment. [EPA-HQ-OAR-2022-0985-1604-A1, p. 19]

42 U.S. EPA, 26072.

Estimates vary on the level of investment needed to support widespread transportation sector electrification, including for HDVs, depending on the timeframe and percentage of BEVs assumed. For example:

- Analysis by Atlas Public Policy suggests the U.S. will need to commit between $100 and $166 billion in charging infrastructure investments this decade to support an acceleration in electric truck adoption (100 percent electric new medium- and heavy-duty truck sales by the end of 2040).43
- The 2035 2.0 study's DRIVE Clean Scenario estimates the U.S. would require approximately 270,000 public charge-points for LDVs and 35,000 MDV/heavy-duty truck charge-points each year for the next 30 years, which would cost approximately $6.5 billion per year between now and 2050.44
- According to the ICCT, the U.S. needs to spend roughly $30 to $35 billion on public charging infrastructure by 2030 to achieve the widespread adoption of light- and heavy-duty ZEVs as described in the ZEV Declaration and the Global Memorandum of Understanding (MOU) on Zero- Emission Medium- and Heavy-Duty Vehicles.45 [EPA-HQ-OAR-2022-0985-1604-A1, pp. 19 - 20]

43 Lucy McKenzie et al., "U.S. Medium- and Heavy-Duty Truck Electrification Infrastructure Assessment" (Atlas Public Policy, November 12, 2021), https://atlaspolicy.com/u-s-medium-and-heavy-duty-truck-electrification-infrastructure-assessment/.

44 "Public Charging for Electric Cars and Trucks Can Be Built Quickly and Cost-Effectively," 2035 2.0, n.d., https://www.2035report.com/transportation/public-charging/.

45 Slowik et al., "Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States," 11.

Fortunately, a combination of federal, state, utility, and private investments is already filling the need for HDV charging infrastructure. [EPA-HQ-OAR-2022-0985-1604-A1, p. 20]

At the federal level, the BIL contains $7.5 billion to develop a nationwide EV charging network, targeting rural and underserved areas.46 To date, all 50 states are moving forward with plans to develop over 75,000 miles (as of July 2022) of EV charging corridors, via funding allocated through the National Electric Infrastructure Program. In addition to the BIL, several federal funding opportunities specifically target infrastructure for the HDV sector. For example:

- The Clean School Bus Program offers school districts $5 billion over 5 years to replace existing school buses with clean and zero-emission models, and recipients can use funds for charging infrastructure for up to $13,000 or $20,000 per bus.47
- The Clean Heavy-Duty Vehicle Program will provide $1 billion in funding to replace dirty HDVs with clean ZEVs, support ZEV infrastructure, and train and develop workers.48
- The U.S. Department of Energy (DOE) and U.S. Department of Transportation (DOT) are funding $7 million for new projects to accelerate decarbonization of medium- and heavy-duty freight transportation.49 [EPA-HQ-OAR-2022-0985-1604-A1, p. 20]

46 "UPDATED FACT SHEET: Bipartisan Infrastructure Investment and Jobs Act," The White House Briefing Room, August 2, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/02/updated-fact-sheet-bipartisan-infrastructure-investmentand-jobs-act/.

47 "Clean School Bus Program," U.S. EPA, n.d., https://www.epa.gov/cleanschoolbus.

48 "Clean Heavy-Duty Vehicle Program," U.S. EPA, n.d., https://www.epa.gov/inflation-reduction-act/clean-heavy-duty-vehicle-program.

49 "Biden-Harris Administration Announces Funding for Zero-Emission Medium- and Heavy-Duty Vehicle Corridors, Expansion of EV Charging in Underserved Communities," U.S. Department of Energy, February 15, 2023, https://www.energy.gov/articles/biden-harrisadministration-announces-funding-zero-emission-medium-and-heavy-duty-vehicle.

The IRA extended for 10 years the Alternative Fuel Refueling Infrastructure tax credit (30C) for private investments in qualified clean-vehicle infrastructure, with a commercial tax credit of 30 percent up to $100,000 per charger (up from the prior $30,000-per-location cap). This tax credit for EV charging infrastructure will help support private investments in a more robust national HDV charging network. [EPA-HQ-OAR-2022-0985-1604-A1, p. 20]

States are also playing a leading role. According to the State of Sustainable Fleets' 2023 Market Brief, "funding commitments have increased in California and within a handful of other states, thus driving up the average annual funding that will target the clean fuel market to approximately $32 billion on average per year during the next four to five years,"50 far exceeding expectations of funding before BIL and IRA. See Figure 13. [EPA-HQ-OAR-2022-0985-1604-A1, p. 20.] [See Figure 13, Annual Funding for Clean Fuel and Vehicle Technologies, on page 21 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

50 "The State of Sustainable Fleets: 2023 Market Brief" (Gladstein, Neandross & Associates (GNA), May 2023), https://cdn.stateofsustainablefleets.com/2023/state-of-sustainable-fleets-2023-market-brief.pdf, 15-16.

State-funded programs aimed at EV charging deployment, including among the largest state ZEV markets (many of which are ACT states), are well on their way to meeting future charging infrastructure demand. [EPA-HQ-OAR-2022-0985-1604-A1, p. 21.] [See Figure 14, State-Funded Programs, on page 21 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

The private sector and charging companies are also moving quickly to take advantage of new incentives and funding. According to Atlas Public Policy, private investment in public EV charging has increased considerably in the last 5 years, rising from under $200 million in 2017 to nearly $13 billion by early 2023.51 For example:

- Pilot Company and Volvo Group signed a letter of intent to co-develop a charging network across Pilot and Flying J travel centers, catered specifically toward medium- and heavy-duty EVs. Pilot has more than 750 locations across 44 states and six Canadian provinces.52
- A $400 million investment by Forum Mobility, CBRE Investment Management, and Homecoming Capital will help build EV charging infrastructure to support the drayage industry, and a $650 million investment by BlackRock will build chargers along freight routes.53
- Cumulative private investments in EV charging by different infrastructure providers, including the auto industry, totaled just over $13 billion as of March 2023.54 [EPA-HQ-OAR-2022-0985-1604-A1, p. 22]

51 Nick Nigro, "Investment in Publicly Accessible EV Charging in the United States (2023)" (Atlas Public Policy, May 2023), https://atlaspolicy.com/wp-content/uploads/2023/05/Investment-in-Publicly-Accessible-EV-Charging.pdf.6.

52 Scooter Doll, "Pilot Co. Will Expand Charging Network to Heavy-Duty EVs with Help of Volvo Group," Electrek, November 15, 2022, https://electrek.co/2022/11/15/pilot-co-expand-charging-network-heavy-duty-evs-with-volvo-group/.

53 Lisa Baertlein, "California's Port Truck-Charging Plan Gets a Jolt from Big Investors," Reuters, April 17, 2023, https://www.reuters.com/business/autos-transportation/big-investors-amp-up-californias-port-truck-charging-plan-2023-04-17/.

54 Nigro, "Investment in Publicly Accessible EV Charging in the United States (2023)," 24

Utilities are also investing in EV charging at scale, and more states are authorizing utility investments to support widespread and equitable access to more customers. Total approved utility investments for transportation electrification totaled $5.230 billion as of December 2022. See Figure 15. [EPA-HQ-OAR-2022-0985-1604-A1, p. 22. See Figure 15, States with Approved Utility Investments in Public Charging, on page 22 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

In summary, national trends combined with historic investments are poised to fill the charging gap and meet the need for increased HDV adoption resulting from more stringent EPA tailpipe rules. In addition, the sizable investment needed will be shared across federal, state, and local governments, the private sector, and utilities, ensuring a more cost-effective charging network for future HDV drivers and fleet owners. [EPA-HQ-OAR-2022-0985-1604-A1, p. 22]

Organization: Environmental Defense Fund (EDF)

IV. Sufficient infrastructure, electric grid capacity, and policies exist to support strong standards.

EPA reasonably considered additional factors, including ZEV infrastructure, in projecting ZEV deployment in its proposal. Recent analyses indicate that buildout of EV infrastructure and the electric grid distribution capacity are sufficient to support even more protective standards. Significant federal, state, and private investments are already being made to grow the HDV infrastructure. States and utilities are initiating processes to ensure adequate infrastructure to meet demand. [EPA-HQ-OAR-2022-0985-1644-A1, p. 61]

a) Federal, state, local and private investments support fast-growing infrastructure

Investment in the infrastructure required to support rapid medium- and heavy-duty ZEV proliferation has already begun. Federal, state, and private parties have directed substantial resources into developing widespread charging networks and driving technological innovation. Together, these investments are laying the groundwork for protective standards. [EPA-HQ-OAR-2022-0985-1644-A1, p. 61]

The federal government has made significant investments towards building the infrastructure necessary for a ZEV future with The Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL). Both laws are putting billions of dollars towards building out charging networks and updating the grid to support the transition to light-, medium- and heavy-duty ZEVs. [EPA-HQ-OAR-2022-0985-1644-A1, p. 61]

Multiple provisions of the IRA will boost the development of infrastructure to support medium- and heavy-duty ZEVs. The Alternative Fuel Refueling Property Credit will directly fund charging infrastructure in low-income and rural areas. Qualifying businesses and individuals can be reimbursed for up to 30 percent of the cost of installing charging equipment in these areas, substantially reducing the costs of this equipment.146 The Congressional Joint Committee on Taxation estimates this credit will cost almost $2 billion over its lifetime, demonstrating the sizeable impact it will make in driving additional investments from private parties.147 The Advanced Energy Project Credit allocates $10 billion for facilities manufacturing advanced energy technologies, which includes manufacturing of charging and refueling infrastructure for ZEVs as well as grid modernization components.148 Other provisions allocate funding that can help build infrastructure at ports,149 fund grants for infrastructure buildout in nonattainment areas,150 and fund improvements to electricity generation and transmission.151 [EPA-HQ-OAR-2022-0985-1644-A1, p. 62]

146 Inflation Reduction Act of 2022, P.L. 117-169, § 13404.

147 Joint Committee on Taxation, Estimated Budget Effects of the Revenue Provisions of Tile I—Committee on Finance, of an Amendment in the Nature of a Substitute to H.R. 5376, “An Act to Provide for Reconciliation Pursuant to Tile II of S. Con. Res. 14,” as Passed by the Senate on August 7.2-22, and Scheduled for Consideration by the House of Representative on August 12, 2022, JCX-18-22, https://www.jct.gov/publications/2022/jcx-18-22/.

148 Inflation Reduction Act of 2022, P.L. 117-169, § 13501.

149 Inflation Reduction Act of 2022, P.L. 117-169, § 60102.

150 Inflation Reduction Act of 2022, P.L. 117-169, § 60101.

151 Inflation Reduction Act of 2022, P.L. 117-169, § 50144, 50145, 50151, 50152.

The BIL is another source of considerable federal investment in infrastructure development. Through its National Electric Vehicle Infrastructure (NEVI) and Charging and Fueling

Infrastructure (CFI) discretionary grant programs, the law allocates $7.5 billion in funding explicitly towards building out ZEV charging and refueling infrastructure.152 The NEVI program directs the Federal Highway Administration (FHWA) to provide funding to states to deploy EV charging stations to build an interconnected and reliable charging network. The FHWA has already announced its first set of plans under the program, which includes investment in all 50 states plus the District of Columbia and Puerto Rico.153 This first round of NEVI investment is set to bring EV charging to 75,000 miles of highway across the country.154 The CFI program provides additional funding for FHWA administered grants to state and local authorities for development of publicly accessible charging infrastructure.155 [EPA-HQ-OAR-2022-0985-1644-A1, p. 62-63]

152 Infrastructure, Investment and Jobs Act of 2021, P.L. 117-58, 135 Stat. 445, 1421.

153 U.S. Department of Transportation, Historic Step: All Fifty States Plus D.C. and Puerto Rico Greenlit to Move EV Charging Networks Forward, Covering 75,000 Milles of Highway (Sep. 27, 2022), https://www.transportation.gov/briefing-room/historic-step-all-fifty-states-plus-dc-and-puerto-rico-greenlit-move-ev-charging.

154 U.S. Department of Transportation, Historic Step: All Fifty States Plus D.C. and Puerto Rico Greenlit to Move EV Charging Networks Forward, Covering 75,000 Milles of Highway (Sep. 27, 2022), https://www.transportation.gov/briefing-room/historic-step-all-fifty-states-plus-dc-and-puerto-rico-greenlit-move-ev-charging.

155 U.S. Department of Transportation, Biden-Harris Administration Opens Applications for First Round of $2.5 Billion Program to Build EV Charging in Communities & Neighborhoods Nationwide, https://www.transportation.gov/briefing-room/biden-harris-administration-opens-applications-first-round-25-billion-program-build.

On top of these programs, an additional $2.5 billion each year through FY 2026 could be allocated towards charging infrastructure through the Congestion Mitigation and Air Quality Management (CMAQ) program, which the BIL amended to include the purchase of medium- and heavy-duty ZEV charging equipment.156 Additional funding from the BIL is directed towards reducing truck emissions at ports157 and funding grants to states and local governments for reducing transportation carbon pollution,158 both of which will fund additional infrastructure investments. [EPA-HQ-OAR-2022-0985-1644-A1, p. 63]

156 Infrastructure, Investment and Jobs Act, P.L. 117-58, § 1115.

157 Infrastructure, Investment and Jobs Act, P.L. 117-58, § 11402, 11403.

158 Infrastructure, Investment and Jobs Act, P.L. 117-58, § 114023.

The ambition of these federal investments is being matched by infrastructure funding in many states, especially in states that have adopted, or are planning to adopt, California's Advanced Clean Trucks (ACT) rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 63]

For example, in California, the California Energy Commission's (CEC) Clean Transportation Program announced a $2.9 billion investment plan to accelerate ZEV charging and refueling availability that includes $1.7 billion of funding for medium-and heavy-duty ZEV infrastructure.159 The CEC estimates the plan will result in 90,000 new EV chargers across the state.160 The state has also approved its three major-investor owned utilities to invest $686 million over five years in medium- and heavy-duty infrastructure projects to support electrification.161 [EPA-HQ-OAR-2022-0985-1644-A1, p. 63-64]

159 California Energy Commission, CEC Approves $2.9 Billion Investment for Zero-Emission Transportation Infrastructure (Dec. 14, 2022), https://www.energy.ca.gov/news/2022-12/cec-approves-29-billion-investment-zero-emission-transportation-infrastructure.

160 California Energy Commission, CEC Approves $2.9 Billion Investment for Zero-Emission Transportation Infrastructure (Dec. 14, 2022), https://www.energy.ca.gov/news/2022-12/cec-approves-29-billion-investment-zero-emission-transportation-infrastructure.

161 State of California Air Resources Board, Advanced Clean Trucks Initial Statement of Reasons, I-16 (Oct. 22, 2019), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/isor.pdf.

Colorado has likewise made significant investments in preparing for a transition to ZEVs. The state's Community Access Enterprise provides funding and support to operators of medium- and heavy-duty fleets by installing charging infrastructure and providing public fast charging capable of supporting medium- and heavy-duty vehicles. The Community Access Enterprise is expected to receive approximately $310 million in its first decade.162 Colorado also has the Clean Transit Enterprise, which includes grant programs towards purchase and installation of charging infrastructure.163 [EPA-HQ-OAR-2022-0985-1644-A1, p. 64]

162 Colorado Energy Office, Community Access Enterprise, https://energyoffice.colorado.gov/about-us/boards-commissions/community-access-enterprise.

163 Colorado Department of Transportation, Clean Transit Enterprise, https://www.codot.gov/programs/innovativemobility/cte. See also https://energyoffice.colorado.gov/zero-emissions-vehicles/dcfc-plazas; https://leg.colorado.gov/sites/default/files/2023a_1272_signed.pdf.

Investments by state and local governments are being matched and exceeded by private investments. Multiple companies have announced expansive plans for developing charging networks for medium- and heavy-duty vehicles. For example, Greenlane is a joint venture between Daimler, NextEra Energy Resources, and BlackRock Alternatives, which will put $650 million towards designing, developing, and installing, charging and hydrogen-fueling infrastructure along various freight routes.164 Volvo and Pilot Group have also announced an intent to offer public charging for medium- and heavy-duty BEVs at over 750 Pilot and Flying J travel center locations.165 [EPA-HQ-OAR-2022-0985-1644-A1, p. 64-65]

164 Electrek, Daimler Just Announced a $650M US-Wide EV Charging Network for Trucks, https://electrek.co/2023/04/27/daimler-just-announced-a-650m-us-wide-ev-charging-network-for-trucks/ (Apr. 27, 2023).

165 Cision, Pilot Company and Volvo Group Partner to Build Charging Network for Medium and Heavy-Duty Electric Trucks (Nov. 15, 2022), https://www.prnewswire.com/news-releases/pilot-company-and-volvo-group-partner-to-build-charging-network-for-medium--and-heavy-duty-electric-trucks-301678542.html.

i. Utilities and states have already begun to implement programs to support HD ZEV charging

Using data provided by Atlas that tracks public utility commission filings, 29 investor-owned utilities (IOUs) in 17 states have already gotten programs approved to support HDV charging infrastructure build out which account for $1.6 billion in investment.168 These utilities account for 34% of IOU electricity sold in the U.S. and 40% of IOU customers. Since municipally owned and cooperative utilities are not subject to the same rate making processes that IOUs go through, this represents a conservative estimate of the investment by utilities that is already underway. [EPA-HQ-OAR-2022-0985-1644-A1, p. 67-68]

168 Database of approved utility programs tagged with "MHDV Charging" from Atlas Public Policy's EVHub provided by Atlas Public Policy on June 2, 2023.

Additionally, states have begun implementing HD charging infrastructure funding programs. Six states, California, Oregon, Pennsylvania, Colorado, New York, and New Jersey, all have statewide funding programs for HD charging infrastructure, with all except California and New York being finalized in the last year.169 170 171 172 173 174 Five of these states have adopted the Advanced Clean Trucks Rule. And both New York and New Jersey have ongoing proceedings to further address barriers to HDV electrification.175 176 [EPA-HQ-OAR-2022-0985-1644-A1, p. 68]

169 Energy Infrastructure Incentives for Zero-Emission. https://www.energiize.org/

170 https://www.oregon.gov/deq/aq/programs/Pages/OZEF.aspx

171 https://www.ahs.dep.pa.gov/NewsRoomPublic/articleviewer.aspx?id=22232&typeid=1

172 https://energyoffice.colorado.gov/fleet-zero

173 https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={6238DD07-3974-4C4E-9201-3E339E311916}

174 https://njcleanenergy.com/files/file/EV/RGGI_MHD_Application_Final_1_12.pdf

175 https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=23-E-0070&CaseSearch=Search

176 https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2110570

c) EPA must design the final rule to limit infrastructure related off-ramps

EPA has sought comment on whether the agency "should consider undertaking any future actions related to the Phase 3 standards, if finalized, with respect to the future growth of the charging and refueling infrastructure for ZEVs"195 [EPA-HQ-OAR-2022-0985-1644-A1, p. 75]

195 88 Fed. Reg. 25934.

As discussed above and shown in EPA's own assessment in the proposal and supporting technical documents, the record supports the feasibility of standards that will result in significant ZEV deployment. Indeed, as these standards provide a clear market signal of future infrastructure needs and as ZEV deployment ramps up over a period of five years beginning in 2027, so too will the necessary charging infrastructure and the foregoing discussion and separate report from the Analysis Group both demonstrate that generation and transmission do not pose challenges for heavy-duty ZEV deployment and solutions related to distribution enhancements either already are or are being developed.196 [EPA-HQ-OAR-2022-0985-1644-A1, p. 75]

196 See supra note 166

Including an offramp in the rule is inconsistent with this record evidence and would frustrate the important pollution reductions outcomes the rule will deliver. EPA has regularly considered issues related to the success of its standards on an ongoing basis, including, for example, periodic technical progress reviews. EPA could similarly here consider the development of infrastructure at future intervals to ensure it is continuing to develop at a pace and scale consistent with EPA's projections. However, we strongly encourage EPA not to attempt to directly integrate infrastructure related reviews in its standards setting. [EPA-HQ-OAR-2022-0985-1644-A1, p. 75-76]

Organization: Environmental Protection Network (EPN)

Sufficient Infrastructure Should Not Be A Problem

A recent paper by ICCT assessed the near-term charging and refueling infrastructure needs for Class 4-8 HDV at the national and sub-national levels. Charger needs in 2025 and 2030 are projected based on ZEV market growth, and priority locations for the deployment of charging and refueling infrastructure are identified in key areas.8 [EPA-HQ-OAR-2022-0985-1523-A1, p. 4]

8 'Near-Term Infrastructure Deployment To Support Zero-Emission Medium- And Heavy-Duty Vehicles In The United States', Pierre-Louis Ragon et al. (May 11, 2023).

Building the charging and refueling infrastructure required to support an accelerated transition to zero-emission HDVs requires timely investments and policy support. A full network of charging infrastructure covering the entire United States is not needed in the near term. To best manage resources, infrastructure deployment in the near term should be prioritized in areas that are expected to see the highest energy needs from HDV traffic flows in 2025 and 2030. The ICCT analysis finds that, in the near term, a few U.S. states are expected to experience the highest energy needs from medium- and heavy-duty vehicle charging. Those include states that have adopted California's Advanced Clean Trucks (ACT) rule, as well as states with the largest industrial activity. Industrial areas in the largest metropolitan areas—including Boston, Chicago, Dallas, Houston, Los Angeles, New York, and Phoenix—are expected to require most of the charging needs, driven first by the energy needs of short- and regional-haul trucks and buses. California and Texas are standout priorities, accounting for a combined 19% of the projected nationwide charging needs in 2030. Seven of the top ten counties by absolute charging needs in 2030 will be in these two states. [EPA-HQ-OAR-2022-0985-1523-A1, p. 4]

As the zero-emission HDV market develops, charging needs are expected to expand along freight corridors that connect those industrial nodes. Deploying charging infrastructure along National Highway Freight Network (NHFN) corridors can accommodate up to 85% of the charging needs from long-haul trucks by 2030. Those charging needs can be satisfied by setting traffic-based targets for the deployment of charging stations every 50 miles, in line with the Federal Highway Administration's Alternative Fuel Corridors, as well as introducing additional criteria for HDV compatibility, including pull-through lanes and wide ingress and egress requirements. [EPA-HQ-OAR-2022-0985-1523-A1, p. 4]

Projections of the total energy consumption of the electric HDV fleet in 2030 represent less than 1% of the national electricity retail market in 2021, suggesting that HDV electrification will not be limited by electric power generation capacity. There are immediately actionable options to optimize the use of existing grid capacity, including smart charging, load rebalancing, and making use of non-firm capacity. In parallel, modifications to existing policy frameworks are needed to enable utilities to incorporate projections of future charging load when planning for near- and long-term grid capacity building. [EPA-HQ-OAR-2022-0985-1523-A1, p. 4]

The Private Sector Is Stepping Up On Infrastructure Daimler Truck North America (DTNA), NextEra Energy Resources and BlackRock Alternatives, through a fund managed by its Climate

Infrastructure business (BlackRock), announced Greenlane, a more than $650-million joint venture to design, develop, install, and operate a nationwide, high-performance, zero-emission public charging and hydrogen fueling network for medium- and heavy-duty battery-electric and hydrogen fuel cell vehicles.9Greenlane's initial focus will be on battery-electric medium- and HDV, followed by hydrogen fueling stations for fuel cell trucks, with plans to expand access to light-duty vehicles in the future to serve the greater goal of electrifying mobility. [EPA-HQ-OAR-2022-0985-1523-A1, pp. 4-5]

9 'Daimler Truck North America and partners move ahead with public charging infrastructure', JV: Greenlane, Green Car Congress (April 28, 2023).

Greenlane addresses the need for a publicly available, nationwide electric charging infrastructure for commercial vehicles, especially for long-haul freight operations, and is a major step toward developing a sustainable ZEV ecosystem across North America. The network of charging sites will be built on critical freight routes along the east and west coasts and in Texas. Where synergistic, Greenlane will leverage existing infrastructure and amenities while also adding complementary greenfield sites to fulfill anticipated customer demand. [EPA-HQ-OAR-2022-0985-1523-A1, p. 5]

Organization: International Council on Clean Transportation (ICCT)

We support the agency's conclusions regarding infrastructure lead time for battery-powered vehicles. Our research shows a very strong business case exists for investment in charging infrastructure to enable these trucks, especially tractor-trucks that consume the most fuel. According to Atlas Public Policy, $20 billion in announced and awarded investments in publicly accessible charging infrastructure for all on-road vehicles have been made through 2023. As soon as 2027, battery-powered tractor-trucks will be cheaper to own and operate than diesel-powered trucks, according to our own published analysis. Billions of dollars are already being deployed to establish a multi-state network of electric truck charging depots and long-distance fast charging corridors. The strong business case for these investments is reflected in companies such as GreenLane, Terrawatt Infrastructure, Forum Mobility, WattEV, Voltera, Tesla, and many others. [EPA-HQ-OAR-2022-0985-1553-A1, p. 3]

PRIVATE SECTOR INVESTMENTS IN CHARGING INFRASTRUCTURE This section responds to the EPA's request for comment on whether development in ZEV charging infrastructure will hinder the adoption of ZEVs and the ability to meet the proposed GHG standards. According to Atlas Public Policy, $20 billion in announced and awarded investments in publicly accessible charging infrastructure for all on-road vehicles have been made through 2023 (Gabriel, 2023). Vehicle manufacturers, charging-as-a-service companies, and utilities, together with public sector agencies, are together investing in this space. In support of the EPA's proposed standards, the ICCT has compiled below selected information on private and utility investments into charging infrastructure. [EPA-HQ-OAR-2022-0985-1553-A1, p. 9]

Gabriel, N. (2023, January 12). $210 Billion of Announced Investments in Electric Vehicle Manufacturing Headed for the U.S. Atlas EV Hub. https://www.atlasevhub.com/data_story/210-billion-ofannounced-investments-in-electric-vehicle-manufacturing-headed-for-the-u-s/

Truck manufacturers are among the leading investors in charging infrastructure. Daimler Trucks, together with NextEra Energy and Blackrock Renewable Power, announced a $650M joint venture in January 2022 to construct a nationwide network for powering battery electric and hydrogen fuel cell vehicles (Daimler Truck North America, 2022). Greenlane, the company established under this joint venture (Nextera Energy, 2023), will initially focus on battery electric trucks and will build a network of publicly accessible charging sites along critical freight routes on the west and east coasts of the U.S., and in Texas. Navistar plans to offer full infrastructure design and construction services for its customers. Navistar is partnering with Quanta Solutions, one of the largest electric grid infrastructure companies in North America, who will provide site selection, engineering, and construction services. (Navistar, 2023). Tesla, who delivered its first electric semitrucks in December 2022, currently owns the nation's largest network of publicly accessible charging stations, albeit serving primarily passenger vehicles. Its existing V3 architecture uses 1MW power cabinets that support up to 250kW of charging per vehicle (Tesla, 2019). GM and Ford have announced plans to adopt Tesla's charging standard, giving their vehicles access to the Tesla Supercharger Network and benefitting trucks in the lighter weight classes (Shepardson & White, 2023). Ford already offers its Ford Pro depot charging service, which will build, operate, and maintain a charging depot for a fleet (Depot-Charging-Brochure.Pdf, n.d.). Based on publicly available information, we expect Tesla to release a V4 architecture with megawatt charging capability to support the Tesla Semi (Kane, 2022). Reports from the first Tesla Semi deployment in Modesto, CA suggest the capacity of installed dispensers is 750kW (Seabaugh, 2023). These investments and partnership illustrate the extent to which vehicle manufacturers are investing capital and establishing strategic partnerships to deliver the necessary charging infrastructure. [EPA-HQ-OAR-2022-0985-1553-A1, p. 9]

Daimler Truck North America. (2022a, January 31). Daimler Truck North America, NextEra Energy Resources and BlackRock Renewable Power Announce Plans To Accelerate Public Charging Infrastructure For Commercial Vehicles Across The U.S. MarsMediaSite. 24 https://media.daimlertruck.com/marsMediaSite/en/instance/ko/Daimler-Truck-North-America-NextEra-Energy-Resources-and-BlackRock-Renewable-Power-Announce-Plans-To-Accelerate-Public-Charging-Infrastructure-For-Commercial-Vehicles-Across-The-US.xhtml?oid=51874160

Nextera Energy. (2023, April 28). Introducing Greenlane: Daimler Truck North America, NextEra Energy Resources and BlackRock Forge Ahead with Public Charging Infrastructure Joint Venture. NextEra Energy Newsroom. https://newsroom.nexteraenergy.com/2023-04-28-Introducing-Greenlane-Daimler-Truck-North-America,-NextEra-Energy-Resources-and-BlackRock-Forge-Ahead-with-Public-Charging-Infrastructure-Joint-Venture

Navistar. (2023, May 3). Navistar Partners With Infrastructure Solutions Provider Quanta Services. Navistar News Releases. https://news.navistar.com/2023-05-03-Navistar-Partners-With-Infrastructure-Solutions-Provider-Quanta-Services

Tesla. (2019, March 6). Introducing V3 Supercharging. Tesla. https://www.tesla.com/blog/introducing-v3-supercharging

Shepardson, D., & White, J. (2023, June 9). GM embraces Tesla's EV charging system, Wall Street cheers. Reuters. https://www.reuters.com/technology/gm-ceo-discuss-future-ev-charging-with-musk-twitter-2023-06-08/

Kane, M. (2022, December 5). Tesla Semi Will Charge At 1+ MW Using New V4 Charging Cable. InsideEVs. https://insideevs.com/news/624881/tesla-semi-1mw-v4-charging-cable/

Seabaugh, C. (2023, January 25). Go Inside the New Tesla Semi: Features, Screens, Seats, and More. MotorTrend. https://www.motortrend.com/reviews/tesla-semi-interior-review/

Depot-Charging-Brochure.pdf. (n.d.). Retrieved June 9, 2023, from https://content.fordpro.com/content/dam/fordpro/us/en-us/pdf/charging/Depot-Charging-Brochure.pdf

Charging-as-a-service companies finance, design, construct, operate, and maintain publicly accessible charging depots. Forum Mobility recently announced a $415 million investment, including funds from the Amazon Climate Pledge and commercial real estate company CBRE, to construct electric truck depot charging to support zero-emission port trucks (CBRE Investment Managament, 2023). Terawatt infrastructure has secured at least $1billion in investment capital to construct a multi-state charging network for medium- and heavy-duty vehicles, beginning with an 800-mile corridor that extends from the Port of Long Beach to El Paso at 150-mile intervals (TeraWatt Developing I-10 Electric Corridor, the First Network of Electric Heavy-Duty Charging Centers, 2022). The investments come from Vision Ridge Partners, Keyframe Capital, and Cyrus Capital (Terawatt Infrastructure, 2022). WattEV is constructing a 200-vehicle truck charging depot in Bakersfield, CA as part of a network of charging depots along the I-5 corridor in California (WattEV, 2021). The company recently opened the first of four charging depots in Southern California at the Port of Long Beach, capable of serving 26 trucks with CCS chargers capable of 360kW (WattEV to Open Charging Depot at Port of Long Beach, 2023) The power cabinets are rated at 1.2 MW and CEO Salim Youssefzadeh tells ICCT these will be converted to megawatt charging once a megawatt charging standard is finalized in 2025. Voltera Power, launched in 2022, builds, identifies and acquires real estate, procures power, designs and constructs charging facilities, and deploys operates and maintains charging infrastructure. The company draws experience from data center siting, design and construction through a partnership with EdgeConneX (EdgeconneX, 2022). And Amply Power, whose fleet solutions include charging equipment procurement, installation, operation, maintenance, and smart charging, will also provide mobile and nonpermanent charging solutions to overcome temporary physical and operational constraints to accessing charging infrastructure (‘Products and Services,’ n.d.). [EPA-HQ-OAR-2022-0985-1553-A1, p. 9]

CBRE Investment Management. (2023, January 17). Forum Mobility and CBRE Investment Management Announce $400 Million Joint Venture and $15 Million Series A Targeting Equitable Electrification of Heavy-Duty Port Transit. https://www.cbreim.com/press-releases/forum-mobility-cbreim-announce-400m-jvtargeting-equitable-heavy-duty-port-transit-electrification

TeraWatt Developing I-10 Electric Corridor, the First Network of Electric Heavy-Duty Charging Centers. (2022, October 20). https://www.businesswire.com/news/home/20221020005252/en/TeraWatt-Developing-I-10-Electric-Corridor-the-First-Network-of-Electric-Heavy-Duty-Charging-Centers

Terawatt Infrastructure. (2022, September 13). TeraWatt Raises Over $1 Billion to Scale Commercial EV Charging Centers Across America | Terawatt Infrastructure. https://terawattinfrastructure.com/ideas/terawattraises- over-1-billion/

WattEV. (2021, December 16).

WattEV Breaks Ground on 21st Century Truck Stop. WattEV. https://www.wattev.com/post/wattev-breaks-ground-on-21st-century-truck-stop WattEV to Open Charging Depot at Port of Long Beach. (2023, May 5). https://www.truckinginfo.com/10198218/wattev-to-open-charging-depot-at-port-of-long-beach

Products and Services. (n.d.). Bp Pulse for Fleets. Retrieved June 9, 2023, from https://bppulsefleet.com/fleet/products/

EdgeconneX. (2022, August 9). EdgeConneX Continues Legacy of Innovation; Launches Voltera, Which Plans to Provide Charging Facilities for Companies Operating Electric Vehicles. EdgeConneX. https://www.edgeconnex.com/company/news-and-pr/edgeconnex-continues-legacy-of-innovationlaunches-voltera/

Fleet owners and operators are also investing in charging infrastructure at their facilities. Schneider, which will have a fleet of 92 battery-electric class 8 tractors in operation by the end of this year, recently opened a 32-vehicle charging depot in South El Monte to support its fleet of Freightliner eCascadias operating in Southern California. The site includes 16 350 kW dual-corded dispensers (Schneider Opens Large- Scale Zero Emission Electric Charging Depot in Southern California, 2023). Sysco, who has announced plans to take delivery of up to 800 battery-electric tractors by 2026, is investing in charging infrastructure in their Riverside, CA facility (Daimler Truck North America, 2022b). And FedEx, who has purchased 150 electric delivery vehicles from BrightDrop, a subsidiary of GM, has invested in a network of 500 chargers in California with additional purchases planned (FedEx, 2022). [EPA-HQ-OAR-2022-0985-1553-A1, p. 10]

Schneider opens large-scale zero emission electric charging depot in Southern California. (2023, June 7). https://www.businesswire.com/news/home/20230606006108/en/Schneider-opens-large-scalezero-emission-electric-charging-depot-in-Southern-California

Daimler Truck North America. (2022b, November 11). Transforming the Future of Foodservice Delivery: Sysco Receives First Battery Electric Freightliner eCascadia. https://www.prnewswire.com/newsreleases/transforming-the-future-of-foodservice-delivery-sysco-receives-first-battery-electricfreightliner-ecascadia-301675939.html

FedEx. (2022, June 21). FedEx Continues Advancing Fleet Electrification Goals with Latest 150 Electric Vehicle Delivery from BrightDrop. https://newsroom.fedex.com/newsroom/global/fedex-continues-advancing-fleetelectrification-goals-with-latest-150-electric-vehicle-delivery-from-brightdrop

Recent announcements by major retailers demonstrate that significant investments in charging infrastructure are underway at their facilities. As part of its planned deployment of 100,000 electric delivery vehicles by 2030, Amazon has added thousands of charging stations at its delivery stations across the country and will continue to build out charging infrastructure (Amazon, 2022). Recognizing the need to make charging infrastructure smaller, cheaper, and more flexible, Amazon has invested in Resilient Power, who is developing solid state transformers that can significantly reduce the cost and space requirements of distribution infrastructure of high-capacity charging depots (St. John, 2021). IKEA, whose goal is to achieve zero-emission home deliveries by 2025, has partnered with Electrify America and Electrify Commercial to install delivery vehicle charging to 25 IKEA retail locations, including 225 chargers with up to 350kW capacity across locations in 18 states (Sickels, 2022). WalMart, whose goal is to achieve zero emissions across their global operations by 2040, has announced plans to construct its own fast charging network at thousands of WalMart and Sam's club locations where delivery vehicles will have the opportunity to charge (Kapadia, 2023). [EPA-HQ-OAR-2022-0985-1553-A1, p. 10]

Amazon. (2022, July 21). Amazon's electric delivery vehicles from Rivian roll out across the U.S. US About Amazon. https://www.aboutamazon.com/news/transportation/amazons-electric-delivery-vehicles-fromrivian-roll-out-across-the-u-s

St. John, J. (2021, November 2). Why Amazon is investing in a startup that's shrinking the footprint…. Canary Media. https://www.canarymedia.com/articles/ev-charging/why-amazon-is-investing-in-a-startup-thatsshrinking-the-footprint-of-ev-charging

Sickels, D. (2022, September 29). Ikea U.S. to quadruple EV chargers via Electrify America. The Buzz - Electric Vehicle News. https://www.thebuzzevnews.com/ikea-electrify-america/

Kapadia, V. (2023, April 6). Leading the Charge: Walmart Announces Plan To Expand Electric Vehicle Charging Network. Corporate - US. https://corporate.walmart.com/newsroom/2023/04/06/leading-thecharge-walmart-announces-plan-to-expand-electric-vehicle-charging-network

Utilities are also making significant investments in charging infrastructure. In 2022, The California Public Utilities Commission approved $1 billion in transportation electrification infrastructure investments by utilities over the period 2025-2029, with 70 percent earmarked for medium- and heavy-duty charging infrastructure (California Public Utilities Commission, 2022). Up to $750 million has already been made available through the period 2020-2024 (California Public Utilities Commission). The California Energy Commission has made an additional $1.7 billion available for medium-and heavy-duty infrastructure for the period 2022-2026 (California Energy Commission, 2022). [EPA-HQ-OAR-2022-0985-1553-A1, p. 10]

California Energy Commission. (2022, December 14). CEC Approves $2.9 Billion Investment for Zero-Emission Transportation Infrastructure. California Energy Commission; California Energy Commission. https://www.energy.ca.gov/news/2022-12/cec-approves-29-billion-investment-zero-emissiontransportation-infrastructure

California Public Utilities Commission. (2021). Charging Infrastructure Deployment and Incentives. https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportationelectrification/charging-infrastructure-deployment-and-incentives

California Public Utilities Commission. (2022, November 17). CPUC Adopts Transportation Electrification Program To Help Accelerate Electric Vehicle Adoption. https://www.cpuc.ca.gov/news-and-updates/all

Based on this review, we find there is considerable ongoing activity and investment to address both present and future charging infrastructure demand. We support EPA’s conclusion that charging infrastructure can be made available to nearly all trucks that need it in the next decade. We also take the view that the proposed rule further strengthens the market signal for private sector investment. In addition, we encourage EPA’s active participation in infrastructure planning with federal, state, and tribal agency partners. [EPA-HQ-OAR-2022-0985-1553-A1, p. 10]

SCOPE OF CHARGING INFRASTRUCTURE NEEDS ICCT analysis supports the view taken in the ‘Lead time assessment’ of the proposal preamble that there is sufficient time for charging infrastructure to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply. [EPA-HQ-OAR-2022-0985-1553-A1, p. 10]

In May 2023, ICCT published an assessment of where, when, and how much charging infrastructure needs to be available to support the deployment of zero-emission class 4-8 vehicles in the contiguous United States (Ragon, Kelly, et al., 2023). We conclude that charging infrastructure needs this decade will be concentrated in a sub-set of states and counties where freight activity is concentrated. This pattern of infrastructure development limits the geographic scale of infrastructure needs during this period and reinforces the business opportunity in the most active freight zones. [EPA-HQ-OAR-2022-0985-1553-A1, p. 10]

Ragon, P.-L., Kelly, S., Egerstrom, N., Brito, J., Sharpe, B., Allcock, C., Minjares, R., & Rodríguez, F. (2023). Near-term infrastructure deployment to support zero-emission medium- and heavy-duty vehicles in the United States. International Council on Clean Transportation. https://theicct.org/publication/infrastructuredeployment-mhdv-may23/

The study finds total energy demand from all Class 4-8 vehicles will be approximately 139,865 MWh. This amount of energy is equivalent to around 1 percent of national electric retail sales in 2021, and we do not expect this share to significantly change in light of the ongoing electrification of other sectors. This relatively small share of national electricity demand suggests to us that the availability of new generating capacity will not be a significant constraint on electrification of this sector. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 10-11]

The overriding infrastructure needs of zero emission class 4-8 vehicles will be concentrated in a subset of U.S. states and major metro areas. This leads us to conclude that the nation's deployment of charging infrastructure will be constructed in stages and not all at once. (See Figure 4.) [Refer to Figure 4, Projected Daily Energy Needs, on p. 11 of docket number EPA-HQ-OAR-2022-0985-1553-A1].The study estimates that 49% of national charging needs in 2030 will exist in ten states led first by Texas and second by California. Texas and California alone will account for 19% of national charging needs in 2030. The study also finds that out of more than 3,079 counties, the top 1% will account for 15% of national charging needs. Among the top ten counties, four of these are located in Southern California (led by Los Angeles then by San Bernardino, San Diego, and Riverside counties) and three are in the Texas triangle (led by Harris and then Dallas and Bexar counties). Other prominent counties that make the top ten include Maricopa, AZ, Salta Lake, UT, and Cook, IL. [EPA-HQ-OAR-2022-0985-1553-A1, p. 11]

While these counties will experience the largest aggregate energy demand, it is also important for planning purposes to consider counties with the largest concentration of energy demand per unit area. From this perspective, nine of the top ten counties are located in the Northeast, including five counties in New York State (the Bronx, New York, Queens, Kings, and Richmond), Suffolk, MA, Philadelphia, PA, and Hudson, NJ. These projections suggest that the infrastructure does not need to be deployed everywhere all at once. A sub-set of states governing these counties and a sub-set of utilities serving them will be responsible for critical charging infrastructure delivery through 2030. [EPA-HQ-OAR-2022-0985-1553-A1, p. 11]

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

B. Charging Infrastructure

Adequate charging infrastructure is crucial to support electrification and the heavy-duty truck industry presents a unique set of challenges. The EPA must incorporate a more realistic projection of charging infrastructure build-out in the proposed standards. We are concerned that the EPA relies too heavily on the projected federal investment that is intended to support ZEV infrastructure18, and instead, should take the sentiment of heavy-duty manufacturers into greater consideration. At least one OEM with a union workforce has expressed concerns about charging infrastructure availability being insufficient under the proposed standards' ZEV adoption rates.19 According to the DOE's most recent report on EV charging infrastructure trends, there are only 166 private fleet heavy-duty EV charging ports in the country.20 The report also found that the rate of charging infrastructure deployment is not paced to meet the Biden Administration's goal of 500,000 charging ports by 2030.21 This uncertainty highlights the need for flexibility. For example, in response to challenges in the pace of infrastructure development, CARB's Advanced Clean Fleet program includes and has expanded infrastructure delay extensions for fleet owners if ZEV infrastructure is impacted by construction or utility delays.22 [EPA-HQ-OAR-2022-0985-1596-A1, p. 7]

18 See id. at 65 (“While dedicated HD charging infrastructure may be limited today, we expect it to expand significantly over the next decade”).

19 See Comment submitted by Volvo Group North America, https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0985-1437

20 Brown, Abby, Jeff Cappellucci, Emily White, Alexia Heinrich, and Emma Cost. 2023. Electric Vehicle Charging Infrastructure Trends from the Alternative Fueling Station Locator: Fourth Quarter 2022 at 24. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5400-85801. https://www.nrel.gov/docs/fy23osti/85801.pdf

21 See id. at viii.

22 California Air Resources Boards. April 26, 2023. “ACF Proposed Changes”: https://ww2.arb.ca.gov/resources/fact-sheets/acf-proposed-changes

The proposed standards should better reflect that federal investment and incentives will take time to reach maturity and that the market and consumer demand will lag further behind. This is particularly important in larger truck segments, as well as truck segments used in long-haul applications or requiring mid-shift charging. To put it simply, commercial customers of heavy trucks will not purchase BEV trucks unless infrastructure and energy costs fit their business models, no matter what vehicles manufacturers offer customers. Given this uncertainty, GHG standards could also incorporate flexibilities for manufacturers should national charging infrastructure and grid capacity for heavy-duty trucks not meet the necessary levels to support compliance. We strongly encourage the EPA to modify the standards to better reflect the availability of charging infrastructure. [EPA-HQ-OAR-2022-0985-1596-A1, p. 8] [See Figure 19 on p. 8 of Docket Number EPA-HQ-OAR-2022-0985-1596-A1]

Organization: Morales, Jorge

Where will the recharge stations be? And will those be from green energy, such as wind/solar/water, or will it be through coal?

Organization: MEMA

Infrastructure Success is Critical

While MEMA urges EPA to consider other propulsion systems, we believe it is imperative to address infrastructure challenges that will limit the success of a zero-emission vehicle fleet. [EPA-HQ-OAR-2022-0985-1570-A1, p. 8.]

There is currently insufficient infrastructure for EV charging and refueling of MHDV vehicles. While government incentives exist for consumer vehicle systems, there are few comparable programs for heavy and medium-duty trucks. Similar to passenger cars, heavy duty and fleet vehicle EV adoption success will be dependent on positive operator experiences with the EV Charging infrastructure. The government needs to incentive and partner with fleet owners to establish this infrastructure. Without significant federal incentives to expand the MHDV charging and refueling infrastructure, a reliable network with sufficient access to energy and fuels will not be available through the numerous transit corridors along U.S. roads. Likewise, urban, industrial centers will need focused buildout while rural areas will need thoughtful rollouts to achieve sustainable GHG reductions. [EPA-HQ-OAR-2022-0985-1570-A1, p. 8]

MEMA applauds the EPA's leadership on its Clean School Bus program. Federal programs such as the FTA grant programs for Transit bus and IRA Grants to Reduce Air Pollution at Ports are also critical to building better, more future-proofed EVSE that can later support a higher quantity of ZEV vehicle deployment during GHG Phase 3 MY2028+. [EPA-HQ-OAR-2022-0985-1570-A1, p. 9]

Although the recommended EVSE outlay is a significant investment upfront, public funds used for high capacity EVSE will offer the highest return on investment by futureproofing this public investment. Publicly funded DC fast charging will also provide useful lessons to the Joint Office of Energy and Transport on the challenges and opportunities for MHDV applications, including building sufficient ZEV infrastructure in both urban and rural environments, which can prioritize Justice40 communities. [EPA-HQ-OAR-2022-0985-1570-A1, p. 10]

Additionally, we propose EPA purchase ACT Research8 reports for these early adopter segments because upon checking EPA's projection based on MOVES MY 2019 data, we note a significant >30% difference in EPA's projected volume for school bus compared to forecasts for MY 2027 based on market sizing from ACT Research, and an even larger difference >75% in market sizing for other bus (Coach, transit, and shuttle). A specific segmentation report of CL5-7 bus markets can be purchased at this link to inform EPA HD TRUCS projections for these ZEV early adopter segments for better alignment with industry and modeling of emissions benefits for the final GHG Phase 3 rule. ACT Research is a trusted industry information source. [EPA-HQ-OAR-2022-0985-1570-A1, p. 10]

8 Example: https://www.actresearch.net/reports-data/state-of-the-industry-reports/north-americaclasses-5-7-bus-market.

Recommendations:

1) EPA futureproof EVSE purchased with public funds, to enable DCFC and vehicle-togrid interactions like bi-directional charging.

2) EPA pursues other sources of useful information for the regulatory impact analyses, to include ACT Research reports. [EPA-HQ-OAR-2022-0985-1570-A1, p. 10]

To provide helpful feedback to the EPA's question about stakeholders that must be involved and metrics that should be tracked to ensure the success of GHG Phase 3 targets, MEMA recommends EPA work with industry, end-customers, and other sources to understand MHDV unique charging requirements and require the Joint Office of Energy and Transportation to develop a dashboard for transparent reporting for the public to track the maturity of infrastructure needed for net-neutral transportation technology. MEMA has prepared a few charts and high-level takeaways from MHDV infrastructure needs in the U.S., Cybersecurity risks for Fast Charging stations, emerging EU Alternative Fuel Infrastructure Regulations, and a comparison of California State vs. U.S. federal actions to coordinate infrastructure readiness. [EPA-HQ-OAR-2022-0985-1570-A1, p. 10]

A smooth transition will require that infrastructure coverage mature along with projected advanced technology vehicle adoption. Otherwise, payback assumptions on capital are in question. Without sufficient charging availability and capacity, EV cannot reach operational parity with Diesel ICE. Without sufficient renewable fuels infrastructure and supply, advanced ICE vehicles cannot be deployed at scale and existing fleets cannot reduce their carbon footprint in operation. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 10 - 11]

Recommendations:

1) Federal government coordinate infrastructure action with state and local stakeholders specifically to address commercial vehicle needs in metro areas and along interstate corridors.

2) Due to long-lead times for capital improvements, utilities are compelled to begin building out capability ahead of demand from transportation.

3) Workforce development and incentives be aligned with capital planning for MHDV end-users to accelerate advanced vehicle adoption.

4) Coordinate standardization efforts to deliver national standards for the installation, operation, and maintenance of EV charging stations.

5) Standards EV and EVSE Cybersecurity policies, especially for areas of the grid where high peak load events need to be addressed for grid reliability. [EPA-HQ-OAR-2022-0985-1570-A1, p. 11]

A recent International Council on Clean Transportation (ICCT) white paper9 reveals that MD and HD vehicles have different infrastructure requirements than light duty and passenger car, which will need to be addressed for end-users to be willing to adopt net-neutral technology such as ZEV and H2ICE. These include:

a) Energy and higher peak load requirements are concentrated in certain areas and states.

(i) 10 counties in metro areas will have the highest peak load, up to 132MW.

(ii) California and Texas are expected to represent 19% of load requirements for MHDV charging by 2030.

(iii) The states with the highest energy demands are expected to come from a mix of CARB Advanced Clean Truck (ACT) adopting and non-ACT adopting states. Texas, Illinois, and Florida have high industrial activity, but are not ACT adopting states.

b) Local and state legislation and coordination of utilities are needed to support MHDV charging needs.

c) Utilities need to be compelled to begin building out for future demand.

d) Rural areas have other unique charging difficulties.

e) Incentives are difficult to stack and align with capital planning needs.

f) The report assumes that end-users will choose to follow minimum charging protocols to support typical daily energy needs at 19-50KW for most vehicles. Based on our anecdotal experience we disagree with this assumption and think more MHDV end-users will plan for higher DC charging needs to maintain productivity and futureproof on-site infrastructure.

g) Hydrogen needs support to reach Total Cost of Ownership (TCO) parity with conventional technology. Hydrogen is not expected to have good TCO unless it gets to $5/gal and then it will need deployment at stations.

h) Cybersecurity risks of fast charging stations10. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 11 - 12]

9 https://theicct.org/publication/infrastructure-deployment-mhdv-may23/

10 https://www.osti.gov/servlets/purl/1607113

The European Union Alternative Infrastructure Regulation has made significant requirements on member states in making the necessary infrastructure investment. [EPA-HQ-OAR-2022-0985-1570-A1, p. 12]

As an example of how EPA might compel State and Regional infrastructure buildout, we note below how the European Union has approached this challenge:

1) European Union Alternative Fuel Infrastructure Regulation (AFIR) as part of EU's "Fit for 55" package the EU has agreed on a direction forward March 2023 that ensures fast charging availability at distance-based intervals along the trans-European transport network (TENT).

1) Member States will be required to ensure publicly available chargers with power output capable to support BEV deployment;

2) The AFIR established targets for urban nodes for trucks and busses.

3) Member States will be required to ensure installation of a fast-charging pool every 60km in each direction along the TEN-T (Trans-European Transport Network) with milestones for completion in 2025, 2027, and 2030. [EPA-HQ-OAR-2022-0985-1570-A1, p. 12]

Additionally, we refer the reader to Appendix 2, in which MEMA has prepared a chart that reviews current CA state and federal actions to support ZEV transition. [EPA-HQ-OAR-2022-0985-1570-A1, p. 12.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, pages 24-26, for Appendix 2.]

Organization: Moving Forward Network (MFN) et al.

12.2. A More Complete Inventory Reveals $67 billion in Announced Investments in Charging Infrastructure, Including $30 Billion Dedicated to Medium and Heavy-Duty Vehicles and $4 Billion that Could Support Medium and Heavy-Duty Vehicles

The Proposed Rule's description of recently announced investments in charging infrastructure underscores the fact that significant progress is being made. 233 However, this narrative should be supplemented by a more comprehensive inventory of the public, private, and utility sectors. As of March 31, 2023, Atlas Public Policy (Atlas) estimates $67 billion dollars in charging infrastructure investments that have been announced by the public, private, and utility sectors but not yet installed as charging ports in the ground. Table 14 provides a summary of tallied investment amounts, which include:

- $33 billion in announced, unspent investments for light-duty vehicle (LDV) charging,

- $30 billion in announced, unspent investments for medium- and heavy-duty (MDHD) vehicle charging, and
- $4 billion in announced, unspent investments for use across any vehicle class. [EPA-HQ-OAR-2022-0985-1608-A1, p. 105.] [See Table 14 Estimated U.S. Charging Infrastructure Investments Announced but Not Yet In the Ground, as of March 31 2023 located on p. 105 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

233 U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). Chapter 1.6.2. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

Public funding programs included are those that cover only EV charging infrastructure, or for which EV charging infrastructure is expected to comprise the vast majority of funding. This includes the federal National Electric Vehicle Infrastructure (NEVI) formula and Charging and Fueling Infrastructure (CFI) Discretionary Grant funding, state funding commitments, and modeled estimates of 26 U.S.C. § 30C tax credit payments consistent with an EV adoption trajectory that meets President Biden's goal of 50 percent ZEV sales share by 2030 (for LDVs) and an electric vehicles sales trajectory matching EPA's proposed emissions regulations for medium- and heavy-duty vehicles. 234 [EPA-HQ-OAR-2022-0985-1608-A1, p. 106]

234 Note that these figures do not include any funding amounts for hydrogen fuel cell vehicles. Regarding the 30C tax credit, Atlas assumes that 1) all qualifying projects receive the tax credit, 2) on average, qualifying projects will receive tax credits worth 18% of covered costs, and 3) that the U.S. Department of the Treasury will classify a census tract as not urban if more than 10% of the blocks within the census tract are designated as rural census blocks (as recommended by Natural Resources Defense Council (NRDC), Alliance for Automotive Innovation, American Council on Renewable Energy (ACORE), Ample, CALSTART, ChargePoint, Clean Energy Works, Earthjustice, Elders Climate Action, Electrification Coalition, Environmental Defense Fund (EDF), EV Charging for All, EVBox, Forth Mobility, Green Latinos, International Brotherhood of Electrical Workers (IBEW), International Parking & Mobility Institute, Itselectric, League of Conservation Voters, National Association of Convenience Stores (NACS), National Consumer Law Center, NATSO, Navistar, Plug in America, Representing America's Travel Plazas and Truck Stops, Rivian, Sierra Club, SIGMA: America's Leading Fuel Marketers, TeraWatt, Transportation for America, Union of Concerned Scientists (UCS), Volvo Group North America). The estimated Low Carbon Fuel Standard value is based on modeling from Dean Taylor Consulting for California, Oregon, and Washington and does not include capacity credits. It uses a 2023 – 2032 EV adoption trajectory for those three states that meets President Biden's LDV goal of 50% ZEV sales share by 2030 (which is lower than the trajectory modeled in the EPA's proposed vehicle emission standards), an MDHD EV adoption curves modeled on the EPA's proposed emissions regulations for MD and HD vehicles, and modeling from Atlas's INSITE tool of MWh demanded by MDHD vehicles. Utility program investments include approved investor-owned utility programs with an EV charging element. Amounts are unspent program dollars as of the most recent program report available as of March 31, 2023. If no program report was available, Atlas used the percentage of time remaining in the approved program schedule to estimate the unspent proportion of program funding.

Even Atlas's tally of private sector commitments is likely incomplete. Private sector actors often do not announce their investment plans, and are especially unlikely to do so if they are investing in home, depot, or workplace charging. Investments here include announced commitments to public charging network developments made after January 1, 2022, by companies including Tesla, Electrify America, BP, General Motors, Daimler, and Mercedes. For MDHD vehicles, private sector commitments are taken largely from Environmental Defense Fund's Electric Fleet Deployment & Commitment List. 235 Tallied private sector commitments exclude an estimated $3.0 billion in capital raised by charging companies (including ChargePoint, EVgo, Blink, and Volta), some percentage of which is expected still to be invested in charging hardware and installation. In sum, there are $34 billion in announced infrastructure investments not yet in the ground that could support strong HDV standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 107]

235 Available at: https://docs.google.com/spreadsheets/d/1l0m2Do1mjSemrb_DT40YNGou4o2m2Ee-KLSvHC-5vAc/edit#gid=2049738669. MDHD fleet vehicle counts are multiplied by charging ports per vehicle and costs per port modeled in Atlas's Investment Needs of State Infrastructure for Transportation Electrification (INSITE) tool

12.3. Barriers to the installation of charging infrastructure identified in the Rule are being actively addressed

The Proposed Rule identifies significant investments in charging infrastructure:

… we expect significant increases in HD charging infrastructure due to a combination of public and private investments. This includes Federal funding available through the BIL and the IRA. As discussed in DRIA Chapter 1.6.2.2, states, OEMs, utilities, EVSE providers and others are also investing in and supporting the deployment of charging infrastructure. For example, Daimler Trucks North America, Volvo Trucks, Navistar, and PACCAR are a few of the HD manufacturers investing in EVSE, sometimes packaging the sale of EVSE with the vehicle. Because of these projected increases and the funding available through the BIL and IRA, and as we are proposing more stringent standards that begin in MY 2027, our assessment supports that there is sufficient time for the infrastructure, especially for depot charging, to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply. 236 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 107 - 108]

236 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 228. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

The Proposed Rule also states:

EPA has heard from some representatives from the heavy-duty vehicle manufacturing industry both optimism regarding the heavy-duty industry's ability to produce ZEV technologies in future years at high volume, but also concern that a slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards. 237 [EPA-HQ-OAR-2022-0985-1608-A1, p. 108]

237 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 28-29. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy.

Both the statement that identified significant investments warrants more stringent standards and the statement that the pace of installing charging infrastructure needs to accelerate are true. There are barriers to the timely installation of charging infrastructure that need to be removed to allow investments to be made at an even greater pace and scale, but those challenges are already being actively addressed. [EPA-HQ-OAR-2022-0985-1608-A1, p. 108]

Most of the challenges that vehicle manufacturers have raised associated with energizing charging infrastructure for HDVs in a timely manner are being faced in California, where most electric HDVs are currently being deployed. Thankfully, a state law enacted in 2022 provides

California’s investor- and publicly-owned utilities with data necessary to inform grid planning to accommodate high levels of EV charging, requires those utilities to propose proactive grid investments in their General Rate Cases to comply with ZEV regulations (as well as a long list of other laws, standards, and requirements), and directs the California Public Utilities Commission (CPUC) and local utility governing boards to ensure the proposed investments are consistent with achieving the state’s goals and regulations. 238 In May 2023, Southern California Edison (SCE) filed its General Rate Case, which includes such proactive investments. 239 And the CPUC recently launched a “Zero-Emission Freight Infrastructure Planning” initiative designed to address the mid- to long-term challenges associated with constructing necessary supporting grid infrastructure in a timely manner to accommodate electric HDVs. 240 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 108 - 109]

238 California Assembly Bill 2700 Transportation electrification: electrical distribution grid upgrades. (2021-2022). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB2700

239 Southern California Edison. 2025 General Rate Case, WP SCE-02. V. 07. Bk. A, TEGR Forecast Development Workpaper.

240 California Public Utilities Commission. Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning. (2023). https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/freight-infrastructure-planning

Fundamentally, the charging infrastructure challenges identified by vehicle manufacturers that caused EPA to solicit comment on this issue can be overcome, as evidenced by the progress described above. We are not starting from scratch and do not need to replicate the gas and diesel refueling network to electrify vehicles. The electric grid is already nearly ubiquitous; it only needs to be extended at the fringes. And because it benefits utility shareholders and customers alike to remove barriers to investment in charging infrastructure, we have reason to be optimistic. America’s utilities have a long history of accommodating significant growth. [EPA-HQ-OAR-2022-0985-1608-A1, p. 110]

In sum, the private and federal infrastructure investments EPA has identified justify strong standards, and the challenges it has identified are being addressed. Furthermore, as noted above, the EPA’s inventory of federal, public, and private investments that already justifies increasingly stringent vehicle standards is incomplete. Critical to the implementation of the infrastructure is the coordination with frontline/fenceline communities to ensure that infrastructure does not increase the burden in these communities. 244 [EPA-HQ-OAR-2022-0985-1608-A1, p. 110]

244 Moving Forward Network. Letter to Administrator Regan. (Oct 2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/11/MFN-Zero-Emission-in-Freight-Letter-to-EPA-10_26_21.pdf “Decisions on siting the new electricity infrastructure must be coordinated with environmental justice leaders, address cumulative impacts and support mandatory emissions reductions.”

Organization: National Association of Clean Air Agencies (NACAA)

EPA also requests comment on the readiness of ZEV charging and refueling infrastructure. Specifically, EPA writes in the proposal that ‘. . .important early actions and market indicators suggest strong growth in charging and refueling ZEV infrastructure in the coming years. Furthermore, as described in Section II of this document, our analysis of charging infrastructure needs and costs supports the feasibility of the future growth of ZEV technology of the magnitude

EPA is projecting in this proposal's technology package. EPA has heard from some representatives from the heavy-duty vehicle manufacturing industry both optimism regarding the heavy-duty industry's ability to produce ZEV technologies in future years at high volume, but also concern that a slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards. Several heavy-duty vehicle manufacturers have encouraged EPA to consider ways to address this concern both in the development of the Phase 3 program, and in the structure of the Phase 3 program itself. EPA requests comment on this concern, both in the Phase 3 rulemaking process, and in consideration of whether EPA should consider undertaking any future actions related to the Phase 3 standards, if finalized, with respect to the future growth of the charging and refueling infrastructure for ZEVs.'16 [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

16 Supra note 1, at 25,934

For reasons we explain earlier in these comments, NACAA does not share the concerns expressed by some representatives of the heavy-duty vehicle manufacturing industry about the ability of electric utilities and/or charging equipment and service providers to continuously meet the incremental rollout needs for ZEV charging and refueling infrastructure. NACAA firmly opposes an 'off-ramp' from the standards or any similar measure. Likewise, anything akin to a mid-term evaluation is unnecessary and inappropriate given the program will begin in just a few years, span the course of only five years and starts from a demonstrated baseline of vehicle and charging technology. NACAA strongly urges EPA to reject any such provisions. [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

There is a great deal of evidence, including what NACAA provides at the beginning of this section on our comments and recommendations, that points to the coming readiness of the charging and fueling infrastructure needed to support strong Phase 3 standards. The federal government has demonstrated its deep commitment to accelerating the transition to ZEVs by providing historic levels of funding and monetary incentives including for timely infrastructure. NACAA notes that given the importance of this federal funding to achieving meaningful nationwide reductions in GHG emissions, including from heavy-duty vehicles and engines, EPA should ensure that these funds are allocated equitably across the country. In addition to federal action, states and local areas are demonstrating leadership by undertaking their own infrastructure initiatives. These are helping to drive private investment to capitalize on these opportunities. The following a few examples. [EPA-HQ-OAR-2022-0985-1499-A1, pp. 6-7]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

Robust Charging Infrastructure is Necessary to Support Heavy-Duty Electrification

The Proposed Rule would result in electrifying 50% of new vocational trucks, 35% of new short-haul tractors, and 25% of new long-haul tractors by 2032.5 These estimates are divorced from the reality of the current ZEV market: for MY21, only 0.2% of all HD vehicles certified by the Agency were electric.6 The extraordinary pace of HD electrification that is effectively mandated under this rulemaking is incompatible with the reality of long-haul trucking in the United States. [EPA-HQ-OAR-2022-0985-1603-A1, p. 4]

5 Proposed Rule at 25,932 (Table ES–3).

6 Id. at 25,940.

These comments focus primarily on long-haul HD trucks, which are the vehicles typically serviced by our members. The challenges to electrifying the HD sector cannot be overstated and will require a gradual and unprecedented effort irrespective of regulatory mandates. One major challenge is a lack of HD charging infrastructure. Currently, there is no U.S. network where over-the-road trucks can stop for rest breaks and recharging at the same time. In fact, recent estimates indicate there are fewer than 3,000 HD truck chargers across the entire United States.7 Such chargers are expensive and specialized, as long-haul trucks require two 8,000-pound batteries to operate.8 Given the size of their batteries, HD trucks cannot use light-duty charging infrastructure. It could take up to ten hours to charge those trucks and that would only provide them with a few hundred miles of range.9 By contrast, a diesel truck can refuel in about 15 minutes and get 1,200 miles of range. Dwell times will increase significantly as a result of recharging needs, which will impact scheduling and have implications for Hours-of-Service limits. Prolonged recharging periods will also further exacerbate challenges related to truck parking availability and capacity. [EPA-HQ-OAR-2022-0985-1603-A1, pp. 4-5]

7 Vivian Lebbon, et al., WOOD MACKENZIE, 'US electric truck sales set to increase exponentially by 2025' (Aug. 10, 2020) available at https://www.woodmac.com/press-releases/us-electric-truck-sales-set-to-increase-exponentially-by-2025/.

8 See AMERICAN TRANSPORTATION RESEARCH INSTITUTE, 'Understanding the CO2 Impacts of Zero-Emission Trucks' (May 3, 2022) available at https://truckingresearch.org/2022/05/understanding-the-co2-impacts-of-zero-emission-trucks/.

9 Jasmin Melvin, S&P GLOBAL, 'Trucking industry worries US EPA put 'cart before the horse' with emissions proposal,' (April 19, 2023); available at https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/041923-trucking-industry-worries-us-epa-put-cart-before-the-horse-with-emissions-proposal.

Organization: National Automobile Dealers Association (NADA)

3. Projections suggest that there will not be enough public charging infrastructure available to support EPA forecasted adoption rates.

Several studies have assessed the scale of the refueling infrastructure that will be needed to meet projected ZEV adoption rates. A 2022 utility industry estimate on the charging infrastructure needed to support the projected 2030 EV marketplace points to an alarming and growing infrastructure gap. According to the report from the Edison Electric Institute (EEI), more than 2.6 million charge ports in workplaces and public locations will be needed by 2030.20 EEI states: "The significant difference between the current availability of charging infrastructure and the expected charging infrastructure needed suggests a growing "infrastructure gap" that must be addressed."21 EEI goes on to state that "the number of DCFC ports needed in 2030 to meet demand is more than double the planned DCFC ports."22 The DCFC planned investments include those investments planned by state and federal governments under relevant incentive programs, automakers, electric companies, and the National Electric Highway Coalition. [EPA-HQ-OAR-2022-0985-1592-A1, p. 11.] [See Docket Number EPA-HQ-OAR-2022-0985-1592-A1, page 11, for figure.]

20 Charles Satterfield et al., Electric Vehicle Sales and the Charging Infrastructure Required Through 2030, EDISON ELECTRIC INSTITUTE (June 2022).

21 Id. at 12.

22 Id. at 15.

Even more alarming is that EEI's conclusions are based solely on an estimated 32 percent of total light-duty vehicle sales in 2030.23 Since then, the EPA has issued sweeping regulatory proposals that together estimate that by MY 2032 new vehicle sales will include:

- Nearly 70 percent ZEV penetration across the light-duty sector;
- Nearly 40 percent ZEV penetration across the combined medium-duty van and pickup truck categories;
- Some 50 percent ZEV penetration for vocational vehicles;
- Some 34 percent ZEV penetration for day cab tractors; and
- Some 25 percent ZEVs for sleeper cab tractors. [EPA-HQ-OAR-2022-0985-1592-A1, p. 12]

23 Government and private support of EV charging has traditionally been focused on light -duty charging as light-duty EVs were introduced to the market first. Medium- and heavy-duty EV charging woes are compounded by the fact that most publicly available EV chargers are not physically accessible to larger vehicles. Chargers are often located in parking lots designed only to accommodate light-duty EVs excluding most medium- and heavy-duty buses and trucks from accessing the growing network of public chargers.

On May 11, 2023, the ICCT released a report entitled, "Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States" (ICCT Report). This report directly addresses commercial infrastructure predictions and confirms industry infrastructure concerns. The ICCT Report states that by 2030, 522,000 overnight chargers, 20,500 fast chargers, and 9,540 ultrafast chargers will be needed to support the estimated 1.1 million ZEV trucks.24 These numbers are over and above those necessary for light duty ZEVs. Further, the ICCT Report states that the "most recent TCO analysis for the United States shows no case of positive TCO for hydrogen trucks relative to battery-electric trucks."25 [EPA-HQ-OAR-2022-0985-1592-A1, p. 12]

24 Pierre-Louis Ragon et al., Near-Term Infrastructure Deployment to Support Zero-Emission Medium-And Heavy- Duty Vehicles in The United States, ICCT (May 2023).

25 Id. at 3.

New investments in charging infrastructure are being announced daily26 and ATD is hopeful EPA's GHG proposals and other government incentive programs will provide investors with the reassurance they need to build necessary infrastructure. Reliable refueling infrastructure is critical to the successful adoption of ZEV HDVs and must be accounted for by EPA. [EPA-HQ-OAR-2022-0985-1592-A1, p. 12]

26 See e.g., Michelle Lewis, Daimler just announced a $650M US-wide EV charging network for trucks, ELECTREK (April 27, 2023) and Vishal Kapadia, Leading the Charge: Walmart Announces Plan To Expand Electric Vehicle Charging Network, Walmart (April 6, 2023).

4. Recommendations

Dealerships are doing their part to sell and service commercial ZEVs. However, without adequate assurances that the appropriate infrastructure will be in place in time, customers will simply not purchase ZEV HDVs. Infrastructure represents the most complex, expensive, and longest lead time challenge to transition our industry. For a Phase 3 GHG rule to be successful, an "all-in" approach by the government is required. Consequently, ATD recommends the following:

- That EPA work with purchaser stakeholders to ensure that that purchaser costs and lead time associated with EVSE equipment and charging are accurate.
- That EPA work with other agencies to establish clear data and related benchmarks for assessing the deployment of essential ZEV HDV refueling infrastructure.

That EPA ensure that forecasted adoption rates are supported by available infrastructure. EPA must monitor necessary infrastructure investments and modifications to the Phase 3 rule should be made if they fall short. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 12 - 13]

Organization: National Rural Electric Cooperative Association (NRECA)

Critical Role of Electric Cooperatives as Heavy-Duty Highway Vehicles are Electrified

Electrification of the transportation sector creates both opportunities and challenges for the electric sector, and electric cooperatives will play a critical role in the success of the transformation now underway. As such, electric cooperatives welcome the opportunity to partner with state and local entities on implementing the programs dedicated to building out the nation's electric vehicle (EV) charging network in the bipartisan infrastructure law (BIL) and through other opportunities. The funding in the BIL is an important down payment in the federal support required to electrify the transportation sector, particularly in rural areas that could otherwise be left behind. [EPA-HQ-OAR-2022-0985-1515-A1, pp. 1-2]

To support the electrification of heavy-duty highway vehicles as laid out in EPA's proposed rule, electric cooperatives and other utilities must be involved from the very beginning of planning for the charging infrastructure these vehicles will require. There are already examples of 1 MW charging stations being built to support these fleets. Electric cooperatives and other utilities need to be integrated at the very beginning of planning for such facilities by the project developers, or other relevant planning authorities where applicable, to avoid unintended consequences. [EPA-HQ-OAR-2022-0985-1515-A1, p. 2]

Organization: Navistar, Inc.

Navistar's ability to meet its stated ZEV goals is dependent on the buildout of necessary public and depot charging infrastructure.

Navistar stated its ambition to have 50% of its US-directed new vehicle sales be zero emission vehicles by 2030 and 100% of its US-directed new vehicle sales by 2040. With the proper support of public policy, state and local governments and other industries, these ambitions are possible. One key requirement is that the current infrastructure and vehicle incentives remain in place. The provisions of the Inflation Reduction Act and Bipartisan Infrastructure Law are important in supporting this transition. The second requirement is that, overall, infrastructure develops in a way to support a national ZEV fleet of 50% by 2030 and 100% by 2040. There are well-known challenges that operators face in building out their own charging infrastructure for depot charging as well as the public charging infrastructure that is important for long-haul applications. Current and future assistance for operators to help with this transition is required for our goals. [EPA-HQ-OAR-2022-0985-1527-A1, p. 2]

The transition to commercial ZEVs is a paradigm shift. That is Navistar's path in the coming years. The move toward zero emissions mobility cannot, however, happen without the successful buildout of charging infrastructure. Navistar's ZEV goals are dependent on the continued expansion of charging infrastructure sufficient to support public and depot charging of at least 50% of the national commercial trucking fleet by 2030. [EPA-HQ-OAR-2022-0985-1527-A1, p. 3]

Diesel-powered vehicles will continue to serve specific applications in our transportation system for some time. The key is to find the right balance that allows diesel technology to become cleaner in a way that is affordable for customers, while simultaneously encouraging ZEV development and charging infrastructure buildout. Charging and refueling infrastructure will serve as an early proof point for our customers that investment in an electric vehicle is possible. A robust charging network will be needed to support the various applications of commercial vehicles due to their significant duty cycles. [EPA-HQ-OAR-2022-0985-1527-A1, p. 3]

Importantly, much of the infrastructure funding to date, such as the NEVI funding, is largely focused on light-duty infrastructure. It is imperative that, as we go forward, heavy-duty needs are explicitly incorporated. There are considerable differences between commercial heavy-duty and light duty infrastructure needs in the amount of energy required, the space required for parking vehicles while they are charged, the locations in which charging will occur, among others. [EPA-HQ-OAR-2022-0985-1527-A1, p. 3]

Recognition of the headwinds associated with creating an entire new vehicle market and infrastructure support must be understood to bring a zero-emission future a reality. It is necessary to ensure that supply chain issues are smoothed, utilities are nimble enough to respond to customer requests for build-out of charging capabilities and resiliency issues are addressed for future needs. Navistar supports the federal and state governments rapidly developing and implementing a national charging master plan that identifies dedicated corridors and areas for future charging and needs. These plans will need to include both lightduty and commercial heavy-duty vehicle operations, with the deep understanding of the unique use cases for commercial vehicles on location, charging downtime allowed and electricity needs to support commercial vehicle operations. [EPA-HQ-OAR-2022-0985-1527-A1, p. 3]

Simply stated, commercial vehicle manufacturers will not be able to sell an increasing number of ZEVs on an economically viable basis unless a robust ZEV infrastructure is assured and in place. For this rule, and the industry, to succeed in this effort we need a reasonable, flexible rule and the right incentives in place to allow the ZEV ecosystem to grow. As provided below, because this kind of transition is unprecedented in the transportation space in living memory, we need the kind of flexibility that will allow for success. [EPA-HQ-OAR-2022-0985-1527-A1, p. 3]

EPA should link the phase-in of the Phase 3 GHG standards to the availability of sufficient infrastructure. Navistar recommends that EPA revise the proposed rule to include appropriate regulatory mechanisms to monitor and correct for infrastructure availability to support ZEVs. Specifically, EPA should add regulatory language that would temporarily extend the proposed rule's compliance determination requirements in advance of their respective deadlines if adequate ZEV infrastructure installations are not forecasted to be in place by 2027. [EPA-HQ-OAR-2022-0985-1527-A1, p. 5]

EPA's proposed rule is predicated on several assumptions regarding infrastructure costs, as further described in the Draft Regulatory Impact Analysis (RIA) (Document EPA-HQOAR-2022-0985-1428). EPA acknowledges that more infrastructure will be needed as ZEV adoption grows. For example, EPA cites an Atlas analysis, which estimates that it will cost $100 to $166 billion by the end of 2030 to install the necessary infrastructure to support 1 million Class 3 through 8 vehicles and future expansion. That would cover 500,000 depot-charging ports, and over 100,000 public en-route DCFC ports for long-haul trucks. See Draft RIA, p. 67.1 [EPA-HQ-OAR-2022-0985-1527-A1, p. 5]

1 Navistar has previously estimated that the minimum investment required to develop a focused public charging network just to support long haul operations on key major freight corridors alone would likely exceed $20 billion.

EPA further acknowledges that the timeline to complete both permitting and utility interconnection will likely be longer for larger, more complex, and/or higher-power charging stations. EPA stated that '[i]f upgrades to the electricity distribution system are required, this could further extend the timeline.' On that point, EPA notes that new charging loads of several megawatts or higher 'could take months to several years to implement.' Draft RIA, pp. 69-70. [EPA-HQ-OAR-2022-0985-1527-A1, p. 5]

Based on the foregoing, EPA should include a regulatory mechanism in the rule to monitor the progress of the development of the necessary ZEV infrastructure against annual benchmarks. Based on that monitoring, if it is determined by EPA that sufficient infrastructure development has not occurred, EPA would temporarily extend the rule's compliance determination requirements in advance of their respective deadlines. [EPA-HQ-OAR-2022-0985-1527-A1, p. 5]

Organization: Owner-Operator Independent Drivers Association (OOIDA)

BATTERY EMISSION/ZERO-EMISSION VEHICLE TECHNOLOGIES

We oppose EPA's proposal to implement Phase 3 beginning in Model year 2028 given the lack of necessary infrastructure necessary to support BEVs for the long-haul trucking sector. EPA notes, "the potential for the application of zero-emission vehicle (ZEV) technologies in the heavy-duty sector presents an opportunity for significant reductions in heavy-duty GHG emissions over the long term," and that, "Major trucking fleets, HD vehicle and engine manufacturers, and U.S. states have announced plans to increase the use of heavy-duty zero-emissions technologies in the coming years." However, our members are skeptical about the effectiveness of BEV mileage capabilities as well as access to commercial BEV charging stations. [EPA-HQ-OAR-2022-0985-1632-A1, p. 5]

OOIDA members routinely make trips over 1,000 miles and can rely upon a nationwide network of truck stops and other locations to fill up on gas whenever and wherever they need to refuel their tank. There are numerous unanswered questions about how a nationwide BEV charging network will be implemented and it's difficult to estimate when such a network would be readily accessible for CMV drivers. Therefore, we question EPA's proposed BEV production timelines without a reliable charging infrastructure in place. [EPA-HQ-OAR-2022-0985-1632-A1, p. 5] [Refer to table 4 on page 5 of docket number EPA-HQ-OAR-2022-0985-1632-A1]

For comparison, a truck parking crisis has existed for decades. DOT has found that the truck parking shortage is a major problem in every state and region of the country, and these shortages exist at all times of the day, week, and year. Unfortunately, the parking shortage continues to worsen with only 1 parking spot available for every 11 trucks on the road, resulting in drivers wasting an average of one hour every day trying to secure parking. States and local communities across the U.S. are struggling to maintain existing capacity, let alone keep pace with increasing demand. While Congress and DOT have prioritized funding for expanding truck parking capacity, drivers have yet to see tangible results that would help address the parking shortage. [EPA-HQ-OAR-2022-0985-1632-A1, p. 5]

EPA relies upon the confidence that recently enacted legislation will expedite BEV development. The proposed rule states, "the 2021 Infrastructure Investment and Jobs Act (commonly referred to as the "Bipartisan Infrastructure Law" or BIL) and the Inflation Reduction Act of 2022 ("Inflation Reduction Act" or IRA) together include many incentives for the development, production, and sale of ZEVs, electric charging infrastructure, and hydrogen, which are expected to spur significant innovation in the heavy-duty sector." We anticipate there will be a number of legislative, regulatory, and economic/market factors that will impact ZEV production and sales along with other challenges before the completion of a fully deploy a reliable nationwide commercial ZEV infrastructure. [EPA-HQ-OAR-2022-0985-1632-A1, p. 5]

Organization: PACCAR, Inc.

PACCAR is working diligently to develop ZEVs for the future, but the necessary supporting infrastructure must be in place before widespread ZEV market penetration and adoption. Planning, developing, and implementing the charging infrastructure required to support battery electric trucks is a major initiative. The hydrogen refueling infrastructure is also not well developed. EPA's proposed standards are premised on the infrastructure being established and functional. EPA should facilitate the feasibility of the regulation by including a mechanism to adjust the applicable standards to correlate with the progress of the necessary infrastructure development and readiness. [EPA-HQ-OAR-2022-0985-1607-A1, p. 2]

Organization: State of California et al. (2)

2. Significant Investments Are Being Made in Charging Infrastructure and Grid Reliability

There is substantial financial support to build out medium- and heavy-duty truck charging stations at both the national level and in our States and Cities. On the federal level, the Infrastructure Investment and Jobs Act includes $7.5 billion for grant programs administered by U.S. Department of Transportation ("DOT") for EV charging infrastructure to expand Alternative Fuel Corridors and a National Electric Vehicle formula grant program at the DOT to provide additional funding to states to support EV charging infrastructure.199 The National Electric Vehicle Infrastructure ("NEVI") Formula Program is expected to help build EV chargers covering approximately 75,000 miles of highway across the country.200 Many of the State Plans submitted through the NEVI Program address infrastructure needs for freight specifically.201 Moreover, the INFRA Grants Program has $8 billion to award competitive grants for multimodal freight and highway projects of national or regional significance to improve the safety, efficiency, and reliability of the movement of freight and people in and across rural and urban areas.202 In November 2022, California committed $1 billion of funding to the development of charging infrastructure. [EPA-HQ-OAR-2022-0985-1588-A1, pp.27-28]

199 Environmental Defense Fund, Electric Vehicle Market Update (April 2022), https://blogs.edf.org/climate411/files/2022/04/electric_vehicle_market_report_v6_april2022.pdf.

200 International Energy Agency, Global EV Outlook 2023, https://iea.blob.core.windows.net/assets/dacf14d2-eabc-498a-8263-9f97fd5dc327/GEVO2023.pdf.

201 See, e.g., Mississippi Dep't of Transportation, Mississippi Electric Vehicle Infrastructure Deployment Plan (Aug. 1, 2022), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/ms_nevi_plan.pdf; Missouri Dep't of Transportation, Missouri Electric Vehicle Infrastructure Deployment Plan (Sept. 2022), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/mo_nevi_plan.pdf; Nebraska Dep't of Transportation, State Plan for Electric Vehicle Infrastructure Deployment (Aug. 1, 2022), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/ne_nevi_plan.pdf.

202 Global Commercial Vehicle Drive to Zero, Global MOU Policy Tracker Dashboard, https://globaldrivetozero.org/progress-dashboard/ (last accessed June 16, 2023).

There is also substantial private investment in developing charging infrastructure in the United States, including both hydrogen and electric-vehicle charging stations. For example, Daimler, NextEra, and BlackRock announced a joint venture, and $650 million initial investment, to design, develop, install, and operate a nationwide charging network for medium- and heavy-duty battery electric vehicles and hydrogen fuel cell vehicles, construction of which is set for 2023.203 And other private efforts to expand heavy-duty charging infrastructure are already underway.204 [EPA-HQ-OAR-2022-0985-1588-A1, p.28]

203 Ryan Kennedy, Daimler, NextEra, and BlackRock to deploy nationwide US electric trucking network, pv magazine (Jan. 31, 2022), https://pv-magazine-usa.com/2022/01/31/daimler-nextera-and-blackrock-to-deploy-nationwide-us-electric-trucking-network/.

204 See, e.g., DTNA opens first heavy-duty electric truck charging site, Fleet Owner (April 21, 2021), https://www.fleetowner.com/emissions-efficiency/press-release/21161913/dtna-opens-first-heavyduty-electric-truck-charging-site; Alan Adler, Forum Mobility in $400M JV for electric truck infrastructure, Freight Waves (Jan. 17, 2023), https://www.freightwaves.com/news/forum-mobility-enters-400m-joint-venture-for-electric-truck-infrastructure; Navistar Forging Ahead on Electric-Truck Development, Heavy Duty Trucking Truckinginfo (May 4, 2023), https://www.truckinginfo.com/10198173/navistar-forging-ahead-on-electric-truck-development; Michelle Lewis, This EV charging depot can charge up to 96 electric semi-trucks at once, electrek (June 13, 2023), https://electrek.co/2023/06/13/electric-truck-charging-oakland/; Seth Clevenger, Navistar Expands Electric Truck Offerings, Transport Topics (May 5, 2023), https://www.ttnews.com/articles/navistar-partners-quanta; TeraWatt Developing I-10 Electric Corridor, the First Network of Electric Heavy-Duty Charging Centers, Business Wire (Oct. 20, 2022), https://www.businesswire.com/news/home/20221020005252/en/TeraWatt-Developing-I-10-Electric-Corridor-the-First-Network-of-Electric-Heavy-Duty-Charging-Centers; Scooter Doll, Schneider opens own depot in SoCal capable of charging 32 Freightliner electric trucks at once, electrek (June 7, 2023), https://electrek.co/2023/06/07/schneider-opens-depot-socal-charging-32-freightliner-electric-trucks-california-ev/; Lisa Baertlein, California's port truck-charging plan gets a jolt from big investors, Reuters (April 17, 2023), https://www.reuters.com/business/autos-transportation/big-investors-amp-up-californias-port-truck-charging-plan-2023-04-17/.

Organization: Stellantis

The proposed HD GHG targets are incredibly challenging and will require electrification at an unprecedented level in a market segment that demands payload and towing capability. Stellantis is committed to electrification and plans to have products in place that will meet consumer needs. However, it will take much more than manufacturing HD EVs and aggressive GHG standards in the proposed rule to create a successful HD electric vehicle market. There is concern that the proposed rule seeks such a rapid and transformative nationwide shift to electrification that it exceeds what the HD sector or market can withstand. Meeting the goals of the Phase 3 program will require a very significant build out of infrastructure along with a broad willingness from fleets and other customers to buy electrified HD vehicles. As noted in EMA comments, these HD vehicles have more demanding infrastructure needs than the LD segment because they are primarily work trucks with a vast array of vehicle uses that are essential for their business operations. [EPA-HQ-OAR-2022-0985-1520-A1, p. 2]

Organization: Tesla, Inc. (Tesla)

Moreover, as manufacturers begin deploying their heavy-duty vehicles, they will similarly be deploying charging infrastructure in parallel, as recognized in the Draft RIA. For example, Volvo has announced joining a partnership to build a publicly accessible medium- and heavy-duty electric vehicle charging network that connects several of California's largest metropolitan areas.206 In partnership with the Department of Energy, Cummins is developing extensive plans for battery-electric charging and hydrogen fueling stations along the stretch of I-80 that crosses Illinois, Indiana, and Ohio. The planned network of charging and fueling stations will be focused on transitioning 30% of the region's medium- and heavy-duty fleets to zero-emission technologies by 2035.207 Similarly, National Grid has undertaken a project to examine freight corridors in Maine, Massachusetts, New Hampshire, Vermont, Rhode Island, Connecticut, New York, Pennsylvania, and New Jersey, with a goal of informing a blueprint for future commercial EV charging.208 Intensive planning is also ongoing to develop infrastructure deployment plans for zero-emission medium- and heavy-duty vehicles along the I-95 freight corridor, which stretches from Savannah, Georgia, to Newark, New Jersey.209 [EPA-HQ-OAR-2022-0985-1505-A1, p. 28]

206 Volvo, Volvo Trucks Constructing California Electrified Charging Corridor for Medium- and Heavy-Duty Electric Vehicles (July 14, 2022) available at https://www.volvotrucks.us/news-and-stories/press-releases/2022/july/constructing-california-electrified-chargingcorridor- for-medium-and-heavy-duty-electric-vehicles/

207 U.S. DOE, Biden-Harris Administration Announces Funding for Zero-Emission Medium- and Heavy-Duty Vehicle Corridors, Expansion of EV Charging in Underserved Communities (Feb. 15, 2023) available at https://www.energy.gov/articles/bidenharris-administration-announces-funding-zero-emission-medium-and-heavy-duty-vehicle

208 Id.

209 Id.

Likewise, Daimler Trucks North America partnered with NextEra Energy Resources and BlackRock Alternatives in a joint venture called Greenlane to design, develop, install, and operate a U.S. nationwide, high-performance zero-emission public charging and hydrogen fueling network for medium- and heavy-duty battery-electric and hydrogen fuel cell vehicles.210 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 28-29]

210 Commercial Carrier Journal, Establishing heavy-duty EV charging infrastructure was a key theme at ACT Expo (May 11, 2023) available at https://www.ccjdigital.com/alternative-power/article/15447477/heavyduty-ev-charginginfrastructure-key-theme-at-act-expo?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue%3A+2023-05-11+Transport+Dive+%5Bissue%3A50409%5D&utm_term=Transport+Dive

All of these projects are indicative that manufacturers, utilities, and other investors are bringing to bear an extensive investment in this area and will rapidly develop medium and heavy-duty charging capacity commensurate with the level of BEV deployment stimulated by the Phase 3 rulemaking. [EPA-HQ-OAR-2022-0985-1505-A1, p. 29]

Further, recent analysis has confirmed that heavy-duty charging infrastructure does not all need to be built at once and that focused deployment can support rapid electrification of the sector. For instance, ICCT has found that the corridors of the National Highway Freight Network are projected to comprise 85% of the charging needs from long-haul trucks by 2030.211 [EPA-HQ-OAR-2022-0985-1505-A1, p. 29]

211 ICCT, Near-Term Infrastructure Deployment To Support Zero-Emission Medium- And Heavy-Duty Vehicles In The United States (May 11, 2023) available at https://theicct.org/publication/infrastructure-deployment-mhdv-may23/

Rapid and Expansive Investment in Charging Infrastructure Supports Stringent Phase 3 Emission Standards

s EPA notes, a number of new Congressionally enacted policies will also facilitate greater and rapid deployment of charging infrastructure sufficient to support more robust Phase 3 standards.212 The Bipartisan Infrastructure Law (IIJA) created the Charging and Fueling Infrastructure Discretionary Grant Program to deploy publicly accessible charging and fueling infrastructure and provides for $2.5 billion over five years for the program.213 At the end of March 2023, FHWA issued a notice of funding opportunity to solicit applications for grants totaling up to $700 million to deploy charging and alternative fueling infrastructure projects. Half of the $700 million is allocated for electric vehicle and other infrastructure located on public roads or in other publicly accessible locations, while the other half is allocated for charging and alternative fueling infrastructure located along designated alternative fuel corridors. These funds can be used to build charging infrastructure for medium- and heavy-duty trucks. [EPA-HQ-OAR-2022-0985-1505-A1, p. 29]

212 88 Fed. Reg. at 25928.

213 Infrastructure Investment and Jobs Act, P.L 117-58 (Nov. 15, 2021), Section 11401.

In addition to the federal investments in charging facilitated by the IIJA, the Inflation Reduction Act Section 30C provides significant tax incentives for the deployment of private capital into charging infrastructure for both light and heavy-duty vehicles.214 It allows for up to $100,000 for each charger with no limit on how many chargers a fleet can purchase and install at one site; this can help fleets commit to larger investments in heavy duty BEVs. [EPA-HQ-OAR-2022-0985-1505-A1, p. 29]

214 Id. at Section 13404.

Additionally, utility investment in charging infrastructure will accrue over the next several years as evidenced by active proceedings in many jurisdictions.215 Investment in charging infrastructure will be further enhanced by state rebates and incentive programs. Numerous incentives that will also facilitate MHDV infrastructure have been established and enacted.216 [EPA-HQ-OAR-2022-0985-1505-A1, p. 29]

215 See e.g., New York State Department of Public Service, Proceeding on Motion of the Commission to Address Barriers to Medium- and Heavy-Duty Electric Vehicle Charging Infrastructure, Case No. 23-E-0070 available at https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=69967&MNO=23-E-0070E

216 See generally, N.C. Clean Energy Technology Center (NCCETC), The 50 States of Electric Vehicles: State ZEV Targets, Managed Charging, & LMI Access Prioritized in 2022 (Feb. 8, 2023) available at https://nccleantech.ncsu.edu/2023/02/08/the-50-states-of-electric-vehicles-state-zev-targets-managed-charging-lmiaccess- prioritized-in-2022/

Recent estimates already peg that the heavy-duty charging segment investment is expected to reach over $534.7 million, while the other type, AC Charger, is projected to be worth more than $237.6 million by 2024.217 The combination of the IIJA funding, federal IRA incentives, state incentives, private and utility investments, and a robust Phase 3 standard will push an exponential growth in this investment leading up to MY 2027. [EPA-HQ-OAR-2022-0985-1505-A1, p. 30]

217 Statista, Projected heavy-duty electric vehicle charging infrastructure market size in the United States between 2018 and 2024, by type (May 11, 2023) available at https://www.statista.com/statistics/1282171/us-heavy-duty-electric-vehiclecharging-infrastructure-market-size-forecast-type/

Organization: Texas Public Policy Foundation (TPPF)

Moreover, the availability of charging stations for electric trucks is currently poor and still developing. It is certainly not as extensive as refueling stations for diesel trucks, and retrofitting existing truck stops for electric charging will place immense strain on electrical infrastructure and the national grid, especially in rural communities often frequented by truckers traveling the nation’s highways, causing prices to skyrocket for average Americans. [EPA-HQ-OAR-2022-0985-1488-A1, p. 5]

The resulting chaos will limit the range and flexibility of electric trucks for long-haul journeys. Electric trucks already have limited range compared to diesel trucks, particularly when fully loaded. This will mean more frequent charging, adjustment to trucking routes, and overall shipping delays, negatively affecting operational efficiency. And even if the myriad infrastructure issues involved in getting power to truck refueling stations were solved or mitigated, the electricity used to charge electric trucks would still primarily come from America’s most reliable and abundant power source: fossil fuels. [EPA-HQ-OAR-2022-0985-1488-A1, p. 5]

In effect, the HD Tailpipe Rule will force truckers to spend substantial financial and human resources to comply with ultra vires government regulations that fail to make even a marginal dent in global issue of changing climate. [EPA-HQ-OAR-2022-0985-1488-A1, p. 5]

Organization: Truck and Engine Manufacturers Association (EMA)

v. ICCT and Ricardo have assessed the magnitude of the ZEV-truck infrastructure challenge

Following the release of the Phase 3 NPRM, both the International Council on Clean Transportation (ICCT) and Ricardo LLC (Ricardo) have assessed the scope of the recharging/refueling infrastructure that will need to be installed and made operational on a nationwide basis over the next seven years to support the implicitly (and explicitly) mandated numbers of ZEV trucks. The scope of the HDOH infrastructure challenge is daunting. In fact, the challenges associated with the recharging/refueling infrastructure needed for the envisioned numbers of light-duty vehicles are minor in comparison to those associated with the HDOH infrastructure. Consequently, and as noted, the implicit ZEV-truck sales mandates included in EPA's Phase 3 program will need to be linked to the pace of progress that is made over the next seven years to install the requisite recharging/refueling infrastructure (as assessed by ICCT, Ricardo, and others) for the envisioned numbers and types of ZEV trucks. [EPA-HQ-OAR-2022-0985-2668-A1, p. 11]

On May 11, 2023, ICCT released a report entitled, "Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States" (ICCT Report). The ICCT Report is directly on point and includes the following relevant findings and conclusions:

- To support the conversion of long-haul trucks to ZEVs, high-capacity charging stations will need to be sited every 50 miles along the National Highway Freight Network (NHFN) by 2030. Some of those charging stations will need capacities up to 22MW, which will require extensive upgrades to grid interconnections.
- The average minimum charging station size for long-haul vehicles along the NHFN will need to be 10MW, a charging capacity size that is roughly half of what is required to power a small town.
- By 2030, approximately 1.1 million ZEV trucks will be deployed, including approximately 130,000 long-haul combination trucks.
- By 2030, 522,000 overnight chargers, 20,500 fast chargers, and 9,540 ultrafast chargers will be needed to support the estimated 1.1 million ZEV trucks.
- Ten key states will comprise roughly half of the energy needed for the anticipated numbers of ZEV trucks by 2030. Within those 10 states, the top 15 counties will account for 11% of the projected energy needs, meaning that targeted infrastructure deployment plans will be required.
- ICCT does not foresee a case for positive TCO for hydrogen trucks relative to battery-electric trucks.
- Table 3 from the ICCT Report (reproduced below) lists the ZEV-charging infrastructure needs for ZEV trucks in the top 10 counties and for the nation as a whole as of 2030: [EPA-HQ-OAR-2022-0985-2668-A1, pp. 11-12.] [See Table 3 on page 12 of docket number EPA-HQ-OAR-2022-0985-2668-A1]

On June 16, 2023, Ricardo issued its own comprehensive needs assessment report regarding the ZEV-truck infrastructure that will be required by 2032 under EPA's Phase 3 proposal (and under CARB's overlapping ACT regulations). The Ricardo Report (a copy of which is attached as Exhibit "1") includes the following key findings and conclusions:

- More than 1.5 million MHD BEV trucks and more than 120,000 FCEV trucks will be on the road by 2032 if EPA's implicit ZEV-truck mandates, as proposed, (and CARB's express ACT ZEV-truck mandates in California and the Section 177 opt-in states) are fully implemented. By way of comparison, only approximately 600 HD ZEVs and zero (0) HD FCEVs were sold in the U.S. in 2021. Eighty percent (80%) of those HD ZEV sales in 2021 were for public transit, shuttle and school bus applications.
- The envisioned level of deployment of ZEV-trucks under EPA's Phase 3 proposal will require the construction of nearly 1.5 million MHD BEV charging ports by 2032. Of that number, approximately 110,000 charging ports will need to be DCFC rated at 150kW or 350kW. The relatively low number of anticipated DCFC chargers stems from Ricardo's utilization of EPA's assumptions regarding the predominance of depot-charging, and the availability of charging times in excess of 8 hours for all trucks in all BEV applications. More realistic assumptions would yield higher estimates for the necessary numbers of DCFCs rated at 50kW or more.
- In order to have 1.5 million MHD BEV chargers installed by 2032, approximately 187,500 chargers will need to be sited, installed and made operational each year over the next 8 years. That equates to the installation of approximately 15,625 MHD BEV chargers every month. Obviously, that is not happening.
- The aggregate cost to construct the necessary number of MHD BEV charging ports under EPA's NPRM will be approximately $21 billion. By way of comparison, the directly available federal funding for the installation of MHD BEV charging ports is approximately $1 billion. The relatively low aggregate cost that Ricardo has calculated stems from utilizing the same EPA assumptions regarding fleets' exclusive reliance on depot-charging and the universal availability of overnight charging. Different assumptions regarding the need for greater numbers of higher-power DCFCs would increase the resultant aggregate cost estimates significantly.
- As a point of reference, the total number of operational DCFS charging stations in California today is approximately 9,200. By 2032, California alone will need more than 60,000 DCFC ports.
- The ZEV-truck infrastructure demands and timelines imposed by the underlying Phase 3 regulatory mandates, as proposed, are likely unworkable. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 12 - 13] [see docket number EPA-HQ-OAR-2022-0985-2668-A2 for Exhibit 1]

5. The Critical Importance of Infrastructure Readiness

Even if the more reasonable outputs from EMA's HD TRUCS are used to frame the final Phase 3 standards, there is no doubt that the infrastructures to power the ZEVs must be in place for any Phase 3 rule to be implementable. For trucking fleets to operate BEVs or FCEVs, whether a few or many, adequate battery-recharging or hydrogen-refueling infrastructures will be needed to power the ZEVs. Without sufficient infrastructures in place in time to meet the needs of the ZEVs implicitly required by EPA's GHG Phase 3 regulation, the rule will be destined to fail. [EPA-HQ-OAR-2022-0985-2668-A1, p. 43]

Based on the data in the NPRM, more than 140,000 battery chargers must be in place by 2027 and 1,400,000 (10-times more) by 2032 to power the MHD BEVs that EPA proposes to indirectly mandate through the Phase 3 rule. More specifically, the following graph depicts the number of chargers needed for the MHD BEVs that manufacturers would be required to sell under the proposed GHG Phase 3 rule: [EPA-HQ-OAR-2022-0985-2668-A1, p. 43] [See the Chargers Needed Table on page 44 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

To establish more than 1,400,000 battery chargers needed by 2032 to support the mandated MHD BEVs, approximately 15,000 chargers must come online each and every month over the ensuing eight years between now and 2031. Additionally, utilities will have to make extensive upgrades to the distribution capabilities of the electricity grid to provide those chargers with the more than 250 gigawatt-hours of aggregate daily power needs. Needless to state, nothing like that necessary infrastructure transformation is yet underway or even adequately planned for. [EPA-HQ-OAR-2022-0985-2668-A1, p. 44]

Moreover, due to their size and power demands, MHD ZEVs will not be able to utilize the charging infrastructure that is being developed for passenger ZEVs. As envisioned in the NPRM, all of the battery-recharging stations for commercial vehicles will be located at trucking depots and terminals where trucks park overnight. Under that scenario, chargers will need to be concentrated at those locations, requiring significant upgrades to the electricity transmission lines and substations to support the new high electricity demands at each depot location. However, contrary to EPA's core assumption, many experts believe that MHD ZEVs also will need to be recharged en route, at public battery-recharging stations, in addition to depot-charging. But public battery-recharging stations for MHD BEVs are not even considered in EPA's HD TRUCS, and adding that expanded infrastructure demand – which needs to be taken into account - will require changing many of the fundamental assumptions and data inputs to EPA's version of HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p. 44]

Unlike passenger cars, commercial vehicles are purchased by trucking businesses for the sole purpose of providing a financial return on the investment. If a new MHD BEV cannot perform the work needed by the fleet, at a lifecycle cost equal to or lower than other available technologies, it will not make financial sense for the fleet to invest in purchasing the BEV. Therefore, the charging infrastructure needed to power a new BEV must be in place before the fleet takes delivery of the ZEV-truck. Without that infrastructure in place in time, fleets simply will not purchase ZEVs, making it impossible for manufacturers to sell them. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 44 - 45]

We acknowledge that utilities may be waiting for the electricity demands associated with increasing numbers of MHD ZEVs to materialize before they commit to undertake the needed investments to upgrade the electricity grid. Unfortunately, however, that wait-and-see approach likely will, in effect, doom the GHG Phase 3 rule. If the recharging infrastructure is not in place before a fleet is expected to take delivery of a BEV, the fleet operator will cancel the order to avoid acquiring a stranded asset that is unable to generate revenue. [EPA-HQ-OAR-2022-0985-2668-A1, p. 45]

In light of the foregoing, a whole-of-government initiative is needed to ensure that the necessary battery-recharging infrastructure will be in place in time to power the annually increasing numbers of MHD BEVs implicitly required by the GHG Phase 3 rule. That initiative will need to determine: (i) the sufficiently-sized locations where battery-recharging stations need to be installed, (ii) the needed power ratings of those stations to meet the specific charging demands of the diverse types of commercial vehicles, and (iii) the "behind the meter" grid upgrades needed to deliver sufficient power to each location. Most importantly, that coordinated initiative must include mechanisms to ensure that the necessary battery-recharging infrastructure will be in place in time to meet the needs of the MHD ZEVs required by the GHG Phase 3 rule. Ricardo's need assessment report provides a useful overview of what will be required, and at what cost. [EPA-HQ-OAR-2022-0985-2668-A1, p. 45]

Regarding the types of battery-recharging station that will be needed, below is our estimate of the minimum power ratings and typical daily energy needs of different types of commercial BEVs. Please note that the estimates assume some BEVs will need to be recharged en route, something the NPRM and EPA's HD TRUCS assume will not be the case. Among other crucial issues, the required whole-of-government initiative should assess which MHD ZEVs are likely to be exclusively depot-charged, which may need to be recharged en route, and which will need to utilize both options. [EPA-HQ-OAR-2022-0985-2668-A1, p. 45.] [See the Estimate of Minimum Power Ratings Table on page 45 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

The NPRM and HD TRUCS incorrectly assume that all commercial BEVs will be depot-charged at night, and that any commercial ZEVs that need to operate further from home will be FCEVs. The NPRM also assumes that trucking fleets will be able to devote up to 30% of each vehicle's cargo carrying capacity for batteries large enough to provide enough power for the vehicle's entire daily work. If a commercial vehicle cannot carry enough batteries to complete its daily work, or if it must travel too far from its home terminal, the NPRM assumes that a FCEV will be used instead of a BEV. Of course, those FCEVs will require an entirely separate infrastructure of hydrogen-refueling stations, which still needs to be designed and developed. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 45 - 46]

EPA has established as a foundational premise of the NPRM that the necessary battery-recharging and hydrogen-refueling infrastructures will be developed in time to meet the needs of the MHD ZEVs that the GHG Phase 3 rule will require manufactures to sell. However, there is a significant chance that EPA's key premise – what really amounts to little more than a stated aspiration – may prove fundamentally wrong, a prospect that would completely undermine this rulemaking. Accordingly, a massive and focused whole-of-government initiative must come together very quickly to ensure the development of the necessary ZEV-truck infrastructures in time. [EPA-HQ-OAR-2022-0985-2668-A1, p. 46]

The current lack of the much-needed whole-of-government initiative already may be chilling investments in the development of necessary battery-recharging and hydrogen-refueling infrastructures. Without clarity about whether long-distance commercial vehicles will be BEVs or FCEVs, investors may be hesitant to commit capital to develop the infrastructure for one of the technologies. For example, clarity is needed regarding whether the required public stations will deliver electricity or hydrogen. Without a long-term technology path identified, investors may be sitting on the sidelines. Similarly, if hydrogen will be part of the solution, clarity is needed to identify whether it will be a compressed gas or cryogenic liquid. Until that hydrogen infrastructure direction is clear, more investors may stay on the sidelines. [EPA-HQ-OAR-2022-0985-2668-A1, p. 46]

Truck manufacturers are doing their part by developing all of the potential ZEV technologies: BEVs, compressed hydrogen-fueled FCEVs, cryogenic hydrogen-fueled FCEVs, compressed hydrogen-fueled H2-ICEs, and cryogenic hydrogen-fueled H2-ICEs. However, without adequate assurances that the appropriate infrastructures will be in place in time, fleets simply will not purchase any of those types of ZEVs. Thus, developing the necessary infrastructures represents the most complicated, most expensive, and longest lead-time challenge to transition the U.S.

trucking industry to ZEVs. Without an effective whole-of-government initiative focused on understanding, developing and ensuring those infrastructures, there may be little chance that the GHG Phase 3 rule will be successful. Consequently, clear links between the phase-in of the Phase 3 rule and the phase-in of the requisite infrastructure must be established, monitored, and acted on if misalignment among the respective phase-ins is detected. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 46 - 47]

In that regard, EMA recommends that EPA work with other agencies, departments and stakeholders to establish clear annual benchmarks for assessing progress in the deployment of the necessary ZEV-truck infrastructures. For example, using the data developed by ICCT, Ricardo, NREL and others, EPA could determine the top 100 counties across the country where the greatest numbers of ZEV-trucks will be deployed under the Phase 3 and ACT regulations by 2032. For each of those counties, benchmarking assessments could be made of the number of BEV-recharging and FCEV-refueling stations that will need to be installed on an annual basis to support the annually increasing deployment of the anticipated numbers of ZEV-trucks in each of those counties. Each year, evaluations could be made on a county-by-county basis to determine whether and how the actual pace of installation of ZEV-truck recharging/refueling stations is keeping up with the benchmark numbers of necessary recharging/refueling stations. If it is determined that the aggregate actual progress in infrastructure development is falling behind the benchmark rates of progress by, for example, 20% or more, the phase-in schedule of the Phase 3 standards could be deferred by one or more years as deemed appropriate by EPA, perhaps in consultation with other agencies and departments. [EPA-HQ-OAR-2022-0985-2668-A1, p. 47]

The foregoing is just an example of the type of direct linkage that needs to be made between the implementation of the Phase 3 rule and the implementation of the fundamentally necessary ZEV-truck infrastructure. Without that type of linkage, there is no real prospect for the proposed rule to stand. To the contrary, much like a one-legged stool, it will be preordained to collapse. [EPA-HQ-OAR-2022-0985-2668-A1, p. 47]

Organization: Truck Renting and Leasing Association (TRALA)

While Battery Electric Vehicle (BEV) charging infrastructure is expanding, much of it is not accessible or practical for commercial fleet use. Short-term rental fleets are highly transient and serve many small businesses that may not have access to ZEV charging and fueling infrastructure. Our members also report that many first-generation charging solutions are unreliable and need frequent repairs. Hydrogen fueling infrastructure is virtually non-existent given the laggard in the design and advancement of hydrogen fuel cell trucks. In addition, not all 50 states are created equal in terms of ZEV fueling infrastructure planning and assistance. Since trucks by nature are not bound to local, state, or international borders, ZEV vehicle travel – aside from hub-and-spoke operations – will be limited to the reach of the nation’s fueling infrastructure. [EPA-HQ-OAR-2022-0985-1577-A1, p. 4]

Return-to-Base Operations Without On-Site Charging Will be Placed in a Precarious Predicament

As previously noted, many TRALA members – and other trucking companies – will not have the luxury of on-site charging installation due to tenant improvement restrictions under their facility lease agreements. If depot charging is not an option, trucking companies will be required to use the public charging network or contract with entities that have surplus charging ports to utilize. However, both scenarios pose problems in that company assets would be required to be parked off-site for extended periods of time in potentially unsecured areas. [EPA-HQ-OAR-2022-0985-1577-A1, p. 6]

Contracting with entities to charge fleet equipment on their property raises several issues involving property access as well as insurance, security, and liability concerns. TRALA asks EPA to address these concerns in the final rule. A regulation is only as feasible as the ability to comply with the requirements. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 6-7]

TRALA requests EPA conduct annual reviews to ascertain whether charging infrastructure, power demands, and hydrogen fuel (when/if available), will satisfy the needs for all ZEVs in every state to meet trucking's charging and hydrogen needs. If the status of charging or hydrogen fueling infrastructure identifies significant gaps that would impede truck mobility in any state, EPA should not implement subsequent milestone year requirements until identified fueling gaps are operational in keeping pace with vehicle needs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 8]

Incentive Use Overestimates ZEV Market Penetration Rates for Trucks

The Bipartisan Infrastructure Law (BIL)25 included a total of $7.5 billion for EV chargers and other alternative fueling facilities. Five billion of that was assigned to the National Electric Vehicle Infrastructure (NEVI) Formula Program. Under the NEVI program, states can receive funding from the Federal Highway Administration (FHWA) for up to 80% of eligible project costs. NEVI requires charging stations receiving assistance be publicly available or available to commercial drivers from more than one company and be installed along designated FHWA Alternative Fuel Corridors (AFCs). [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

5 Infrastructure Investment and Jobs Act (P.L. 117-58).

The freight industry needs dedicated charging capabilities for both Medium-Duty (MD) and Heavy-Duty (HD) trucks near or within the properties of major warehouses, ports, rail yards, and industrial facilities. These sites can serve multiple companies through an agreement with the site operator but won't necessarily allow 'public' access. In comments filed on behalf of the trucking industry to FHWA on its National Electric Vehicle Infrastructure Formula Program Notice of Proposed Rulemaking (Federal Register, June 22, 2022), FHWA was asked to direct states to dedicate specific funding levels towards the build-out charging infrastructure for the trucking sector. [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

In its final rule, the FHWA addressed this request as follows:

'FHWA understands that the MD/HD charging industry is very nascent and rapidly evolving; as such, FHWA has not modified the language in this final rule to specifically accommodate MD/HD needs so as not to preempt the pace of the technological innovation. The rule does not preclude MD/HD charging infrastructure and FHWA strongly encourages project sponsors to consider future MD/HD needs. The FHWA will continue to monitor the technological advancements in the MD/HD industry for consideration as to whether further regulation is needed to provide applicable minimum standards and requirements at a future date.' 26 [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

26 Federal Register, Vol. 88, No. 39, Page 12731 (February 28, 2023).

Given the fact that truck charging infrastructure under NEVI was and remains an afterthought, TRALA is less optimistic than EPA in assuming the BIL will address the tremendous financial needs for powering truck ZEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

Organization: Valero Energy Corporation

C. EPA's consideration of HD ZEV infrastructure is inadequate and insufficient.

In order to evaluate HD ZEV infrastructure readiness, EPA relies on projections as evidence-in-fact to support the proposed rulemaking while ignoring the material conditions and limitations disclosed in EPA's own sources. By way of example, EPA states that "[i]n the United States, there was $200 million or more in mergers and acquisition activity in 2022 according to the capital market data provider Pitchbook, indicating strong interest in the future of the charging industry."161 But EPA's source material further provides as follows:

Yet charging companies face plenty of challenges. Even with funding, building EV-charging infrastructure remains extremely costly and time-consuming.

Because of these struggles, not every company will make it — some smaller companies are betting that larger ones will gobble them up and take on their assets through mergers and acquisitions. Global M&A activity in the charging space this year hit at least $900 million across 25 deals as of this week, according to PitchBook. That includes at least $200 million across seven deals in the US.

"For the smaller companies, it's hard to scale up on their own. They really need larger partners," Steve Hilfinger, a partner and senior business counselor with the law firm Foley & Lardner, said. "This is going to take a lot of capital." 162 [EPA-HQ-OAR-2022-0985-1566-A2, p. 33]

161 EPA's HD Phase 3 GHG Proposal at 25934 (citing to St. John, Alexa, and Nora Naughton. "Automakers need way more plug-in stations to make their EV plans work. That has sparked a buyer frenzy as big charging players gobble up smaller ones.'' Insider, November 24, 2022. Available online: https://www.businessinsider.com/evcharging-industry-merger-acquisition-meet-electricvehicle-demand-2022-1).

162 Id.

The above excerpt suggests that much of the mergers and acquisitions is related to smaller companies being absorbed by larger ones, not an overall growth in the marketplace for charging infrastructure. [EPA-HQ-OAR-2022-0985-1566-A2, p. 34]

EPA also states that "[r]ecent findings from Phadke et al. suggest that BEV TCO [total cost of ownership] could be 13 percent less than that of a comparable diesel ICE vehicle if electricity pricing is optimized."163 But the Phadke article also cautions that "major barriers need to be addressed to fully realize [the] potential" of electric trucks.164 These include "[e]lectricity prices, especially demand charges" as well as "higher cost of new [electric HD] vehicles and slow return on charging infrastructure".165 [EPA-HQ-OAR-2022-0985-1566-A2, p. 34]

163 EPA's HD Phase 3 GHG Proposal at 25942 (emphasis added).

164 Phadke, A., et. al. (2021) ''Why Regional and Long-Haul Trucks are Primed for Electrification Now''. https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf

165 Id. at 6.

Additionally, per EPA, "[t]he Rocky Mountain Institute found that because of the [Inflation Reduction Act] IRA, the TCO of electric trucks will be lower than the TCO of comparable diesel trucks about five years faster than without the IRA".166 The Rocky Mountain Institute, however, also provides that:

"[E]-truck manufacturers will have to ramp up production by a factor of 20 by 2035 while meeting new North American final assembly requirements, both of which will be challenging. Utilities and regulators will have to prepare for an unprecedented amount new electric load that can range from as large as a skyscraper to greater than a central business district. By 2035 our grid must be prepared to add 230 TWh of new truck electricity demand, including power for nearly 150,000 fast public chargers and 860,000 depot chargers."167 [EPA-HQ-OAR-2022-0985-1566-A2, p. 34]

166 EPA's HD Phase 3 GHG Proposal at 25942.

167 Kahn, Ari, et. al. ''The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking''. Rocky Mountain Institute. August 25, 2022. https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

EPA also cites to an article detailing DC Metro's plans to shift to a ZEV bus fleets over the next 20 years.168 Yet EPA ignores comments made by a federal representative on DC Metro's Board in the same article:

"[V]ehicle procurements, [are] easy to understand, but it's much less sexy to talk about the infrastructure and what needs to happen behind the scenes…[W]ithout the infrastructure for charging, Metro would have vehicles on their hands that they couldn't run." He cited concerns about load capacity during a hot summer day trying to charge dozens of buses while everyone is also running air conditioners in their homes. "A Metro garage would need 9 megawatts of high-capacity electric connection to support 150 buses in a garage — and so far no garage has that. That amount of electricity is the equivalent needed to power 6,000 homes." [Further,] "Metro would also have to retrain a maintenance workforce to work on electric buses. 'The goals are certainly something we need to establish, but we need to figure out how we're going to execute them,' he said.169 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 34 - 35]

168 EPA's HD Phase 3 GHG Proposal at 25943.

169 Pascale, Jordan. "Metro Approves Plans For Fully Electric Bus Fleet By 2045". DCist. June 10, 2021. https://dcist.com/story/21/06/10/metro-goal-entirely-electric-bus-fleet-2045/

EPA argues that ZEV obstacles can be overcome through "federal incentive programs like those in the BIL and IRA to offset ZEV purchase costs, as well as state and local incentives and investments…with improvements in BEV and FCEV component costs playing an increasing role in reducing costs in the longer term."170 But EPA ignores factors outside the control of regulators and OEMs alike that will be material to the feasibility of EPA's proposal and are highlighted in one of the very sources EPA cites to in support of its assertion.171 EPA glosses over and obfuscates these obstacles in FN 148, stating "[o]ther barriers that fleet managers prioritized for fleet electrification included: [i]nadequate charging infrastructure—our facilities, inadequate product availability, inadequate charging infrastructure—public" etc.172 Indeed, the American Council for an Energy-Efficient Economy White Paper that EPA cites to discusses challenges facing electric truck deployment in-depth, including model availability, greater upfront cost, range, charging, and other challenges. Yet these discussions are absent from EPA's analysis, including the white paper's proposition that "in some cases, EVs may not be the solution."173 Further, the White Paper provides:

"Existing infrastructure at these sites may not be capable of serving such [fleet] loads. Meeting this demand could require upgrades to or the build-out of new infrastructure, often at considerable cost. For example, a Southern California facility had to install a $470,000 transformer after the meter to meet the demand of deploying 20 electric trucks. Installing several chargers at a depot, truck stop, or filling station involves many players to obtain permits, undertake construction, and work with the utility to ensure that adequate power is available when and where needed."174 [EPA-HQ-OAR-2022-0985-1566-A2, p. 35]

170 EPA's HD Phase 3 GHG Proposal at 25943.

171 See id.

172 Id.

173 Nadel, S. and Junga, E. (2020) "Electrifying Trucks: From Delivery Vans to Buses to 18-Wheelers". American Council for an Energy-Efficient Economy White Paper. https://www.aceee.org/white-paper/electrifying-trucks-delivery-vans-buses-18

174 Id. at 27 (internal citations omitted).

Collectively, these issues illustrate the neglected assumptions underpinning EPA's central trajectory for HD ZEV sales and supporting infrastructure. These issues are central to EPA's proposal and make EPA's proposal unreasonable, arbitrary and contrary to law. [EPA-HQ-OAR-2022-0985-1566-A2, p. 35]

Organization: Volvo Group

Infrastructure Implications

Because of these complications customers have been reluctant to take truck deliveries, leading to extension requests for many of our Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) vouchers in California. While supply chain challenges have contributed to some delivery delays, 70% of the extension requests are due to problems with infrastructure projects and site planning. [EPA-HQ-OAR-2022-0985-1606-A1, p. 8]

Commercial vehicle owners engaged in freight hauling for profit are very different from passenger car owners. Uptime is critical to maximize miles traveled and minimize Total Cost of Ownership (TCO). Commercial trucks are capital assets that customers buy or lease to do a certain job and provide a return on investment. Fleet owners need flexibility in their operations and stability in the availability and cost of electricity to keep their customers satisfied. Fleets can face significant variability in the cost of charging based on the season and the time of day, not to mention the threat of complete unavailability in the case of extreme weather or blackouts. This complicates the ZEV transition experience for fleets, impacting dealership business, and negatively affecting sales. [EPA-HQ-OAR-2022-0985-1606-A1, p. 8-9]

Organization: Zero Emission Transportation Association (ZETA)

d. HDEV Charging Infrastructure

A commonly cited barrier to HDEV adoption is the lack of available charging infrastructure. It is important to note that charging needs for fleet-owned HDEVs can be much different than consumer-owned LMDEVs. HDEVs tend to have higher capacity batteries requiring faster charging rates or longer charge times, or a combination of both. While most electric HD fleet vehicles have shorter, scheduled routes and can rely primarily on depot charging overnight, some fleets may require on-route charging to supplement longer trips. While a public HDEV charging network is still in the early stages of deployment, electric vehicle supply equipment (EVSE) manufacturers and operators are already investing the necessary resources to ensure multiple methods of charging are available and reliable for the 2027-2032 model years affected by these emissions standards. [EPA-HQ-OAR-2022-0985-2429-A1, p. 47]

75% of fleet owners surveyed cite concerns about the cost of installing HDEV-specific charging as one of the greatest barriers to adoption.143 Indeed, an ultra-fast charger capable of 350kW can cost up to $140,000.144 However, the amount of power needed is not the same across all classes of vehicles and smart charging software can optimize power distribution among vehicles according to their charging capabilities and needs. To ensure upfront capital is spent on the appropriate equipment, installation projects will benefit from a customized analysis of a fleet's charging needs based on fleet size and type, average VMT, duty cycles, and time of charging. While the investment in charging infrastructure will be returned via lower lifetime operating costs associated with EV ownership, the upfront investment presents a real but surmountable barrier. [EPA-HQ-OAR-2022-0985-2429-A1, p. 47]

143 Id. at Page 10

144 Michael Nicholas, "Estimating Electric Vehicle Charging Infrastructure Costs across Major U.S. Metropolitan Areas," The International Council on Clean Transportation (August 2019) https://theicct.org/sites/default/files/publications/ICCT_EV_Charging_Cost_20190813.pdf

As discussed previously, the need for increased HDEV charging also creates significant economic opportunities. The charging infrastructure necessary to accommodate the transition to an electrified HD fleet has the potential to create more than 29,000 jobs.145 Considering the Bipartisan Infrastructure Law's Buy America Build America requirements for light-duty charging infrastructure under the NEVI Formula Program146 and CFI Discretionary Grant Program,147 it is reasonable to expect that many of the high-quality jobs in HD EVSE manufacturing will be domestic as manufacturers build increasingly robust domestic supply chains. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 47 - 48]

145 The Commanding Heights of Global Transportation - Quantifying the Employment Effects (March 2021) https://safe2020.wpenginepowered.com/wp-content/uploads/2021/03/The-Commanding-Heights-Of-Global-Transportation-Quantifying-The-Employment-Effects.pdf

146 National Electric Vehicle Infrastructure Formula Program, US Department of Transportation, accessed May 12, 2023. https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi_formula_program.cfm

147 Charging and Fueling Infrastructure Discretionary Grant Program, US Department of Transportation, accessed May 12, 2023. https://www.fhwa.dot.gov/environment/cfi/

While the buildout of HDEV charging infrastructure is still in the nascent stages, so too is HDEV deployment. It is also important to remember that just as HDEV deployment will not occur all at once, neither will HD EVSE deployment. Initial strategic buildout of depot-based charging in high-priority areas will help ensure EVSE manufacturing capacity can scale while continuing to support a more rapid HDEV transition. This is already under way at certain locations148, 149 and HD EVSE product offerings are increasing rapidly.150,151,152 [EPA-HQ-OAR-2022-0985-2429-A1, p. 48]

148 “Electric Island: First US Charging Station for Electric Semis is Ready for Megawatt Fast-Charging,” Green Car Reports, (April 22, 2021) accessed May 24, 2023 https://www.greencarreports.com/news/1132019_first-charging-station-electric-semis-megawatt-fast-charging

149 “WattEV breaks ground on nation’s first electric truck stop charging station in Bakersfield,” KGET.com, (December 17, 2023) accessed May 24, 2023 https://www.kget.com/news/business/wattev-breaks-ground-on-nations-first-electric-truck-stop-charging-station-in-bakersfield/

150 “Siemens Unveils Fast and Flexible Charging Solution for Electric Buses, Trucks, and Heavy-Duty Vehicles at ACT Expo,” Siemens e-Mobility, (August 31, 2021) accessed June 8, 2023 https://www.siemens.com/us/en/company/press/press-releases/smart-infrastructure/siemens-launches-sicharge-uc-inthe-united-states.html

151 “ChargePoint Express Plus,” Chargepoint, accessed June 8, 2023 https://www.chargepoint.com/fleet/stations/express-plus

152 “EVgo Fleet Charging Solutions,” EVgo, accessed June 8, 2023 https://www.evgo.com/charging-solutions/evgo-fleet-solutions/

i. EVSE operator statements on EPA emissions standards

As discussed previously, EPA’s proposed rule setting GHG emissions standards for heavy-duty vehicles provides much needed certainty throughout the supply chain, including EVSE manufacturers and operators. A clearer picture of future EVSE demand enables manufacturers and operators to plan and allocate capital accordingly. The statements mentioned below by ZETA’s EVSE manufacturers and operators in response to EPA’s announcement of these standards indicate as much:

- “EVgo applauds the EPA for proposing ambitious tailpipe emissions standards. These standards would accelerate the transition to electric vehicles and result in cleaner air, healthier communities, and create jobs across the country. More EVs demands more EV charging and we will continue to expand our fast charging network to provide the infrastructure to support the growing EV market.”153
- “ChargePoint is pleased to see USEPA’s tailpipe emission proposal, which will shift the electric mobility revolution into high gear. These rules will undoubtedly lead to more investment in heavy-duty EVs. We are actively building a national network of charging infrastructure to support the increased adoption of EVs, including heavy-duty vehicles, and deploying the hardware and software needed to effectively support heavy-duty vehicle charging in depots. Over our 15 year history, we have ensured charging infrastructure deployment kept pace with EV adoption, and we are well-positioned to meet the increased demand these standards will generate.”154 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 48 - 49]

153 EVgo on LinkedIn, accessed May 10, 2023 https://www.linkedin.com/posts/evgo_biden-administration-proposes-toughest-auto-activity-7054487813681025024-gCc0/?utm_source=share&utm_medium=member_android

154 Chargepoint on LinkedIn, accessed June 14, 2023 https://www.linkedin.com/posts/chargepoint_epa-proposes-ground-breaking-new-vehicle-activity-7074468492602667008-0G5F/

ii. Depot-based applications will satisfy the majority of HDEV charging needs

As studied by the International Council on Clean Transportation, the majority of class 4-8 HDEV charging will occur at depots, with the exception of single unit long-haul trucks.155 Depot charging is ideal for minimizing cost and maximizing battery health, whereas on-route charging prioritizes convenience. [EPA-HQ-OAR-2022-0985-2429-A1, p. 49]

155 Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States, International Council on Clean Transportation, (May 2023) https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf

Depot charging stations are structures where charging infrastructure is co-located with off-duty HDEV storage facilities. Often located at warehouses, logistic hubs, or public stations in industrial areas, fleet owners and operators typically own the charging infrastructure and can use it for overnight charging of vehicles.156 Deploying this method saves fleet operators money: they install the chargers at a pre-existing facility, charge their vehicles during scheduled downtime (which means they do not have to stop during typical hours spent on the road), and pay less for the electricity that they use (per-mile public charging rates are often higher).157 [EPA-HQ-OAR-2022-0985-2429-A1, p. 49]

156 Alana Aamodt, Karlynn Cory, & Kamyria Coney, “Electrifying Transit: A Guidebook for Implementing Battery Electric Buses,” National Renewable Energy Laboratory (April 2021) https://www.nrel.gov/docs/fy21osti/76932.pdf

157 Charles Satterfield and Nick Nigro, “Assessing Financial Barriers to Adoption of Electric Trucks,” Atlas Public Policy (February 2020) http://atlaspolicy.com/wp-content/uploads/2020/02/Assessing-Financial-Barriers-to-Adoption-of-Electric-Trucks.pdf

Given its centralized nature, depot charging is also well-suited for electricity load management. Depots can allow for easier coordination with grid operators to distribute charging activity to off-peak load times and facilitate tracking up-time fleet charging metrics. In an analysis conducted by Atlas Public Policy, more than 98% of cost-competitive scenarios for HDEV fleets included depot charging.158 [EPA-HQ-OAR-2022-0985-2429-A1, p. 49]

158 Id.

Companies may also look into bulk charging negotiations through purchase agreements. Fleets that traditionally run short-haul delivery operations may be attuned to applied charging strategies to flatten the load profile and save money through off-peak charging incentives. Further opportunities for cost-savings may overlap with retail energy designs and could align charging with cheaper renewable energy sources.159 [EPA-HQ-OAR-2022-0985-2429-A1, p. 50]

159 Brennan Borlaug, et al. “Heavy-duty truck electrification and the impacts of depot charging on electricity distribution systems,” Natural Energy (June 21, 2021) https://doi.org/10.1038/s41560-021-00855-0

iii. Ensuring strategic HD EVSE buildout

While depot charging will be suitable for most HDEV applications, a national highway freight network (NHFN) will be necessary to ensure adequate charging access for long-haul trucking applications. A typical highway site will eventually need more than 20 fast-chargers to serve expected traffic.160 [EPA-HQ-OAR-2022-0985-2429-A1, p. 50]

160 “Electric Highways: Accelerating and Optimizing Fast-Charging Deployment for Carbon-Free Transportation,” National Grid, (November 2022) https://www.nationalgrid.com/document/148616/download

Setting targets for charging station deployment along key NHFN corridors can accommodate up to 85% of long-haul charging needs by 2030.161 As discussed in ICCT’s May 2023 white paper on MHDV infrastructure deployment, 844 charging stations will be needed along the Federal Highway Administration’s Alternative Fuel Corridors to accommodate 50-mile spacing intervals between chargers along the entire length of the NHFN.162 [EPA-HQ-OAR-2022-0985-2429-A1, p. 50]

161 Id. at Page 45

162 Id. at Page 45

Under federal regulations, the number of hours drivers can travel per day is limited, with drivers required to take a 30-minute break within an eight-hour driving period and restricting drivers to a limit of 11 hours of driving per day, after which they are required a 10-hour rest break.163 During these mandatory rest times, drivers may be able to charge at individual stations or charging depots. [EPA-HQ-OAR-2022-0985-2429-A1, p. 50]

163 Id. at Page 8

Work is already underway to install HD EVSE at high-traffic freight locations,164,165 and NREL is working to electrify four key freight corridors across the United States:166

- In collaboration with CALSTART, NREL researchers will launch an intensive planning effort to develop infrastructure deployment plans for zero-emission medium- and heavy-duty vehicles along the I-95 freight corridor, which stretches from Savannah, Georgia, to Newark, New Jersey.
- Led by a Cummins Inc. team, NREL researchers will help develop extensive plans for battery-electric charging and hydrogen fueling stations along the stretch of I-80 that crosses Illinois, Indiana, and Ohio.
- In collaboration with a Utah State University team, NREL researchers will assist in developing a community-, state-, and industry-supported action plan for corridor electrification along Utah’s Wasatch Front.
- Led by a National Grid team, NREL researchers will help create a detailed model of truck operations along New England’s freight corridors and then use that data to simulate future electric truck operations, ideal charging locations, and the amount of energy those charging stations will use. The project will examine freight corridors in Maine, Massachusetts, New Hampshire, Vermont, Rhode Island, Connecticut, New York, Pennsylvania, and New Jersey, with a goal of informing a blueprint for future commercial EV charging. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 50 - 51]

164 California installs first battery charger for heavy trucks, (March 28, 2023), accessed May 12, 2023 https://www.ccjdigital.com/alternative-power/battery-electric/article/15380695/california-installs-first-battery-charger-for-heavy-trucks

165 “EV Charging Hub in Riverside Will Power 40 Sysco Trucks,” The Press Enterprise, (April 20, 2023) accessed May 17, 2023 https://www.pressenterprise.com/2023/04/20/sysco-building-a-massive-ev-charging-hub-for-its-fleet-trucks-in-riverside/

166 NREL Tapped To Help Electrify 4 Major Freight Corridors, (April 18, 2023), accessed May 12, 2023 https://www.nrel.gov/news/program/2023/nrel-tapped-to-help-electrify-4-major-freight-corridors.html

Despite both the public and private sector investments to build out HDEV charging capacity, more support will be needed in the coming years to ensure the expected growth of HDEVs is complemented with adequate charging infrastructure. Policies such as EPA's proposed GHG emissions standards for heavy-duty vehicles provide the regulatory certainty needed to support those investments by creating more clarity on expected HD EVSE demand. The lead time provided by the standards' MY 2027-2032 time frame also aids in ensuring HDEV charging infrastructure manufacturers and operators can make the investments necessary today to meet anticipated charging needs of tomorrow. [EPA-HQ-OAR-2022-0985-2429-A1, p. 51]

EPA Summary and Response:

Summary:

Vehicle manufacturers and others raised concerns about the lack of charging infrastructure, asserting that it is inadequate today and that the pace of deployment is not on track to meet levels needed if the standards are finalized. Commenters cited a variety of recent studies that estimate future heavy-duty infrastructure needs. For example, EMA cited a Ricardo study (submitted as Exhibit 1 of EMA's comments), which found that by 2032 about 1.5 million EVSE ports would be needed to support the approximately 1.5 million BEVs it estimates will be on the road if the proposed standards are finalized (along with CARB's ACT program and its adoption by Section 177 states). EMA notes this is equivalent to over 15,000 new ports deployed each month over the next 8 years, which it characterizes as infeasible. Multiple commenters (e.g., EMA, NADA) cited a recent ICCT paper (Ragon et al. 2023), which found a mix of over 550,000 chargers serving medium- and heavy-duty vehicles would be needed in 2030. EMA also highlighted ICCT's modeling of long-haul BEV charging needs in 2030, noting that high-power public charging stations would be needed on the National Highway Freight Network (National Highway Freight Network) at 50-mile intervals and that the stations would need to have high charging capacities that may necessitate some grid upgrades.

Some commenters highlighted what they claim are the high cost of future infrastructure needs estimated in the literature, asserting that current funding streams for heavy-duty charging are far short of what will be needed. For example, citing the same Ricardo study noted above, EMA said, "The aggregate cost to construct the necessary number of MHD BEV charging ports under EPA's NPRM will be approximately $21 billion. By way of comparison, the directly available federal funding for the installation of MHD BEV charging ports is approximately $1 billion." NADA referenced a 2022 EEI report that examined 2030 charging infrastructure needs (focused on LD vehicles) and found that the amount of DCFC ports from planned investments will be under half of those estimated as needed in the study. NADA further noted that the study failed to account for charging demand associated with EPA's proposed rulemakings for light-, medium, and heavy-duty vehicles, implying the actual gap between investments and needs would be even higher. Navistar noted that in the NPRM, EPA cited an ATLAS study, which estimated that between $100 and $166 billion in cumulative investments in charging infrastructure would be needed by 2030 to support HD BEVs. Am Free et al. referenced the same study, to support its conclusion that a public charging network of sufficient scope cannot be completed within the timeframe of a Phase 3 rule.

Multiple commenters (e.g., AmFree et al., ATA, CFDC et al., EMA, and NACS, NATSO, and SIGMA) emphasized the different charging needs of heavy-duty vehicles relative to light-duty vehicles, for example that HD vehicles may need higher power DCFC ports and that charging sites must be designed to accommodate larger vehicles and be located to meet freight needs. Several commenters noted that very few public charging stations that can accommodate heavy-duty vehicles are available today. UAW made a similar point about private stations, citing a recent DOE report that listed 166 private EVSE ports serving HD fleet vehicles. In its comments, CFDC et al. described reliability as an additional barrier to infrastructure availability citing a recent news article about work by J.D. Power on non-functioning public stations and consumer dissatisfaction. A variety of commenters (e.g., AmFree et al., AVE, EMA, Navistar, and UAW) asserted that either fleets will not buy, or customers will cancel orders for, BEVs if infrastructure is not available.

Several commenters asserted the EPA overestimated the impact of BIL and IRA investments. For example, while Navistar noted the importance of these laws to support infrastructure, it stated that so far funding has had a light-duty focus. Other commenters had a similar concern, noting the lack of requirement that any of the $7.5 billion in dedicated infrastructure funding in BIL be used for heavy-duty charging, with AmFree et al. also noting that even if it were, the total would still be insufficient. TRALA commented that FHWA had failed to provide specific guidance to States to dedicate some of the funding received through the National Electric Vehicle Infrastructure (NEVI) program to heavy-duty infrastructure. ATA wrote that it's not aware of states using NEVI funds for heavy-duty charging though it did note that CA, OR, and WA applied for a competitive grant to support heavy-duty charging buildout on I-5. Appendix B to the DTNA comments summarizes each State's infrastructure plan submitted to FHWA for 2022–2023, noting that few had specific commitments regarding using BIL funds for HD BEV infrastructure, and that some failed to mention HD BEV infrastructure.

AVE cited an EDF study noting that small fleets may have a particular difficulty absorbing the cost of charging infrastructure without support, and separately stated, "the IRA does not provide fleet owners with any incentives to install charging stations." AmFree et al. said EPA overstates the potential benefit of the IRA tax credit, given that it is capped at $100,000, far less than the cost of a large-scale charging site intended to serve many vehicles. TRALA noted that many of their customers may not be eligible for IRA tax credit due to census tract restrictions and other requirements (see RTC Chapter 6.3.2).

In its comments, AmFree et al. stated that the private investments cited in the NPRM are uncertain as it's unclear how many announced stations will actually be built. The commenter also noted that private investment amounts are small compared to the amount needed.

DTNA expressed concern that infrastructure availability is largely out of the control of manufacturers but will be critical to complying with proposed standards if finalized. Manufacturers (DTNA, EMA, PACCAR, Navistar) along with NADA, and UAW all requested that EPA monitor infrastructure deployment after the final rulemaking and adjust the stringency or timeline of the standards if it is not keeping pace with needs. EMA suggested that EPA develop annual infrastructure benchmarks in collaboration with other agencies and stakeholders. DTNA recommended that EPA directly incorporate a scalar reflecting installed infrastructure compared to infrastructure needs in its estimates of CO_2 stringency levels whereas Navistar suggested that EPA extend the compliance determination for 2027 standards if sufficient infrastructure is not available.

Several commenters pointed to other regulations as positive examples of how EPA could address infrastructure availability concerns. For example, MEMA noted that EU's "Alternative Fuel Infrastructure Regulation" requires member states to deploy public heavy-duty charging stations at designated intervals along a specified transit network. UAW pointed to provisions in CARB's Advanced Clean Fleet program that allows compliance extensions for fleets if infrastructure is delayed.

We also received comments from non-governmental organizations electrification groups, electric vehicle manufacturers, States and utilities (e.g., CARB, CALSTART, Colorado Department of Transportation et al., Con Edison, DTNA, EEI, Electrification Coalition, Energy Innovation, the EDF, EPN, ICCT, MFN et al., State of California et al., Tesla, and ZETA) highlighting the many public and private investments and plans in charging infrastructure that have been announced or are underway. The Clean Air Task Force (CATF) et al. and Moving Forward Network et al. said that almost $30 billion specifically for medium-and heavy-duty charging infrastructure has been committed according to Atlas Public Policy, noting that actual totals could be higher in light of recent announcements, and given that private depot charging investments may not be fully captured. Some commenters (e.g., ICCT, and CALSTART as shown in RTC Chapter 6.2) also flagged innovative charging solutions such as charging-as-a-service and mobile charging that can help meet the needs of fleets that experience delays installing EVSE or for which there are other barriers to depot charging.

Citing their own recent studies, CALSTART and ICCT noted that public charging needs will be geographically concentrated in early years, allowing for a phased approach for public infrastructure deployment starting with areas likely to have the most initial demand. The Clean Air Task Force et al. also noted that infrastructure could phase in gradually over time, pointing to estimates in EPA's NPRM analysis that ZEVs may represent only one percent of the entire on-road HD fleet in 2027 and eight percent in 2032 if the proposal is finalized, and still less than 25 percent in 2040.

Some commenters noted that EPA finalizing stringent standards would provide certainty to manufacturers, EVSE providers and others and spur further investments in charging infrastructure. For example, the Clean Air Task Force et al. addressed the 'chicken-and-egg conundrum' (i.e., that EVSE providers will not build out infrastructure without having assurance of demand, but vehicle purchasers will not buy without initial assurance of adequate supporting charging infrastructure) saying EPA should not wait on finalizing standards. CATF et al. cited historical precedent in other areas (e.g., E85 stations to support flex-fuel vehicles) and economic theory to support the point that sufficient charging infrastructure will be built to meet demand. Several commenters—EDF and NACAA– explicitly recommended that EPA reject any "off-ramps" to the stringency of the rule based on infrastructure availability.

Response:

EPA agrees that expanding charging infrastructure is important for enabling greater BEV adoption. How much infrastructure will be needed in future years will depend on a number of factors, including not just the number and distribution of BEVs on the road, but also vehicles' duty cycles and daily energy needs, as well as the charging preferences and behaviors of owners.

Indeed, the significant differences in estimates for how many EVSE ports will be needed to support HD vehicles among the studies highlighted by commenters underscores this point. As discussed in RIA Chapter 2.6 and RTC 6.3.1, we project that the majority of BEVs in the modeled potential compliance pathway for the final rule will charge at depots. However, we have updated our final rulemaking analysis to account for the public charging needs for certain vehicle types, such as long-haul trucks, starting in MY 2030. We discuss infrastructure needs for depot and public charging below.

As discussed in RIA Chapter 2.10.3, EPA estimates that about 520,000 EVSE ports will be needed at depots to support MY2027–MY2032 depot-charged BEVs. This is similar to estimates of depot or overnight charging needs from several studies highlighted by commenters. For example, the ICCT study (Ragon et al. 2023)[398] estimated that 522,000 EVSE ports could meet overnight charging needs of Class 4 to 8 BEVs in 2030 (along with about 38,0000 ports for opportunity charging)[399] while the ATLAS study (McKenzie et al. 2021)[400] estimated that between 470,000 and 564,000 EVSE ports would be needed at depots in the same timeframe (along with significant on-road charging infrastructure). A CRC study[401] published after the close of the comment period estimated that 432,000 EVSE ports would be needed at depots to support medium- and heavy-duty BEVs in 2030, growing to just over 700,000 depot ports in 2032 (along with 46,000 and 92,000 public charging ports, respectively). It is important to note that the scope of these studies, including the years covered and number and types of battery electric vehicles, varies significantly. However, the assumed number of BEVs—one of the biggest factors driving charging needs—for the estimates shown in these studies was generally at least as high or higher[402] than the number of BEVs underlying our estimates of the number of EVSE ports needed at depots (see RIA Chapter 1.6 for more information on these studies.)

The Ricardo study (Kuhn et al. 2023)[403] submitted with EMA's comment estimated that about 1.5 million depot ports would be needed through 2032, almost three times higher than EPA's estimate. There are several reasons for this difference.[404] The largest is that Kuhn et al. projected significantly more depot-charged BEVs (about 1.5 million) by 2032 compared to the approximately 630,000 depot-charged BEVs in EPA's FRM analysis. Part of this difference is

[398] Ragon, Pierre-Louis et al. "Near-term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States." May 2023. Available online: https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf.

[399] For this discussion, we present ICCT's estimates of overnight and opportunity chargers. However, ICCT notes some opportunity charging may take place at depots while overnight charging for long-haul vehicles is expected at public charging stations.

[400] McKenzie, Lucy, James Di Filippo, Josh Rosenberg, and Nick Nigro. "U.S. Vehicle Electrification Infrastructure Assessment: Medium- and Heavy-Duty Truck Charging." Atlas Public Policy. Available online: https://atlaspolicy.com/wp-content/uploads/2021/11/2021-11-12_Atlas_US_Electrification_Infrastructure_Assessment_MD-HD-trucks.pdf.

[401] Coordinating Research Council. "Assess the Battery-Recharging and Hydrogen-Refueling Infrastructure Needs, Costs and Timelines Required to Support Regulatory Requirements for Light-, Medium-, and Heavy-Duty Zero-Emission Vehicles." Prepared by ICF. September 2023. Available online: https://crcao.org/wp-content/uploads/2023/09/CRC_Infrastructure_Assessment_Report_ICF_09282023_Final-Report.pdf.

[402] The number of 2030 BEVs in the Atlas study was estimated from a graph on p.13 of McKenzie et al. 2021.

[403] Kuhn, Mark et. al. "Feasibility study of EPA NPRM Phase 3 GHG standards for Medium Heavy-Duty Vehicles, Prepared for: Truck and Engine Manufacturers Associations." Ricardo. June 16, 2023. (Submitted with "Comments of the Truck and Engine Manufacturers Association." June 16, 2023.)

[404] We summarize a few key differences, but it is not intended to be a comprehensive list.

that EPA's estimates are for BEVs sold in MY 2027 to MY 2032 only while the Ricardo study also includes estimates for BEVs in 2022 to 2026, though BEVs in these earlier years are a small share (under 10%) of the estimated 2032 on-road fleet. For 2027 and later, Kuhn et al. cites EPA's estimated ZEV sales from the NPRM. However, as discussed in RIA Chapter 2.2.3, the number of Class 2b-3 vehicles included in the NPRM version of HD TRUCS was much higher than the number anticipated to be engine certified and within the scope of this rulemaking. Chassis certified Class 2b-3 vehicles are included in the LMDV rulemaking. We project that these Class 2b-3 vehicles have the greatest BEV adoption rates among vehicles within the scope of this rulemaking and consequently contribute significantly to the total count of depot EVSE ports in the NPRM. This has been updated for the FRM. Additionally, EPA made updates in the final rule analysis that directly impacted EVSE needs. As discussed in RIA Chapter 2.6 and RTC 6.3.1, we have updated our analysis to model some long-range day cab tractors as relying on public charging instead of depot charging starting in MY 2030, which reduces the overall number of depot EVSE ports needed.[405] We also adjusted other assumptions related to dwell times and how many vehicles can share a port, for example, in response to comments and updated information (see RIA Chapter 2.6). For these reasons, we do not think the estimates of EVSE ports that will need to be deployed each year over the next 8 years cited by EMA based on Ricardo's study are an appropriate reflection of the final rule.

As seen in comments, and discussed in RIA Chapter 1.6, estimates of future public charging needs for HD BEVs also vary among studies. We did not directly estimate the number of public EVSE ports that would be needed to support the BEVs that we project to use public charging in our FRM analysis, but rather assumed (in agreement with some commenters, as noted in RTC 6.3.1) that hardware and installation costs for public charging infrastructure would typically be passed onto BEV owners through the charging price. As such, we expect that public EVSE stations will be built to meet demand, though we projected public charging in our FRM analysis to begin with MY 2030 in order to allow several additional years for it to develop (see discussion of lead time in RTC 7 (Distribution). We agree with commenters who said that finalizing strong standards will itself spur investments in charging infrastructure to meet the coming demand—both by fleet owners installing EVSE at depots and by OEMs, utilities, EVSE providers, and others installing public charging stations. As noted in many of the public comments, such an effect is well supported in the literature. See e.g., Comments of Clean Air Task Force at pp. 46-47 and n.189; and Comments of CARB (summarized in RTC Chapter 2.4).

We agree with ICCT and CALSTART that public charging infrastructure can be phased in over time, starting with geographic areas that are likely to have the most BEV demand, and we agree with ICCT that freight corridors are likely candidates within the standard's timeframe. As EMA noted, ICCT's study (Ragon et al. 2023)[406] projects that as much as 85% of the charging needs for long-haul BEVs could be covered by building stations every 50 miles along the National Highway Freight Network (NHFN) for a total of just 844 stations. In a supplemental

[405] We also model sleeper cabs and coach buses as using public charging, but they were not modeled as using depot charging in the NPRM and thus would not have contributed to the depot EVSE port count in the Ricardo study.
[406] Ragon, Pierre-Louis et al. "Near-term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States." May 2023. Available online: https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf.

analysis submitted to EPA[407] that assumed 100-mile intervals between stations, ICCT estimated that only between 100 and 210 electrified truck stops on priority corridors may be needed by 2030. See RTC 7 (Distribution) for a discussion on estimating increased demand on the grid in certain high freight corridors.

While dedicated HD charging infrastructure may be limited today, we expect it to expand significantly over the next decade. We appreciate the many comments we received highlighting already announced plans and commitments for both depot and public infrastructure and we have updated our summaries of public and private infrastructure investments in RIA Chapters 1.3 and 1.6, respectively. As commenters noted, Atlas Public Policy estimates that about $30 billion in public and private investments has been committed specifically for charging infrastructure for medium- and heavy-duty BEVs.[408] The U.S. government is making large investments in charging infrastructure through the BIL and the IRA. This includes extending and modifying a tax credit (I.R.C. §30C) that could cover up to 30 percent of the costs for procuring and installing charging infrastructure (subject to a $100,000 per item cap) in eligible census tracts, reducing costs for both HD depot and HD public charging. We acknowledge the point made by TRALA that not all fleets will be able to use or maximize the tax credit due to eligibility restrictions including limitations to certain census tracts. However, a map developed by Argonne National Laboratory shows that eligible census tracts cover a large majority of the U.S.[409] In addition, DOE conducted an analysis to assess the average value of this tax credit for charging equipment that supports heavy-duty BEVs. It estimated that approximately 60 percent of depots and 90 percent of public EVSE may be located in qualifying census tracts.[410] (See RIA Chapter 2.6.2.1.2 for a discussion of DOE's analysis and how we accounted for the tax credit in our analysis of depot EVSE costs.)

In addition, there are billions of dollars in funding programs that could support HD charging infrastructure either on its own or alongside the purchase of a HD BEV. As discussed in RIA Chapter 1.3, this includes dedicated HD programs like the EPA-administered Clean School Bus program, Clean Heavy-Duty Vehicle and Clean Ports programs, and DOT-administered Low or No Emission Vehicle program. It also includes programs for which LD and HD charging are eligible investments such as the NEVI and Charging and Fueling Infrastructure (CFI) programs established under the BIL. In the first awards issued under CFI, there were at least five programs that will explicitly support HD BEV charging, as indicated in Table 1.[411] It is possible that other CFI projects along designated Alternative Fuel Corridors may also have stations that accommodate larger vehicles.

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[407] ICCT. "Supplemental comments of the International Council on Clean Transportation on the EPA Phase 3 GHG Proposal." January 3, 2023.

[408] Lepre, Nicole. "Estimated $30 Billion Committed to Medium- and Heavy-Duty Charging Infrastructure in the United States." Atlas Public Policy. EV Hub. January 26, 2024. Available online: https://www.atlasevhub.com/data_story/estimated-30-billion-committed-to-medium-and-heavy-duty-charging-infrastructure-in-the-united-states/.

[409] U.S. Department of Energy, Argonne National Laboratory, "30C Tax Credit Eligibility Locator." Available online: https://experience.arcgis.com/experience/3f67d5e82dc64d1589714d5499196d4f/page/Page/.

[410] U.S. Department of Energy. "Estimating Federal Tax Incentives for Heavy Duty Electric Vehicle Infrastructure and for Acquiring Electric Vehicles Weighing Less Than 14,000 Pounds." March 11, 2024.

[411] U.S. Department of Transportation, Federal Highway Administration. "Charging and Fueling Infrastructure Program Grant Recipients: FY 2022 and 2023 Grant Award Recipients." Available online: https://www.fhwa.dot.gov/environment/cfi/grant_recipients/.

Table 6-1 CFI Grant Awards for EV Charging Corridors[412]

Lead Applicant State: Project Name	Amount
CA: City of Blythe WattEV I–10 Truck Charging Terminal*	$19,635,156
CA: FY 2023 San Joaquin Valley I–5 Electric Freight Corridor (Valley EFC) Project*	$56,008,096
NM: New Mexico Clean Fuel Build–out Project for Medium – and Heavy–duty Electric Corridors along Interstate 10 Unincorporated Hidalgo and Dona Ana Counties	$63,898,809
NY: Urban Area Strategies to Electrify Light – to Heavy – duty Mobility in NYC – Corridor Component*	$15,000,000
WA: Catalyzing Zero–Emission Drayage Trucking Infrastructure & Opportunities in the Seattle–Tacoma Region	$12,000,000

* Programs that indicate support for both LD and HD BEVs

Although we agree with commenters that states are not required to use NEVI funds for deploying HD charging stations, as they note, FHWA's guidance encourages states to consider station designs and power levels that could support heavy-duty vehicles.[413] In particular, the guidance states that, "Station designs should consider the potential for future expansions needed to support the electrification and charging demands of medium- and heavy-duty trucks, including station size and power levels."[414] We also note that there are multiple rounds of NEVI formula funding. The summary Daimler submitted in Appendix B of its comments, which it characterizes as showing a lack of firm State commitments for HD charging in NEVI plans, only covered FY2022 and 2023 funds. This represents about $1.5 billion of the total $5 billion to be distributed.[415] DOE has funded HD charging infrastructure plans that can help guide phased investment.[416] Significant utility investments of up to $1.7 billion in HD charging infrastructure

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[412] U.S. Department of Transportation, Federal Highway Administration. "Federal Highway Administrations' Charging and Fueling Infrastructure Discretionary Grants Program: FY 2022- FY 2023 Grant Selections." Available online: https://highways.dot.gov/sites/fhwa.dot.gov/files/CFI%20Grant%20Awards%20Project%20Descriptions%20FY22-23.pdf.

[413] U.S. Department of Transportation, Federal Highway Administration. "Memorandum: National Electric Vehicle Infrastructure (NEVI) Formula Program Guidance (Update)." June 2, 2023. Available online: https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/90d_nevi_formula_program_guidance.pdf.

[414] U.S. Department of Transportation, Federal Highway Administration. "Memorandum: National Electric Vehicle Infrastructure (NEVI) Formula Program Guidance (Update)." June 2, 2023. Available online: https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/90d_nevi_formula_program_guidance.pdf.

[415] U.S. Department of Transportation. "Historic Step: All Fifty States Plus D.C. and Puerto Rico Greenlit to Move EV Charging Networks Forward, Covering 75,000 miles of Highway." September 27, 2022. Available online: https://www.transportation.gov/briefing-room/historic-step-all-fifty-states-plus-dc-and-puerto-rico-greenlit-move-ev-charging.

[416] U.S. DOE. "Biden-Harris Administration Announces Funding for Zero-Emission Medium- and Heavy-Duty Vehicle Corridors, Expansion of EV Charging in Underserved Communities." February 15, 2023. Available online: https://www.energy.gov/articles/biden-harris-administration-announces-funding-zero-emission-medium-and-heavy-duty-vehicle.

have been approved by state regulators.[417] Additionally in March 2024, the Joint Office of Energy and Transportation released the National Zero-Emission Freight Corridor Strategy which aims to target public investment to amplify private sector funding and focus utility and regulatory energy planning and align industry activity in order to prioritize deployment over four phases encompassing infrastructure deployment 2024-2040.[418]

We agree with commenters who state that public charging needs for HD vehicles are different than those for light- and medium-duty vehicles in certain respects. RIA Chapter 1.6.3.2 describes some of the reasons that heavy-duty charging stations may differ from light-duty charging stations; for example: stations that serve heavy-duty vehicles may require more ingress and egress, higher canopies or roofs, and longer charging cords. That said, we also note that some stations designed for light-duty vehicles may be able to accommodate (or be modified in the future to accommodate) medium-duty or heavy-duty vehicles. See RIA Chapter 2.6 for a description of our FRM analysis of charging infrastructure, including the EVSE power levels we considered.

We agree with commenters that it's important for charging stations to be reliable. Our HD TRUCS analysis considers EVSE maintenance costs at both depots and public stations (see RIA Chapter 2.4.4.2). Separately, as described in RIA Chapter 1.3, there are many efforts underway to advance infrastructure reliability in advance of the timeframe of this rule. In January 2024, the first round of grants under FHWA's Electric Vehicle Charger Reliability and Accessibility Accelerator Program were awarded, providing nearly $150 million for repairs or replacements of non-operational BEV charging ports.[419] This will complement efforts of the National Charging Experience Consortium (ChargeX Consortium). Launched in May 2023 by the Joint Office of Energy and Transportation (JOET) and led by U.S. DOE labs, the ChargeX Consortium will develop solutions and identify best practices for common problems related to the consumer experience, e.g., payment processing and user interface, vehicle-charger communication, and diagnostic data sharing.[420] Relatedly, in January 2024, JOET announced $46.5 million in federal funding to support 30 projects to increase charging access, reliability, resiliency, and workforce development.[421]

In their comments, manufacturers suggested that EPA establish mechanisms to reduce the stringency of the CO_2 standards if the infrastructure deployment falls short of the amount necessary to support the rule while other stakeholders opposed this suggestion. After carefully

[417] Lepre, Nicole. "Estimated $30 Billion Committed to Medium- and Heavy-Duty Charging Infrastructure in the United States." Atlas Public Policy. EV Hub. January 26, 2024. Available online: https://www.atlasevhub.com/data_story/estimated-30-billion-committed-to-medium-and-heavy-duty-charging-infrastructure-in-the-united-states/.
[418] U.S. Joint Office of Energy and Transportation. "Biden-Harris Administration, Joint Office of Energy and Transportation Release Strategy to Accelerate Zero-Emission Freight Infrastructure Deployment." March 12, 2024. Available online: https://driveelectric.gov/news/decarbonize-freight.
[419] U.S. Department of Transportation, Federal Highway Administration. "Electric Vehicle Charger Reliability and Accessibility Accelerator." Available online: https://www.fhwa.dot.gov/environment/nevi/evc_raa/.
[420] Joint Office of Energy and Transportation. "Joint Office Announces National Charging Experience Consortium." May 18, 2023. Available online: https://driveelectric.gov/news/chargex-consortium.
[421] U.S. Department of Energy. "Biden-Harris Administration Announces Over $46 Million to Enhance EV Charging Reliability and Workforce Development." January 19, 2024. Available online: https://www.energy.gov/articles/biden-harris-administration-announces-over-46-million-enhance-ev-charging-reliability-and.

assessing infrastructure needed for the modeled potential compliance pathway, we conclude that the Phase 3 standards are feasible and appropriate. As described in Preamble II.B.2, EPA commits to actively engaging with stakeholders and monitoring heavy-duty BEV infrastructure deployment. In consultation with other agencies, EPA will issue periodic reports on infrastructure buildout throughout the lead up to the Phase 3 standards in MYs 2027 through 2032. Based on these reports, as appropriate and consistent with CAA section 202(a) authority, EPA may decide to issue guidance documents, initiate a rulemaking to consider modifications to the Phase 3 rule, or make no changes to the Phase 3 rule program.

6.2 Charging Infrastructure Lead Time and Deployment

Comments by Organizations

Organization: Advanced Energy United

To fully unlock these investments, the U.S. will need to undertake permitting reform, to streamline transmission projects and free up interconnection queues. [EPA-HQ-OAR-2022-0985-1652-A2, p. 5]

Digital permitting processes could also alleviate bottlenecks in EVSE infrastructure. The Department of Energy’s SolarApp+ is a model program that has saved customers and contractor valuable time and money on solar installations by standardizing and streamlining permitting processes in localities across the U.S. Policymakers across the country should consider a similar approach to slash soft costs for the permitting of EV charging infrastructure. Investment alone cannot satisfy new demand. We must enable streamlined permitting processes if we are to meet the Biden Administration’s goal of building 500,000 new charging stations. [EPA-HQ-OAR-2022-0985-1652-A2, p. 6]

Organization: American Highway Users Alliance

With the two large-scale rules being advanced at the same time, the feasibility of the proposals is more challenging. It is not as if manufacturing charging stations for heavy-duty, light-duty, and medium-duty vehicles is unrelated. At least some supplies and components are relevant to all; some manufacturers will try to manufacture for heavy-duty, light-duty and medium-duty needs; the critical minerals and related processing are needed for all. But suppliers and electric utilities can only gear up so quickly. This confluence of proposed regulations (further combined with separate and significant regulatory actions by the California Air Resources Board) compounds the challenges for relevant industries to comply. It makes it harder to make favorable assumptions on how quickly changes can be made to facilitate marketplace acceptance of heavy-duty EVs.4 [EPA-HQ-OAR-2022-0985-1550-A1, p. 3]

> 4 Given such complexity, we support the request of the American Petroleum Institute and the American Fuel & Petrochemical Manufacturers for a 90-day extension of the comment deadline in this docket.

Set forth below are concerns of key stakeholders. [EPA-HQ-OAR-2022-0985-1550-A1, p. 5]

Concerns of An Original Equipment Manufacturer

The Volvo Group North America presented at EPA's May 3 hearing on the proposed rule and that May 3 statement is in the docket for this NPRM. Volvo made clear that, with respect to the proposed rule, Original Equipment Manufacturers (OEMs) --

- cannot do their part without assurance that charging station providers and utilities as well as federal, state and local governments can deploy electric and hydrogen fueling infrastructure at scale in a timeline that matches the regulation's requirements. [EPA-HQ-OAR-2022-0985-1550-A1, p. 5]

The statement explains that --

- Our customers will not purchase zero emission trucks unless both the vehicles and the fuels are cost-effective and readily available so as not to negatively impact their business operations (emphasis in original). [EPA-HQ-OAR-2022-0985-1550-A1, p. 5]

Noting that EPA had referenced Volvo in the NPRM for having strong goals for manufacture of heavy-duty EVs, Volvo nonetheless found that it could not support the rule as proposed, stating that it --

- look[ed] forward to working with EPA to develop a final rule that it could support which addresses the interdependence of vehicle and infrastructure availability, and alleviates the sole risk of noncompliance being borne by manufacturers. [EPA-HQ-OAR-2022-0985-1550-A1, p. 5]

Testimony presented to the House Transportation and Infrastructure Committee on May 10, 2023 by the Owner-Operator Independent Drivers Association (OOIDA) strongly made very similar points:

- In April, the agency [EPA] released its Phase 3 greenhouse gas (GHG) proposal. ... With these moves, our members are again facing higher projected costs for new vehicles and insufficient lead-up time to properly implement manufacturing standards. The Phase 3 rule is also a blatant attempt to force consumers into purchasing electric vehicles while a national charging infrastructure network remains absent for heavy-duty commercial trucks. Professional drivers are skeptical of EV costs, mileage range, battery weight and safety, charging time, and availability. It's baffling that the EPA is pushing forward with more impractical emissions timelines without first addressing these overwhelming concerns with electric CMVs.[EPA-HQ-OAR-2022-0985-1550-A1,[p. 7]

Organization: American Petroleum Institute (API)

ii. Infrastructure

1. Leadtime and deployment

API, and many other stakeholders, are concerned about the lack of infrastructure for the HD ZEV market. Even coupled with significant tax credits and incentives, fleet operators and vehicle owners will not purchase new HD ZEVs without a reliable charging infrastructure. For the small number of HD ZEVs that are currently available15, it appears most are utilizing depot charging and the vehicles are largely being used for shorter trips. [EPA-HQ-OAR-2022-0985-1617-A1, p. 11]

15 https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect#:~:text=There%20are%20already%20about%20150%20existing%20medium-%20and,that%20are%20commercially%20available%20in%20the%20U.S.%20today

EPA notes in the proposal various partnerships and plans to build battery manufacturing plants in the U.S., taking advantage of incentives such as the IRA, one must view these as highly complex projects – in addition to siting and construction, it will take time for these new battery manufacturing facilities to ramp up to full production. Further, there is the probability that not all announced projects will materialize. [EPA-HQ-OAR-2022-0985-1617-A1, p. 11]

Organization: American Trucking Associations (ATA)

Lead times are long

Onsite power availability limits the number of BEVs a site can charge. Regardless of location, all fleets surveyed had similar feedback regarding conversations with utilities. Usually, these conversations can begin years before an order is placed for a BEV. Among surveyed fleets, 40 percent indicated a lead time of 12 to 14 months, and 30 percent received quotes of over 36 months for additional electricity. As a fleet looks to acquire one electric vehicle, they begin to assess the available power capacity available from the utility and on their physical site. Site-level analysis, land use configuration, and long-term power usage planning and facility modifications are all outside the typical competencies of most fleets, require learning by doing, and invariably increase the amount of time it takes to adopt ZEV technologies. [EPA-HQ-OAR-2022-0985-1535-A1, p. 15] [See Docket Number EPA-HQ-OAR-2022-0985-1535-A1, p. 15, for Figure 3]

Organization: California Air Resources Board (CARB)

The NPRM provides several excellent examples of times the nation has adapted to new electrical load including the adoption of A/C and the rapid growth of data centers. The implementation of fleet charging infrastructure is much the same and, it should be noted, not expected to happen overnight. The phase in schedule proposed by U.S. EPA provides ample time for fleets and utilities to plan for and implement charging solutions that meet truck electrification needs. [EPA-HQ-OAR-2022-0985-1591-A1, p.45]

The NPRM requests comment on time considerations for all levels of HD charging infrastructure, including Level 2 up to 350-kilowatt direct current fast charger (DCFC) systems. NPRM states that 2027 provides adequate timing to establish initial levels of depot charging with the expectation that charging capacity will grow over the remainder of the decade. With current CEC MD/HD infrastructure projects, staff are seeing projects take about two to three years from inception to operations. Equipment shipping delays have made up a significant portion of the delays. Those can be expected to improve over time, and, in any event, even with permitting process requirements in California, there is sufficient time to meet U.S. EPA's 2027 and beyond timeframe. With planning, the lead times identified here should be sufficient to support the stringency of the proposed standard and more stringent alternative i.e., values that would reflect the level of ZEV adoption in CARB's ACT regulation. A number of truck OEMs and private companies are already working to provide both depot charging solutions as well as corridor infrastructure solutions. Daimler is leading the Greenlane $650 million investment in West Coast, Southeast Coast and Texas corridors.149 Volvo has a truck-stop agreement150 and is also working on a dealership-based California corridor.151 Hyundai is working to establish a San

Pedro ports to Texas southwest hydrogen corridor.152 TerraWatt is working on a similar fast charging network along I-10 from California to Texas.153 Nikola has an agreement with Voltera to build 50 hydrogen stations.154 Voltera,155 Zeem,156 Electrify America,157 Forum Mobility,158 WattEV,159 and TerraWatt160 among others are developing depot charging projects. Private companies dependent on transportation services have announced both electrification plans as well as vehicle and infrastructure projects moving them toward those goals. USPS has announced 66,000 BEV delivery vehicles by 2028 with all electric purchases from 2026 and an initial order of 14,000 chargers.161,162 Walmart has announced its own network of DCFCs aimed at lighter vehicles,163 an order of 4,500 delivery vehicles164 and a fleetwide 100 percent electrification.165 Amazon has ordered 100,000 BEV delivery vehicles166 with "thousands" of chargers already installed167 including reports of sizable charging depot installations.168,169 Amazon is backing class 8 drayage truck charging depots170,171 and has ordered 329 BEV terminal tractors.172 FedEx has committed to ZE delivery vehicles reaching 50 percent by 2025 and 100 percent by 2030 with a 100 percent ZE full delivery fleet by 2040.173,174 UPS has a 10,000 BEV delivery vehicle order175 and has participated in showcasing innovative charging technologies. DHL Supply Chain has cancelled further orders of diesel terminal tractors, ordered 50 BEV terminal tractors toward a 100 percent ZE fleet by 2025 and ordered BEV semi tractors on their way to a 30 percent ZE on-road fleet by 2030.176 [EPA-HQ-OAR-2022-0985-1591-A1, pp.45-48]

149 Introducing Greenlane: Daimler Truck North America, NextEra Energy Resources and BlackRock Forge Ahead with Public Charging Infrastructure Joint Venture, April 28, 2023. https://www.prnewswire.com/news-releases/introducing-greenlane-daimler-truck-north-americanextera-energy-resources-and-blackrock-forge-ahead-with-public-charging-infrastructure-joint-venture-301811101.html

150 Pilot Company and Volvo Group Partner to Build Charging Network for Medium- and Heavy-Duty Electric Trucks, November 15, 2022. https://www.prnewswire.com/news-releases/pilot-company-and-volvo-group-partner-to-build-chargingnetwork-for-medium--and-heavy-duty-electric-trucks-301678542.html

151 Volvo Trucks Constructing California Electrified Charging Corridor for Medium- and Heavy-Duty Electric Vehicles, July 14, 2022. https://www.volvotrucks.us/news-and-stories/press-releases/2022/july/constructing-california-electrifiedcharging-corridor-for-medium-and-heavy-duty-electric-vehicles/

152 Transport Topics: New Mexico to be Part of 'Clean Freight Corridor', September 26, 2022. https://www.ttnews.com/articles/new-mexico-be-part-clean-freight-corridor

153 Business Wire: TeraWatt Developing I-10 Electric Corridor, the First Network of Electric Heavy-Duty Charging Centers, October 20, 2022. https://www.businesswire.com/news/home/20221020005252/en/TeraWatt-Developing-I-10-Electric-Corridor-the-First-Network-of-Electric-Heavy-Duty-Charging-Centers

154 Nikola Partners With Voltera To Build Up To 50 Stations For Hydrogen Trucks, May 2, 2023. https://www.forbes.com/sites/alanohnsman/2023/05/02/nikola-partners-with-voltera-to-build-up-to-50-stations-for-hydrogen-trucks/?sh=6ce0eea8fb0d

155 EV Truck Charging Station Garden City https://www.savannahnow.com/story/news/2023/05/29/ev-truck-charging-station-gardencity/70254024007/

156 Zeem Solutions Launches First Electric Vehicle Transportation-As-A-Service Depot, March 30, 2022. https://zeemsolutions.com/zeem-solutions-launches-first-electric-vehicle-transportation-as-a-servicedepot/

157 Electrify America: Business Solutions, last accessed June 13, 2023. https://www.electrifyamerica.com/business-solutions/

158 East Bay Community Energy and Forum Mobility Announce Innovative Financing for First of Its Kind Electric Truck Charging Depot in Livermore, June 13, 2023. https://www.prnewswire.com/news-releases/east-bay-community-energy-and-forum-mobility-announceinnovative-financing-for-first-of-its-kind-electric-truck-charging-depot-in-livermore-301849030.html

159 WattEV Breaks Ground on 21st Century Truck Stop, December 16, 2021. https://www.wattev.com/post/wattev-breaks-ground-on-21st-century-truck-stop

160 Terawatt Infrastructure, Ideas: TeraWatt Raises Over $1 Billion to Scale Commercial EV Charging Centers Across America, September 13, 2022. https://terawattinfrastructure.com/ideas/terawatt-raises-over-1-billion/161 USPS Intends To Deploy Over 66,000 Electric Vehicles by 2028, Making One of the Largest Electric Vehicle Fleets in the Nation, December 20, 2022. https://www.prnewswire.com/news-releases/usps-intends-to-deploy-over-66-000-electric-vehicles-by-2028--making-one-of-the-largest-electric-vehicle-fleets-in-the-nation-301707407.html

162 USPS Moves Forward with Awards to Modernize and Electrify the Nation’s Largest Federal Fleet - Newsroom - About.usps.com, February 28, 2023. https://about.usps.com/newsroom/national-releases/2023/0228-usps-moves-forward-with-awards-tomodernize-and-electrify-nations-largest-federal-fleet.htm

163 Leading the Charge: Walmart Announces Plan To Expand Electric Vehicle Charging Network, April 6, 2023. https://corporate.walmart.com/newsroom/2023/04/06/leading-the-charge-walmart-announces-plan-toexpand-electric-vehicle-charging-network

164 Walmart To Purchase 4,500 Canoo Electric Delivery Vehicles To Be Used for Last Mile Deliveries in Support of Its Growing eCommerce Business, July 12, 2022. https://corporate.walmart.com/newsroom/2022/07/12/walmart-to-purchase-4-500-canoo-electricdelivery-vehicles-to-be-used-for-last-mile-deliveries-in-support-of-its-growing-ecommerce-business

165 Greenbiz: Walmart drives toward zero-emission goal for its entire fleet by 2040, September 23, 2020. https://www.greenbiz.com/article/walmart-drives-toward-zero-emission-goal-its-entire-fleet-2040

166 The Verge: Amazon says it has ‘over a thousand’ Rivian electric vans making deliveries in the US, November 7, 2022. https://www.theverge.com/2022/11/7/23443995/amazon-rivian-electric-delivery-van-fleet-ev

167 Amazons-Custom-Electric-Delivery-Vehicles-from-Rivian-Start-Rolling-Out-Across-the-U.S, July 21, 2022. https://press.aboutamazon.com/2022/7/amazons-custom-electric-delivery-vehicles-from-rivian-startrolling-out-across-the-u-s

168 Journal Times: Amazon prepares to go electric in a big way with delivery vans at Racine County hub, June 28, 2022. https://journaltimes.com/news/local/amazon-prepares-to-go-electric-in-a-big-way-withdelivery-vans-at-racine-county/article_a89d3c0e-f342-11ec-823f-0f3f5e4a7dea.html

169 Dallas News: Amazon begins installing charging stations in North Texas for electric delivery fleet, May 10, 2022. https://www.dallasnews.com/business/energy/2022/05/10/amazon-begins-installing-charging-stationsin-north-texas-for-electric-delivery-fleet/

170 AJOT: Backed by Amazon & CBRE, Forum Mobility is building harbor truck charging stations in California, April 4, 2023. https://www.ajot.com/insights/full/ai-backed-by-amazon-cbre-forum-mobility-is-building-harbor-truckcharging-stations-in-california

171 AJOT: Backed by Amazon & CBRE, Forum Mobility is building harbor truck charging stations in California, April 4, 2023. https://www.ajot.com/insights/full/ai-backed-by-amazon-cbre-forum-mobility-is-building-harbor-truckcharging-stations-in-california

172 GAUSSIN Group receives an order from AMAZON for 329 electric yard tractors, December 14, 2022. https://www.gaussin.com/news/gaussin-group-receives-an-order-from-amazon-for-329-electric-yardtractors

173 UPS: Electrifying our future, May 23, 2022. https://about.ups.com/us/en/social-impact/environment/sustainable-services/electric-vehicles---aboutups.html

174 The Buzz EV News: BrightDrop produces 150 electric delivery vans for FedEx Fleet, August 10, 2022. https://www.thebuzzevnews.com/brightdrop-electric-vans-fedex/

175 UPS: UPS and DP World delivering world firsts, October 4, 2021. https://about.ups.com/us/en/our-stories/innovation-driven/delivering-world-firsts.html

176 DHL Supply Chain Advances Sustainability Efforts With 50 Electric Yard Trucks, May 1, 2023. https://www.dhl.com/us-en/home/press/press-archive/2023/dhl-supply-chain-advances-sustainabilityefforts-with-50-electric-yardtrucks.html#:~:text=The%20company%20is%20also%20looking,of%20its%20fleet%20by%202030

Organization: CALSTART

There are several other important considerations in this rapidly evolving infrastructure build out that we believe is imperative that EPA consider. [EPA-HQ-OAR-2022-0985-1656-A1, p. 22]

Transitional and mobile infrastructure: EPA assumes that depot charging implementation will be limited based on capacity expansion delays from utilities. While utility distribution capacity is a limiting factor in today’s early market, it is showing signs of improvement as utilities gain experience and develop installation templates and frameworks. In the near term, the market has created innovative solutions to these constraints in the form of mobile, temporary, and transitional infrastructure options. CALSTART has recently assembled an inventory of transitional infrastructure solutions which could assist in the deployment of vehicles. Some vehicle manufacturers are coupling this mobile infrastructure with sales of new ZE-MHDVs to bridge the gap between when vehicles are available for delivery and when energy supply system upgrades can be performed, enabling vehicle deployment before permanent infrastructure is fully deployed. Temporary and mobile charging solutions can usually be installed and inspected in less than one month, currently cost under $200,000, and generally can be leased rather than owned. The option saves fleet permitting and installation costs in the short term and enables vehicle deployments to stay on pace. FreeWire, Dannar, Eaton, BP Pulse, Proterra, Veloce Energy, Beam, GM, Lightning, XOS, and Voltera all manufacture systems. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 22 - 23]

Infrastructure services: Additional strategies not being considered in EPA’s scenarios are Trucks-(or Transport)-as-a-Service (TaaS), Charging-as-a-Service (CaaS), and smart charging and load management systems which can manage charging timing, sequencing, and facility loads. At the depot level, several efforts are also underway to aggregate demand among multiple fleets at a co-located site, or to coordinate one fleet across multiple locations. CaaS strategies are expanding around freight facility clusters. Vendors have adopted reservation systems or per-charge solutions which can be built out to supply a co-located set of fleets and, in many ways, can be integrated into new facility design and construction, especially in the logistics and warehousing space, shortening timelines and giving predictable coordination to utilities.44 In our analysis, we find that even conservative estimates of the total amount of shared charging arrangement in key areas can reduce the overall cost of total deployment compared to a maximum deployment scenario. Multiple companies offer these solutions, including but not limited to BP Pulse, Forum Mobility, TeraWatt, WattEV, and Zeem Solutions. [EPA-HQ-OAR-2022-0985-1656-A1, p. 23]

44 https://globaldrivetozero.org/site/wp-content/uploads/2021/03/Taking-Commercial-Fleet-Electrification-to-Scale-White-Paper.pdf

Organization: Daimler Truck North America LLC (DTNA)

- Streamlined Authorization Process for EVSE Installation. DTNA recommends that EPA work with stakeholders to develop model building codes that can be adopted by state and local governments to streamline authorizations for EVSE installation projects. Model codes should address zoning reviews, standardize permit review and inspection processes, run these processes in parallel, and make the processes transparent for fleets. EPA should consider encouraging state and local governments to adopt these model codes as a critical enabler for the rapid build-out of EVSE infrastructure that will be needed to support implementation of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 15]
- Educational and Training Programs for Municipal Governments. DTNA recommends that EPA and DOE jointly develop educational and training programs for state and municipal governments to prepare reviewers and inspectors who are unfamiliar with the processes for EVSE project development (including direct current fast charging (DCFC) projects), to ensure that state and local governments are adequately prepared to handle project reviews and authorizations. [EPA-HQ-OAR-2022-0985-1555-A1, p. 15]

Timing for Infrastructure Development

EPA implies that in the next five years, electric infrastructure will be sufficiently built out to support the BEVs required by the Proposed Rule, and that buildout will continue to support substantially higher fleet adoption rates by 2032. Without major regulatory and/or legislative action, DTNA does not believe the infrastructure needed will materialize on the timeline required to enable compliance with the Phase 3 CO2 standards as proposed. New interconnection requests are processed on a first-come-first-serve basis, and transportation electrification competes with all other utility priorities, including decarbonization mandates, resiliency, and other residential and commercial interconnection requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

Utilities are noting extended timelines for installing critical hardware, both in front of and behind the meter, due to supply chain and other constraints. During the ACF rulemaking process, for example, one electric utility commented to CARB that the lead time for transformers was 40 weeks, and that the lead time customer side meter panels/switchgears was 70 weeks.118 In the Company’s experience, utilities will wait for this hardware to be received to perform other upgrades, and these types of sequential gating events can add significant time to transportation electrification projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

118 See Comments of Pacific Gas and Electric Company, Proposed Advanced Clean Fleets Regulation (Oct. 17, 2022), https://www.arb.ca.gov/lists/com-attach/370-acf2022-AXEFZFUxUFxRY1Bl.pdf.

In a recent joint presentation by Southern California Edison (SCE), Pacific Gas & Electric (PG&E), and San Diego Gas & Electric (SDG&E) at a California Energy Commission (CEC) workshop, the following table was presented reflecting the utilities’ estimations of typical timelines for distribution capacity improvements: [EPA-HQ-OAR-2022-0985-1555-A1, p. 50] [Refer to Table 17 on p. 50 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

As the scope of the necessary distribution capacity improvements is often unknown until detailed site planning is underway, predicting how long fleets will wait for interconnection requests is challenging. DTNA believes many depot electrification projects may require increases in substation capacity, sub-transmission improvements, or new substations to serve the concentrated power demands. One of DTNA's customers cancelled a BEV deployment because their utility returned a 5-8 year lead time for a new substation. Another fleet's initial ZEV deployment at scale required construction of a 6 MW facility, able to charge 32 Class 8 drayage tractors simultaneously.120 Providing these capacities to many sites clustered together, as will be required to support concentrated freight hubs and logistics centers, is likely to require substantial grid upgrades. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 50-51]

120 See 'Schneider's Electric Heavy-Duty Trucks Start Off on Regional Routes' (June 8, 2023) https://www.truckinginfo.com/10200304/new-electric-heavy-duty-trucks-start-off-on-regional-routes.

Because of California's climate policies, including Executive Order N-79-20 requiring all new passenger car and truck sales to be zero emission by 2035, and CARB's ACT and ACF regulations, a number of transportation electrification planning procedures and make-ready programs have already been implemented or have begun to develop in California. Thus, it is important to keep in mind that electric utilities in other states may generally be less prepared to respond to transportation electrification requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

In the Company's experience, fleets typically purchase their vehicles 6 - 12 months ahead of need, and often utilities require proof of purchase to show the fleet is committed to move forward with infrastructure development. DTNA has experienced fleet customers cancelling BEV orders when utilities respond to interconnection requests with multi-year lead times. Many of these cancellations include the return of incentive program funds, such as HVIP or Clean School Bus Program vouchers. Purchasers who apply for and are granted HVIP funds for example, must redeem the voucher within 90 days, or apply for three-month extensions up to 540 total days.121 It is not uncommon for infrastructure projects to exceed the 540 day timeline, which would require the fleet to take delivery of BEVs with no charging infrastructure, resulting in a stranded capital investment and no air quality improvements. One of DTNA's customers cancelled an order and returned HVIP funding for 20 Class 8 tractors when their utility estimated their site would take 3 years (1,095 days) to energize. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

121 See Implementation Manual for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) (March 15, 2022) at 20, https://californiahvip.org/wp-content/uploads/2022/03/HVIP-FY21-22-Implementation-Manual-03.15.22.pdf.

Furthermore, it is unlikely that fleets will make major investments in long-term infrastructure that require commitments longer than the vehicle trade cycle. For example, if a fleet plans for a 4-year vehicle product cycle, but the infrastructure lead time is 4 years for an increase in substation capacity, by the time the infrastructure is available, the fleet will be working with the next generation of vehicles, which may or may not have the same power needs. Similarly, where utilities have made capital investments in infrastructure, fleets may be required to commit to a certain utilization rates for 5 to 10 years. Fleets working with shorter trade cycles, contracted routes, or leased properties are likely to see operational changes well before they are released from their utilization obligations. Committing to minimum utilization rates may be a major financial risk for fleets, which is unaccounted for in the cost estimates in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

Fleets have also cited the lack of firm interconnection dates as a major deterrent to committing to long-term infrastructure projects. DTNA appreciates that infrastructure buildout projects are difficult to project, and may encounter unanticipated delays, but fleets are unable to make fleet transition plans, place orders for electric vehicles, or apply for funding without firm interconnection timelines. Some of DTNA's fleet customers committed to ZEV deployment have sought temporary power solutions to address these timeline issues. However, temporary power solutions incur additional costs and generally must be paid up front by the fleet. For instance, SDG&E Rule 13 ('Temporary Service') provides that an applicant for temporary service 'shall pay, in advance or otherwise as required by the utility, the estimated cost installed plus the estimated cost of removal, less the estimated salvage of the facilities necessary for furnishing service.'122 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 51-52]

122 See SDG&E Rule 13, https://www.sdge.com/sites/default/files/elec_elec-rules_erule13.pdf.

In addition to electrical interconnection complexities, fleets must navigate their local building codes and permitting processes. As noted by the Northeast States for Coordinated Air Use Management (NESCAUM) in a 2019 paper on DCFC deployment, 'the permitting process for DCFC stations is sometimes lengthy and fraught with delays due to unfamiliarity with the technology, protracted zoning reviews, and undefined requirements for permitting DCFC. As a result, the DCFC permitting process can be resource-intensive for both applicants and [authorities having jurisdiction (AHJs)].'123 Since the NESCAUM paper was published, DTNA's eConsulting team has encountered many AHJs that lack defined processes for DCFC installation projects and the expertise needed to move projects along quickly. [EPA-HQ-OAR-2022-0985-1555-A1, p. 52]

123 NESCAUM, 'Preparing Our Communities for Electric Vehicles: Facilitating Deployment of DC Fast Chargers' (May 2019), https://www.nescaum.org/documents/dcfc-permit-streamlining-whitepaper-final-5-14-19.pdf.

Fleets may encounter additional complications related to EVSE installation that impact BEV technology adoption rates. For example, when converting vehicles to BEVs, the infrastructure needed for charging equipment takes up physical space that could otherwise be occupied by additional trucks. Figure 4 below illustrates the components needed for combined charging systems (CCS). Megawatt Charging Systems (MCS) require additional space for installation as well. [EPA-HQ-OAR-2022-0985-1555-A1, p. 52] [Refer to Figure 4 on p. 53 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Figure 5 below shows an overhead view of one such fleet operation in Southern California where physical space will limit the number of BEVs that can be deployed. This site will require additional power poles, new transformers, and new switchgears to support only a fraction of the fleet. To convert additional tractors to BEVs, fleets working with constrained spaces like the site shown below will likely be required to purchase additional real estate. Recently, Denver's Regional Transportation District (RTD) announced the cancellation of an $18 million deal for new electric buses, citing space constraints for charging and EVSE equipment.124 RTD officials estimated they would need an additional $85 million to construct a new building to support this deployment. Space constraint issues of this type—and the associated costs—are not accounted for in EPA’s cost estimates for the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 53] [Refer to Figure 5 on p. 53 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

124 See Denver Post, ‘RTD cancels purchase of 17 electric buses it doesn’t have space to maintain—and orders fleet transition strategy’ (April 26, 2023), https://www.denverpost.com/2023/04/26/regional-transportation-district-battery-electric-buses-contract/.

DTNA’s fleet customers have faced a number of similar challenges, which have resulted in order cancellations or reductions, revealing the following issues :

- Fleet customers have been quoted 1.5 - 8 years for depot site electrification for deployments that are modest compared to the scale of those discussed in the Proposed Rule.
- Depot installation projects are complex and resource intensive for fleets, utilities, and AHJs. DTNA often observes differing views of roles and responsibilities in transportation electrification projects and a lack of expertise in this developing space.
- Infrastructure lead time is not synchronized with funding program lead time, leading fleets to return vouchers they spent resources securing, highlighting that available funding and the calculated TCO is only part of the adoption equation.
- Utilities and fleets sometimes cannot come to agreement on contractual terms, including load restrictions, managed charging, and guaranteed utilization time periods. It is unlikely these issues will be resolved without significant regulatory or legislative changes.
- State and municipal building codes and processes lack transparency and add significant time to depot electrification projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 54]

EPA Request for Comment, Request #59: Because of these projected increases and the funding available through the BIL and IRA, and as we are proposing more stringent standards that begin in MY 2027, our assessment supports that there is sufficient time for the infrastructure, especially for depot charging, to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply. We request comment on time considerations for all levels of HD charging infrastructure, including Level 2 up to 350 kW DCFC systems.

- DTNA Response: As discussed in Section II.B.3 of these comments, DTNA is concerned the BIL and IRA may not have as significant of an impact on the HD ZEV market and infrastructure development as EPA is projecting. With respect to available electrical grid distribution capacity, there is little transparency to understand what size projects will trigger major distribution system upgrades, and how long these upgrades will take. In working with early adopters, DTNA has had fleet customers with relatively modest initial deployments quoted 5-8 years for the required grid upgrades. Other fleet customers have been quoted 8-12 years for initial deployments that require major distribution system upgrades. Further, EPA should consider the need for charging speeds up to 2 MW to enable use in applications with short dwell times and high energy usage, and the buildout of public charging infrastructure that is required to support small businesses and fleets where depots cannot be constructed, as discussed in Section II.B.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 169]

Organization: Dana Incorporated

Charging Infrastructure and Grid Capacity

Another key issue in the success of the proposed rule is whether charging infrastructure, power demands, and hydrogen fuel (when/if available) will satisfy the needs for all ZEVs in every state to meet trucking's charging needs and vehicle adoption rates. A number of recent studies have raised concerns about increased demand on the electricity grid driven by vehicle electrification. EPA should conduct annual reviews to determine whether charging infrastructure and grid capacity are expanding to meet growing needs in those states (such as California) where electrification is likely to proceed most quickly. EPA should also conduct studies to analyze the impact of new federal incentives on the cost of producing hydrogen, which could play an important role for long-haul trucks. [EPA-HQ-OAR-2022-0985-1610-A1, p. 2.]

Charging Infrastructure for Fleet Operations

Charging infrastructure will remain an issue for several reasons and Dana, like many firms in the automotive industry, remains concerned that the charging infrastructure will not develop quickly enough to support the projected ZEV adoption rates. First, there are backlogs of suppliers to provide DC charging terminals for use in public applications, and much of the current public-sector funding focuses more heavily on developing charging infrastructure for light-duty vehicles rather than heavy-duty trucks. Second, the level of power needed at a service center to adequately charge 30-50 HD BEVs would require investment beyond what a typical fuel supplier can provide today. In addition, according to a study from the utility, National Grid, a large service station designed to provide charging for both cars and trucks would need to provide 19 megawatts of peak power by 2035 or 30 megawatts by 2045 — putting significant strain on the grid and creating the potential for peak-demand surcharges. A 2022 study by the American Transportation Research Institute found that electrification of the trucking sector would put a heavy strain on the generating capacity of U.S. utilities. Additionally, HD BEV battery packs will be significantly larger than what is required on light and medium duty applications, which further presents a challenge for charging time required to make them useful fleet vehicles with minimum downtime. A final complication is the potential need for hydrogen fueling infrastructure for long-haul applications. The European Union, for example, has set a target of having a network of hydrogen fueling stations along key European trunk routes by 2031. From Dana's viewpoint the pace of infrastructure development will have a significant impact on the development pipeline and adoption rate of ZEVs. [EPA-HQ-OAR-2022-0985-1610-A1, p. 2]

Organization: National Association of Chemical Distributors (NACD)

Current Electric Vehicle Infrastructure

A significant aspect of the proposed rule is the need for heavy-duty truck manufacturers to adopt additional ZEVs into their fleets in order to meet emission requirements. While NACD supports the adoption of new zero emission technologies to reduce the carbon footprint of the trucking industry, the United States' charging infrastructure makes the mandating of rapid adoption impractical. [EPA-HQ-OAR-2022-0985-1564-A1, p. 4]

When examining the expected number of ZEVs on the road, S&P Global Mobility estimated that the number of chargers will need to be increased four-fold by 2025 and eight-fold by 2030.7 Also, these estimates were made before the EPA's Phase 3 GHG emission proposals, meaning the true need for additional charging stations will likely be much higher if the rules move forward as written. [EPA-HQ-OAR-2022-0985-1564-A1, p. 4]

7 S&P Global Mobility, "EV Chargers: How many do we need?," spglobal.com, S&P Global Mobility, https://www.spglobal.com/mobility/en/research-analysis/ev-chargers-how-many-do-we-need.html

It is not practical to expect the necessary charging stations to be built in time to handle the increase in ZEV heavy-duty vehicles that would be required under this proposal. Constructing these stations can take months or even longer when taking into account the necessary electrical fittings. The California Air Resources Board acknowledged this in their Advanced Clean Fleets rule, allowing for extensions of up to five years for certain truck carriers that have electrification issues when building ZEV charging stations. It is not realistic to expect charging infrastructure to accommodate the increase in heavy-duty ZEVs by Model Year 2027; more time is needed. [EPA-HQ-OAR-2022-0985-1564-A1, p. 4]

This complicated issue requires significant lead-time due to the amount of coordination among states, those responsible for construction, and other stakeholders. NACD urges the EPA to adopt less strict emission standards that adopt ZEVs more gradually in order to allow for the United States charging infrastructure to develop the required capacity. [EPA-HQ-OAR-2022-0985-1564-A1, p. 4]

Organization: National Automobile Dealers Association (NADA)

1. HDV dealer and purchaser infrastructure costs and lead times.

As mentioned, dealerships are investing billions in the infrastructure and equipment to sell and service ZEV HDVs. Customers will also require infrastructure at their facilities and an existing and reliable public refueling infrastructure to support the effective use of ZEV HDVs. A typical CMV dealership would require the following facility and infrastructure upgrades to sell and service ZEV HDVs.:

- Two EV chargers (Level 2 or DCFC) to ensure availability for sales and service;
- Service lifts with higher weight capacity;
- Service bays that can accommodate additional lift heights of approximately six feet to facilitate high-voltage battery maintenance and removal;
- Battery storage and quarantine containers16; and
- Workplace safety and emergency response training to navigate the potential dangers associated with vehicle high-voltage systems and components. [EPA-HQ-OAR-2022-0985-1592-A1, p. 9]

16 EV battery temperature must remain at approximately 70 to 75 degrees, depending on the manufacturer. When a vehicle comes in for repair, a battery may be removed or disconnected from the low-voltage system (12-volt) which maintains the battery temperature. For example, for any body work that requires painting, a battery may need to be removed due to high temperatures achieved within a paint booth, especially during the curing of the paint. Any removed battery requires special storage. The optimal scenario would be a storage/building outside facility that is temperature-controlled and has a ventilation system. Current National Highway Transportation Safety Administration guidelines suggest 50 feet of separation between a stored battery and a building or another vehicle. Ventilation is very important for EV

batteries; there must be ventilation around the battery, including underneath it. When a high-voltage battery is damaged, it can leak fluoride gas, which is heavier than air, causing it to sink and not rise. This gas is highly flammable, and this situation can be created by a chemical reaction in the battery cells before a thermal runaway (or high-voltage battery fire) occurs.

The costs involved in these investments can easily exceed $1,000,000 per dealership. Ultimately, the ability and timeline to make facility upgrades and install chargers will vary significantly by dealership location, the utility upgrades necessary, and permitting lead times. In an initial survey of ATD members, dealership charger installation timelines ranged from less than one year to greater than three years. Some locations will need minimal to no utility upgrades for charger installation, but in most cases, electrical infrastructure (e.g., trenches, distribution transformers, switchboards, and conduit) will need to be upgraded or installed to accept the high-power service necessary to support several chargers. EPA correctly notes power needs as low as 200 kW could trigger a requirement to install a distribution transformer.17 However, EPA fails to acknowledge that the electric sector is facing significant supply chain issues for distribution transformers with the average lead time for transformer delivery at 12- 18 months (which is expected to increase).18 Dealerships requiring distribution transformer upgrades have stated that it has increased their charger installation lead times to between three and five years. In effect, they will be unable to begin selling and servicing ZEV HDVs until these upgrades are completed. Further, dealerships that rent or lease their buildings or property are generally unable to even install chargers due to landlord restrictions on property and building modifications. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 9 - 10]

17 88 Fed. Reg. at 25,983.

18 Robert Walton, Utilities sound alarm over distribution transformer shortage as procurement times surpass 1 year and costs triple, Utility Drive (Dec. 19, 2022). Further, the electric sector anticipating a final rule from the Department of Energy which would increase the distribution transformer efficiency standards, and shift production to an entirely different type of steel, for distribution transformers further exacerbating this issue. See also Paul Ciampoli, Proposed efficiency standards for distribution transformers would worsen shortages, POWER GRID INTERNATIONAL (March 31, 2023).

ZEV HDV fleets and owner/operators will also require facility and infrastructure upgrades. Their needs will vary, but in many cases will meet or exceed those of HDV dealerships. This is particularly true for fleets that perform their own service work or engage in depot charging during off hours. For example, a local transit agency with 15 ZEV school buses may need several ZEV-ready service bays, parking lot upgrades, and several chargers for fleet charging. [EPA-HQ-OAR-2022-0985-1592-A1, p. 10]

It’s worth noting that dealership investments are being made now in preparation for an expected future marketplace. But customers are asking whether ZEV HDVs will be affordable and will meet their needs and expectations. Only when ZEV HDVs and related refueling infrastructure costs “pencil out” will customers begin to adopt them. EPA must strive to accurately assess the costs and timing of necessary ZEV HDV refueling infrastructure. [EPA-HQ-OAR-2022-0985-1592-A1, p. 10]

Organization: NTEA - The Association for the Work Truck Industry

MY 2027 Target - EV Infrastructure Needs

The proposal calls for 20% of vocational trucks be a ZEV by MY 2027. This time frame does not seem possible given the resources needed to achieve such a goal in a compressed amount of time. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

As an industry, companies involved in the manufacture and distribution of work trucks (manufacturers of truck chassis, bodies, equipment and final assembly) will require EV charging equipment and power that has not previously been required for their facilities. While these producers of work trucks may not need the recharging capacity of a major truck fleet, they will need to provide charging for all of the EV chassis at their facility for assembly or alteration. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Much like truck dealers who will need EV charging infrastructure, anecdotally, NTEA has been informed that one of the biggest initial challenges is the availability of electricity from local utilities. In some cases, EV charging equipment is available but they can't yet be installed without agreement for power from the utility company, which appears could in some cases be multiple years away. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Based on the current statutory and regulatory landscape, it is assumed that the highest initial energy needs for medium- and heavy-duty vehicle charging is likely to occur in those states that have adopted California's Advanced Clean Trucks rule. While prioritizing charging infrastructure along freight corridors within these states may be a prudent approach, many vocational trucks are not necessarily involved in moving freight but rather accomplishing work tasks at whatever location is required – whether it be along a freight corridor or on a side street or in a rural area. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Given the long lead times involved in building power generation capacity and electric transmission systems, the NTEA questions if the aggressive time frames being mandated for the phase-in of medium and heavy-duty vocational trucks is possible. Will the operators of the wide variety of work trucks have access to charging when and where they will need it in order to complete their vocational missions within the existing timeframe? [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Organization: Schneider National Inc.

The EPA Proposed Rule makes no allowance for infrastructure lead time.

- As we experienced in building our first large-scale zero emissions electric charging depot in southern California, lead times for infrastructure enhancements and ZEV charging/filling equipment are long. The project process includes engineering, site design, permitting, construction, installation and testing, all of which can take a significant amount of time. There are also many elements of this process that are outside the control of the party who is installing the infrastructure, all of which can negatively affect the construction time (e.g., out of stock parts, utility improvement timelines, approvals, etc.). Our experience is that the overall process can range from 24-48 months per location for owned sites.
- Motor carriers generally have limited space available at owned and leased facilities. As we have experienced at our southern California location, charging infrastructure takes up a significant amount of space. Adding ZEV charging/filling capabilities will negatively

impact the amount of usable space, requiring carriers to add additional property to their real estate portfolios.

- Lead times for leased sites will likely be longer and add layers of complexity. Additional time will be necessary to seek and obtain formal approvals from property owners to add the infrastructure and equipment.
    - In all likelihood, this could add 6-12 months to the lead time of an individual project. Further, there will certainly be instances where the property owner does not desire to add the infrastructure, thus requiring the carrier to find an alternate location to charge/fill and incur additional real estate costs.
- As the deadline to meet the EPA's requirement comes closer, and as more companies push to meet the deadline, lead times in general will become longer. The ability to meet the deadline will become progressively more challenging due to substantial and increasing competition for limited resources and equipment. [EPA-HQ-OAR-2022-0985-1525-A1, p. 3]

Organization: South Coast Air Quality Management District (South Coast AQMD)

As mentioned in the comment above, zero emissions charging and fueling infrastructure poses the most significant barrier to deployment of zero emissions heavy-duty vehicles at scale. The difficulty in installing this infrastructure varies considerably from site to site. Our early experience has shown that there are many factors that require improvement to speed the transition to zero emissions. Regulations like the proposed Phase 3 rule are helpful, but additional action is needed beyond requirements for vehicle and engine manufacturers. Much of these improvements are best addressed at a local or state level, however the federal government can be a critical partner to speed the transition too. [EPA-HQ-OAR-2022-0985-1575-A1, p. 3]

As a first example, states regulate their own utilities and building codes are often set at the local level. However, most of these regulations and policies were not designed to address the rapid buildout required with zero emission vehicles (e.g., the ability for third party-providers to resell electricity for heavy duty charging stations, the role of demand charges, etc.). There are many potential policy approaches to help streamline infrastructure buildout. At minimum, the federal government can track the innovative solutions that different states and localities are taking to speed the buildout of charging/fueling infrastructure and make the information readily available for consideration in other areas. Key metrics should be tracked to see the effect these policies have, such as the total time needed to install infrastructure for different kinds of sites. [EPA-HQ-OAR-2022-0985-1575-A1, p. 3]

Organization: Tesla, Inc. (Tesla)

Lead Time and Rapid Deployment Mean Other Factors Are Not Barriers to More Stringent Standards

While Section 202(a)(3) directs the agency to give appropriate consideration to cost, energy, and safety factors associated with the application of such technology, these considerations must take place under the same technology forcing context utilized in assessing the vehicle technology. Similarly, the substantial lead time provided to the deployment on new heavy-duty technologies under the statute further favors a similar context for assessment of considerations such as the adequacy of the BEV charging infrastructure. [EPA-HQ-OAR-2022-0985-1505-A1, p. 26]

Assessed under this rubric, any concerns about charging infrastructure adequacy should not dampen the agency's move forward with a stringent heavy-duty rule. Economics dictate that build out of charging infrastructure follows deployment of BEVs, as without adequate vehicles on the road investment in such infrastructure risks becoming a stranded asset. Initial customers will focus on operations that allow heavy-duty BEVs to return to the depot after a shift, thus the focus will be on building out charging infrastructure at truck depots in the near future. [EPA-HQ-OAR-2022-0985-1505-A1, p. 27]

At the outset, nothing in the statute directs EPA to give great weight to infrastructure or similar considerations in evaluating whether a standard can be implemented in a time period the Administrator finds sufficient 'to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.'194 This is in contrast to other portions of the statute, which specifically direct the agency to consider, for example, 'the impact of renewable fuels on the infrastructure of the United States, including deliverability of materials, goods, and products other than renewable fuel, and the sufficiency of infrastructure to deliver and use renewable fuel.'195 [EPA-HQ-OAR-2022-0985-1505-A1, p. 27]

194 42 U.S.C. 7521(a)(2).

195 42 U.S.C. 7545(o)(2)(B)(ii)(IV).

In any event, adequate charging infrastructure will be available. EPA's analysis of this issue should focus on when the standards come into effect: to the extent EPA has authority to consider infrastructure issues, it would be under its authority to have the regulation take effect 'after such period as the Administrator finds necessary to permit the development and application of the requisite technology,'196 which necessarily entails a predictive judgment about what the infrastructure capacities would be in the future (including in response to the proposed rule), rather than being limited to the status quo. For example, in the past EPA has considered whether technology would 'would be perfected early enough to allow its mass production and installation.'197 [EPA-HQ-OAR-2022-0985-1505-A1, p. 27]

196 42 U.S.C. 7521(a)(2) (emphasis added).

197 NRDC v. EPA, 655 F.2d 318, 324 (D.C. Cir. 1981).

Organization: Truck Renting and Leasing Association (TRALA)

Charging Infrastructure and Grid Capacity Challenges and Constraints

Fleets wanting to install charging infrastructure are confronted with permitting delays, insufficient power, long installation periods, large monetary outlays, and parking space reductions. TRALA members interested in installing chargers at rented or leased facilities are subject to agreements that depending on the landlord, restrict these types of tenant improvements. If facilities have inadequate power or layouts, real estate acquisition can add one to two years onto many infrastructure development and construction projects. Further illustrating the lengthy lead time to expand charging infrastructure, Pacific Gas and Electric indicated in public comments to the ACF rule that the utility 'strives to interconnect projects in a timely manner, however mid-sized projects such as new distribution circuits or substation modifications can take 2-3 years. Larger projects that require new substations or transmission lines requiring licensing, permitting, or land rights acquisition can take 7 or more years.' 1 [EPA-HQ-OAR-2022-0985-1577-A1, pp. 3-4]

1 Pacific Gas and Electric, 2022 ACF Comments: https://www.arb.ca.gov/lists/com-attach/370-acf2022-AXEFZFUxUFxRY1Bl.pdf.

Organization: Volvo Group

Infrastructure

In 2007 and 2010, new Particulate Matter (PM) and NOx regulations required fueling related changes to meet new regulatory standards (availability of Ultra Low Sulfur Diesel and Diesel Exhaust Fluid respectively); however, these cases were far less onerous than requiring the development and adoption of an entirely unfamiliar new fuel with unknown operational implications. [EPA-HQ-OAR-2022-0985-1606-A1, p. 6]

In the case of EPA's Phase 3 proposal, the availability of fuel (and its requisite infrastructure) is the most significant factor influencing the speed of ZEV penetration in the marketplace and thus, OEMs' ability to comply with the regulation. Many factors including supply chain delays, workforce training and high costs will all affect heavy-duty ZEV adoption; but fleets can't use their vehicles if they can't fuel them, and if they can't use them, they won't buy them. Through our Volvo LIGHTS project (Low Impact Green Heavy Transport Solutions) and experience deploying BEVs across 12 different states and provinces, we've experienced a mix of factors contributing to infrastructure delays ranging from permitting delays, incongruence between infrastructure and vehicle funding programs, energization delays, and supply chain challenges for charger and electrical components. These issues must be addressed if OEMs are to be held responsible for meeting ZEV penetration levels on a national level. [EPA-HQ-OAR-2022-0985-1606-A1, p. 6]

Of all states, California is by far the best positioned to achieve its Heavy-Duty (HD) ZEV penetration goals because of its financial and policy inducements. Yet several Volvo fleet customers have had to wait over 18 months to have chargers built and energized at their sites. This experience makes the California Energy Commission's AB2127 report estimate that "an additional 157,000 chargers are needed to support 180,000 medium- and heavy-duty vehicles anticipated for 2030" seem unrealistic. [EPA-HQ-OAR-2022-0985-1606-A1, p. 6]

It is important to note that these challenges can and will be addressed over time. Involvement in the Volvo LIGHTS project and other ZEV deployments in the state have helped California utilities better understand how to service this new market. Likewise, the California Air Resources Board (CARB) and the California Energy Commission (CEC) began working in 2018 to develop a joint project solicitation that packaged incentives for vehicles and infrastructure together to help fleets coordinate public funding needs. [EPA-HQ-OAR-2022-0985-1606-A1, p. 7]

For example, customers are routinely quoted 40 to 50-week lead times for transformers if site upgrades are needed to support fleet electrification. In addition, lead times for electric vehicle supply equipment (EVSEs, or "chargers") are often 30-50 weeks and ensuring everything shows up at the same time is nearly impossible in today's environment.3 Many of the internal components of an EVSE are common with photovoltaic (PV, or solar) inverters, which means that component supplies are further stressed from industries even outside of vehicle and charger manufacturing. [EPA-HQ-OAR-2022-0985-1606-A1, p. 7]

> 3 Smith, G. (2023, May 8). Charging infrastructure delays temper rollouts of battery-electric trucks. Trucknews.com. Accessed on 14 June 2023 at https://www.trucknews.com/sustainability/charging-infrastructure-delays-temper-rollouts-of-battery-electric-trucks/1003174982/?utm_medium=email&utm_source=newcom&utm_campaign=TruckNewsDaily&utm_content=2023050902809&hash=b8dc1bbe8cbdd5dc1fa8f2d3d3026004.

The cost of charging infrastructure for fleets is another issue influencing ZEV penetration. California has established an infrastructure incentive program and several utilities in the state have established make-ready programs to help offset fleet concerns about long term profitability/viability. While most early adopters have installed chargers at their own facilities, many smaller fleets and independent owner-operators will need to rely on the availability of public charging. Over the last two years, a handful of public chargers have been developed; however, their number will likely remain low for some time since concern over long term viability of the business model will continue as long as the utilization level needed to be profitable remains unknown. [EPA-HQ-OAR-2022-0985-1606-A1, p. 7-8]

EPA Summary and Response:

Summary:

Vehicle manufacturers and others raised concerns about ongoing challenges to deploying charging infrastructure and the associated lead times, which commenters said could impede successful adoption of BEVs at levels they believe would be needed under the proposed standards. In particular, they highlighted three ongoing challenges that could extend lead times: permitting, supply chain issues, and utility interconnection. Additional concerns included space constraints and competing demands. Other commenters asserted there is sufficient lead time to deploy charging infrastructure.

Permitting was identified as a potential source of delays by Advanced Energy United, DTNA, TRALA, Schneider and Volvo. Several commenters suggested that permitting reform was needed to standardize and streamline the process. For example, Advanced Energy United suggested digital permitting process could save time and costs, pointing to DOE's SolarAPP+ as a positive example. DTNA suggested that EPA partner with others to help to advance this effort, e.g., by creating model building codes and training programs for state and municipal employees engaged in permitting and inspection. The SCAQMD likewise commented that building codes and other relevant state and local policies should be examined with EVSE deployment in mind, and that the federal government can help track and share best practices.

Several commenters discussed supply chain considerations. For example, CARB stated that delays in shipping EVSE units contributed to an overall lead time of 2 to 3 years for recent California Energy Commission medium- and heavy-duty projects but noted that it expects this issue to improve. Dana Incorporated expressed concerns about supplier backlogs for DCFC equipment while Volvo suggested a 30- to 50-week lead time is typical for EVSE. Commenters also expressed concern about purported supply chain delays for power sector equipment, particularly transformers. For example, NADA stated that current lead times of 12 to 18 months for transformers could increase, while Volvo noted a 40- to 50-week lead times being given as estimates to customers. DTNA commented that in addition to transformers, panels and switchgears may experience long lead times, providing one utility's estimate of 70 weeks as an example.

Many commenters stated that utility interconnection—particularly when upgrades to the distribution system are needed—extend lead times. For example, ATA conducted a survey of fleets finding that, "Among surveyed fleets, 40 percent indicated a lead time of 12 to 14 months, and 30 percent received quotes of over 36 months for additional electricity." TRALA cited a Pacific Gas and Electric comment for a California rulemaking that interconnection times of two to three years may be needed for mid-size projects with 7 or more years for projects involving new transmission lines or substations. NTEA noted that agreements from utility companies to install power can take multiple years in some cases. DTNA provided multiple examples of long lead times experienced by its customers, noting they have been given quotes of 1.5 to 8 years for electrifying depots that "are modest compared to the scale of those discussed in the Proposed Rule." DTNA also discussed challenges connected to the uncertainty in interconnection times, lack of experience among fleets and utilities, and other factors.

In addition, multiple commenters discussed space constraints as a barrier or source of delay for infrastructure deployments as well as unique challenges for fleets that lease property for depots. For example, Schneider National Inc. said it experienced overall lead teams of 2 to 4 years for depot charging station projects but posited that an additional 6-12 months may be needed for projects on leased sites to factor in time to work with the property owner. DTNA cited an announcement by Denver's Regional Transportation District to cancel an electric bus project due to space constraints and related costs, which DTNA said were not accounted for in the proposed rule.

Commenters also said that competing demands could further extend timelines for heavy-duty BEV charging infrastructure buildout. For example, the American Highway Users Alliance noted that both EPA's proposed light- and medium-duty vehicle rule and this heavy-duty proposal would take effect at the same time (while California regulations are also in effect), increasing the overall demand for new infrastructure from manufacturers and utilities.

Several commenters were generally cautious about the charging infrastructure deployment tasks ahead. ATA mentioned there is a learning curve associated with aspects of deployment like site-level analysis and planning for long-term power usage that can increase the time it takes to adopt ZEV technologies. Dana Incorporated noted challenges related to the scale of charging infrastructure and grid needs and suggested that EPA conduct annual reviews to determine whether they are expanding at a sufficient pace, particularly in states where BEV adoption is likely to be concentrated in early years. NACD suggested that it is not practical to build charging stations to handle the proposed adoption levels by MY 2027 due in part to the levels of coordination required among states and other stakeholders. Several commenters noted the high costs of these investments and resources required, which they indicated are new for some stakeholders.

On the other hand, both Tesla and CARB said that lead time for charging infrastructure deployments would be sufficient to support BEVs under the stringency levels in EPA's proposal, with Tesla stating the infrastructure would be available in time and CARB pointing to many ongoing or planned depot charging projects. CALSTART acknowledged that distribution upgrades can be a source of delay, but also stated that utilities are gaining experience and working to reduce lead times. CALSTART also highlighted temporary and mobile solutions that fleets can use to support BEVs while depot charging is being deployed, noting that these can typically be leased and deployed in under a month. They also encouraged EPA to consider alternate business models such as charging-as-a-service, in which charging solutions (and any associated lead times) are provided or handled by a third party or vendor as opposed to the fleet customer and noting that shared charging facilities can also reduce total deployment costs compared to individual depot station buildouts.

Response:

EPA recognizes that it takes time for individual or fleet owners to develop charging site plans for their facility, obtain permits, purchase the EVSE, and have it delivered and installed. We acknowledge, as we had in the NPRM,[422] that the longest lead times will likely be for high-power stations that require significant upgrades to the distribution system (such as to feeders or substations). This is consistent with the comments we received. We also acknowledge comments on supply chain challenges, in particular with respect to lead times for transformers. Lead times associated with distribution system upgrades (including transformers), utility interconnection and other grid topics are covered extensively in RTC Section 7 (Distribution). Here we discuss lead time issues around permitting, EVSE supply, and charging infrastructure more broadly. As further discussed in preamble Section II.D.2.iii and II.F.3, and RIA Chapters 1 and 2, and this response, we assessed these lead time issues and based on that assessment took lead time into account in a balanced and measured approach to setting the Phase 3 final standards.

With respect to permitting, we agree with commenters that streamlining the process and promoting best practices could reduce infrastructure deployment times. As noted in RIA Chapter 1.6.3, permitting generally falls within state and local jurisdictions; specific policies to streamline or standardize it are outside the scope of this rulemaking. While permitting times vary based on applicable state or local jurisdiction, specifics of station sites, and other factors, we note as one example that Electrify America reported that, in 2022, permitting took an average of 13 weeks for its U.S. "ultra-fast" DCFC stations.[423]

Though we recognize permitting is just one step in the deployment process, and that the process could take longer for more complex sites, we don't think permitting times will pose a barrier to the overall pace of infrastructure deployment supporting BEV adoption under the modeled compliance pathway for the final rule. We conclude this for several reasons. The final standards include a lower increase in stringency of standards compared to the proposal for many HD vehicle categories in MY 2027, a slower phase-in of standards through MYs 2028 and 2029, and a phase-in of standards from MYs 2030 through 2032 that, for many of the subcategories, achieves similar levels of stringency in MY 2032 as those proposed. Also, as discussed in RIA Chapter 2.10.3, most (approximately 88%) of our projected depot ports will be Level 2, and as we explain in RTC section 7 (Distribution) we generally do not expect longer lead times being needed for associated buildout for such EVSE ports (which would be an additional lead time consideration to any permitting timelines). In addition, as discussed in RTC 6.3.1, while we determined it was appropriate to incorporate some public charging into our analysis as part of the

[422] DRIA at 70.

[423] Electrify America. "2022 Annual Report to U.S. Environmental Protection Agency." April 2023. Accessed March 11, 2024, at: https://media.electrifyamerica.com/assets/documents/original/1018-2022NationalAnnualReport.pdf.

modeled potential compliance pathway that supports the feasibility of the final standards, we do so starting in MY 2030 to allow time for public infrastructure to develop. Thus, overall the final standards provide greater lead time than proposal and adequate lead time taking into consideration such concerns, among others.

In response to calls to support state and local agencies in the process, we note that federal agencies already offer a variety of resources on charging infrastructure for stakeholders, including information and best practices for permitting,[424] EVSE project planning,[425,426] building codes and standards,[427] and other topics.[428] In addition, EPA, participates in the Electric Vehicle Working Group established under the Bipartisan Infrastructure Law, along with DOE, DOT, and a wide variety of other government, industry, and stakeholders participants.[429] As noted by the Joint Office of Energy and Transportation, the group was formed to make recommendations "regarding the development, adoption, and integration of light-, medium-, and heavy-duty electric vehicles (EVs) into the U.S. transportation and energy systems";[430] its scope includes permitting among other deployment issues.[431]

Another cause of delay identified by commenters was with deliveries of equipment throughout the supply chain. We note generally that there have been disruptions to global supply chains in recent years, and there are ongoing efforts to strengthen and diversify supply chains to improve resiliency.[432] We also acknowledge comments that competing demands for charging infrastructure for light-, medium, and heavy-duty BEVs could extend deployment times. However, as described in RIA Chapters 1.3.2 and 1.6.2, there are many ongoing and planned investments in charging infrastructure through the BIL and IRA and from a wide variety of the private sector participants, and there are indications that the market is already preparing to meet the coming demand for EVSE. DOE estimates that about forty companies have already announced over $500 million of investments in U.S. facilities to construct charging equipment, with planned domestic production capacity of more than 1,000,000 chargers (including 60,000

[424] U.S. Department of Energy, Alternative Fuels Data Center. "Permitting Processes for Electric Vehicle Charging Infrastructure." Available online: https://afdc.energy.gov/fuels/electricity_permitting_processes.html.
[425] U.S. Department of Transportation. "EV Infrastructure Project Planning Checklist." Available online: https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-planning/project-planning-checklist.
[426] U.S. Environmental Protection Agency, Clean School Bus. "Charging and Fueling Infrastructure Resources." Available online: https://www.epa.gov/cleanschoolbus/charging-and-fueling-infrastructure-resources.
[427] U.S. Department of Energy, Alternative Fuels Data Center. "Building Codes, Parking Ordinances, and Zoning Ordinances for Electric Vehicle Charging Infrastructure." Available online: https://afdc.energy.gov/fuels/electricity_codes_and_ordinances.html.
[428] We note that the citations shown here are examples only, and not intended to be a comprehensive list. See for example, additional resources and technical assistances offered by the Joint Office of Energy and Transportation. (JOET. "Technical Assistances and Resources for States." 2024. Available online: https://driveelectric.gov/states.)
[429] JOET. "Electric Vehicle Working Group Membership Balance Matrix." Available online: https://driveelectric.gov/files/EVWG-Membership-Matrix.pdf.
[430] Joint Office of Energy and Transportation. "Electric Vehicle Working Group." Available online: https://driveelectric.gov/ev-working-group.
[431] U.S. Department of Energy, Alternative Fuels Data Center. "Electric Vehicle Working Group (EVWG)". Available online: https://afdc.energy.gov/laws/12739.
[432] See, e.g., The White House. "Issue Brief: Supply Chain Resilience." November 30, 2023. Available online: https://www.whitehouse.gov/cea/written-materials/2023/11/30/issue-brief-supply-chain-resilience/.

DCFCs) annually.[433,434] We reasonably predict that this will continue to expand as the market grows. We also note that workforce development is on the rise (e.g., through training and certification programs for those installing EV charging stations); see RIA Chapter 1.6.2 and RTC Section 1.6.4 for additional information on this topic. As previously explained in this response, in part after taking into account lead time considerations, including supply chain and deployment timing, overall the final standards provide greater lead time than proposal. See Preamble Section II.

We acknowledge comments on other implementation challenges for fleets and EVSE developers such as space constraints. We note these and other aspects of station planning, siting, and design considerations in RIA Chapter 1.6.3.2. However, as described in Preamble II.D.2.iii and RIA Chapter 1.6.2, and as noted by commenters (see also comments in RTC Section 6.1), there are a variety of solutions being offered for, and explored by fleets. Manufacturers (e.g., PACCAR, DTNA, Mack Trucks, Navistar, and Nikola) are providing EVSE solutions to their customers either directly or in partnerships with charging providers and other companies. Alternate business models such as transportation- or charging-as-a-service will provide options for fleets that have challenges deploying infrastructure at their depots or otherwise prefer these third-party operated stations. We also agree with CALSTART that mobile chargers (or other transitional charging options) offer a temporary solution for fleets to deploy BEVs while depot charging infrastructure is being installed, and note that some OEMs and fleets are already pursuing this option (see RIA Chapter 1.6.2.).

As described in RIA Chapters 1.3.2 and 1.6.2, there are also many public and private investments to support the buildout of a public charging network that can serve heavy-duty BEVs. As discussed in RTC Section 6.1 and extensively in RTC Section 7 (Distribution), we agree with findings of several recent assessments that charging needs will be geographically concentrated in early years, and that this will allow a phased approach for public charging infrastructure deployment starting with areas likely to have the most initial demand. In March 2024, the U.S. released a National Zero-Emission Freight Corridor Strategy[435] that, "sets an actionable vision and comprehensive approach to accelerating the deployment of a world-class, zero-emission freight network across the United States by 2040. The strategy focuses on advancing the deployment of zero-emission medium- and heavy-duty vehicle (ZE-MHDV) fueling infrastructure by targeting public investment to amplify private sector momentum, focus utility and regulatory energy planning, align industry activity, and mobilize communities for clean transportation."[436] The strategy has four phases. The first phase, from 2024-2027, focuses on establishing freight hubs defined "as a 100-mile to a 150-mile radius zone or geographic area centered around a point with a significant concentration of freight volume (e.g., ports, intermodal

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[433] U.S. Department of Energy, "Building America's Clean Energy Future". 2024. Available online: https://www.energy.gov/invest.

[434] U.S. Department of Energy, Vehicle Technologies Office. "FOTW #1314, October 30, 2023: Manufacturers Have Announced Investments of Over $500 million in More Than 40 American-Made Electric Vehicle Charger Plants". October 30, 2023. Available online: https://www.energy.gov/eere/vehicles/articles/fotw-1314-october-30-2023-manufacturers-have-announced-investments-over-500.

[435] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy." DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf.

[436] Joint Office of Energy and Transportation. "Biden-Harris Administration, Joint Office of Energy and Transportation Release Strategy to Accelerate Zero-Emission Freight Infrastructure Deployment." March 12, 2024. Available online: https://driveelectric.gov/news/decarbonize-freight.

facilities, and truck parking), that supports a broader ecosystem of freight activity throughout that zone."[437] The second phase, from 2027-2030, will connect key ZEV hubs, building out infrastructure along several major highways. The third phase, from 2030-2045, will expand the corridors, "including access to charging and fueling to all coastal ports and their surrounding freight ecosystems for short-haul and regional operations."[438] The fourth phase, from 2035-2040, will complete the freight corridor network. This corridor strategy provides support for the development of HD BEV infrastructure that corresponds to the modeled potential compliance pathway for meeting the final standards.

Taken together, and with conclusions in RTC Section 7 that there is sufficient time for any needed distribution grid upgrades (and solutions available to mitigate the need for such buildout), EPA agrees with CARB and Tesla that there is sufficient lead time for charging infrastructure to be deployed to support the modeled potential compliance pathway for the final rule. In consideration of lead time concerns raised by commenters (on both infrastructure and vehicle developments), and to ensure the necessary infrastructure will be available, EPA applied constraints (in a conservative approach in the earlier model years) such that the final standards include a lower increase in stringency of standards for many HD vehicle categories in MY 2027, a slower phase-in of standards through MYs 2028 and 2029, and a phase-in of standards from MYs 2030 through 2032 that, for many of the subcategories, achieves similar levels of stringency in MY 2032 as those proposed. In addition, as discussed in RTC 6.3.1, while we determined it was appropriate to incorporate some public charging costs into our analysis as part of the modeled potential compliance pathway that supports the feasibility of the final standards, we do so starting in MY 2030 to allow time for public infrastructure to develop.

In sum, our assessment after considering the lead time challenges identified by commenters, is that given the many public and private investments that will support both depot and public charging, along with infrastructure solutions available to fleets, the ability to prioritize initial public charging deployment in discrete freight corridors, and the extra lead time afforded for BEV applications projected to utilize public charging under the modeled potential compliance pathway, we conclude that there is sufficient time to plan and deploy both depot and public charging infrastructure that will support HD BEV adoption in the modeled potential compliance pathway in the MY 2027 to MY 2032 timeframe.

Finally, as noted in RTC 6.1 and described in Preamble II.B.2, EPA commits to actively engaging with stakeholders and monitoring heavy-duty BEV infrastructure deployment. Based on this monitoring, and as appropriate and consistent with CAA section 202(a) authority, EPA may decide to issue guidance documents, initiate a future rulemaking to consider modifications to the Phase 3 rule, or make no changes to the Phase 3 rule program.

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[437] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy." DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 3.
[438] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy." DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 8.

6.3 Charging Infrastructure Analysis

6.3.1 General

<u>Comments by Organizations</u>

Organization: American Trucking Associations (ATA)

Public charging will serve as a redundant power supply for fleets

Onsite "behind the fence" depot charging is preferred by early adopters. While public charging could allow for defrayed investment costs for fleets, the unpredictability of electricity prices and uncertain build out of public charging locations are forcing these fleets to invest capital in on-site charging. Today, there is one truck parking space for every 11 drivers in the industry, equating to 313,000 available spaces nationwide. Very few of those spaces have the infrastructure or capacity to charge heavy-duty ZEVs.25 Fleets see public charging stations needing to meet specific requirements to support electrification in the commercial vehicle industry. Public charging stations and sites should be:

- Closely located to where trucks fill up today. Freight corridors are already built out for optimal movement and charging stations will need to be located at or near sites where trucks spend downtime.
- Able to charge trucks at the same rate or faster than the time it takes to refuel a diesel truck today. Even one or two hours of charging downtime requires fleets to reconfigure and reoptimize routes, hours-of-service, scheduled downtime, and delivery schedules.
- Be designed for pull-in-charging to allow for a truck with a trailer to fit properly. [EPA-HQ-OAR-2022-0985-1535-A1, p. 18-19]

25 U.S. Department of Transportation, Jason's Law Commercial Motor Vehicle Parking Survey and Comparative Assessment, December 1, 2022.

Organization: Arizona State Legislature

EPA recognizes that '[m]ore charging infrastructure will be needed to support the growing fleet of HD [battery electric vehicles].' 88 Fed. Reg. 25926, 25978. But in its regulatory impact analysis, EPA only estimates costs for charging depots, not for en-route charging. 'We also do not estimate upfront hardware and installation costs for public or other en-route electric vehicle charging infrastructure because [battery electric vehicle] charging needs are met with depot charging in our analysis.' Draft Regulatory Impact Analysis, 195. EPA also argues that public and private funding 'will help meet future charging infrastructure needs.' Id. at 195-196. [EPA-HQ-OAR-2022-0985-1621-A1, p. 27]

Contrary to EPA's assumptions, en-route charging is critical for long-haul trucking. A diesel truck can travel more than 1,200 miles between refueling, which takes about 15 minutes.43 However, a two-hour charge of an electric battery only allows a truck to travel 200 miles.44 [EPA-HQ-OAR-2022-0985-1621-A1, p. 27]

43 Cleaner Vehicles: Good for Consumers and Public Health: Hearing before the Sen. Comm. On Env't and Public Works Subcomm. On Clean Air, Climate, and Nuclear Safety, 118th Cong. 4 (Apr. 18, 2023) (statement of Andrew Boyle, First Vice Chair of the American Trucking Associations and Co-President,

Boyle Transportation), available at https://www.epw.senate.gov/public/_cache/files/0/d/0d62639d-9821-4f0c-b4f5- 166ab4e7fb06/2DF4F5B6DD996B956650A34F09B92040.04-18-2023-boyle-testimony.pdf.

44 Id.

Chargers en route are required if battery electric vehicles will travel more than 200 miles. Analysis of fleet data indicates that almost 70% of vehicle miles traveled by semis would need to charge at public stations and not at company depots.45 The Department of Energy estimates that 40% of trucks travel between 250 and 750 average miles per workday.46 A study by the International Council on Clean Transportation found that one-third of truck trips leaving Los Angeles went to destinations more than 1,000 miles away.47 [EPA-HQ-OAR-2022-0985-1621-A1, p. 27]

45 Will Sierzchula, Electrifying US long haul trucks will require 504 TWh a year. But that won't be the hardest part, UTILITYDIVE, Dec. 1, 2022, available at https://www.utilitydive.com/news/electrifying-us-long-haul-trucks-willrequire-504-twh-a-year-but-that-won/636684/.

46 Jason Marcinkoski et al., 'Hydrogen Class 8 Long Haul Truck Targets,' U.S. Department of Energy, Dec. 12, 2019, 3, available at https://www.hydrogen.energy.gov/pdfs/19006_hydrogen_class8_long_haul_truck_targets.pdf.

47 Dale Hall and Nic Lutsey, Estimating the Infrastructure Needs and Costs for the Launch of Zero-Emission Trucks, THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION, Aug. 2019, 5, available at https://theicct.org/wpcontent/uploads/2021/06/ICCT_EV_HDVs_Infrastructure_20190809.pdf.

EPA has not considered availability of chargers. As the American Trucking Association noted, diesel fueling stations can serve 4-5 trucks per hour, while charging stations only could serve 2-3 trucks per day.48 The American Transportation Research Institute estimated that 'truck charging needs at a single rural rest area . . . would require enough daily electricity to power more than 5,000 U.S. households.'49 A study by the utility National Grid found that by 2035, the necessary charging capacity for a large passenger and truck stop 'will be roughly equivalent to the electric load of a small town.'50 Electricity loads needed to operate highway charging sites 'will begin to exceed distribution line capacity in the next 5-10 years.'51 [EPA-HQ-OAR-2022-0985-1621-A1, p. 27]

48 Statement of Andrew Boyle, supra note 43, at 4.

49 Cristina Commendatore, supra note 29.

50 National Grid, Electric Highways: Accelerating and Optimizing Fast-Charging Deployment for Carbon-Free Transportation, Nov. 2022, 32, available at https://www.nationalgrid.com/document/148616/download.

51 Id.

EPA also has not considered the cost of en-route chargers. The American Transportation Research Institute estimates that '[i]nitial equipment and installation costs at the nation's truck parking locations will top $35 billion.'52 [EPA-HQ-OAR-2022-0985-1621-A1, p. 28]

52 American Transportation Research Institute, supra note 42, at 2.

EPA also has not considered the time required by en-route chargers. Even top-of-the-line chargers that cost $100,000 each would still take five hours to achieve the same range as the current 15-minute diesel refueling, assuming a truck could even carry a battery of that size.53

Lost time would impact trucking companies' profitability and dramatically increase costs of shipped goods. [EPA-HQ-OAR-2022-0985-1621-A1, p. 28]

53 Statement of Andrew Boyle, supra note 43, at 4.

Organization: California Air Resources Board (CARB)

U.S. EPA estimates depot charging will fulfill BEV daily charging needs. This approach reflects U.S. EPA's expectation that many HD BEV owners will opt to purchase and install EVSE at depots. Therefore, U.S. EPA does not estimate upfront hardware and installation costs for public and other public electric charging infrastructure. U.S. EPA requests comment on this analytical approach.181 [EPA-HQ-OAR-2022-0985-1591-A1, p.50]

181 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, Proposed Rules, 88 Fed. Reg., April 27, 2023, page 25978. https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

CARB staff believes this analysis approach is sound but could benefit from also considering that some fleets will want to use pubic fueling. In California, staff are learning that small fleets and independent operators may benefit from access to public overnight charging. Additionally, assuming that all charging needs will be met at the fleet's depot limits the utility of a BEV fleet that may occasionally need to broaden their range beyond the duty cycle that the vehicles and depot charging is designed to handle. [EPA-HQ-OAR-2022-0985-1591-A1, p.50]

The U.S. EPA's analytical approach should include public charging. Given the available information on the relative costs of depot and public charging, it is reasonable to assume that they are similar and that including public charging would not materially affect the analysis. However, the analytical approach would more closely reflect real-world conditions if it were to accommodate public charging. The CEC's analysis shows a ratio of approximately one public charger for every ten depot chargers.182 The installation of depot charging will be less preferred for certain fleets for reasons such as business model preferences, available parking and site footprint, site-level electrical capacity constraints, or others. Public charging, including charging during operational hours, will enable additional vehicles and fleets to electrify. Public charging supports long haul trucking where driving distances exceed range. Public charging will also support equitable access. Smaller independent owner-operators of vehicles such as drayage trucks and goods movement may not have access to depot charging. With that said, under all of EPA's proposed standards (including the most stringent alternative), ZEV penetration rises gradually and never rises above 40/60 percent, which both means there is time to develop public charging and that the fleets that do not need public charging can (if need be) make up the 40/60 percent, thus making public charging supportive but not required for successful implementation. Both hardware and installation costs vary over time. U.S. EPA research indicates that hardware cost would likely decrease over time due to economic scale and manufacturers learning. On the other hand, research indicate installation cost will likely increase due to higher labor and material costs over time. After considering the variation in how costs may change over time, U.S. EPA combined hardware and installation cost into the EVSE. U.S. EPA requests comment on this approach.183 CARB staff agrees with this general approach. There are a range of costs to install at any particular site even with the same hardware. Costs for hardware and some "balance of system" costs are likely to decrease with scale and learning. On the other hand, material and labor costs for installation may increase as they tend to do in general for construction and equipment installation (an effect not unique to EVSE and hydrogen stations), and the lowest-cost sites (with sufficient ground level space and existing electrical capacity) may be occupied first with higher-cost sites being put into use later. Combining these costs shows a cancellation effect allowing costs to remain constant for modeling purposes. It will be important to continue to monitor cost trends. [EPA-HQ-OAR-2022-0985-1591-A1, pp.50-51]

182 Electric Vehicle Charging Infrastructure Assessment - AB 2127, last accessed June 4, 2023. https://www.energy.ca.gov/data-reports/reports/electric-vehicle-charging-infrastructure-assessment-ab-2127

183 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, Proposed Rules, 88 Fed. Reg., April 27, 2023, page 25982. https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

Organization: Clean Fuels Development Coalition et al.

C. The proposal underestimates the cost for charging infrastructure.

Charging infrastructure is the single largest expense accounted for in the proposal—$47 billion in "electric vehicle supply equipment (EVSE) costs." But this expense only accounts for "depot" charging installation, or the cost to install heavy-duty chargers at an electric vehicle's home base. This completely ignores "upfront hardware and installation costs for public or other en-route electric vehicle charging infrastructure" because it assumes "BEV charging needs are met with depot charging." 88 Fed. Reg. 25,978. This is unrealistic, particularly given the short ranges of heavy-duty batteries and the long travel distances expected of heavy-duty vehicles. To compound this error, the proposal makes unreasonable assumptions about how many of these depot chargers are needed. EPA "assume[s] that up to two vehicles can share one DCFC port if there is sufficient depot dwell time for both vehicles to meet their daily charging needs." DRIA at 200. This allows, as EPA explains, "per-vehicle EVSE costs [to] decline by 50 percent or more." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 33]

Organization: Daimler Truck North America LLC (DTNA)

Importance of Public Charging Infrastructure

Because of the costs, complexities, and timelines discussed above, some depot-based fleets will be unable to rely on depot-only charging and will be required to utilize publicly available charging. Small business fleets are less likely to have dedicated depot locations and access to capital for ZEVs and their associated infrastructure, and are more likely to rely on public charging, consistent with today's retail station refueling model. Finally, we predict that some of the vehicle applications and routes modeled in the HD TRUCS tool and assumed to be only depot-charged may in fact require en-route opportunity charging. For example, the Class 8 Regional Day Cab with a 90th percentile daily VMT of 349 miles may exceed the range capabilities of a BEV tractor on a single charge and need to utilize public charging. Estimating the proportion of BEVs that will utilize public versus private charging needs further study as the market develops. Figure 6 below from ICCT's ZEV Infrastructure White Paper may present a reasonable approximation for consideration during this rulemaking process. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

Public charging sites will need to be equipped with a range of charging capacities to serve a variety of needs from low-speed overnight charging to ultrafast charging to reenergize large HDV batteries in a short period of time. In its April 2023 white paper on TCO for Class 8 alternative powertrain technologies, ICCT estimates the costs to develop electric infrastructure for dually equipped public charging sites and presents projected public charging rates for select states, as shown in Figure 7 below.126 DTNA recommends that EPA consider incorporating a public charging scenario in HD TRUCS, as the dollar per kilowatt-hour rate is significantly different in this public charging scenario compared to EPA's projection for depot charging on commercial rates. [EPA-HQ-OAR-2022-0985-1555-A1, p. 56] [Refer to Figure 7 on p. 56 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

126 See ICCT, Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States (April 2023), https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf (ICCT TCO White Paper).

EPA Request for Comment, Request #30: In draft RIA Chapters 2.6 and 2.7.7 we describe how we accounted for charging infrastructure in our analysis of HD BEV technology feasibility and adoption rates for MYs 2027- 2032. For this analysis, we estimate infrastructure costs associated with depot charging to fulfill each BEV's daily charging needs off-shift with the appropriately sized electrical vehicle supply equipment . . . This approach reflects our expectation that many heavy-duty BEV owners will opt to purchase and install EVSE at depots; accordingly, we explicitly account for all of these upfront costs in our analysis. By contrast, we do not estimate upfront hardware and installation costs for public and other en-route electric charging infrastructure because the BEV charging needs are met with depot charging in our analysis . . .We request comment on this analytical approach.

- DTNA Response: EPA's assumption that all BEVs will rely exclusively on depot charging is mistaken. DTNA believes that many depots will not be able to install adequate charging infrastructure and that many vehicles do not return to depots. DTNA also believes that many vehicles do not have the 12-hour dwell time EPA projects, necessitating much higher power demands for BEV charging. Many vehicles will exceed EPA's projected power demands due to high VMT or accessory loads, and will require opportunity charging that EPA does not account for. Additionally we expect many fleets, especially small businesses, will rely exclusively on public charging. This lack of infrastructure could undermine the feasibility of the Proposed Rule, as discussed in Section II.B.3 and Appendix A to these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 163]

Organization: Electrification Coalition (EC)

We concur with EPA that many HD EV owners will opt to utilize depot charging, particularly in the near-term, but en-route charging will also be needed for long-term success in achieving electrification across all HD classes. [EPA-HQ-OAR-2022-0985-1558-A1, p. 13]

The EPA specifically requests comment on their approach to include costs associated with depot charging in the draft RIA Chapters 2.6 and 2.7.7, as their expectation is that many HD EV owners will opt to purchase and install EV charging infrastructure at depots versus utilize en-route charging.36 The EC comments that while depot and en-route public charging will both be needed to scale HD vehicle electrification, we see a trend that depot charging will play a greater role, particularly in the immediate term. [EPA-HQ-OAR-2022-0985-1558-A1, p. 13]

36 See page 25978 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

During the New York and New Jersey MHDV Fleet Workshop in October 2022 hosted by the Environmental Defense Fund and Atlas Public Policy, speakers representing fleets stated that their preference is depot or at home charging, while noting that there will be an opportunity for en-route public charging in the future. Speakers stated concerns that en-route public charging is too cost prohibitive compared to depot charging, as en-route charging might subject the driver to peak prices if charging during the day, whereas depot charging will likely offer lower overnight rates. In addition, speakers shared concerns of en-route public charging not built out yet to meet the current demands from industry. [EPA-HQ-OAR-2022-0985-1558-A1, p. 13]

We are seeing a trend of companies making investments into HD vehicle depot charging. Prologis, for example, are making investments to provide depot charging for their fleet tenants at their warehouses. Additionally, trucking-as-a-service companies provide customers with access to both electric HD vehicles and depot charging. [EPA-HQ-OAR-2022-0985-1558-A1, p. 13]

To facilitate the long-term adoption of HD electric vehicles, public and en-route charging will be necessary, particularly for long-haul trucking and to charge vehicles that may not have access to depot charging. Where the concertation of depot versus public charging will be installed may be dependent on the use cases for HD vehicles, particularly in the freight sector. The ICCT noted in their report on near-term infrastructure needs of HD vehicle electrification that counties with a greater percentage of urban and regional trucking will require a higher concentration of depot charging whereas counties with a greater percentage of long-haul trucking will require more en-route public charging.37 [EPA-HQ-OAR-2022-0985-1558-A1, pp. 13-14]

37 https://theicct.org/publication/infrastructure-deployment-mhdv-may23/

Organization: MEMA

BEV early adopter market segments with predictable daily routes and usage: Bus applications, including school bus and transit, are early adopter segments for BEV. Even though Heavy Duty BEV is still in early stages of deployment worldwide, school bus and transit bus have already had more time to validate that BEV technology can be 1:1 with ICE for performing daily missions for a larger percentage of fleets than the adoption currently projected in the HD TRUCS model for these segments (0-32% in MY27 and 35-45% in MY32). [EPA-HQ-OAR-2022-0985-1570-A1, p. 22]

Segments that can reliably charge overnight in depot: School bus, transit bus, and port drayage can take advantage of the flexibilities of overnight depot charging and opportunity charging throughout the day when not in use. Although more costly EVSE is required to maintain the fleet's business model, these three applications also have increased incentive support to overcome initial cost barriers of vehicle and EVSE at the state and federal level. These fleets can also participate in V2G bi-directional charging capabilities. [EPA-HQ-OAR-2022-0985-1570-A1, p. 22]

Port drayage fleets are more likely to require multi-shift operation during peak shipping periods, which will need higher power EVSE to maintain productivity. Multishift operation can challenge 1:1 productivity parity for BEV vs. conventional technology if minimum charging infrastructure is assumed, as is currently reflected in HD TRUCS at 50KW. However, purchasing high power EVSE (350KW+) as noted above can be part of the drayage fleet manager's and port operator's plans for electrifying port operations due to domiciled operations allowing for re-charging during 30-minute lunch breaks. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 22 - 23]

End-users with goals to minimize fuel costs and/or achieve progress towards ESG metrics

Pickup a delivery duty cycles served by Box trucks, Step-Vans, and Regional Haul tractors, especially those purchased by fleets motivated by ESG goals, indicate fleet owner/operators with more willingness to adopt new technology faster. Many of the early orders of BEV included in EPA's GHG Ph 3 preambles come from packaging and consumer package goods fleets who have aligned goals to reducing GHG from operations. [EPA-HQ-OAR-2022-0985-1570-A1, p. 23]

Recommendations:

a) EPA and other Federal agencies consider how incentivized support for infrastructure can be used to 1) future-proof DC charging needs, 2) allow faster ZEV deployment for early adopter segments, 3) provide opportunity to leverage potential benefits in bi-directional charging for school bus and other suitable municipal applications, resulting in 4) improved grid resiliency to maintain critical services in case of casualty. [EPA-HQ-OAR-2022-0985-1570-A1, p. 23]

b) EPA reexamine the readiness for ZEV adoption for the three advanced applications noted above and adjust the TRUCS model accordingly. [EPA-HQ-OAR-2022-0985-1570-A1, p. 23]

Organization: RMI

The EPA projects manufacturers will make a combination of internal combustion engine (ICE) and zero-emission vehicle technologies in order to comply with the rules. Electric heavy-duty trucks are a critical way to reduce transportation emissions and improve environmental health. Electric trucks provide an economic, practical, and environmentally clean solution for our increasing trucking demand. [EPA-HQ-OAR-2022-0985-1529-A1, p. 1]

RMI's analysis of trucking in California and New York found that almost 50% of heavy-duty trucks can complete their routes using electric trucks commercially available today without the need for public charging.2 RMI's partner organization, the North American Council for Freight Efficiency (NACFE), has shown that trucks with routes less than 200 miles a day can be electrified now, with adoption hinging on vehicle economics improving and available depot and on-route charging extending the truck's range.3 [EPA-HQ-OAR-2022-0985-1529-A1, p. 1]

2 Jessie Lund et al., Charting the Course for Early Truck Electrification, RMI, 2022, https://rmi.org/insight/electrify-trucking/.

3 Roeth et al,. Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors, NACFE, May 5, 2022, https://nacfe.org/wp-content/uploads/edd/2022/05/HD-Regional-Haul-Report-FINAL.pdf

RMI recently released two reports on the benefits of EVs that the comments below pull from:

- A report, Preventing Electric Truck Gridlock, which provides a background on electric trucks, their market potential, and an overview of the challenges facing rapid electrification of the industry.
- A report, How Policy Actions Can Spur EV Adoption in the United States, which includes analysis on the market transforming Inflation Reduction Act EV incentives [EPA-HQ-OAR-2022-0985-1529-A1, pp. 1-2]

RMI is working to support the North American Council for Freight Efficiency in their 2023 biannual Run On Less – Electric DEPOT Event in September which will focus on fleet scaling considerations such as charging infrastructure, engagement with utilities, total cost of ownership management, driver and technician training, and more. This event will provide useful information for the EPA on the truck industry. Current sponsors include PepsiCo, Cummins, and Shell [EPA-HQ-OAR-2022-0985-1529-A1, p. 2]

Organization: Truck Renting and Leasing Association (TRALA)

EPAs methodology within its Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS) also assumes that all customers will choose minimal on-site charging power to keep capital costs low. 27 The agency's assumption for 19-50KW charging across many vehicle applications in medium heavy-duty vehicles seems fundamentally incorrect based on what TRALA is hearing from end-users about intentions to install 150KW-350KW charging on-site. This assumption does not match many end-users plans to future-proof their charging infrastructure to enable use across more vehicles and opportunity charging for multi-shift or peak operational periods. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

27 EPA's Heavy-Duty Technology Resource Use Case Scenario (HD TRUCS) was specifically developed by EPA to evaluate HD ZEV technologies and costs under Phase 3.

Some MD truck applications, such as Class 4-8 box trucks, port drayage tractors, Class 4-7 step vans, and Class 6-7 flatbed trucks are used for routes similar to those of regional haul tractors which are projected in HD TRUCS to need 150-350KW charging. However, in HD TRUCS the applications mentioned above are only assumed to require 19-50KW chargers. TRALA recommends EPA issue a request for information (RFI) to end-users to acquire information on charging power needs for commercial vehicle operations and test these sensitive up-front cost assumptions that are used to project end-user willingness to adopt ZEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

To demonstrate the importance of testing this assumed critical input, EPA should run a sensitivity analysis to project the payback for all vehicle applications that are assumed to require 19-50KW charging if they require higher power DC charging. If, as many in industry suspect, most medium heavy-duty end-users require higher power charging in the 150-350KW and beyond range to maintain 1:1 productivity, this will change HD TRUCS model payback and ZEV projections. [EPA-HQ-OAR-2022-0985-1577-A1, p. 19]

The uncertainty within FHWA's guidance for public charging infrastructure for medium heavy-duty vehicles undermines end-user confidence that there will be sufficient public infrastructure to support ZEV technologies. Therefore, it will benefit EPA, and all stakeholders impacted under Phase 3, to define medium heavy-duty charging requirements for 1:1 productivity now so that HD TRUCS has correct Electric Vehicle Supply Equipment (EVSE) costs modeled and FHWA has clear requirements for NEVI planning early in the program to ensure public funding efficiently enables ZEV deployment across all targeted vehicle applications. [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Organization: Valero Energy Corporation

5. EPA's analysis inappropriately categorizes all HD EVSE as depot charging.

Regarding HD PEV charging, EPA states "we…do not estimate upfront hardware and installation costs for public or other en-route electric vehicle charging infrastructure because BEV charging needs are met with depot charging in our analysis."53 [EPA-HQ-OAR-2022-0985-1566-A2, p. 12]

53 DRIA at 195.

However, EPA separately acknowledges that "certain vehicles, such as long-haul trucks, may depend on these [en-route] stations for a significant fraction of their daily electricity needs."54 EPA cites to studies by ICCT, Atlas Public Policy, and the Goldman School of Public Policy that project future infrastructure needs and costs for HD EVSE. But these studies do not support EPA's assumption that all BEV charging needs will be met with depot charging – in fact, they directly contradict EPA's assumption:

- A "depot charging approach limits freedom of movement of the vehicle, so additional infrastructure investments will be necessary. Some trips will require more power than one overnight depot charging event can provide." 55
- A "reasonable share of vehicle owners, particularly independent owner-operators, will not have the resources to install a private network of charging points and will depend on chargers installed by others."56
- "In 2030, internal combustion engines will continue to power 96% of tractor-trailers operating in the United States," and while "around 75% of charging points will provide overnight private depot charging, an additional 14% will provide overnight publicly accessible depot charging, and 11% will provide publicly accessible charging speeds of 350 kW or greater."57
- Personally-owned Class 4-8 trucks and all long-haul trucks will use on-road charging exclusively; and personally-owned Class 3 trucks and Class 3-8 fleet vehicles (excluding long-haul) use depot/home charging 75 to 90 percent of the time and on-road charging 10 to 25 percent of the time.58
- For heavy-duty trucks, "the combination of 125-, 350-, and 1,000-kW HDT chargepoints will be spread across about 2,700 truck stops."59 [EPA-HQ-OAR-2022-0985-1566-A2, p. 12]

54 DRIA at 63.

55 ICCT Working Paper 2021-33, "Infrastructure to support a 100% zero-emission tractor-trailer fleet in the United States by 2040" at 2 (September 2021).

56 ICCT Working Paper 2021-33, "Infrastructure to support a 100% zero-emission tractor-trailer fleet in the United States by 2040" at 2 (September 2021).

57 ICCT Working Paper 2021-22, at 9.

58 Atlas Public Policy, “U.S. Vehicle Electrification Infrastructure Assessment: Medium- and Heavy-Duty Truck Charging” at 15, (November 12, 2021).

59 Goldman School of Public Policy, University of California Berkeley, “Plummeting Costs and Dramatic Improvements in Batteries can Accelerate our Clean Transportation Future” at 31 (April 2021).

Despite EPA’s statement that its EVSE and operating costs represent “estimated costs incurred by users and society more generally of MY 2027 and later HD vehicles,”60 EPA fails to account for the hardware and installation costs for en-route PEV charging in its overall program costs. Rather, EPA anticipates “that a variety of public and private funding—including Federal investments under the BIL and the IRA, and funding from states, automakers, charging providers, utilities, and others—will help meet future charging infrastructure needs.”61 EPA must acknowledge in its impact analysis that public and private funding is not “free” – every dollar supported by public funding is ultimately borne by taxpayers, and every dollar invested by private funders is supported by a plan for recouping the investment. [EPA-HQ-OAR-2022-0985-1566-A2, p. 13]

60 DRIA at xiii, emphasis added.

61 DRIA at 195-196.

Even if fleet owners will not bear the direct burden of capital costs for installing the requisite en-route stations, EPA should assume that the station capital costs will be amortized within the price of electricity, consistent with the methodology that EPA has applied for both FCEV and ICEV fueling.62 [EPA-HQ-OAR-2022-0985-1566-A2, p. 13]

62 DRIA at 85.

EPA Summary and Response

Summary:

In the NPRM, EPA estimated infrastructure costs associated with depot charging to fulfill each BEV’s daily charging needs off-shift with appropriately sized EVSE. While we acknowledged some vehicles may use public or other en-route charging, we did not directly estimate these costs since BEV charging needs were met with depot charging in our NPRM analysis (see DRIA at 195). We requested comment on this approach.

Multiple commenters agreed with EPA that depot charging would be preferred and sufficient for many BEVs, particularly in the Phase 3 program’s early years. For example, RMI cited an analysis they conducted of heavy-duty trucks in California and New York, which found that almost half of the vehicles can meet their daily needs without public charging. The Electrification Coalition noted that New York and New Jersey fleet owners participating in a 2022 workshop stated that they currently preferred depot charging, expressing concern that public charging may not yet be available and that electricity costs would be higher due to peak daytime pricing. Likewise, ATA noted that early adopters prefer depot to public charging noting some of the challenges with the latter. MEMA also cited several vocations—school buses, transit buses, and port drayage—for which depot charging can be effective.

However, most commenters on this topic also saw a role for public charging at some point in the Phase 3 rule’s time frame and many recommended that EPA include public charging in its analysis. For example, the Electrification Coalition said that en-route charging would be needed in the longer term both for vehicles without depot charging access and for long-haul applications. CARB stated that EPA's decision to only model depot charging was sound given the ZEV penetration levels and phase-in time in the agency's modeled compliance pathway but noted that the analysis would better reflect the real world if it included some public charging. CARB further noted that it did not anticipate a significant impact on costs based on comparable cost data for depot and public EVSE.

The Arizona State Legislature, Clean Fuels Development Coalition et al., DTNA, and Valero also said that EPA should account for public charging costs. The Arizona State Legislature commented that en-route charging would be needed for long-haul or other vehicles with daily VMT over 200 miles, citing several sources showing significant numbers of vehicles are over that threshold or would otherwise need public charging. DTNA also stated that BEVs with high VMT (e.g., a Class 8 regional cab with 349 miles a day) may need public charging as would other vehicles (e.g., those in small business fleets) for which it's difficult to install depot charging (e.g., due to location or capital costs). DTNA suggested that EPA could use a recent ICCT paper (Ragon et al.) to inform modeling of public infrastructure needs and costs within HD TRUCS.

Valero commented that EPA should include the costs for public charging infrastructure in its impacts analysis regardless of whether it is borne directly by fleet owners or paid for with public or private investments, and suggested amortizing costs of public charging within the estimated electricity price (noting this would be consistent with the approach EPA uses for ICE vehicles and FCEVs). The Arizona State Legislature said EPA did not consider costs of downtime associated with en-route charging.

EPA also received comments about the EVSE power levels in our depot charging analysis, which included L2 charging at 19.2 kW and DCFC at 50 kW, 150 kW, and 350 kW. TRALA commented that EPA's approach to select the lowest cost option is inconsistent with the user preferences and plans to install higher power (150 kW+) charging. TRALA suggested EPA issue a request for information to better understand power needs and to conduct a sensitivity within HD TRUCS to assess impact on payback periods if depot charging is assumed to be 150 kW to 350 kW. MEMA likewise noted that higher power charging than is assumed in HD TRUCS may be needed to serve multi-shift operations for port drayage vehicles (e.g., fleets may opt for 350 kW EVSE to enable charging during operators' lunch breaks.)

Other comments on EVSE costs, charging costs, and dwell times are summarized and addressed in the following sections.

Response:

As discussed above, EPA's NPRM analysis estimated infrastructure costs associated with depot charging to fulfill each BEV's daily charging needs. This reflected our expectation that many heavy-duty BEV owners would opt to purchase and install sufficient EVSE to ensure their vehicle's operational needs are met. Commenters agreed that charging at depots is likely to be preferred over public (or en-route charging) for certain fleets and vehicle types, particularly in the early years of the Phase 3 program. Therefore, we continue to project that most vocational vehicles and certain day cab tractors—those with return-to-base operations—will rely on depot charging and we model them accordingly in our FRM analysis (though we have made updates to that analysis as described in RIA 2.6 and RTC 6.3.2 to 6.3.4 below).

However, we acknowledged in the proposal that some public charging may be needed in future years, and we agree with commenters that it is appropriate to incorporate some public charging costs into our analysis as part of the modeled potential compliance pathway that supports the feasibility of the final standards. In particular, we agree that long-haul and certain other vehicles with long daily ranges or that do not regularly return to base may rely on en-route or public charging. As described in RIA 2.6, starting in MY 2030 in our final rule HD TRUCS analysis we project public charging will be used by certain long-haul vehicles (both sleeper cab and long-range day cab tractors) and coach buses (although we note that the coach bus custom chassis standards are unchanged for the Phase 3 – we assume that if there are electrified coach buses, they would utilize public charging networks). We further agree with the commenters who suggested that the hardware and installation costs for public charging infrastructure would typically be passed onto BEV owners through the charging price. Accordingly, we have incorporated amortized public charging infrastructure costs into a $ per kWh charging cost for vehicles that we project will use public charging. DTNA suggested a public charging cost of $0.196 per kWh sourced from a recent ICCT paper (Basma et al. 2023).[439] We agree that is a reasonable choice and have utilized it in our FRM analysis (while also making adjustments in future years to reflect changes in electricity prices over time as described in RIA 2.4.4.2 and RTC 6.3.3). These public infrastructure costs reflect ICCT's assumed mix of 1 MW and 150 kW EVSE ports to meet long-haul BEV charging needs with each station capable of 20 MW power.[440] See RIA 2.6.3 for a discussion of this topic, including estimated charge times for vehicles that we project will use public charging at 1 MW.

We selected MY 2030 as the year when we project there will be sufficient public charging infrastructure for HD vehicles for the projected utilization of such technologies under the modeled potential compliance pathway (see our discussion of lead time in RTC Chapter 6.2).

For depot charging, we continue to model four EVSE power levels (19.2 kW, 50 kW, 150 kW, and 350 kW) and to select the lowest cost EVSE option for each of the depot-charging vehicle types in HD TRUCS that can meet its needs. However, we agree with TRALA that some fleet owners may opt for higher power and higher cost EVSE options, as we acknowledged in the NPRM (DRIA at 201). TRALA suggested we conduct a sensitivity that restricts depot charging options to 150 kW or higher but did not provide detailed information on the specific scenario EPA should use for such a sensitivity. In particular, we note that per vehicle EVSE costs are impacted not only by the hardware and installation costs of the selected EVSE, but by how many vehicles can share that EVSE port. Fleet owners that opt for higher-power ports may be doing so in order to share those ports across more vehicles (and reduce total installed depot costs) or to future-proof the depot so additional EVSE do not need to be installed as more BEVs are incorporated into the fleet. To illustrate this point, consider a fleet of transit buses that each need to add 350 kWh of energy from charging over the same 8-hour dwell period at a depot. A fleet owner opting for 50 kW EVSEs would need one port per bus at a cost of about $54,000 each

[439] Hussein Basma, Claire Buysee, Yuanrong Zhou, and Felipe Rodriguez. "Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-haul Trucks in the United States." International Council on Clean Transportation. April 2023. Available online: https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf.

[440] Hussein Basma, Claire Buysee, Yuanrong Zhou, and Felipe Rodriguez. "Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-haul Trucks in the United States." International Council on Clean Transportation. April 2023. Available online: https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf.

(using EVSE cost and charging loss assumptions from our FRM analysis) whereas if the fleet owner opts for 350 kW charging, up to seven buses could share the same port at a per vehicle cost of about $28,000 (just over half the costs under 50 kW.) EPA did not conduct a sensitivity in HD TRUCS, but notes that overall costs could be higher or lower (depending on assumptions), and to the extent fleets owners opt for higher power charging in order to share ports among vehicles, EPA's costs could be conservative.

We address the issue of potential need for distribution grid buildout to support public charging stations in RTC 7 (Distribution) below.

6.3.2 EVSE Costs

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

EPA's cost analysis also assumes—without any concrete support—an "upfront" cost for ZEV purchasers of EVSE at or near the time of the vehicle purchase. [EPA-HQ-OAR-2022-0985-1659-A2, p. 30]

Organization: American Trucking Associations (ATA)

The uncertainty of the costs associated with opportunity public charging and the availability of mega charging sites requires fleets to invest in onsite charging. Investment in charging onsite has become a barrier as well. On average, a 180-kW charger with dual ports costs fleets $100,000 each. In consultation with utilities, available power and expected power usage dictate the number of chargers on site. In many cases, the high cost of installation and planning also limits fleets from electrifying a greater number of ZEVs or narrows their electrification plans to just forklifts or yard trucks. [EPA-HQ-OAR-2022-0985-1535-A1, p. 18]

Organization: CALSTART

Technology diffusion and infrastructure costs: EPA's cost scenario assumes no reduction in the cost of infrastructure over time. Both the range of costs used in EPA's assumptions and the lack of reduction do not match market realities. EPA references an ICCT assumption of a 3 percent annual cost reduction but does not include it.53F54 To assume no change in costs over time can cause an incorrect assumption of payback timing and introduce artificial cost/benefit tradeoffs for fleets. Analyses show that capital costs across energy supply infrastructure have shown significant reductions due to technology learning rates, such as in solar technology.54F55 Our analysis considers a technology reduction cost between 4 percent and 7 percent annually, similar to those seen in wind and solar, as reasonable. Using this assumption in our assessment reduces total capital costs of electric vehicle supply equipment in our scenarios by 11 percent. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 24 - 25]

54 https://theicct.org/wp-content/uploads/2021/06/ICCT_EV_Charging_Cost_20190813.pdf

55 https://www.sciencedirect.com/science/ar..cle/pii/S1364032120307747#fig4

Organization: Clean Fuels Development Coalition et al.

And, as will be discussed later in this comment, the proposal's listed costs grossly underestimate the rule's true costs. The proper metric is aggregate cost because the major-questions doctrine asks about the rule's significance to the "national economy." West Virginia v. EPA, 142 S. Ct. at 2609 (2022). These aggregate costs include: [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

Vehicle fueling infrastructure: Not only the costs to build depot chargers that the proposal contemplates, but also the cost to install and maintain all the DC fast-charging stations necessary for purchasers to use the heavy-duty vehicles when they are out on the road. [EPA-HQ-OAR-2022-0985-1585-A1, p. 5]

Electric power costs: Researchers estimate that the 350 million electric vehicles required to decarbonize the U.S. fleet by 2050 could use as much as half of U.S. national electricity demand. See Thea Riofrancos et al., Achieving Zero Emissions with More Mobility and Less Mining, U.C. Davis Climate + Community Project (Jan. 2023), https://subscriber.politicopro.com/eenews/f/eenews/?id=00000185-e562-de44-a7bf-ed7751a00000. The proposal would hence amount to a complete transformation of the electric power sector, requiring substantially more generation, transmission, and distribution, which in turn would result in higher power prices not just for those using electrified vehicles, but for all users. [EPA-HQ-OAR-2022-0985-1585-A1, p. 5]

Organization: Daimler Truck North America LLC (DTNA)

Infrastructure Costs Electrical infrastructure costs are not adequately accounted for in EPA's HD TRUCS modeling. As a counterpoint to EPA's estimates in the Proposed Rule, the Company presents a summary of the average combined hardware and installation EVSE costs in Table 10 below, based upon DTNA's experience working with fleet customers. EPA assumes all customers will have 12- hour depot dwell times for lower speed overnight charging, however, DTNA believes that a significant portion of the HD fleet sees higher utilization, requiring faster charging times. We would thus expect higher costs for customers where faster charging speeds are required. [EPA-HQ-OAR-2022-0985-1555-A1, p. 30] [Refer to Table 10 on p. 30 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

EPA Request for Comment, Request #75: We request comment on our estimated EVSE costs as well as our proposal to add EVSE costs to each vehicle's purchaser RPE costs in estimating purchaser costs.

> DTNA Response: As EVSE is required for fleets, and heavy-duty public charging networks do not exist, EPA should include EVSE costs in each vehicle purchaser's RPE. DTNA believes that EPA underestimates EVSE costs and is willing to share relevant data confidentially with EPA. As discussed in Section II.C of these comments, EPA should re-evaluate its assumptions on this issue on a regular basis, using the best available data. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172]

EPA Request for Comment, Request #36: After considering the uncertainty on how costs may change over time, we keep the combined hardware and installation costs per EVSE port constant. We request comment on this approach.

- DTNA Response: See DTNA Response to Request # 20, above. In addition, DTNA believes EPA is under-estimating EVSE costs, and is willing to share relevant data confidentially with EPA. [EPA-HQ-OAR-2022-0985-1555-A1, p. 164]

EPA Request for Comment, Request #37: We request comment, including data, on our approach and assessment of current and future costs for charging equipment and installation

DTNA Response: See DTNA Response to Request # 20 and 36, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 164]

Organization: Environmental Defense Fund (EDF)

1. EPA's underlying component costs are high

While EPA includes the Commercial Clean Vehicle Credit and the production tax credit for batteries, it fails to include the Alternative Fuel Refueling Property Credit in its assessment of cost. The IRS has not published guidance yet on how this credit will be applied, but the language from the IRA indicates that businesses could receive up to a 30% credit on up to $100,000 of EVSE. Roush, in a recent report, showed that this also could save vehicle owners $1,064 for a 25 kW charger to $26,000 for a 100 kW charger.130 [EPA-HQ-OAR-2022-0985-1644-A1, p. 53]

130 H. Saxena, S. Pillai, "Impact of the Inflation Reduction Act of 2022 on Medium- and Heavy-Duty Electrification on MYs 2024 and 2027," 2023. Roush.

In their modeling, EPA has a maximum of two vehicles per charger even if many more vehicles could be charged in the 12 hours of dwell time EPA assumes. This results in a high estimate of number of EVSE ports needed, driving up the EVSE costs and driving down the stringency of the rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 53]

Organization: MEMA

- The model assumes that end-users will buy the lowest cost, lowest power chargers possible given the vehicle application's daily energy expenditures and overnight dwell time -12 hours. This assumption does not match what we have heard from end-users that indicates commercial vehicle end users want to invest in EVSE at a higher power level than minimum requirements. Because of the need for faster charging time, 150KW-350KW charging rather than 19-50KW charging is more desirable in the commercial vehicle space due to desires to future proof infrastructure investments and have more flexibility in charging options for overnight and opportunity charging. It is believed this higher kW power charging provides a margin of safety that fleet operators will seek to avoid costly vehicle downtime. [EPA-HQ-OAR-2022-0985-1570-A1, p. 16]

Recommendation: EPA run a sensitivity analysis using HD TRUCS to see how payback and adoption analyses would change if the applications currently assumed to use 19- 50 KW in the model instead are projected using 150-350KW. EPA issue a public request for information about vehicle dwell time and intentions to install higher power DC fast charging on site. [EPA-HQ-OAR-2022-0985-1570-A1, p. 16]

Some percentage of the above noted vehicle applications can electrify once suitable charging is available near the job site. We would expect BEV adoption to increase in areas where fast charging (>150-350KW) has been deployed in industrial, metro, and interstate locations. However, we would not recommend full-BEV technology be modeled, recommended or mandated for utility vehicles that restore critical services in emergency situations due to the risk of charging infrastructure downtime impeding the vehicles' missions. [EPA-HQ-OAR-2022-0985-1570-A1, p. 19]

Given sufficient time to gather data, industry can support EPA development of HD TRUCS model with GPS-driven geographical inputs of a variety of vehicle applications to assess the variability of routes/location and assess public infrastructure charging needs. A MEMA member provides an example below of the kind of additional data that could be provided to EPA using telematics, GPS, and elevation maps on a refuse application. [EPA-HQ-OAR-2022-0985-1570-A1, p. 19.] [See Docket Number EPA-HQ-OAR-2022-0985-1570-A1, page. 19, for referenced figure.]

Organization: PACCAR

C. EPA UNDERESTIMATES CHARGER COSTS

TRUCS underestimates the cost of electric vehicle supply equipment (EVSE). EPA assumed a $162,333 cost in 2021 dollars for a 350 kW charger. However, during the Phase 3 timeframe, PACCAR projects that actual per-charger costs will be tens of thousands of dollars more. The TRUCS analysis also fails to consider EVSE maintenance costs, including those for periodic cable replacement, repairs due to operator damage, and filter replacement, each of which can be significant. A recent ICCT paper, for example, estimates that annual maintenance charger costs will be $3,200 annually.4 [EPA-HQ-OAR-2022-0985-1607-A1, p. 6.] [See table 8 on page 7 of EPA-HQ-OAR-2022-0985-1607-A1.]

4. Id.

E. TRUCS DOES NOT ACCOUNT FOR IMPORTANT OPERATING COSTS

TRUCS omits other key considerations that will affect electric vehicle operating costs. For example, only onsite-charging costs are considered in estimating electric vehicle charging cost. Although EPA's Regulatory Impact Analysis recognizes that "public charging price may incorporate the profit margin of the third-party charging provider along with operating expenses, and costs associated with charging equipment depreciation," TRUCS does not factor in such public charging station cost increases.5 It was unrealistic for EPA to assume that all charging will take place onsite, so EPA should have considered higher offsite-charging costs as well. [EPA-HQ-OAR-2022-0985-1607-A1, p. 8]

5 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis at 68, EPA-420-D-23-001 April 2023, available at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

Organization: Tesla, Inc. (Tesla)

Turning to the record the agency has set forth then, first, the agency's cost estimates for DCFC installation are higher than Tesla's experience. Tesla has established the lowest cost in the industry and shown the costs to be more than 50% below current industry averages.198 Importantly, EPA should recognize that non-utility ownership of BEV charging stations is associated with significantly reduced cost of installation.199 Further, charging technology, like vehicle technology, is also maturing as more suppliers and manufacturing facilities are coming online.200 [EPA-HQ-OAR-2022-0985-1505-A1, p. 27]

198 Tesla, Investor's Day Presentation (March 1, 2023) at 97 - 101 available at https://digitalassets.tesla.com/teslacontents/image/upload/IR/Investor-Day-2023-Keynote

199 See Grid Strategies/Electric Serving Customers Best: The Benefits of Competitive Electric Vehicle Charging Stations (May 2023) at Table 3 (showing calculations for average cost per EV charging port by company) available at https://www.electricadvisorsconsulting.com/wp-content/uploads/2023/05/The-Benefits-of-Competitive-EV-Charging- Stations.pdf

200 See, ABB, ABB expands US manufacturing footprint with investment in new EV charger facility (Sept. 14, 2023) available at https://new.abb.com/news/detail/94725/abb-expands-us-manufacturing-footprint-with-investment-in-new-ev-chargerfacility; See also, Tritium, Tritium Celebrates the Opening of Its First Global EV Fast Charger Manufacturing Facility in the United States (Aug. 23, 2022) available at https://tritiumcharging.com/tritium-celebrates-the-opening-of-its-first-global-evfast- charger-manufacturing-facility-in-the-united-states/

Organization: Truck and Engine Manufacturers Association (EMA)

EVSE Costs – The EVSE costs included in EPA's HD TRUCS cover the cost of the EVSE unit (charger) and the installation cost downstream of the electricity meter. The NPRM expects that the vehicle owner will be responsible for those costs. The data for those costs in the EPA tool came from an article published on June 21, 2021 by Nature Energy, as referenced in the Draft RIA. That article is based on a study authored in part by NREL as part of a DOE contract. The EVSE cost data from that study forms the basis of the EPA's EVSE costs, as shown in the Draft RIA Table 2-58 (p. 197), reproduced below. Significantly, EPA uses the low-end in each range of estimated ESVE costs in HD TRUCS. [EPA-HQ-OAR-2022-0985-2668-A1, p.28]

EMA data from OEMs shows that the low-end costs are consistently too low in comparison to what actually is being experienced in the field today and what likely will be experienced in the future. Instead, EMA has determined that the midrange values (average of the high and low values in the table) are far more consistent with OEM experience and with what is reasonably expected in the future for the Level 2, DC-50kW and DC-150kW installations. The high end of the range is more appropriate for the DC-350kW EVSE, even though that is still significantly below the current cost in the field. [EPA-HQ-OAR-2022-0985-2668-A1, p.28]

EMA agrees with EPA that the EVSE costs should be held constant throughout the regulated years. Increased labor costs are expected to offset or even overtake any reductions in the cost of the EVSE units over time. [EPA-HQ-OAR-2022-0985-2668-A1, p.29]

Based on the foregoing, the table below reflects the recommended values for EVSE costs that EMA has used in the EMA HD TRUCS model. [EPA-HQ-OAR-2022-0985-2668-A1, p.29] [See the EMA Recommended Values for EVSE Costs table on page 29 of docket number EPA-HQ-OAR-2022-0985-2668-A1]

EVSE Costs – EMA's recommended EVSE costs, shown in the table below, also were run together. The ensuing table shows the revised projected ZEV adoption rates for 2027 and 2032. [EPA-HQ-OAR-2022-0985-2668-A1, p. 37] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032 Tables on page 37 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Organization: Truck Renting and Leasing Association (TRALA)

The maximum 30% tax credit, up to $100,000 per EV charger, also has qualifying conditions including that charging stations must be located in an eligible census tract which by definition requires:

- A poverty rate of at least 20%; OR
- Location in a census tract that is not in a metropolitan area and the medium family income for the tract does not exceed 80% of the applicable statewide median family income; AND
- Laborers employed in the construction of EV charging stations must meet the new prevailing wage and apprenticeship requirements [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Many TRALA customers (i.e.., lessees) will not likely be able to maximize this tax credit either since they may not meet the preceding criteria or they will not have permission to install charging ports on leased property under their lease terms. [EPA-HQ-OAR-2022-0985-1577-A1, p. 20]

Organization: Valero Energy Corporation

6. The EVSE installation costs adopted by EPA are unrealistic.

Table 2-58 of the draft RIA summarizes the ranges of costs that EPA considered for EVSE hardware and installation, for Level 2 (19.2 kW), DC-50 kW, DC-150 kW and DC-350 kW power levels.63 [EPA-HQ-OAR-2022-0985-1566-A2, p. 13.] [See Table 2-58 Combined Hardware and Installation Costs, per EVSE Port: ICCT Costs on page 13 of docket number EPA-HQ-OAR-2022-0986-1566-A2.]

63 DRIA at 197.

While EPA details the significant funding opportunities made available for EV charging infrastructure under the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA),64 it acknowledges the “complexity of analyzing the combined potential impact of these provisions (including IRA programs for which implementation guidance is not yet available)”65 and clarifies that it did “not directly account[] for these cost savings in our depot charging analysis.”66 Instead, “to reflect our expectation that these programs could significantly reduce the overall infrastructure costs paid by BEV and fleet owners for depot charging, we are using the low end of our hardware and installation cost ranges, as shown in Table 2-60, for each charging type.”67 [EPA-HQ-OAR-2022-0985-1566-A2, p. 13.] [See Table 2-60, Combined Hardware and Installation Costs, per EVSE Port, on page 14 of docket number EPA-HQ-OAR-2022-0986-1566-A2.]

64 DRIA at 15-22.

65 DRIA at 202.

66 DRIA at 202.

67 DRIA at 202.

EPA again regards funding opportunities through the BIL and IRA as being "free," when in reality the funding comes at a very real cost to the U.S. taxpayer. Further, the cost ranges presented by EPA are drawn from sources published between 2017 and June 2021,68 all of which pre-date the adoption of the BIL in November 2021. In contrast to EPA's expectation that the BIL and IRA funding opportunities will reduce the cost of EVSE hardware and installation, industry warns that the "Build America, Buy America" provisions of the BIL will "slow the rollout, drive up costs" of compliant charging infrastructure.69 [EPA-HQ-OAR-2022-0985-1566-A2, p. 14]

68 DRIA at 197, footnotes 145 to 148.

69 See https://www.reuters.com/business/autos-transportation/ev-charger-makers-brace-slowdown-new-made-america-rules-kick-2023-03-21/ (accessed May 13, 2023).

In fact, recent estimates by EV charging station vendors and in DOT-approved state EV Infrastructure Deployment Plans project significantly higher EVSE costs than used by EPA in their cost analysis, ranging from $500,000 to $1.2 million in capital expenditures for a minimally-compliant NEVI charging station containing four simultaneously operable 150 kW CCS ports (i.e., $125,000 - $300,000 per DC-150 kW port).70,71,72,73 [EPA-HQ-OAR-2022-0985-1566-A2, p. 14]

70 See https://www.evgo.com/blog/building-ev-charging-stations-with-nevi/ (accessed May 13, 2023).

71 https://betterenergy.org/wp-content/uploads/2023/01/EV_CorridorRoadmap2023.pdf (accessed May 13, 2023).

72 ARDOT, "Arkansas Electric Vehicle Charging" (July 2022), https://www.ardot.gov/wp-content/uploads/2022/07/ARDOT_NEVI_FAQ.pdf.

73 U.S. DOT Fiscal Year 2022/2023 EV Infrastructure Deployment Plans (accessed May 20, 2023), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/. See plans submitted by and approved for Alabama, Alaska, Colorado, District of Columbia, Idaho, Indiana, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Nebraska, North Dakota, Ohio, Oklahoma, Rhode Island, South Dakota, Texas, and Wyoming.

EPA Summary and Response

Summary:

Comments on EPA's assumptions about hardware and installation costs for EVSE generally fell into three categories: comments on the EVSE costs themselves, comments on whether and how these should be adjusted based on tax credits, and comments on whether EVSE costs should vary or be kept constant over time.

Vehicle manufacturers including DTNA and PACCAR asserted that EPA underestimated hardware and installation costs. PACCAR stated that costs for 350 kW will be tens of thousands higher than the $162,333 value used in the proposed rulemaking, while DTNA confidentially provided average EVSE cost estimates informed by its experience with fleet customers. EMA commented on EPA's choice to use the low end of a range of EVSE costs presented in the NPRM, stating that this underestimated costs. EMA recommended that EPA use the mid (or average) point of the range for L2 ports and DCFCs at 50 kW and 150 kW. For the highest-power depot charging option of 350 kW, EMA recommended using the high end of the range though noted this was still low compared to today's costs. Valero also stated that EPA underestimated costs and asserted that EPA's assumptions come from older sources published from 2017 to 2021. Valero provided an estimated range of $125,000 to $300,000 per DC-150 kW port drawn from state NEVI plans and EVSE providers as a purported example of current costs.

By contrast, Tesla commented that EPA's EVSE costs for DC fast charging installations in the NPRM are high, noting that Tesla's own costs are half of the average industry costs. More broadly, Tesla stated that installation costs are lower in situations where entities other than utilities own the charging stations. While not directly addressing EPA's EVSE cost assumptions, ATA cited as an example that a dual port 180-kW charger could cost $100,000 in its comment on how high EVSE costs for fleets could impede adoption.

Several commenters addressed the Alternative Fuel Refueling Property tax credit that was extended and modified by the IRA. EDF said that EPA's EVSE costs were too high because the NPRM analysis failed to incorporate the tax credit, and cited a Roush report that found it could save owners as much as $26,000 for a 100-kW charger. TRALA noted the limitation of the tax credit to certain census tracts and the prevailing wage requirements, indicating that its customers may not be eligible for the maximum credit. TRALA also noted that customers with leased property may not be able to install charging infrastructure. Valero disagreed with EPA's approach to account for the potential savings from the tax credit by using the low end of EVSE cost ranges. It noted that costs funded by public sources under IRA or BIL are borne by taxpayers and therefore still must be accounted for in EPA's analysis. Beyond the tax credit, Valero cautioned that due to "Build America, Buy America" provisions, costs for EVSE funded under BIL programs could increase.

Both EMA and CARB thought that EPA's approach of holding combined EVSE hardware and installation costs constant over time was reasonable, noting as EPA did in the proposal, that EVSE unit costs could decline, but installation costs could rise and offset these cost savings. By contrast, CALSTART said that EPA should account for learning rates when assessing EVSE equipment costs and noted that they have considered annual reductions of 4 to 7 percent in their analysis, consistent with reductions from renewable energy generation.

Response:

As described in RIA Chapter 2.6.2.1, we made several changes in how we estimate the EVSE costs incurred for depot charging in the final rule analysis in response to these comments and to account for the most up-to-date information available.

For the NPRM analysis, we developed cost ranges for each of the four EVSE types considered in our depot charging analysis. The DCFC costs were sourced from a 2021 study specific to heavy-duty electrification at charging depots while L2 cost ranges were informed by several sources (as described in RIA Chapter 2.6.2.1). After reviewing new information on EVSE costs provided in comments as well as a new NREL study released since the publication of the NPRM (Wood et al. 2023),[441] we determined it was appropriate to increase the underlying hardware and installation cost ranges we considered for DCFC-150 kW and DCFC-350 kW to those in Wood et al. 2023. As discussed in RIA Chapter 2.6.2.1, hardware and installation costs vary due to differences in equipment, installation sites, labor costs and other factors. We selected

[441] Wood, Eric et al. "The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure." 2023. Available online: https://driveelectric.gov/files/2030-charging-network.pdf.

the midpoint of the EVSE cost ranges to use in our cost analysis for the final rule to reflect an average cost for charging infrastructure deployment. We note that this differs from our approach in the NPRM. For that analysis, we used the low end of EVSE cost ranges to reflect typical costs that may be borne by BEV and fleet owners for installing EVSE after accounting for savings from the Alternative Fuel Refueling Property tax credit as well as grants, rebates, or other funding available through the IRA (see DRIA at 202). As described below, and to reflect new and more detailed information on the potential value of the tax credit, we now consider the tax credit in a separate step.

The resulting EVSE costs used in our FRM analysis before accounting for the tax credit for L2 and DC-50 kW ports now match the NPRM midpoint values as recommended by EMA. The updated cost for each DC-150 kW port in our FRM analysis is $154,200, which is within the range Valero provided in its comments as an example, and higher than the value recommended by EMA.[442] For a 350-kW port, the updated EVSE cost in our FRM analysis is $232,700, which is consistent with PACCAR's comment that costs would be "tens of thousands of dollars more" than the approximately $162,000 in the NPRM analysis and similar to the value recommended by EMA of about $228,000.[443] We also acknowledge Tesla's comments reporting significantly lower installed DCFC costs. To the extent that is experienced more widely by the industry in future years, our EVSE costs could be considered conservative.

We agree with EDF that it is appropriate to account for the potential savings to BEV owners from the Alternative Fuel Refueling Property Tax credit, but also with TRALA that it is important to consider eligibility restrictions when assessing the value of the tax credit. As described in RIA Chapter 2.6.1, DOE conducted an analysis of the average value of this tax credit for charging equipment that supports heavy-duty BEVs. DOE estimated that approximately 60 percent of depots will be located in qualifying census tracts and that businesses will generally meet prevailing wage and apprenticeship requirements to utilize the maximum 30 percent tax credit where applicable.[444] Accordingly, we apply an average reduction of 18 percent to the upfront costs we assume BEV owners will incur for EVSE at depots in our HD TRUCS model for the FRM (see RIA 2.6.1 for more information on this assumption.) We also agree with Valero that even though purchasers will pay less for EVSE due to the tax credit, these costs are still borne by taxpayers and represent a societal cost. Therefore, for the FRM analysis, we only include the assumed 18% cost savings as a savings to purchasers. We include the full EVSE costs in our cost benefits calculations as presented in RIA Chapter 8.

For the FRM analysis, we determined it was still appropriate to keep total hardware and installation costs constant over time as both EMA and CARB had affirmed in their comments. However, we agree with CALSTART that EVSE unit costs could decline significantly due to learning or other factors, as we acknowledged in the NPRM. As described in RIA Chapter 2.6, we decided to keep overall EVSE costs constant to reflect that while hardware costs may decline, installation costs could rise over time, particularly if fleet owners choose to install charging

[442] While EPA did not estimate the cost associated with a 180-kW EVSE port, we note that our assumed costs for the lower power 150-kW port are higher than those ATA cited for a 180-kW unit.
[443] As PACCAR noted, the $162,333 in the NPRM was expressed in 2021 dollars and the same is true of the $227,687 value recommend by EMA. We treat the $232,700 value in our FRM analysis as being expressed in 2022 dollars.
[444] Department of Energy. "Estimating Federal Tax Incentives for Heavy Duty Electric Vehicle Infrastructure and for Acquiring Electric Vehicles Weighing Less Than 14,000 Pounds." March 11, 2024.

stations at easier (and lower cost sites) first, and then move onto more challenging sites. To the extent installation costs stay constant or even decline, the combined hardware and installation EVSE costs we utilized for the FRM analysis could be considered conservative for future years.

6.3.3 Charging Costs

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

In addition, EPA underestimates the cost of the electricity to those customers who are not able to install their own charging stations and take advantage of charging at low-cost times, as the EPA's cost analysis uses a commercial rate and does not consider peak power or time of use charges. Notably, the cost to consumer also fails to account for the decreased range and loads for ZEV HDs in accounting for the payback occurring between three and seven years for long-haul tractors. EPA also fails to account for infrastructure impacts from increased operation of heavier ZEVs on the road including road and bridge deterioration and commensurate reduced funding for infrastructure from fuel tax collections as EPA fails to account for the fact that ZEVs do not pay federal and state liquid transportation fuel taxes. [EPA-HQ-OAR-2022-0985-1659-A2, p. 30]

Critically, EPA fails to account for billions of dollars in electric power infrastructure upgrades needed to supply power to the mandated heavy-duty ZEVs, including additional power generation, transmission, substations, transformers, and other distribution equipment. [EPA-HQ-OAR-2022-0985-1659-A2, p. 30]

Organization: Arizona State Legislature

Finally, EPA has not considered other important factors necessary to enable cross-country freight transportation by electric heavy-duty trucks. 'Other barriers include laws preventing commercial charging at public rest areas and the remoteness of many truck parking locations.'54 EPA acknowledges that 'the buildout of public and private charging stations (particularly those with multiple high-powered DC fast charging units) could in some cases require upgrades to local distribution systems.' 88 Fed. Reg. 25,982. EPA also recognizes that '[t]here is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by [battery electric vehicle] or fleet owners.' Id. at 25,983. But rather than conduct a comprehensive analysis of the cost and technology availability as the statute requires, EPA punted: 'Therefore, we do not model them directly as part of our infrastructure cost analysis.' Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 28]

54 American Transportation Research Institute, supra note 42, at 2.

Organization: Clean Fuels Development Coalition et al.

This charging infrastructure analysis further ignores the massive increase in electricity infrastructure necessary to supply an additional 110,000 GWh per year the rule says will be needed by 2055. Supplying this load will not only require significant new generation assets, but also additional transmission and distribution equipment including replacement of every transformer between the substation and the "depot." Assuming that this can all be done on EPA's timeline (and it almost certainly can't), these costs will be borne either by the buyers of the electric trucks or by electric ratepayers, many of whom will receive no benefit. EPA unreasonably ignores these costs. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 33 - 34]

Organization: Daimler Truck North America LLC (DTNA)

As discussed in more detail in Section II.B.3.f, grid side updates to support transportation electrification must be included in EPA's payback period calculation, either as a separate input or as a cost per kilowatt-hour addition to the base electricity price. DTNA recommends that the costs set forth in Table 11 be included in EPA's assessment of payback period in HD TRUCS to assess the cost of grid updates as a separate input:56 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 30-31] [Refer to Table 11 on p. 31 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

56 Alternatively, EPA could consider ICCT's approach to estimating public infrastructure costs on a cent per kilowatt-hour basis, which is reflected in Table 7 of the ICCT TCO White Paper. See id. at Table 7 (estimating grid upgrade and connection costs, plus behind-the-meter charger-related cost estimates in cents-per-kWh). The ICCT figures may reasonably estimate the costs of depot site electrification; however, ICCT assumes that new public charging sites will have flexibility in station location selection to reduce the grid connection costs and that there will either be space inside the existing substation to add another substation transformer, or it would be possible to upgrade an existing transformer. Id. at 14. Using these assumptions, the ICCT TCO White Paper does not consider land acquisition costs, nor engineering design or right-of-way acquisition activities. As discussed in Section II.B.3.f, fleet depot locations do not have this flexibility, and therefore ICCT may underestimate grid side costs. Further, there is significant uncertainty in ICCT's grid update cost estimates, as the cost of grid improvements to support transportation electrification will widely vary based on the project scope. DTNA believes that its grid update cost estimates set forth in Table 11 are more accurate than the ICCT figures, but it requests that EPA consider using the ICCT cent-per-KW/h figures if it determines not to use the Company's per-vehicle cost figures in HD TRUCS.

DTNA also recommends that EPA proactively engage with electric utilities to better understand the range of associated grid update costs and that these costs be updated regularly in the HD TRUCS tool as additional data becomes available. [EPA-HQ-OAR-2022-0985-1555-A1, p. 31]

A number of fleet operations will require some charging to occur during peak hours or at public charging infrastructure, both of which will likely have higher associated costs than the commercial electricity end-use rate projection used by EPA in the HD TRUCS tool. These are factors fleets will likely consider when assessing the payback period for a BEV, thus EPA should periodically update electricity costs in the HD TRUCS model to inform its payback periods and adoption rates. To perform this analysis, it may be reasonable for EPA to rely on the 19.6 cents per kilowatt-hour charging cost estimate from the ICCT TCO White Paper as the basis for more accurate cost estimates. [EPA-HQ-OAR-2022-0985-1555-A1, p. 32]

EPA's projected electricity costs are based on the DOE EIA AEO 2022 reference case, but these estimates do not account for the supply-demand relationship, decarbonization mandates in the power generation sector, nor rate increases for large scale utility projects. In a 2022 article exploring the impact of the net-zero transition on a number of sectors, including electricity generation, McKinsey Sustainability projects that electricity costs could rise by about 40% by 2040 over 2020 prices, as power companies must invest in building renewable generation, transmission, and storage capacity—and some fossil fuel-based power assets would continue to incur capital costs, even if underutilized or prematurely retired.58 [EPA-HQ-OAR-2022-0985-1555-A1, p. 32]

58 See McKinsey Sustainability, 'The economic transformation: What would change in the net-zero transition' (Jan. 25, 2022), https://www.mckinsey.com/capabilities/sustainability/our-insights/the-economic-transformation-what-would-change-in-the-net-zero-transition.

A number of fleet operations will require some charging to occur during peak hours or at public charging infrastructure, both of which will likely have higher associated costs than the commercial electricity end-use rate projection used by EPA in the HD TRUCS tool. These are factors fleets will likely consider when assessing the payback period for a BEV, thus EPA should periodically update electricity costs in the HD TRUCS model to inform its payback periods and adoption rates. To perform this analysis, it may be reasonable for EPA to rely on the 19.6 cents per kilowatt-hour charging cost estimate from the ICCT TCO White Paper as the basis for more accurate cost estimates. [EPA-HQ-OAR-2022-0985-1555-A1, p. 32]

There are a number of TCO Inputs that EPA has not accounted for. [EPA-HQ-OAR-2022-0985-1555-A1, p. 34]

There are a number of TCO inputs that EPA has not accounted for in the HD TRUCS tool that should be included to more accurately inform payback periods and adoption rate projections for the Proposed Rule, including:

- Grid Update Costs. As discussed in this section and in Section II.B.3.f of these comments, fleets will pay for the grid updates required to support charging equipment for HD BEVs. EPA should include these costs either as a standalone line item in the HD TRUCS tool (using the per-vehicle costs provided above in Table 11, 'DTNA Proposed Grid Update Cost Inputs for HD TRUCS') or as an increase on its estimated costs per kilowatt hour (potentially using the estimates in Table 7 of the ICCT TCO White Paper). [EPA-HQ-OAR-2022-0985-1555-A1, p. 34]
- Land Acquisition. As discussed in Section II.B.3.f, fleets with space constraints may need to purchase additional land to site charging equipment. As real estate prices are extremely variable, and DTNA does not have information about how many fleets would need to expand their depot locations, we do not offer cost estimates here; however, the Company recommends that EPA consider adding land acquisition cost to HD TRUCS as more data becomes available. [EPA-HQ-OAR-2022-0985-1555-A1, p. 35]

Infrastructure Costs

EPA asserts 'there is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners. Therefore, we do not model them directly as part of our infrastructure analysis.'115 DTNA appreciates that there is significant complexity and uncertainty in modeling these costs, but believes that omitting front-of-meter costs is a significant error in the TCO calculation that has major implications for EPA's proposed CO2 standard stringency levels. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

115 Proposed Rule, 88 Fed. Reg. at 25,983.

How fleet owners pay for infrastructure will depend on a variety of factors, including utility structure (investor-owned, municipal, cooperative), existing available grid capacity, project scale, real estate needs, etc. For fleets in cooperative and municipality service territories, including many in critical urban freight hubs, upgrade costs are likely borne directly by the fleet. For fleets working with investor-owned utilities, the cost mechanism will vary. If infrastructure is needed by more than one utility customer, the utility will typically ask the fleet for a pro-rata share of those costs, or in some cases, increase electricity rates to cover those costs. Where fleets do not meet the minimum utilization rates for the contracted time period (5 to 10 years), fleets may be required to reimburse the utility for infrastructure upgrades, or costs are distributed among all ratepayers. One DTNA customer fleet has cancelled an order for 25 Class 8 tractors because of what they viewed as risky contract terms, including requirements for load management and a 10-year commitment to construct capacity for a 3 MW site. Regardless of the pathway, fleets will bear the cost of infrastructure upgrades to support charging needs, and those costs should be included in the proposed rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

DTNA relied on a cost study by the Boston Consulting Group (BCG) to estimate an optimized and non-optimized dollar-per-kilowatt cost figure for grid updates.116 To estimate per-vehicle grid update costs for Class 3 - 8 BEVs, we applied the BCG dollar-per-kilowatt cost estimates to an assumed average daily power need for each vehicle class that would be subject to the Phase 3 CO_2 standards, shown in Table 11 (‘DTNA Proposed Grid Update Cost Inputs for HD TRUCS’) presented in Section II.B.3.b. As reflected in Table 11, these costs are non-negligible, significantly impact the TCO proposition, and must be considered in EPA’s HD TRUCS analysis. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

116 See Boston Consulting Group, ‘The Costs of Revving Up the Grid for Electric Vehicles’ (Dec. 20, 2019), https://www.bcg.com/publications/2019/costs-revving-up-the-grid-for-electric-vehicles.

Using the same average daily power assumptions, DTNA estimated the additional installed capacity that will be needed to support HD BEVs at the adoption rates projected in the Proposed Rule. The Company calculated a 5-year average of commercial vehicle sales in all 50 states from the Polk Automotive database from 2017-2021, applied EPA’s projected ZEV volumes for 2027-2032, and calculated the total installed charging capacity that will be required by these vehicles in 2027 - 2032 to be approximately 45 gigawatts. In Appendix C to these comments, DTNA estimates the investments in charging infrastructure and grid upgrades, as well as total installed charging capacity, that will be required in each of the 50 states to support implementation of the Proposed Rule.117 DTNA considers installed capacity in this context to mean the total power available as EVSE to charge commercial vehicle batteries. Using installed capacity is a more appropriate metric for evaluating available charging capacity than the number of chargers alone, as installed capacity better reflects the variability in charging speeds needed to support different vehicle dwell times and truck-to-charger ratios. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 48-49]

This installed capacity must be available at a combination of public and private purpose built HD-accessible charging stations. To be HD-accessible, public charging stations must include pull-through charging lanes and accommodate wide ingress and egress to support all vehicle types. Commercial vehicles are often unable to utilize existing passenger car charging infrastructure, due to space constraints that are not compatible with HDVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 49] [Refer to graphics on p. 49 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Based on the projected vehicle mix in the Proposed Rule and installed capacity needed to support these vehicles, DTNA estimated the total costs of EVSE charging equipment and necessary supporting grid updates to support Class 3-8 BEVs that would be required under the Proposed Rule. These figures, summarized in Table 16 below, do not include the additional capacities and investments needed to support passenger car electrification. [EPA-HQ-OAR-2022-0985-1555-A1, p. 49] [Refer to Table 16 on p. 49 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Even with incentive funding available, many fleets are unable to make the capital investments required to add BEVs to their fleets. DTNA is currently working with one school bus fleet that has secured Clean School Bus funds from EPA for 23 buses, as well as a payment plan through their utility's Make Ready program, and is still facing a $500,000 funding gap for site construction that threatens to jeopardize the project. Private fleet deployments are likely to face similar gaps, even where some combination of incentive program funding is available. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

EPA Request for Comment, Request #38: However, there is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners. Therefore, we do not model them directly as part of our infrastructure cost analysis. We welcome comments on this and other aspects of our cost analysis.

- DTNA Response: In using this approach, EPA significantly underestimates the cost of associated infrastructure in the BEV payback period calculation. Fleets will pay for the necessary grid upgrades in a variety of ways, depending on their utility structure and scope of project. EPA should consider these costs in its payback analysis, either as an up-front cost for fleets, or by building in a rate increase, as detailed in Section II.B.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 164]

Organization: Edison Electric Institute (EEI)

EPA notes that 'there is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners' in explaining why it models these costs as part of the infrastructure cost analysis. 88 Fed. Reg. 25,983. In general, the upgrades to the local electric system needed to bring sufficient power to the site may be known as 'electric company-side make-ready' or 'front-of-the-meter' infrastructure and includes but is not limited to poles, vaults, service drops, transformers, mounting pads, trenching, conduit, wire, cables, meters, other equipment as necessary, and associated engineering and civil construction work. Front-of-the-meter infrastructure is distinct from infrastructure on the customer side of the meter ('behind-the-meter'), which includes the supply infrastructure (conduit and wiring to bring power from the service connection to the charging station, and the associated installation costs, sometimes known as 'customer-side make-ready') and the charging equipment, sometimes known as Electric Vehicle Supply Equipment (EVSE). [EPA-HQ-OAR-2022-0985-1509-A2, p. 17]

Front-of-the-meter infrastructure is generally installed, owned, and operated by the electric company. However, the costs associated with front-of-the-meter infrastructure may be borne by the site host customer in full or in part if the costs exceed an allowance as determined by the electric company's line-extension and/or service extension policy. These costs may also be known as 'contributions in aid of construction.' [EPA-HQ-OAR-2022-0985-1509-A2, pp. 17-18]

Modeling these front-of-the-meter infrastructure costs is inappropriate for the following reasons. First, estimating distribution upgrade costs may be beyond the scope of EPA's analysis, as it is not clear that a similar scope of analysis is applied to traditional liquid fuels. For example, the analogous cost comparison for internal combustion engine vehicle would include cost considerations for fleet operators either 1) installing refueling stations at their own facilities, or 2) the embedded cost of fuel retailers' business operations in the cost of diesel or gasoline. [EPA-HQ-OAR-2022-0985-1509-A2, p. 18]

Second, as described above, distribution upgrades are highly location specific. The costs associated with these upgrades are also highly variable, depending on the upgrade requested by the customer and the local distribution capacity. As stated in EEI's Preparing to Plug In Your Fleet guide, 'the grid can expand as needed to accommodate the needs of any customer, but the time and resources needed to make the required upgrades are highly dependent on the specific facility and the circuit that serves it.'27 [EPA-HQ-OAR-2022-0985-1509-A2, p. 18]

27 See EEI, Preparing To Plug In Your Fleet – 10 Things to Consider, https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Electric-Transportation/PreparingToPlugInYourFleet.pdf.

Third, the share of any distribution costs that the customer may bear varies as a matter of policy. Some electric companies have or are seeking approval for line extension allowances to cover some or all of these costs for serving EV charging infrastructure. In California, for example, legislation required electric companies in the state to file tariffs that would authorize them to 'design and deploy all electrical distribution infrastructure on the utility side of the customer's meter for all customers installing separately metered infrastructure to support charging stations, other than those in single-family residences.' This policy prompted tariffs from EEI members Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), and SCE that essentially allow electric companies to invest in more of the electric company-side infrastructure costs as part of the standard distribution system investment. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 18-19]

Fourth, EEI expects that the majority of fleets to electrify in the next several years will be those with return-to-base operations, which enables depot charging that is owned and operated by the fleet itself. Public charging, analogous to the existing gas station model, will be needed to serve long-haul electric trucks, but that opportunity will be limited in the near-term by battery capabilities. However, there are many new refueling models emerging, including but not limited to: fleet charging facilities owned by third parties and accessed by fleet operators through a reservation or subscription system; charging-as-a-service companies that disintermediate the fleet operator from the electric company, owning and operating the charging equipment at a customer facility and assessing the fleet operator a fully-bundled, flat charging fee (e.g., $/kWh); and transportation-as-a-service companies that provide the vehicle and charging to a fleet operator, such that the fleet operator pays a fully-bunded, flat service feel (e.g., $/mile). In all of these models, the fleet operator itself is not exposed to the front-of-the-meter infrastructure costs, but rather these costs are borne by a third party that then recoups all of its costs through their charging or service fees. [EPA-HQ-OAR-2022-0985-1509-A2, p. 19]

In conclusion, EPA is justified in not modeling front-of-the meter costs because doing so would result in an apples-to-oranges comparison to liquid fuels, those costs are site-specific and variable, the recovery mechanism of those costs depends upon state-specific policies, and fleet-operators may not always bear those costs. [EPA-HQ-OAR-2022-0985-1509-A2, p. 20]

Organization: Moving Forward Network (MFN) et al.

12.7. EV Charging is Already Putting Downward Pressure on Electric Rates to the Benefit of All Utility Customers

Because much EV charging can be accomplished when there is spare capacity on the grid, charging can spread the costs of maintaining the system over a greater volume of electricity sales, reducing the per-kilowatt-hour price of electricity to the benefit of all customers. This has already been demonstrated in the real-world with light-duty EV charging and is expected to hold true for HD EV charging as well. [EPA-HQ-OAR-2022-0985-1608-A1, p. 117]

In fact, real-world data compiled by Synapse Energy Economics shows EV drivers are not being subsidized by other utility customers and, in fact, they are putting downward pressure on rates. Between 2011 and 2020, EV customers across the United States have contributed more than $1.7 billion in net-revenue to the body of utility customers. 266 [EPA-HQ-OAR-2022-0985-1608-A1, p. 117]

266 Melissa Whited, Tyler Fitch, Jason Frost, Eric Borden, Courtney Lane, Ben Havumaki Sarah Shenstone- Harris, and Elijah Sinclair. Electric Vehicles Are Driving Rates Down. (June 2023). https://www.synapse-energy.com/sites/default/files/Electric%20Vehicles%20Are%20Driving%20Rates%20Down%20Factsheet.pdf

The results shown in Figure 34 compare the new revenue the utilities collected from EV drivers to the cost of the energy, capacity, transmission, and distribution system upgrades required to charge those vehicles, plus the costs of utility EV infrastructure programs that are deploying charging stations for EVs. In total, EV drivers contributed an estimated $1.7 billion more than associated costs. That net-revenue is returned to the body of utility customers in the form of electric bills that are lower than they otherwise would be. [EPA-HQ-OAR-2022-0985-1608-A1, p. 117.] [See Figure 34 Total Utility Revenues vs. Total Costs Associated with EVs (2011-2020) located on p. 118 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

While the costs associated with serving generally higher-powered HD EV charging could be more significant on a per-vehicle basis, there is still significant potential for HD EV charging (much of which can still be done during off-peak hours when there is plenty of spare grid capacity) to improve the utilization of the electric grid and put downward pressure on utility rates as a result. In fact, analysis conducted by ERM estimates that widespread medium and heavy-duty EV charging could result in $433 million in net-utility-revenue in 2030, rising to $2.4 billion in 2040, and $4.1 billion in 2050. 267 [EPA-HQ-OAR-2022-0985-1608-A1, p. 118]

267 ERM. Federal Clean Trucks Program: An Analysis of the Impacts of Low NOx and Zero-Emission Medium- and Heavy-Duty Trucks on the Environment, Public Health, Industry, and the Economy. ERM. (2022). p. 23. https://www.erm.com/contentassets/f3d6061dd8a04147a3f38b7db256ae44/federal-clean-trucks-report.pdf

12.8. New Utility Rates Designed for EV Charging Increase the Fuel Cost Savings EVs Can Provide

Gasoline, diesel, and electricity prices vary across the country, and electricity prices vary depending upon the particular characteristics of the utility rate on which a customer takes service. And many existing commercial and industrial utility rates have “demand charges” that can reduce fuel cost savings for high-powered/low-utilization applications like some EV charging use-cases. Thankfully, the challenge such demand charges can pose for EV charging has long been recognized and across the nation, many utilities and regulators have already implemented solutions or are in the process of doing so. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 118 - 119]

In fact, the BIL amended the Public Utility Regulatory Policies Act (PURPA) Section 111(d) to require regulators and non-regulated utilities to consider new rates that:

promote affordable and equitable electric vehicle charging options for residential, commercial, and public electric vehicle charging infrastructure; improve the customer experience associated with electric vehicle charging; accelerate third-party investment in electric vehicle charging for light-, medium-, and heavy-duty vehicles; and appropriately recover the marginal costs of delivering electricity to electric vehicles and electric vehicle charging infrastructure. 268 [EPA-HQ-OAR-2022-0985-1608-A1, p. 119]

268 H.R.3684. Infrastructure Investment and Jobs Act. 117th Congress. (2021-2022). Section 40431 www.congress.gov/bill/117th-congress/house-bill/3684/text.

This has spurred new regulatory proceedings across the country. But many utilities, regulators, and state legislatures were already acting to address this issue before the BIL became law. [EPA-HQ-OAR-2022-0985-1608-A1, p. 119]

As detailed in a publication of the National Association of Regulatory Utility Commissioners (NARUC) entitled “Best Practices for Sustainable Commercial EV Rates and PURPA 111(d) Implementation,” rates designed for EV charging can deliver significant fuel cost savings without relying upon cross-subsidies from other utility customers. 269 For example, on a new Pacific Gas & Electric rate designed for commercial EV charging that still recovers all associated marginal costs, the San Joaquin Regional Transit District reduced its overall fuel cost per mile from $2.31 to $0.68 (in a utility service territory that has some of the higher underlying marginal costs in the nation). 270 The paper also details rates that take a similar approach that were approved for Southern California Edison, San Diego Gas & Electric, and Alabama Power. [EPA-HQ-OAR-2022-0985-1608-A1, p. 119]

269 Nancy Ryan, Alissa Burger, Jenifer Bosco, John Howat, and Miles Muller. Best Practices for Sustainable Commercial EV Rates and PURPA 111(d) Implementation. (2022). https://pubs.naruc.org/pub/55C47758-1866-DAAC-99FB-FFA9E6574C2B

270 Id.

Since the publication of that NARUC paper, many other utilities and regulators have either proposed or secured approval of new rates designed for EV charging. And by the time the HDV rule goes into effect in 2027, many more will have followed suit, increasing the fuel cost savings EVs can provide. [EPA-HQ-OAR-2022-0985-1608-A1, p. 119]

Organization: National Automobile Dealers Association (NADA)

D. EPA's proposed rule fails to appropriately consider infrastructure lead times and costs.

EPA has failed to analyze or model the essential and unique refueling infrastructure needs and costs associated with its Phase 3 GHG proposal. ZEV HDVs will have special refueling infrastructure needs versus light-duty ZEVs. Without sufficient infrastructure, the number of ZEV HDVs purchased between 2028 and 2032 will be far lower than EPA forecasts. One of several impediments to widespread charging infrastructure availability is the cost.14 Among other things, the costs associated with EV charging infrastructure include the equipment itself, ongoing operation and maintenance costs, and the back-end equipment, transmission, and installation costs needed to get power to the charging station site. These should be considered as purchaser costs in the HD TRUCS tool as those costs are passed on to HDV purchasers installing infrastructure. In addition to private infrastructure, a massive amount of costly public refueling infrastructure designed for ZEV HDVs must be built out. This will take time.15 [EPA-HQ-OAR-2022-0985-1592-A1, pp. 8 - 9]

14 M. Melaina et al., Consumer Convenience and the Availability of Retail Stations as a Market Barrier for Alternative Fuel Vehicles, NREL (Jan. 2013).

15 Hydrogen Fueling Station Locations, DOE.

2. EPA's infrastructure assumptions must be adjusted to reflect reality.

The infrastructure needed to support ZEV HDVs will require increased electricity generation capacity and a more comprehensive transmission system than exists today. EPA has not considered necessary public charging investments. Apparently, the Phase 3 GHG proposal envisions that all the battery-recharging stations for ZEV HDVs will be located at trucking depots and terminals where trucks park overnight. But depot charging will result in high electricity demands and significant upgrades to transmission lines and substations to support each depot. On-site power availability limits the number of ZEV HDVs a site can charge. The assumption that ZEV HDVs will exclusively charge at night is a fallacy as many will need to be charged on route at public battery-recharging stations, in addition to at depots. Sites acting as electrified truck stops will also concentrate electricity demands and could require the same amount of energy as a small town.19 EPA's final Phase 3 GHG rule must reflect realistic infrastructure timelines and demand considerations. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 10 - 11]

19 High-Voltage Transmission Grid Critical to Meeting Electric Vehicle Charging Demands, First -in-the-Nation Study Finds, NATIONAL GRID (Nov. 14, 2022).

Organization: National Waste & Recycling Association (NWRA)

NWRA also asks that EPA work with the Department of Energy to understand the electrical load that would be needed to electrify the heavy-duty truck fleet. NWRA members are concerned that the electrical infrastructure is not expanding fast enough to support an electrified fleet. [EPA-HQ-OAR-2022-0985-1616-A1, p. 2]

Organization: Schneider National Inc.

The EPA assumes all vehicles will have a 12-hour overnight dwell time for charging.

- A driver break is 10 hours, so a 12-hour dwell for charging requirements would extend the driver's standard break time and would likely negatively impact work time/hours for a driver. Additionally, a 12-hour overnight dwell time would eliminate a motor carrier's ability to slip-seat a truck to be used in multiple shifts in a day (again, affecting productivity and freight transportation capabilities). In the over-the-road trucking industry, a 12- hour overnight dwell time – particularly at a specific location that has charging infrastructure – is not typical.
- Team drivers would be most impacted as they would need to shut down for charging; whereas, today, they trade off sleeper berth time with driving time. As a result, until infrastructure is more prevalent and charging times are faster, forcing team drivers to utilize ZEVs will certainly affect productivity and pay.
- Today, drivers will often take their DOT break and fuel at the same time/location. If a charger is not available (and, to be clear, charging infrastructure certainly is not prevalent), it will negatively impact a driver's ability to pick up, deliver or take his/her mandatory break when needed.
- Driver parking is already very congested and there is limited visibility to locations with available parking spots, especially at third-party fuel locations. Requiring a 12-hour charging shutdown would exacerbate the situation.
- DOT breaks would need to take place where there is the availability to charge the tractor instead of after a driver utilizes his/her full complement of 11 available driving hours and 14 available on-duty hours, thus reducing a driver's productive hours and further increasing the need for additional capacity to perform the same amount of work. [EPA-HQ-OAR-2022-0985-1525-A1, p. 2]

Organization: Tesla, Inc. (Tesla)

Utility Rate Design Reform Will Spur Greater Infrastructure Investment

Addressing utility demand charges will also play a role in facilitating the expansion of heavy-duty charging infrastructure. 218 The combination of low load factors with high demand charges can result in uneconomic operation of charging stations and stymies investment in charging infrastructure in otherwise promising markets where heavy-duty electrification is growing. EPA should recognize that this issue is changing with many utilities now proposing or already having implemented novel approaches to mitigate the impact of demand charges and encourage time of use rates to facilitate higher volume charging.219 Moreover, since BEV charging stations are large upfront investments assessed over a long-time horizon, the longer-term certainty provided in many of these rate reform proceedings will drive greater infrastructure investment. A number of utilities proceedings have already addressed these issues including the following:

- Illinois Commerce Commission Docket No. 20-0170 – In the Matter of Ameren Illinois Company d/b/a Ameren Illinois's Proposed Creation of Rider Optional Vehicle Charging Program ('Rider EVCP').
- Oregon Public Utilities Commission Docket No. UE 374 – In the Matter of Pacificorp d/b/a Pacific Power Request for a General Rate Revision

- New Jersey Board of Public Utilities Docket No. EO18101111 – In the Matter of the Petition of Public Service Electric and Gas Company for Approval of its Clean Energy Future – Electric Vehicle and Energy Storage ('CEF-EVES') Program on a Regulated Basis
- Colorado Public Utilities Commission Proceeding No. 21AL-0494E – In the Matter of Advice No. 1867- Electric Filed by Public Service Company of Colorado to Revise Its PUC No. 8-Electric Tariff and to Add Schedule S-EV-CPP and Implement Changes to Schedules S-EV, EVC, and TEPA, to be Effective on Thirty- Days' Notice
- Massachusetts Department of Public Utilities Docket # 21-90 – Petition of NSTAR Electric Company d/b/a Eversource Energy for approval of its Phase II Electric Vehicle Infrastructure Program and Electric Vehicle Demand Charge Alternative Proposal
- Illinois Commerce Commission Docket No. 22-0432 Petition for Approval of Beneficial Electrification Plan under the Electric Vehicle Act, 20 ILCS 627/45 and New EV Charging Delivery Classes under the Public Utilities Act, Article IX
- New York PSC's Case No. 22-E-0236 Proceeding to Establish Alternatives to Traditional Demand-Based Rate Structures for Commercial Electric Vehicle Charging. [EPA-HQ-OAR-2022-0985-1505-A1, p. 30]

218 See Alliance for Transportation Electrification, Rate Design for EC Fast Charging: Demand Charges (May 2022) available at https://evtransportationalliance.org/wp-content/uploads/2022/06/Rate.Design.TF_.Demand-Charge-Paper-Final- 5.25.22.pdf

219 Utility Dive, With looming EV load spikes, PG&E, Duke, other utilities adopt new rate design and cost recovery strategies (Apr. 18, 2023) available at https://www.utilitydive.com/news/electric-vehicle-load-spikes-pge-duke-sce-entergy-apsdynamic-rate-design-reduced-demandcharges/646603/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202023-04-21%20Utility%20Dive%20Newsletter%20%5Bissue:49850%5D&utm_term=Utility%20Dive

Additional proceedings addressing these issues will help further facilitate investment and deployment of charging infrastructure that can support a more ambitious Phase 3 standard. [EPA-HQ-OAR-2022-0985-1505-A1, p. 31]

Organization: Truck and Engine Manufacturers Association (EMA)

HD TRUCS calculates BEV charging characteristics using the known losses that occur with the flow of electricity from the grid to the battery. Four unique EVSE (i.e., chargers) are included in the HD TRUCS assessment tool. The AC EVSE and DCFC EVSEs provide a spread of possible recharging equipment that could be used with a given type of BEV truck. [EPA-HQ-OAR-2022-0985-2668-A1, p. 21]

As noted above, EPA chose to assume that all BEV-truck charging will occur at private depot locations at the end of each daily shift. EPA determined that a 12-hour dwell time (downtime) is most appropriate based on its literature search. HD TRUCS assesses the appropriate EVSE, and its associated cost, for the various truck applications using the 12-hour dwell time and calculates the least expensive EVSE unit capable of performing the modeled needed charging. [EPA-HQ-OAR-2022-0985-2668-A1, p. 22]

Annual BEV Electricity Cost in A3a_Cost worksheet – HD TRUCS calculates the annual cost of electricity based on the energy that is consumed by the vehicle from the batteries rather than from the electricity that is used to recharge the batteries. The latter includes the wall-to-battery loss factor for the charging process. The current formula in HD TRUCS underestimates the annual electricity cost by approximately 11%. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23] Annual BEV Electricity Cost in A3a_Cost worksheet – HD TRUCS calculates the annual cost of electricity based on the energy that is consumed by the vehicle from the batteries rather than from the electricity that is used to recharge the batteries. The latter includes the wall-to-battery loss factor for the charging process. The current formula in HD TRUCS underestimates the annual electricity cost by approximately 11%. [EPA-HQ-OAR-2022-0985-2668-A1, p. 23]

Electricity Cost – Electricity cost in HD TRUCS is based on the commercial rate from the AEO 2022 Report, Table 8. The cost starts at 10.63 cents per kilowatt-hour. While that may be a good estimate of the base rate that is paid by large commercial users of electricity, it does not adequately reflect the total cost of electricity that purchasers of BEVs will experience. Three important elements are missing, and a fourth is recommended to be added. The missing elements of the cost of electricity are: peak time-of-use (TOU) electricity rates, monthly peak demand charge, and upfront costs of modifications to the electrical grid upstream of the electric meter. The item to be added is the annual maintenance cost of the EVSE unit, normalized to a cents per kilowatt-hour basis. [EPA-HQ-OAR-2022-0985-2668-A1, p.29]

In ICCT's April 2023 TCO white paper, they report on their study of electricity costs for BEV battery charging. Their study looked at seven states, covering all four corners of the US plus the middle of the country. It shows the spread of electricity costs and provides real-world data for use in determining more complete electricity costs. [EPA-HQ-OAR-2022-0985-2668-A1, p.29]

EMA's research directionally aligns with the data shown in the ICCT white paper. With the limited time for this comment period, a more exhaustive study by EMA could not be accomplished. [EPA-HQ-OAR-2022-0985-2668-A1, p.29]

Using the ICCT data, the average cost of electricity for businesses charging BEVs works out to be 12.26 cents per kilowatt-hour (cents/kWh). That includes 10% of the charging at peak rates and 30% at super off-peak rates. Based on the charging times and vehicles per-charger calculations in HD TRUCS, EMA believes the percent time at peak rates, between 4 PM and 9 PM, is lower than will be seen by fleet owners, but is acceptable until a more comprehensive study can be completed. [EPA-HQ-OAR-2022-0985-2668-A1, p.29]

Also included in the ICCT paper are estimates of the cost of required upstream infrastructure changes, normalized to cents/kWh. Utilities have not shown a willingness to absorb those upfront costs without including them in the electricity rates for the end users. Thus, those costs need to be included in the cost of electricity. [EPA-HQ-OAR-2022-0985-2668-A1, p.29]

The cost to maintain the EVSE units is estimated by ICCT to be $3,200 annually. Normalized, this becomes 0.52 cents/kWh. This maintenance cost needs to be included in the cost of electricity in HD TRUCS as well. [EPA-HQ-OAR-2022-0985-2668-A1, p.30]

With the foregoing in mind, the table below provides a breakdown of all the relevant components of the cost of electricity for BEV battery charging:

EMA has applied this total cost of electricity (14.29 cents/kWh) for each year of the proposed regulation in the EMA HD TRUCS tool. [EPA-HQ-OAR-2022-0985-2668-A1, p.30] [See the Cost of electricity for BEV Battery Charging table on page 30 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Electricity Cost – The revised total cost of electricity of 14.29 cents/kWh, as detailed above, was run on its own in EMA HD TRUCS. The table below shows the revised projected ZEV adoption rates for 2027 and 2032 from running that one updated input: [EPA-HQ-OAR-2022-0985-2668-A1, p. 37] [See the Projected ZEV Adoption Rates for MYs 2027 and 2032, Electricity Table on page 37 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Organization: Valero Energy Corporation

Beyond the EVSE hardware and installation costs, EPA fails to consider annual operating and maintenance costs for EVSE, estimated by the District of Columbia to run $1,000 per Level 2 charger and $1,400-$2,000 per Level 3 DC fast charger.74 [EPA-HQ-OAR-2022-0985-1566-A2, p. 14]

74 Government of the District of Columbia, "District's Electric Vehicle Infrastructure Deployment Plan" at 13 (2022), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/dc_nevi_plan.pdf.

Although EPA acknowledges that upgrades to electricity distribution systems may be required to meet the charging loads associated with EVSE, it immediately dismisses the costs, explaining that "in many cases, costs for some distribution system upgrades may be borne by utilities rather than directly incurred by BEV or fleet owners whose costs we model in our analysis of depot charging infrastructure; therefore, we do not include these costs in our analysis."75 Regardless of who is paying, upgrades to electrical infrastructure are real impacts associated with EVSE installation and come with real costs. In their EV Infrastructure Deployment Plans, several states quantify the cost of electrical system upgrades needed to accommodate EVSE, including:

- Idaho cites that "charging stations installed with NEVI formula funds must be able to provide a power output of at least 600kW. In Idaho, most NEVI sites will require transformer upgrades. Additional improvements such as installing new feeder lines and completing substation upgrades also may be needed. At the very least, new electrical upgrades for a new transformer cost approximately $20-30,000."76
- Indiana cites that "Utilities estimated investment between $50,000 to $125,000 to serve 600kW per station with locations requiring significant system upgrades totaling greater than $1 million. Upgrades could include new transformers, trenching, concrete/asphalt work, conduit, underground vaults, new conductor, and other miscellaneous equipment to serve the DCFC. Respondents expressed they would not deny an installation from proceeding. However, as expressed above, costs may be prohibitive for the prospective customer at certain locations."77 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 14 - 15]

75 DRIA at 201.

76 Idaho Transportation Department, "2022 State of Idaho Electric Vehicle Infrastructure Baseline Plan" at 38 (August 1, 2022), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/id_nevi_plan.pdf.

77 Indiana Department of Transportation, "Indiana Electric Vehicle Infrastructure Deployment Plan" at 37 (July 29, 2022), https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/in_nevi_plan.pdf.

These utility costs may not be borne solely by individual customers; in some cases, these costs will ultimately be passed on to ratepayers. EPA fails to acknowledge these costs, nor to assess the cumulative cost burden resulting from the concurrent increase in electrical demand resulting from implementing the proposed heavy-duty vehicle rule in the same time frame it seeks to force electrification of the light- and medium-duty vehicle fleet. [EPA-HQ-OAR-2022-0985-1566-A2, p. 15]

7. The charging efficiencies adopted by EPA for purposes of this proposed rule are arbitrarily inconsistent with other contemporaneously proposed rules.

EPA adopts the following charging efficiency rates for use in this rulemaking:78 [EPA-HQ-OAR-2022-0985-1566-A2, p. 15.] [See Table 2-68, Charging Efficiency, on page 15 of docket number EPA-HQ-OAR-2022-0986-1566-A2.]

78 DRIA at 227.

Upon examination of the NREL study to which EPA cites,79 these charging efficiencies represent NREL program goals, not projections. Further, the years represent assumptions of when the goals will reach commercial production, which NREL expects to occur 5 years after demonstration in a lab.80 At the time of publication of the NREL report (2021), then, these charging efficiencies had not yet even been demonstrated in a lab, and yet EPA incorporates them as fact and relies upon them for purposes of the proposed rulemaking. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 15 - 16]

79 NREL, "Vehicle Technologies and Hydrogen and Fuel Cell Technologies Research and Development Programs Assessment Report for 2020" (August 2021), https://www.nrel.gov/docs/fy21osti/79617.pdf.

80 NREL, "Vehicle Technologies and Hydrogen and Fuel Cell Technologies Research and Development Programs Assessment Report for 2020" at 26 and v (August 2021), https://www.nrel.gov/docs/fy21osti/79617.pdf.

Further, the EV charging efficiencies used by EPA in this rulemaking are inconsistent with those used in other proposed rulemakings:

- In the "Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes," to support the generation of eRINs, EPA used an EV charging efficiency of 85% and a line loss factor of 5.3%, yielding a total loss rate of 19.5% (p. 329).
- The efficiency and loss factors applied in EPA's Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles81 assume an overall loss rate of 15.9% (i.e., 1 – 0.9*0.935).
- Here, EPA proposes a third distinct charging efficiency, but fails to account for transmission line losses.
- EPA provides no explanation for why the efficiency values should differ among the three proposed rules. [EPA-HQ-OAR-2022-0985-1566-A2, p. 16]

81 88 Fed. Reg. 29303 (May 5, 2023).

EPA Summary and Response

Summary:

EPA received comments both on the electricity prices we used in the NPRM analysis, and on additional categories of costs that commenters said should be included in the FRM analysis either as part of the $ per kWh cost to charge or through other means.

In general, most commenters stated that our assumed electricity costs—based on the commercial rate in the AEO 2022 reference case—were too low and understated the cost to charge. DTNA noted several limitations of AEO's costs, saying they "do not account for the supply-demand relationship, decarbonization mandates in the power generation sector, nor rate increases for large scale utility projects." DTNA pointed to McKinsey work, which suggests that electricity costs could be significantly higher by 2040 given the costs of new generation, transmission, and storage to increase renewable electricity.

AFPM, DTNA, and NADA stated that EPA failed to consider the higher costs associated with public charging, which may happen during peak hours and include higher time of use rates and demand charges (among other costs). EMA likewise noted that the AEO electricity rates do not account for demand charges or peak time of use rates and that EPA should include these costs in its FRM analysis.

Many commenters stated that upgrades to the electric distribution system or, in some cases, to generation or transmission infrastructure, would be needed to meet increased demands from BEV charging. Most—including AFPM, the Arizona State Legislature, CFDC et al., DTNA, EMA, NADA, and Valero—said that EPA should account for the cost of such power sector upgrades in the analysis. Valero provided examples of estimated potential distribution upgrade costs ranging from $20,000 to $125,000 or more per station from two state plans for NEVI-funded stations. DTNA shared estimates of potential distribution costs that it recommended EPA use for this purpose but noted that costs from a 2023 ICCT TCO paper (Basma et al. 2023) may be a reasonable alternative. EMA also pointed to the ICCT paper as a source for distribution upgrade costs.

DTNA, EMA, NADA, and Valero all stated that EPA should include EVSE maintenance costs in its analysis, with several pointing to values in the same ICCT paper of $3200 per port per year, amortized as $0.0052 per kWh. Valero cited cost estimates from the District of Columbia's plan for NEVI-funded stations of $1000 per L2 charger and up to $2000 per DCFC each year. DTNA additionally commented that the costs to purchase or lease land for station deployments should be accounted for in EPA's cost analysis.

As noted above, both EMA and DTNA suggested the ICCT paper (Basma et al. 2023) as a potential source to inform charging costs in EPA's analysis, since it accounts for many of the costs discussed above. EMA suggested that $0.1429 per kWh, which combines ICCT's electricity price, amortized EVSE maintenance costs, and costs associated with distribution system upgrades, is a reasonable choice for depot charging. DTNA suggested ICCT's value of $0.196 per kWh—which includes the aforementioned costs as well as amortized costs of public charging equipment—may be a reasonable source of public charging costs (while noting some limitations).

However, not all commenters agreed with the above points. Whereas DTNA and others suggested that EPA's assumed electricity prices were too low and did not properly account for the impacts of BEV charging demand on the power grid, the Moving Forward Network et al. stated that EV charging can actually reduce electricity prices for all users by taking advantage of unused grid capacity (e.g., at night) and distributing system costs that would be incurred anyway over more electricity sales. The commenter cited data from Synapse Energy Economics showing that EV charging was responsible for $1.7 billion in net revenue that helped lower electricity bills in the 9 years leading up to 2020, and an ERM study, which projected that future medium-heavy-duty charging could also reduce rates.

Both the Moving Forward Network et al. and Tesla acknowledged that demand charges are currently a challenge for EVSE providers and customers. However, both commenters characterized this as a well-known issue that utilities and others are working to address. For example, the Moving Forward Network et al. pointed to an amendment to the Public Utility Regulatory Policies Act (promulgated in the Bipartisan Infrastructure Law) to promote affordable EV charging rates and "appropriately recover the marginal costs of delivering electricity to electric vehicles and electric vehicle charging infrastructure" among other actions. The Moving Forward Network et al. and Tesla also noted utilities and regulators have already been addressing this issue through rate reform or other strategies, with Tesla citing a variety of recent utility proceedings.

EEI commented that EPA was justified in its decision not to model costs of distribution upgrades to fleets in the NPRM as EEI stated that these costs will be site specific, who bears the costs (utilities vs. fleets) will vary, and accounting for these costs would be inconsistent with the approach EPA has taken for liquid fuels, in which comparable upgrades are not directly accounted for in fleet costs. EEI also discussed a variety of emerging market solutions including third-party subscription or bundled services (e.g., charging-as-a-service or transportation-as-a-service), in which fleets would not directly bear the upfront costs for front-of-the meter upgrades.

Separately, Valero commented on EPA's charging efficiency assumption stating that the value is inconsistent with comparable values in other contemporaneous EPA proposed rulemakings and that the underlying source for the charging assumption is an NREL program goal rather than a projection of feasible or demonstrated charging efficiencies. Valero also stated that EPA did not account for transmission line losses.

Response:

For the NPRM analysis, we used the DOE EIA AEO 2022 reference case commercial electricity end-use rate projection for our electricity price. EPA agrees with commenters that this approach likely underestimates charging costs that will be experienced by BEV owners, and we have updated our assumed charging costs for the FRM analysis. For example, in the NPRM, we acknowledged that certain stations, particularly those with many high-power DCFC, may require upgrades to the distribution system; however, we did not include these estimates in our EVSE or charging costs. On further consideration, and taking into account comments received, EPA has included these costs in our FRM analysis.As described in RIA Chapter 2.4.4.2, to estimate charging costs for the final rule analysis, we start by modeling future electricity prices, as charged by utilities, that account for the costs of BEV charging demand and the associated distribution system upgrade costs. We do this in three steps: 1) we model future power generation using the Integrated Planning Model (IPM), 2) we estimate the cost of distribution system upgrades associated with charging demand through the DOE Transportation Electrification Impact Study (TEIS),[445] and 3) we use the Retail Price Model (RPM) to project electricity prices accounting for both (1) and (2).

As described in RIA Chapter 4.2, IPM models the power sector, including changes to power generation based on future demand scenarios. In order to capture the potential future impacts on

[445] National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, Kevala Inc., and U.S. Department of Energy. "Multi-State Transportation Electrification Impact Study: Preparing the Grid for Light-, Medium-, and Heavy-Duty Electric Vehicles." DOE/EE-2818. U.S. Department of Energy. March 2024. ("TEIS").

the power sector from ZEVs, we ran IPM for a scenario that combined electricity demand from an interim version of the final standards case and EPA's proposed rulemaking "Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles."[446] The same demand scenario was used as the action case for the TEIS. The TEIS research team modeled how many new or upgraded substations, feeders, and transformers would be needed to meet projected electricity demand from transportation, including demand from residential workplace, depot, and public charging to support projected light-, medium-, and heavy-duty plug-in electric vehicles. For all public and workplace charging, vehicles were assumed to charge at full power upon arrival. At homes and depot charging stations—where vehicles have longer dwell times—a managed charging scenario was developed to spread out charging and reduce peak power.

The changes to power generation in our modeled IPM scenario and the distribution cost estimates from TEIS were then input to the Retail Price Model.[447] The RPM developed by ICF generates estimates for average electricity prices over consumer classes accounting for the regional distribution of electricity demand. The resulting national average retail prices, which include distribution upgrade costs, were used as a basis for the charging costs in HD TRUCS.

We agree with commenters that we could model additional costs related to BEV charging that drivers may incur beyond just electricity prices. For the final rule, in HD TRUCS we differentiate between depot charging and public charging when assigning charging costs. We agree with EMA, DTNA, and other commenters that it is appropriate to account for EVSE maintenance costs, and that the estimate from a recent ICCT paper[448] of $0.0052 per kWh is a reasonable choice. Accordingly, we have incorporated this into both our depot and public charging costs.

Our public charging price additionally includes the amortized cost of public charging equipment and land costs for the station; we project that third parties may install and operate these stations and pass costs onto BEV owners via charging costs. For public charging, we use a total charging cost of 19.6 cents per kWh, from the previously mentioned ICCT paper and as recommended by DTNA, for 2027. We adjust it for future years according to the results of the IPM Retail Price Model discussed above. The initial value from the ICCT study reflects costs for public charging at stations designed for long-haul vehicles. Stations are assumed to have seventeen 1 MW EVSE ports and twenty 150 kW EVSE ports for a total peak power capacity of 20 MW. The 19.6 cent per kWh price includes the amortized cost of this charging equipment, land costs, both electricity prices (cents/kWh) and demand charges (cents/kW) associated with high peak power, distribution upgrade costs for substations, feeders, and transformers associated with these public charging stations, and EVSE maintenance costs. Overall, our charging costs

[446] Electricity demand for heavy-duty ZEVs matches that of the interim control case as described in RIA Chapter 4.2.4 while demand from light- and medium-duty vehicles was based on Alternative 3 from EPA's proposed "Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles" (88 FR 29184 et seq.)
[447] ICF. "Documentation of the Retail Price Model: Draft." 2019. Available online: https://www.epa.gov/sites/default/files/2019-06/documents/rpm_documentation_june2019.pdf.
[448] Hussein Basma, Claire Buysee, Yuanrong Zhou, and Felipe Rodriguez. "Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-haul Trucks in the United States." International Council on Clean Transportation. April 2023. Available online: https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf.

used in the final rule analysis for both depot and public charging are higher than those used in the NPRM analysis. See RIA Chapter 2.4.4.2 for a more complete discussion and a summary of depot and public charging costs used in the FRM analysis.

EPA updated the wall-to-battery efficiency for the FRM analysis to a value (89.3 percent) sourced from the EPA MOVES model, as described in RIA Chapter 2.8. Regarding Valero's comment about inconsistent charging efficiencies across EPA analyses, we note that the final RFS rule did not make use of the value noted by the commenter and slightly different efficiencies between values used for rulemakings covering light- and medium-duty vehicles versus heavy-duty vehicles (90 percent versus 89.3 percent) is not inappropriate from our perspective given differences in the light-duty and heavy-duty markets. Valero stated that EPA did not account for transmission losses in the proposal. As described above, EPA's charging costs utilized electricity prices from IPM's Retail Price Model in the FRM analysis; these prices reflect the price to the end user and therefore account for upstream losses, including transmission. More broadly, the power sector modeling conducted in IPM to estimate emissions associated with BEV charging and other electricity demand accounts for transmission losses (see RIA Chapter 4).

6.3.4 Dwell Time & EVSE Sharing

Comments by Organizations

Organization: American Trucking Associations (ATA)

Onsite charging is preferred

As fleets examine battery electric and hydrogen fuel cell trucks, they prefer to charge and refuel onsite. Today, most fleets have diesel refueling onsite for beginning trips, and line-haul fleets manage their refueling and break time for drivers to overlap. As ATA's Vice Chairman Andrew Boyle testified at the Senate Environment and Public Works Committee, today's diesel technology allows a fleet to travel 1,200 miles and refuel in 15 minutes for an additional 1,200 miles. Based on the range for Class 8 battery-electric trucks today, that same truck can travel roughly 250 miles before the need to charge with downtime of up to 3-8 hours, depending on the charging equipment available.24 [EPA-HQ-OAR-2022-0985-1535-A1, p. 18]

24 Boyle, Andrew, Testimony at Hearing: Cleaner Vehicles: Good for Consumers and Public Health, Senate Environment and Public Works Committee, April 18, 2023.

EPA assumes that battery electric trucks can accommodate eight hours of charging downtime. While this could work for certain truck applications that return to base each night, constantly moving regional and line-haul trucks will require more energy for shorter charge times. The agency's assumption is based on electricity pricing, where overnight charging would be more cost-effective than daytime charging. While this is true for electricity costs, truck operators have already found the most optimal time for them to operate. For example, line-haul fleets prefer to run at night due to less congestion on the road. In addition, many line-haul fleets "slip seat" their drivers to meet federal hours-of-service regulations and ensure that their investment, the truck, operates 24 hours a day. Many regional fleets begin their days in the pre-dawn hours to stage before sites open to begin their routes for the day's pickup and delivery routes. [EPA-HQ-OAR-2022-0985-1535-A1, p. 18]

Organization: California Air Resources Board (CARB)

The EVSE cost estimates include both direct and indirect costs also referred to as EVSE retail price equivalent costs. U.S. EPA assume that up to two vehicles can share one DCFC port if there is sufficient dwell time for both vehicles to meet their daily charging needs. While fleet owners may also choose to share Level 2 chargers across vehicles, U.S. EPA is conservatively assigning one Level 2 charger per vehicle. They assume that EVSE costs are incurred by purchasers/ fleet owner.184 Assigning two vehicles per fast charger and one vehicle per Level 2 is reasonable on a cost basis given current information. There will be variation on a site-by-site basis on power and number of depot chargers and it is not clear the proportion of Level 2 assigned to vehicles to estimate costs. Level 2 is suitable in a limited number of cases. Also, the model could be improved by explicitly including public charging. However, the assumption that depot and public charging will be approximately the same cost is reasonable considering the available information. The cost estimation in NPRM Table IV-6: EVSE Costs for the Proposed Option Relative to the Reference Case, Millions 2021 Dollars is reasonable without an explicit accounting for public chargers. [EPA-HQ-OAR-2022-0985-1591-A1, p.51]

184 Ibid. Page 26030

Organization: Clean Fuels Development Coalition et al.

C. The proposal underestimates the cost for charging infrastructure.

Charging infrastructure is the single largest expense accounted for in the proposal—$47 billion in “electric vehicle supply equipment (EVSE) costs.” But this expense only accounts for “depot” charging installation, or the cost to install heavy-duty chargers at an electric vehicle’s home base. This completely ignores “upfront hardware and installation costs for public or other en-route electric vehicle charging infrastructure” because it assumes “BEV charging needs are met with depot charging.” 88 Fed. Reg. 25,978. This is unrealistic, particularly given the short ranges of heavy-duty batteries and the long travel distances expected of heavy-duty vehicles. To compound this error, the proposal makes unreasonable assumptions about how many of these depot chargers are needed. EPA “assume[s] that up to two vehicles can share one DCFC port if there is sufficient depot dwell time for both vehicles to meet their daily charging needs.” DRIA at 200. This allows, as EPA explains, “per-vehicle EVSE costs [to] decline by 50 percent or more.” Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 33]

Organization: Daimler Truck North America LLC (DTNA)

DTNA also evaluated the average stop duration for this population of vehicles to assess EPA’s 12-hour charging dwell time assumption, and found that the median average stop time for day cabs in this population to be 5.9 hours for day cab tractors and 7.4 hours for sleeper cab tractors, as reflected in Appendix A. DTNA believes only approximately 25% of the tractor population meets or exceeds EPA’s estimate of 12-hour charging dwell time. The need for shorter dwell times can be addressed by high speed charging; however, higher charging speeds require additional installed capacity for EVSE and the grid, which is not widely available given the associated higher costs and complexities. EPA should account for these costs and complexities, or reduce ZEV suitability to better reflect fleet operational needs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 22]

> Using this same data snapshot, DTNA assessed where these tractors end their work days. In doing so, the Company considered vehicles to have "returned-to-base" if during the 18 day evaluation period, the tractor ended its day of operation repeatedly in the same location. On average, we found that day cabs returned to base 21% of the time, with sleeper cabs returning only 9% of the time. DTNA evaluated 90th percentile daily VMT, charging dwell time, and return-to-base as independent variables, consistent with EPA's approach. *See* Appendix A. However, we note that fleets will only deem a ZEV suitable if it meets *all* daily operational criteria, including VMT, dwell time, and return-to-base operation. Neither DTNA's nor EPA's data determines if the return-to-base VINs dwell greater than 12 hours and have suitable daily VMTs. It is possible return-to-base vehicles dwell for significantly shorter periods of time and/or exceed the daily VMT. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 22-23]

The 12-hour dwell time that EPA assumes for recharging for modeling purposes is not realistic for many routes and operations, including some daily VMTs assumed in the HD TRUCS tool. NACFE states regional haul accounts for 30% of tractor applications, and typically include long dwell times that could be suitable for BEVs.50 Vocational applications and long haul applications need further study to understand what proportion of operations have significant dwell times that can support charging. As discussed above, DTNA's telematics data suggests approximately 5.9 hours and 7.4 hours are more reasonable assumptions for day cabs and sleeper cabs, respectively. Shortening the dwell time may be possible with high speed charging and allow BEV penetration in more applications, but charging at higher speeds adds significant cost that must be considered in the TCO calculation and additional infrastructure challenges. [EPA-HQ-OAR-2022-0985-1555-A1, p. 27]

50 Id. at 127.

There are a number of TCO inputs that EPA has not accounted for in the HD TRUCS tool that should be included to more accurately inform payback periods and adoption rate projections for the Proposed Rule, including:

- Charging Downtime. EPA assumes all HD BEVs will have 12-hour depot dwell times for overnight charging. While DTNA believes this may be true in some applications, many fleets run two-shift operations, and any charging time that exceeds today's diesel refueling time is likely to be viewed as downtime, as the asset is unusable. EPA should collect additional data on fleet operating characteristics, and either constrain suitability to single-shift operations or somehow account for downtime in HD TRUCS. [EPA-HQ-OAR-2022-0985-1555-A1, p. 35]

EPA Request for Comment, Request #50: Our request for comment includes a request for data to inform an assessment of the distribution of daily miles traveled and the distribution of the number of hours available daily to charge for each of the vehicle types that we could use to update a constraint like this in the final rulemaking analysis.

- DTNA Response: Based upon DTNA's analysis, EPA significantly underestimates daily VMT in the tractor categories and over-estimates dwell time available for vehicles to charge, as reflected in Section II.B.3 and Appendix A to these comments. An accurate estimate is critical to the feasibility of HD ZEVs to replace conventional vehicles, thus EPA should reevaluate VMT using the best available data, including the data DTNA provides for certain vehicle categories in Section II.B.3 and Appendix A to these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 167]

Organization: Delek US Holdings, Inc.

b. BEV charging consumes significantly more time than refueling ICE-powered vehicles.

The Proposed Rule fails to consider the impact that increased HD BEV charging times will have on consumer adoption rates and whether end users will be willing to accept disruptions to fleet usage in addition to the increased purchase price of HD BEVs. According to DOT, Level 1 EV chargers can take 40-50 hours to fully charge a BEV from empty, Level 2 chargers can take 4-10 hours to fully charge a BEV from empty, and Direct Current Fast Charging Technology chargers can take up to an hour to fully charge a BEV from empty. But under any scenario, HD BEVs will incur additional downtime for more frequent, and longer, charging times as compared to the equivalent ICE. For example, a 3,000 mile cross-country freight journey taking 54 hours by ICE would take 71 hours by BEV.37 Yet the Proposed Rule fails to consider whether, in light of these impacts, consumers will purchase HD BEVs at the rate necessary to meet EPA's targets. [EPA-HQ-OAR-2022-0985-1561-A1, p. 8]

37 MCKINSEY & COMPANY, "Powering the transition to zero-emission trucks through infrastructure," (Apr. 21, 2023), available at https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/powering-the-transition-to-zero-emission-trucks-through-infrastructure.

Organization: Environmental Defense Fund (EDF)

1. EPA's underlying component costs are high

While EPA includes the Commercial Clean Vehicle Credit and the production tax credit for batteries, it fails to include the Alternative Fuel Refueling Property Credit in its assessment of cost. The IRS has not published guidance yet on how this credit will be applied, but the language from the IRA indicates that businesses could receive up to a 30% credit on up to $100,000 of EVSE. Roush, in a recent report, showed that this also could save vehicle owners $1,064 for a 25 kW charger to $26,000 for a 100 kW charger.130 [EPA-HQ-OAR-2022-0985-1644-A1, p. 53]

130 H. Saxena, S. Pillai, "Impact of the Inflation Reduction Act of 2022 on Medium- and Heavy-Duty Electrification on MYs 2024 and 2027," 2023. Roush.

In their modeling, EPA has a maximum of two vehicles per charger even if many more vehicles could be charged in the 12 hours of dwell time EPA assumes. This results in a high estimate of number of EVSE ports needed, driving up the EVSE costs and driving down the stringency of the rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 53]

Organization: International Council on Clean Transportation (ICCT)

SENSITIVITY OF ZEV ADOPTION RATES OF VOCATIONAL VEHICLES TO LEVEL 2 CHARGING ASSUMPTIONS EPA assumes that each Level 2 charging station (AC charging up to 19.2 kW in this context) will not be shared by more than one truck. EPA explicitly states that this is a conservative assumption. Level 2 charging is considered the main charging technology for step vans, box trucks, shuttle and school buses, and utility trucks. Given the long dwell times of these vehicles and their relatively smaller battery sizes, it is technically possible to share charging ports between at least two trucks, and fleets will take advantage of port sharing among several trucks to reduce their capital investment. ICCT modified this assumption in the HD TRUCS model to investigate the impact on the payback period and adoption rates. The total ZEV adoption rate of vocational vehicles increased by 6% in 2027 and 4% in 2032 under this new assumption. [EPA-HQ-OAR-2022-0985-1553-A1, p. 8]

Organization: Schneider National Inc.

The EPA assumes all vehicles will have a 12-hour overnight dwell time for charging.

- A driver break is 10 hours, so a 12-hour dwell for charging requirements would extend the driver's standard break time and would likely negatively impact work time/hours for a driver. Additionally, a 12-hour overnight dwell time would eliminate a motor carrier's ability to slip-seat a truck to be used in multiple shifts in a day (again, affecting productivity and freight transportation capabilities). In the over-the-road trucking industry, a 12- hour overnight dwell time – particularly at a specific location that has charging infrastructure – is not typical.
- Team drivers would be most impacted as they would need to shut down for charging; whereas, today, they trade off sleeper berth time with driving time. As a result, until infrastructure is more prevalent and charging times are faster, forcing team drivers to utilize ZEVs will certainly affect productivity and pay.
- Today, drivers will often take their DOT break and fuel at the same time/location. If a charger is not available (and, to be clear, charging infrastructure certainly is not prevalent), it will negatively impact a driver's ability to pick up, deliver or take his/her mandatory break when needed.
- Driver parking is already very congested and there is limited visibility to locations with available parking spots, especially at third-party fuel locations. Requiring a 12-hour charging shutdown would exacerbate the situation.
- DOT breaks would need to take place where there is the availability to charge the tractor instead of after a driver utilizes his/her full complement of 11 available driving hours and 14 available on-duty hours, thus reducing a driver's productive hours and further increasing the need for additional capacity to perform the same amount of work. [EPA-HQ-OAR-2022-0985-1525-A1, p. 2]

Organization: Tesla, Inc. (Tesla)

Second, Tesla believes that more than two vehicles can use high powered DCFC as is suggested in the Draft RIA.201 Depending on the driving use case, battery sizes and charging power levels, when fast charging, one could have more than five vehicles per charger. This higher utilization rate can vitiate many concerns about the volume of charging ports needed to be deployed at the outset of the Phase 3 program. [EPA-HQ-OAR-2022-0985-1505-A1, p. 27]

201 Draft RIA at 202 (Table 2-60).

Third, regulations that mandate rest periods can also provide a time window for mid-shift charging if fast or ultra-fast charging options are available in route, allowing for a greater number of vehicles to utilize individual chargers.202 Recent studies of power requirements for regional and long-haul truck operations in the U.S. and Europe find that charging power higher than 350 kW, and as high as 1 MW, may be required to fully recharge electric trucks during a 30- to 45-minute break.203 In Tesla's case, it is deploying 750 kW chargers (using a version of a megawatt charging standard) at depots utilizing Tesla Semi's. Like Tesla, others are already deploying depot charging for the tractor class.204 Moreover, a number of analyses have found that that the total cost of ownership for depot-charging electric trucks, including charging infrastructure, will be cost-competitive with diesel in the near future without incentives.205 [EPA-HQ-OAR-2022-0985-1505-A1, p. 28]

202 See generally, U.S. Federal Motor Carrier Safety Administration, Summary of Hours of Service Regulations available at https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-serviceregulations#:~:text=Drivers%20must%20take%20a%2030,combination%20of%20these%20taken%20consecutively

203 IEA, Global EV Outlook 2023, Trends in charging infrastructure available at https://www.iea.org/reports/global-evoutlook-2023/trends-in-charging-infrastructure#abstract (emphasis added).

204 See e.g. Charged, WattEV opens heavy-duty electric truck charging depot at Port of Long Beach (May 19, 2023) available at https://chargedevs.com/newswire/wattev-opens-heavy-duty-electric-truck-charging-depot-at-port-of-longbeach/?utm_source=ChargedEVs.com+Email+Newsletter+Opt-in&utm_campaign=f8268c83c5-Daily+Headlines+RSS+Email+Campaign&utm_medium=email&utm_term=0_6c05923d39-f8268c83c5-343935020Daily+Headlines+RSS+Email+Campaign&utm_medium=email&utm_term=0_6c05923d39-f8268c83c5-343935020

205 Atlas Public Policy, U.S. Medium- and Heavy-Duty Truck Electrification Infrastructure Assessment available at https://atlaspolicy.com/u-s-medium-and-heavy-duty-truck-electrification-infrastructure-assessment/

Organization: Truck Renting and Leasing Association (TRALA)

Increased ZEV Use Will Impact Federally Mandated Hours-of-Service Requirements

Federal Hours-of-Service (HOS) regulations require drivers to take a 30-minute break after driving for eight hours and a 10-hour break after 14 hours. (See Figure 4). [Refer to Figure 4 on p. 13 of docket number EPA-HQ-OAR-2022-0985-1577-A1] Driver break times will not likely align with where chargers are physically located or available for immediate use. While rapid charging using megawatt ports will evolve over time and allow greater range for trucks and faster charging intervals, every minute of not driving reduces the period that drivers can legally operate their trucks on the road. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 12-13]

Driver dwell times at shipper and receiver facilities are already severely impacting driver HOS windows and adding a layer of inefficiency into the supply chain. According to the American Transportation Research Institute (ATRI), in 2021, drivers rated dwell time as their second-highest concern.16 In its report, ATRI summarizes its current dwell time findings as follows:17

- The average dwell time at facilities for all fleets was 1 hour and 54 minutes per stop.
- Refrigerated carriers had an average dwell time of 3 hours and 16 minutes.
- LTL carriers averaged dwell times was 1 hour.
- Fleets with 25 or fewer trucks experienced the highest dwell time averaging 2 hours and 23 minutes per stop.

- At 1 hour and 37 minutes per stop, fleets with more than 1,000 trucks had the lowest average dwell time. [EPA-HQ-OAR-2022-0985-1577-A1, p. 13]

16 An Analysis of the Operational Costs of Trucking, American Transportation Research Institute (August 2022).

17 Id. at 40.

In addition, truck drivers often park prior to exhausting available drive time and drivers surrender an average of 56 minutes of available drive time per day.18 [EPA-HQ-OAR-2022-0985-1577-A1, p. 14]

18 Managing Critical Truck Parking Case Study: Real World Insights From Truck Parking Diaries, American Transportation Research Institute (December 2016).

Route planning will become critical to account for EV operational range limitations, needed charging infrastructure on travel routes, and charger types (i.e., slow versus fast charging). While EV and fleet software continues to evolve, the best route planning involving an EV can be thrown a curveball based upon congestion, temperature extremes, charging time, charger up-times, charger availability, battery health, and driver behavior. [EPA-HQ-OAR-2022-0985-1577-A1, p. 14]

High energy needs and big battery packs present challenges for truck EV dwell times. Direct current fast chargers (DCFCs) are the fastest chargers available today. A 600-kWh electric truck would require six hours to charge using a 100 kW DCFC. More powerful DCFCs will of course greatly reduce charge and dwell times. When it comes to EV charger ratings and speed, size matters. [EPA-HQ-OAR-2022-0985-1577-A1, p. 14]

Given the uncertainties as to how EVs may impact federal HOS requirements, TRALA requests EPA coordinate with DOT to conduct on-going analysis and reporting on how driver HOS requirements are being impacted by the increased use of ZEV vehicles. [EPA-HQ-OAR-2022-0985-1577-A1, p. 14]

EPA Summary and Response

Summary:

Multiple commenters said that EPA's assumed dwell time in the NPRM is too long or may not be applicable for some vehicles, particularly long-haul vehicles or those with multi-shift operations. DTNA conducted its own analysis of tractors' dwell times from telematics data, estimating that only one-quarter of tractors had a dwell time of 12 hours or longer and instead finding a median dwell time for day cabs of under 6 hours and for sleeper cabs just above 7 hours. DTNA further found that the large majority of the time, day cabs and sleeper cabs sampled did not return to base. ATA, which incorrectly noted that EPA assumed an 8-hour dwell time, cautioned that this would not work for line-haul or other vehicles that operate at night or those that "slip-seat" (change drivers so the truck can operate for the full 24-hour day). Schneider raised similar concerns.

Tesla stated that drivers' mandatory rest periods present an opportunity for en-route charging, though it also noted that higher charging powers (up to 1 MW) may be needed to deliver the electricity required during these breaks. (Tesla noted it is installing 750 kW DCFC ports at its depots.) TRALA also discussed the mandatory driver rest periods in its comments, noting that charging may not be available in locations where drivers have these 30-minute breaks so that significant route planning would be needed. TRALA asked that EPA coordinate with DOT to better understand the impact of if ZEV adoption on federal hours-of-service regulations. TRALA expressed concern about added downtime for charging, and cited an ATRI report that found average downtime at shipping and receiving facilities was just under two hours a stop.

Delek US Holdings and DTNA also commented on cost of additional downtime for charging. While Delek's comments primarily concerned the potential impact on BEV adoption, DTNA recommended that EPA account for charging downtime in its analysis, or alternately limit BEV feasibility in HD TRUCS to vehicles with single-shift operations. DTNA also suggested EPA gather data to better understand dwell times and other aspects of fleet operations.

EPA also received comments on how many vehicles can share EVSE ports. CARB found our assumption that up to two vehicles could share a DCFC port and one for L2, to be reasonable, whereas Clean Fuels Development Coalition et al. thought allowing two vehicles to share a DCFC port (and therefore halving the EVSE costs in those cases) to be unreasonable.

Tesla commented that our assumed limits on DCFC sharing were too restrictive, stating that 5 or more vehicles could share a DCFC in some circumstances. EDF stated that EPA overestimated EVSE costs by assuming only up to two vehicles could share a charger, noting that in some cases, many more could charge. ICCT commented that multiple vehicles could also share L2 ports and that fleets are likely to do to save costs.

Response:

How long a vehicle is off-shift and parked at a depot, warehouse, or other home base each day is a key factor for determining which charging type(s) could meet its needs. We refer to this as dwell time. In the NPRM, we assumed all vehicle types would have at least 12 hours of available time to charge at a depot or other location the vehicle is parked off-shift. However, we acknowledged that the amount of time available at the depot for charging will depend on a vehicle's duty cycle and other factors (88 FR at 25979). We requested comment on this approach. EPA further assumed that up to two vehicles could share a DCFC port if both vehicles could meet their charging needs within this dwell time, while each vehicle using L2 charging would have its own port (see DRIA Chapters 2.6.4.1 and 2.6.4.2).

Commenters on this topic generally thought the 12-hour dwell time assumption is too long, particularly for regional or long-haul applications in which vehicles may not return to their home base. As discussed in RTC 6.3.1, EPA agrees that it is appropriate to model long-haul vehicles, certain other long-range tractors, and coach buses as relying on public rather than depot charging and we have updated our FRM analysis accordingly. Given that, we no longer estimate a depot dwell time for these vehicles.

To better understand how dwell times might vary by vehicle application and class for vehicles that we assume will use depot charging in our FRM analysis, we supported new data analysis by NREL through an interagency agreement between EPA and the U.S. Department of Energy. NREL analyzed several data sets for this effort: General Transit Feed Specification (GTFS) data for about 21,700 transit buses, operating data for nearly 300 school buses from NREL's Fleet DNA database, and a set of fleet telematics data from Geotab's Altitude platform covering about

13,600 medium- and heavy-duty trucks. As described in the report Bruchon et al. 2024,[449] NREL separately analyzed data for 18 unique combinations of vocations and class types. We mapped the resulting dwell times to the applicable BEV type in our HD TRUCS model, as described in Chapter 2.6.2.1.4 of the RIA. As shown in Table 2-78 of RIA, Chapter 2.6.2.2, the updated dwells times in HD TRUCS range from 7.4 hours (for a class 8 regional vehicle) to 14.5 hours (for school buses). For the large majority of depot-charged BEV types in HD TRUCS, dwell times used are under 12 hours.

For the NPRM, we assumed that each vehicle using Level 2 charging would have its own EVSE port, while up to two vehicles could share DCFC if charging needs could be met within the assumed dwell time. We agree with comments received by EDF, ICCT, and Tesla that these limits were conservative as fleet owners have a strong financial incentive to share EVSE ports among vehicles if it could decrease their costs while still ensuring operational needs are met. Accordingly, and in consideration of more robust dwell time assumptions, in our final rule analysis we allow up to two vocational vehicles to share one EVSE port if there is sufficient depot dwell time for all vehicles to meet their daily charging needs. For tractors, which tend to be part of larger fleets, we allow up to four vehicles to share one EVSE port if there is sufficient daily depot dwell time for each vehicle to meet its charging needs. To the extent higher numbers of BEVs can share EVSE ports and still meet their daily electricity consumption needs, these limits should still be considered conservative. See RIA Chapter 2.6.2.1.5.

In response to the comments about the impact of charging time on slip seating operations, if slip seating is utilized, then this would be an instance when ICE vehicles would be appropriate. As noted, EPA's modeled compliance pathway allows for ICE vehicles, and the majority of sleeper cabs would remain ICE vehicles in that modeled compliance pathway. See also RTC Section 4.3.3.

6.4 Charging Infrastructure (Miscellaneous)

Comments by Organizations

Organization: Daimler Truck North America LLC (DTNA)

- Mandatory Transportation Electrification Infrastructure Reporting. DTNA is not aware of any existing tool where fleets, manufacturers, or regulators can find information about public or private charging stations that can accommodate HD BEVs with pull-through charging and ingress/egress appropriate for commercial vehicles. DOE's Alternative Fueling Station Locator could serve as one such tool by adding fields to indicate whether or not the charging site can support medium heavy-duty (MHD)18 and/or heavy heavy-duty (HHD) vehicles.19 Collecting this data is critical to inform the Agency of the development of HD electric vehicle supply equipment (EVSE) and should be used to inform and enable increased CO2 stringencies throughout the GHG Phase 3 program. This data is also critical information for fleets utilizing BEVs that may need en route access to public charging. DTNA also recommends that EPA work with FHWA to

[449] Bruchon, Matthew, Brennan Borlaug, Bo Liu, Tim Jonas, Jiayun Sun, Nhat Le, and Eric Wood. "Depot-based Vehicle Data for National Analysis of Medium- and Heavy-Duty Electric Vehicle Charging." NREL/TP-5400-88241. February 2024. Available online: https://www.nrel.gov/docs/fy24osti/88241.pdf.

reconsider the designations of Alternative Fuel Corridors (AFCs), in particular to ensure that the ‘ready’ corridor designation is reserved for AFCs that have HD-accessible BEV and hydrogen infrastructure spaced at regular intervals. Even where an AFC has stations 50-100 miles apart, if the stations cannot accommodate HDVs, then the corridor is not HD-ready. [EPA-HQ-OAR-2022-0985-1555-A1, p. 14]

18 DTNA uses the term ‘Medium Heavy Duty’ (MHD) to refer to Class 5 and Class 6 vehicles and the term ‘Heavy Heavy-Duty’ (HHD) to refer to Class 7 and 8 vehicles.

19 See DOE, Alternative Fueling Station Locator, available at https://afdc.energy.gov/stations/#/analyze.

- National Electric Vehicle Infrastructure (NEVI) Formula Program Funding. DTNA recommends that 15% of NEVI funding be set aside for charging stations that can accommodate HD BEVs with at least one pull-through charging lane. To be eligible for the set-aside, station owners should be required to build at least one dual-use (HDV and light-duty vehicle capable) pull-through charging lane with a charging level above 150 kilowatts (kW). Station owners located near known fleet operating routes or major distribution hubs should be given priority for funding applications to encourage fleet owners to integrate electric HD BEVs into their fleets. Site proposals that include future-proofing measures to increase charging speeds for HDVs, up to 1.5 MW, should also receive additional consideration. Other site design considerations for station owners to accommodate HD charging include: (1) cable lengths and management systems; (2) vehicle turning radius; and (3) charger locations. DTNA recommends that EPA work with FHWA to issue additional HD guidance and direct state departments of transportation to include the above in next year’s NEVI plans. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 14-15]

Organization: Daimler Truck North America LLC (DTNA)

Recommendations to Facilitate ZEV Infrastructure Buildout and CO2 Standard Feasibility

While EPA does not have regulatory authority over many of the factors that currently pose challenges to ZEV infrastructure development, the Agency could help to mitigate these challenges by supporting the policies, legislation, and regulatory initiatives that are detailed in Section I.B.4 of these comments, including:

- Align with EIA vehicle uptake estimates, to ensure accurate estimates of real power demand by MHD and HHD ZEVs and net CO2 emissions.
- Work with FERC to direct utilities to incorporate demand projects into both a system-wide transportation electrification electricity forecast and a utility distribution grid capacity requirement forecast, to serve these medium- and heavy-duty transportation electrification loads on a geographic basis.
- Assume financial liability as a demand guarantor for infrastructure buildout that is undertaken based upon EPA’s ZEV penetration forecasts.
- Work with FERC to identify high traffic freight hubs that are likely to see rapid increase in BEVs, and direct utilities to proactively upgrade this infrastructure.
- Encourage state utility regulatory commissions to adopt PBRs to incentivize faster interconnection timelines for charging infrastructure projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 57]

- Work with stakeholders to develop model building codes that can be adopted by state and local governments to streamline authorizations for EVSE installation projects and encourage state and local adoption of these model codes.
- Require reporting of medium- and heavy-duty ZEV infrastructure and make this information available to fleets.
- Work with FHWA to revise the NEVI formula program to more actively encourage states to provide HD-accessible public charging infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

Organization: Fermata Energy

There are numerous reasons for the EPA to encourage the adoption of V2G technology and support our detailed recommendations below. We feel strongly that the EPA has a unique opportunity to make a major difference in the commercialization of V2X technology. If the EPA were to provide incentives or regulations on V2X, as we are recommending, it could provide market confidence for vehicle manufacturers and V2X charging equipment providers, and accelerate V2X by providing a positive value to consumers, including low- and moderate-income consumers. EPA action to unlock the full potential of V2X could help mitigate the emerging generation shortage because with V2X, EVs become grid assets.3 For example, PG&E CEO Patti Poppe recently noted that EVs on the road in “PG&E’s service area today have 6,700 MW of capacity,” which equals “three Diablo Canyon nuclear power plants. It’s on the road today, and we are not using it as a power source. We’re only using it as a power draw.”4 EPA action on V2X could also help address the duck curve, evening ramp, and summertime “needle” peaks in many generation and distribution grids. More importantly V2G, as a storage asset, unlocks and enables the large GHG benefits of the on-going, large-scale transition to intermittant renewable energy. EPA action to help commercialize V2X could create a low-cost, cleaner alternative to the zero-emission portable gensets required by California Air Resources Board’s (CARB) recent Small Off-Road Engines (SORE) regulation and replace dirty portable gensets in other states. Finally, Fermata Energy encourages the EPA to support all connectors, protocols, and EVSE sizes in any V2X recommendations for incentives or regulation in order to foster competition and encourage lower cost solutions. [EPA-HQ-OAR-2022-0985-1662-A2, p.3]

3 Decommissioning of Diablo Canyon and lack of hydropower in drought years. https://www.utilitydive.com/news/california-drought-could-halve-summer-hydropower-share-leading-to-more-nat/624489/
https://www.utilitydive.com/news/california-grid-reliability-2022-2023-summer/609261/

4 https://www.latimes.com/environment/newsletter/2021-10-14/as-california-fires-burn-pge-ceo-promises-fixes-boiling-point

BNEF data (Figures 1 and 2) show over 10 million battery-powered EVs on the road globally at the end of 2020, with a combined 296-gigawatt hours of lithium-ion batteries installed in them. That’s a lot of batteries driving around – 8 times more than the number of stationary grid-scale batteries installed globally.5,6 While these figures are mostly for light duty EVs and electric buses, they illustrate what will soon be happening with heavy duty vehicles in a few years as a result of EPA’s final rule. [EPA-HQ-OAR-2022-0985-1662-A2, p.3] [[See Docket Number EPA-HQ-OAR-2022-0985-1662-A2, page 4, for Figures 1 and 2]]

5 More EVs Are Being Designed to Push Power to The Electrical Grid - Bloomberg

6 https://news.bloomberglaw.com/environment-and-energy/electric-vehicles-to-drive-massive-battery-demand-bnef-chart

7 Electric Vehicles to Drive Massive Battery Demand, BNEF, 2021 [[Reference for Figures 1 and 2]]

In addition, a May 2022 presentation by the World Resources Institute using Bloomberg NEF and Energy Information Administration data found the power capacity in 2030 for EVs to be 10 to 20 times more than the 2030 power capacity of stationary storage.8 While these numbers are for light-duty EVs, electrified trucks can also contribute and some fleets (e.g., school buses, municipal trucks, trucks in one-shift operations) are expected to be early adopters. [EPA-HQ-OAR-2022-0985-1662-A2, p.4]

8 See slide 5 at https://www.slideshare.net/emmaline742/building-resiliency-with-v2g-in-residential-homes-by-camrongorguinpour

V2X bidirectional charging is a win-win-win investment: many benefits accrue:

- Achieves EPA's environmental goals. Just like stationary storage, V2X bidirectional charging platforms can reduce carbon and criteria pollutant emissions from generators by shifting electricity consumption to the cleanest hours of the day and removing the need for dirty thermal peaker electricity generation. However, V2X is more cost-effective than stationary storage, as ratepayers don't have to pay for purchase of the EV battery and can accelerate the renewable transition.
- Provides grid services. With V2X bidirectional charging, utilities gain a low-cost energy storage resource to help integrate renewable energy into the electric grid by shifting energy, providing resource adequacy, and ancillary services (Figure 3). For example, modeling by the CPUC currently projects 14,700 MW of new energy storage is needed in CA by 2032 to support the integration of renewables but only 2,185 MW is operational today.9,10 V2X, with supportive policies, can provide many thousands of MW by 2030.
- Lower vehicle ownership costs. EV owners can earn money by selling electricity back to the grid, significantly cutting the cost of vehicle ownership. Offsetting the cost of owning and maintaining an EV supports equitable access to EVs, particularly those EVs in the used car market, such as the low-income EV driving community.
- Increased resiliency. Unidirectional charging is a grid load. V2X bidirectional charging cost-effectively supports grid resilience. During black outs and public safety power shut offs, EV owners can power their homes, businesses, and critical infrastructure.
- Ratepayer benefits. EV adoption has already been shown to significantly benefit utility ratepayers and V2X technology can further those benefits.12 For example, a 2018 CEC study projects $1 Billion in annual ratepayer benefits if 50% of chargers were V2X capable.13 V2X technology also improves driver economics which would likely drive further EV adoption and even greater ratepayer benefits. [EPA-HQ-OAR-2022-0985-1662-A2, pp.4-6] [[See Docket Number EPA-HQ-OAR-2022-0985-1662-A2, page 5, for Figure 3]]

9 CPUC Approves Long Term Plans To Meet Electricity Reliability and Climate Goals, CPUC, 2022

10 Infographic: Q4'21 US Battery Storage by the Numbers, S&P Global, 2022

11 California Energy Commission, March 2019, Distribution System Constrained Vehicle-to-Grid Services for Improved Grid Stability and Reliability, Figure 42 [[Reference for Figure 3]]

12 Electric Vehicles Are Driving Electric Rates Down, Synapse Economics, 2019, Electric Vehicles Benefit All Utility Ratepayers, Forbes, 2019

13 Distribution System Constrained Vehicle-to-Grid Services for Improved Grid Stability and Reliability, CEC 2018, Table 8, High PEV Forecast Scenario

Organization: Manufacturers of Emission Controls Association (MECA)

Charger Infrastructure and Standards

The prioritization of building forward-looking vehicle charging infrastructure is critical to the penetration of electric commercial vehicles. Furthermore, analogous to vehicle electronic designs and material selection impacts electric vehicle efficiency, similar approaches can be used to improve charger efficiency in delivering the maximum power to the vehicle. For this reason, we believe that EPA should work with other agencies, like the Joint Office on Energy and Transportation, in setting minimum charger efficiency standards to ensure that infrastructure funds are spent on chargers with the best utilization of electric power. [EPA-HQ-OAR-2022-0985-1521-A1, p. 11]

While overnight charging at lower power may be appropriate for certain vehicle applications and fleets on a regimented schedule, we recommend the EPA prioritize the planning and building of direct current fast chargers (DCFC). The planning of public DCFCs is indispensable to allow in-service electric vehicles to address unforeseen day-to-day vehicle use variables (i.e., weather, traffic conditions, needed route changes, etc.). The availability of strategically placed, publicly accessible DCFCs prevents vehicles becoming inoperable due to these use variables, allowing vehicles to be rapidly charged and quickly placed back into service while minimizing interruptions to vehicle operations, traffic disruptions from vehicle strandings and maximizing the utilization of available space for heavy-duty vehicle recharging. [EPA-HQ-OAR-2022-0985-1521-A1, p. 11]

DCFC is also crucial to address long-term heavy-duty vehicle charging needs. Many commercial EVs will need to achieve fast charging times to encourage fleet owners to transition to e-mobility. This is particularly true for those vehicle operators who do not have access to charging at their own facilities. EV fleet adopters with slower rate overnight charging should also diversify their charging assets with DCFCs to have more flexibility as their fleets grow and unforeseen needs arise to charge vehicles and return them to service. [EPA-HQ-OAR-2022-0985-1521-A1, p. 12]

Additionally, DCFCs futureproof infrastructure investments by allowing fleet operators to immediately convert and deploy BEVs while also allowing them to remain up to date with advancements in battery technology. Vehicle batteries are quickly improving in size, chemistry, energy density, and efficiency resulting in increased vehicle range. This range improvement will, however, require faster charging capabilities. While HD BEV vehicles typically require large batteries with increasing power density, DCFCs enable quicker and more efficient charging of these vehicles. In addition, site and infrastructure owners maximize their investment because DCFCs enable site-readiness for future DCFC expansions while allowing the best utilization of available space and higher turnover of serviced vehicles. [EPA-HQ-OAR-2022-0985-1521-A1, p. 12]

DCFCs also allow for bidirectional charging which futureproofs infrastructure investment further by providing support for increasing electricity demand. Vehicle-to-Grid ("V2G") technology can help address energy use and manage peak demand times and costs, as well as serve as backup power during an outage. As EV adoption increases, this technology becomes more critical to enable sustainable grid management, grid resilience, utilization, and national security protection. [EPA-HQ-OAR-2022-0985-1521-A1, p. 12]

MECA also recommends the EPA consider national certification, such as UL Certification, for EV supply equipment to provide consistency, quality, safety, efficiency and compliance. A Certificate of Compliance will mean the product has passed a series of rigorous tests to demonstrate performance, safety, quality, and serviceability, while enhancing sustainability, strengthening security, and managing risk. National certification also supports local permitting efficiency, therefore, helps fast track deployment of charging stations. [EPA-HQ-OAR-2022-0985-1521-A1, p. 12]

For these reasons, MECA urges EPA to work with other government agencies, such as the Joint Office for Transportation and Energy, and industry to develop national standards for minimum charger efficiency which will ensure the efficient energy utilization and lowest operating cost for electric vehicles. With regards to technology, several suppliers of vehicle power electronics are applying similar electric efficiency technology innovation to the development of more efficient chargers to minimize switching losses and deliver maximum power to the battery. This is important to fleets as charging losses increase their operating cost and it is important to the environment because these loses represent electricity that is generated but never used. The difference in electric efficiency between the first generation of chargers, that are deployed in the field today, and the advanced second generation chargers can be as much as 10-20%. This becomes significant given the magnitude of battery energy in conventional vehicles. [EPA-HQ-OAR-2022-0985-1521-A1, p. 12]

Organization: MEMA

EVSE that has higher DC charging capacity (i.e., DC fast charging, or DCFC) than the minimum requirements modeled in the HD TRUCS tool will enable opportunity charging and help future-proof charging infrastructure, which is especially important to further encourage EV rollouts. School bus and other applications suited to bi-directional charging can also offer a layer of grid resiliency that will address stakeholder concerns about increasing dependency on electrical grids and also improve local and national security. Likewise, significantly more investment is needed to address fleet operator confidence and reliability for EVs. For medium- and heavy-duty EV, DCFC is critical. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 9 - 10]

Organization: Nuvve Holding Corporation

EVs equipped with V2G technology can help further reduce GHG emissions in multiple ways beyond the emissions reductions that EVs alone can achieve, and enhance infrastructure resilience and national security. For example, EVs equipped with V2G technology can help reduce GHG emissions and help avoid harmful health effects from diesel generators, when used to provide emergency backup power as a substitute for diesel. V2G also supports the integration of variable clean generation resources, such as solar and wind energy, into the grid and can enhance the management thereof. These benefits can be realized across all types of EVs, from

HD to light-duty EVs (both battery-only and plug-in hybrids). [EPA-HQ-OAR-2022-0985-1572-A1, p. 2]

In addition, V2G technology can provide valuable grid flexibility, e.g., to regional power grids, by leveraging V2G as a grid resource during periods of extreme grid strain, thereby helping to avoid local, state, or regional power outages. An Electric Power Resources Institute ("EPRI") study found that implementing V2G capability can provide two-to-three times the value that unidirectional, managed charging (otherwise known as "V1G") from the grid to a vehicle can provide.2 EPRI estimates that V2G could generate $1 billion in annual grid benefits to California ratepayers under an aggressive EV adoption scenario of 5 million EVs by 2030 with 50 percent of the vehicles being V2G-enabled. Another study of light-duty bidirectional EVs in California estimated an annual V2G value of $2,850 per vehicle.3 [EPA-HQ-OAR-2022-0985-1572-A1, p. 2]

2 Electric Power Research Institute (EPRI). "Vehicle-to-Grid: $1 Billion in Annual Grid Benefits?" EPRI Journal. https://eprijournal.com/vehicle-to-grid-1-billion-in-annual-grid-benefits/.

3 Tarroja, Brian, and Eric Hittinger. The value of consumer acceptance of controlled electric vehicle charging in a decarbonizing grid: The case of California. Energy. Vol. 229. August 15, 2021. https://www.sciencedirect.com/science/article/pii/S0360544221009397.

Organization: South Coast Air Quality Management District (South Coast AQMD)

The workforce needed to install this infrastructure also can present a key challenge. In California, our Energy Commission estimated that 157,000 fast charging stations (>50 kW) would be needed by 2030 to support zero emissions heavy-duty on-road vehicles.1 This equates to more than 400 charging stations per week that need to be installed. This is in addition to those needed for light duty vehicles. A significant workforce is needed to do the site work, the upstream utility distribution, transmission, and generation work, as well as the manufacturing of electrical equipment (e.g., transformers, etc.). The federal government has a key role in developing programs across the nation to first estimate the workforce needed and in which key sectors and regions, and then to provide resources to ensure that workforce is trained and available. [EPA-HQ-OAR-2022-0985-1575-A1, pp. 3-4]

1 https://www.energy.ca.gov/data-reports/reports/electric-vehicle-charging-infrastructure-assessment-ab-2127

Finally, while most sites installing infrastructure are focused on their local needs (e.g., site installation, local utility distribution infrastructure, etc.), when implemented at scale, additional generation/production and transmission/transportation of electricity and hydrogen will be needed, in many cases across state lines. The federal government can continue to facilitate these interstate connections to ensure a streamlined market that will encourage the rapid growth of zero emissions vehicles. Key factors in the adoption of zero emissions vehicles is the actual price that end consumers will pay for electricity and hydrogen as well as a reliable supply of both, especially in comparison to conventional fossil fuels. The federal government can play a role in driving down the cost to consumers as well as ensuring stable and reliable fuel supplies to the extent that they cross state lines. [EPA-HQ-OAR-2022-0985-1575-A1, p. 4]

Organization: Truck Renting and Leasing Association (TRALA)

ZEVs Will Exacerbate the Nation's Shortage of Truck Parking Spaces

TRALA is concerned over how the build-out of a national truck charging network will impact the nation's truck parking space shortage. Truck drivers count on safe parking spaces to comply with trucking regulations and to get a good night's sleep. Parking has been in short supply for years, over 300,000 spaces to be more precise. For every 11 drivers in the U.S., there is one truck parking space.19 Drivers spend, on average, one hour each day searching for truck parking.20 The DOTs 2019 Jason's Law Report found that approximately 98% of drivers have trouble finding parking compared to 75% in 2015 – a 23% increase. Admittedly 70% of commercial motor vehicle drivers were forced to violate HOS regulations seeking safe, legal parking.21 DOT also found that the truck parking shortages exist in every state and region and is most acute along major freight corridors – the very same corridors targeted to install truck EV charging. [EPA-HQ-OAR-2022-0985-1577-A1, p. 14]

19 'Truck Parking Shortage: A Heavy Load for Truck Drivers to Bear,' Driver Safety (July 5, 2022).

20 Id.

21 'Trucking Groups Urge Secretary Buttigieg to Address Safe Parking Shortage,' Safety+Health (March 1, 2022).

Diesel remains the predominant fuel in trucking and will continue to be over the near-term future. With that being the case, as truck parking facilities add or expand charging infrastructure, it will likely take away valuable parking spaces for diesel-powered trucks that – at this point in time – are more likely to need limited parking spaces. What is more troublesome are areas having few parking spaces, little land for parking expansion, or under-utilized truck parking spaces reserved for truck charging, will result in spill-over parking along roadways and in surrounding neighborhoods.[EPA-HQ-OAR-2022-0985-1577-A1, pp. 14-15]

One has to go no further than rest areas along the interstate to see trucks parked on interstate entry and exit ramps due to lack of parking. Rural areas may have better opportunities to purchase land for expanding parking and adding charging spaces but they may also be less inclined to do so until sufficient ZEV product lines are available and in use. Even electrified parking spaces can compound parking shortages depending on vehicle dwell times, wait periods for electrified spaces to become available, charger downtimes, speed of charging, fire code spacing requirements, and the numbers of chargers. TRALA recommends the agency coordinate with DOT to conduct periodic reviews, assessments, and define solutions regarding any truck parking impacts created from electrifying current truck parking locations. [EPA-HQ-OAR-2022-0985-1577-A1, p. 15]

Organization: Volvo Group

Even other seemingly unrelated issues could influence the availability of charging, such as parking concerns. Parking for Class 8 vehicles is a significant problem today and many truck stop operators are understandably nervous about converting existing parking stalls for EV charging for fear of having those spaces blocked by internal combustion engine (ICE) trucks. This parking problem has been exacerbated by state decisions to close existing, and limit future development of interstate rest stop parking. More state and federal dollars for parking along with amendments to the Federal-Aid Highway Act currently restricting EV charging at rest areas will help. [EPA-HQ-OAR-2022-0985-1606-A1, p. 8]

EPA Summary and Response:

Summary:

At least one commenter requested better public information and resources to support HD BEV charging. For example, DTNA suggested that mandatory reporting could help resolve the lack of public information for fleets, manufacturers, and regulators about charging stations for HD BEVs. They noted that stations for HD BEVs have special requirements that need to be accounted for (e.g., along designated Alternative Fuel Corridors and in NEVI plans). DTNA stated that DOE's AFDC could be supplemented to share additional data relevant to HD vehicles, which could also be useful to EPA for tracking purposes. They suggested working with agencies like FHWA, EIA, FERC, the NEVI program, and others to align data, encourage programs that accommodate and support BEV charging for HD vehicles, and help mitigate challenges to ZEV infrastructure deployment.

Others commented on the value of encouraging vehicle-to-grid (V2G) and vehicle-to-X (V2X) technologies. Fermata, MECA, MEMA, and Nuvve noted the benefits of future-proofing BEV infrastructure to address long-term needs. Fermata and Nuuve encouraged the use of V2G and V2X technologies to enhance infrastructure resilience. Fermata said the technology could provide a potential revenue stream for charging equipment owners, and with proper implementation can act as a grid asset that would benefit ratepayers at large. Fermata commented that V2X could provide a "positive value to consumers and low- and moderate-income consumers." They recommend that EPA provide incentives or regulations on V2X to increase confidence in the technology, and to help commercialize V2X. They also encourage EPA to "support all connectors, protocols, and EVSE sizes in any V2X recommendations for incentives or regulations in order to foster competition and encourage lower cost solutions." Nuvve pointed to V2G as an alternative to diesel generators, which offers emissions benefits. They noted that V2G can work across vehicle types and pointed to a few studies on the financial benefits of V2G. Nuvve and MECA also highlighted the national security benefits of V2G.

Also as a means of future-proofing infrastructure, MECA and MEMA wrote about the importance of improving charger efficiency and setting minimum charger efficiency standards to ensure the efficient use of energy and to lower operating costs. MECA stated that EPA should prioritize the planning and building of public DCFCs. They described many reasons including the fact that DCFC allows for bidirectional charging, which can support increasing electricity demand. They suggested that EPA work with other government agencies such as JOET to develop national standards and certification requirements to ensure reliability. MEMA noted that higher-power chargers like DCFC are critical for HD BEVs. For example, DCFCs can enable opportunity charging, and bidirectional charging can offer additional benefits. They suggested that more investment is needed to improve reliability and promote confidence in these technologies.

At least one commenter expressed concerns about workforce requirements. South Coast AQMD focused on the workforce needed in California to install charging infrastructure. They said the federal government has a key role to play in creating programs to develop the skills and training needed to ramp up the deployment of charging stations. The rapid scaling of infrastructure for ZEVs, they note, will require interstate connections, and the federal government is in a good position to help facilitate the market, create stability and reliable fuel supplies, and drive down costs.

Finally, TRALA and Volvo commented on an existing truck parking station shortage that they say could be impacted by the buildout of a national HD BEV charging network. TRALA explained issues that commercial vehicle drivers must deal with to find safe, legal parking and expressed concerns about converting limited spaces for diesel trucks to spaces for BEV charging. They recommend that EPA coordinate with DOT to monitor and assess conditions as the market evolves and develop solutions. Volvo suggested that additional state and federal funding for parking and restrictions on BEV charging at rest stops could help.

Response:

In response to DTNA's comment suggesting that EPA work with other agencies to improve public information about HD BEV charging infrastructure, EPA has worked closely with the Joint Office of Energy and Transportation (JOET) and other federal agencies on a range of BEV charging infrastructure issues and challenges. For example, EPA works with DOE and DOT (along with other government, industry, and other stakeholders participants) on the Electric Vehicle Working Group, which, as described by JOET, was formed to make recommendations "regarding the development, adoption, and integration of light-, medium-, and heavy-duty electric vehicles (EVs) into the U.S. transportation and energy systems."[450] EPA collaborated with other agencies in development of a National Zero-Emission Freight Corridor Strategy,[451] released in March 2024, that, "sets an actionable vision and comprehensive approach to accelerating the deployment of a world-class, zero-emission freight network across the United States by 2040. The strategy focuses on advancing the deployment of zero-emission medium- and heavy-duty vehicle (ZE-MHDV) fueling infrastructure by targeting public investment to amplify private sector momentum, focus utility and regulatory energy planning, align industry activity, and mobilize communities for clean transportation."[452] The strategy has four phases. The first phase, from 2024-2027, focuses on establishing freight hubs defined "as a 100-mile to a 150-mile radius zone or geographic area centered around a point with a significant concentration of freight volume (e.g., ports, intermodal facilities, and truck parking), that supports a broader ecosystem of freight activity throughout that zone."[453] The second phase, from 2027-2030, will connect key ZEV hubs, building out infrastructure along several major highways. The third phase, from 2030-2045, will expand the corridors, "including access to charging and fueling to all coastal ports and their surrounding freight ecosystems for short-haul and regional operations."[454] The fourth phase, from 2035-2040, will complete the freight corridor network. This corridor strategy provides support for the development of HD ZEV infrastructure that

[450] Joint Office of Energy and Transportation. "Electric Vehicle Working Group". Available online: https://driveelectric.gov/ev-working-group.

[451] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf.

[452] Joint Office of Energy and Transportation. "Biden-Harris Administration, Joint Office of Energy and Transportation Release Strategy to Accelerate Zero-Emission Freight Infrastructure Deployment." March 12, 2024. Available online: https://driveelectric.gov/news/decarbonize-freight.

[453] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 3.

[454] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 8.

corresponds to the modeled potential compliance pathway for meeting the final standards. In addition, EPA has announced several funding opportunities through BIL and IRA focused on HD sectors that allow for spending on HD BEV charging infrastructure, as discussed in RIA Chapter 1.3.2, and we offer information on our website to inform the public about implementation of these funding programs. As discussed in RTC Section 2.10, we are committed to continuing our engagement with federal partners and with multiple stakeholders and to monitoring build-out of major elements of the HD ZEV infrastructure. We may in the future request additional information, as appropriate, and as consistent with our Clean Air Act and other authorities, but we do not agree with the commenter that mandatory reporting about infrastructure deployment is warranted at this time.

The commenter suggested that DOE's Alternative Fuels Data Center (AFDC), for example, could be a tool for providing public information about HD BEV charging stations. We agree the AFDC Station Locator is a useful resource for finding stations and further note that it is possible to identify stations with access for HD BEVs through advanced filters.[455] We encourage industry to also partner with DOE to ensure that accurate and useful information is made publicly available in a timely manner, given that the AFDC Station Locator data collection methods include "collaborating with infrastructure equipment and fuel providers, original equipment manufacturers (OEMs), and industry groups".[456] We also note that many utilities publish hosting capacity maps, and there is a Department of Energy publication compiles all of these maps' locations in a central registry. See RTC Section 7 (Distribution) below.

We agree with the commenters that V2G and related technologies may offer numerous benefits and potentially save money for fleets, as discussed further in RIA Chapter 1.6.4 and RTC Section 7. We did not quantitatively include these benefits in our analysis for the rule so to the extent that fleets monetize such benefits, our costs analysis may be considered conservative.

In response to comments about charger efficiency, we note that DOT's Federal Highway Administration 2023 rule sets minimum charging infrastructure standards and requirements for infrastructure projects funded under the NEVI program, including DCFCs. The rule "does not specifically accommodate" HD BEV charging, but FHWA explicitly and strongly encourages the consideration of future HD charging needs and notes that they will continue to monitor technological advancements.[457] In January 2024, DOT's FHWA awarded the first EV Charger Reliability and Accessibility Accelerator Program grants to address charger reliability.[458] We agree that the efficiency of technologies can help lower costs, and that higher power chargers like DCFCs make sense for some HD BEV charging scenarios that require faster charging times, such as en-route charging. EPA encourages the use of energy efficient chargers through our

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[455] U.S. Department of Energy. "Alternative Fueling Station Locator". Available online: https://afdc.energy.gov/stations/#/analyze?fuel=ELEC&maximum_vehicle_class=HD.
[456] U.S. Department of Energy. "About the Alternative Fueling Station Locator Data". Available online: https://afdc.energy.gov/stations/#/analyze?fuel=ELEC&maximum_vehicle_class=HD&show_about=true.
[457] Federal Register. "National Electric Vehicle Infrastructure Standards and Requirements". February 28. 2023. Available online: https://www.federalregister.gov/documents/2023/02/28/2023-03500/national-electric-vehicle-infrastructure-standards-and-requirements.
[458] U.S. Department of Transportation, Federal Highway Administration. "NEVI Program: Electric Vehicle Charger Reliability and Accessibility Accelerator". Available online: https://www.fhwa.dot.gov/environment/nevi/evc_raa/.

voluntary EnergyStar program, which certifies AC-Output and DC-Output charger models with power levels of up to 350 kW.[459]

Please see RTC Section 19.2 for a detailed response to comments regarding employment, including some discussion related to workforce and training needs to install charging infrastructure. There are many programs to support the training of technicians supporting ZEV infrastructure, including through federal agencies. For example, both EPA and JOET identify resources related to workforce development and training on their websites.[460,461] In January 2024, DOE announced $46.5 million for BEV charging that is intended in part to grow the clean energy workforce.[462] In November 2023, the National Governors Association and the National League of Cities launched a State and Local Collaborative to Support an Inclusive Workforce for the Electric Vehicle Charging Sector to develop career pathways, supported by the Siemens Foundation's EVeryone Charging Forward initiative that has a similar focus.[463] We expect that programs like the many that are listed throughout RTC Section 19.2 and this rulemaking, as well as other efforts not included, will increase with the increasing buildout of charging infrastructure.

We acknowledge concerns about the availability of parking for commercial trucks and potential impacts due to public charging, particularly along major freight corridors where the shortages may be most acute according to TRALA. We note that DOT released a truck parking handbook for state and local planners that mentions designing facilities for future freight vehicles, including electric vehicles. They recognize that parking will continue to play a significant role in trucking and that as vehicle technologies evolve, activity at a site may change over time. DOT also updated guidance on funding eligibility for commercial vehicle parking projects that recognizes truck parking shortages as a national concern.[464,465] We thus note that this issue is being addressed as part of the federal government's response to promoting successful deployment of needed HD ZEV infrastructure, as discussed further in RTC Section 2.10.

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[459] EnergyStar. "Electric Vehicle Chargers". Available online: https://www.energystar.gov/products/ev_chargers.
[460] U.S. Environmental Protection Agency. "Clean School Bus: Workforce Development and Training Resources". Available online: https://www.epa.gov/cleanschoolbus/workforce-development-and-training-resources.
[461] Joint Office of Energy and Transportation. "Webinar: Workforce Development Tools and Resources". March 5, 2024. Available online: https://driveelectric.gov/webinars/workforce-development-tools-resources.
[462] U.S. Department of Energy. "Biden-Harris Administration Announces Over $46 Million to Enhance EV Charging Reliability and Workforce Development". January 19, 2024. Available online: https://www.energy.gov/articles/biden-harris-administration-announces-over-46-million-enhance-ev-charging-reliability-and.
[463] National Governors Association. "EV Workforce Collaborative". November 8, 2023. Available online: https://www.nga.org/projects/ev-workforce-collaborative/.
[464] Gallagher, John. "DOT issues truck parking handbook for local planners". FreightWaves. September 30, 2022. Available online: https://www.freightwaves.com/news/dot-issues-truck-parking-handbook-for-local-planners.
[465] Knopp, Martin C. and Thomas Keane. Memorandum from FHWA/FMCSA to Division Administrators. "INFORMATION: Eligibility of Title 23 and Title 49 Federal Funds for Commercial Motor Vehicle Parking (Updated)". September 20, 2022. Available online: https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/title23fundscmv/title23_49_funds_cmv.pdf.

7 Distribution

Comments by Organizations

Organization: Advanced Energy United

Transportation is the largest source of domestic [GHG] emissions. In 2021, 28% of emissions came from the transportation sector, 23% of which came from HDVs1. We have a unique opportunity to not only decarbonize this sector, but improve public health, create good paying jobs, and produce technologically advanced vehicles for consumers and businesses in the process. The EPA's promulgation of the new emissions reductions rule on heavy-duty vehicles provides a pathway to meet emissions reductions targets and expand the adoption of zero-emissions vehicles on our roads. [EPA-HQ-OAR-2022-0985-1652-A2, p. 1]

1 EPA. (28 April, 2023). Sources of Greenhouse Gas Emissions. https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

A large percentage of emissions reductions from the transportation sector will be accomplished by replacing gas- and diesel-powered buses, trucks and vans with EV models. EVs are not only much more energy efficient than gas-powered cars but are also less expensive to fuel and maintain over their lifetimes. Thus, the EPA's proposed rule presents an opportunity to decarbonize the largest source of emissions in the American economy while scaling up an emerging domestic market. Electrified transportation reduces our reliance on fossil fuels, strengthens America's energy independence, and produces economic benefits across the value chain of the automotive industry. [EPA-HQ-OAR-2022-0985-1652-A2, pp. 1 - 2]

However, in order to fully realize the benefits of this new fuel source, we must consider innovative approaches that will effectively manage that electric load and mitigate potential grid impacts. In the draft regulatory impact assessment for the Phase 3 rule, the EPA rightly recognized that grid constraints will be a challenge, and the likely necessity of a variety of approaches to reduce the need or scale of upgrades.2 While some solutions to this challenge will require the engagement of state and federal policymakers, others are already being deployed by innovative companies across the advanced energy industry. [EPA-HQ-OAR-2022-0985-1652-A2, p. 2]

2 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis p 70 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

Building out a decarbonized electric grid with advanced energy technologies—and the infrastructure necessary to ensure its stability—will require the innovation and speed demonstrated by President Roosevelt's Arsenal of Democracy. In response to the need for tanks, weapons, and planes, American companies like Ford, GM, and Boeing ramped up manufacturing production and began making the technologies, equipment, and parts necessary to bolster Allied efforts. That is the kind of American innovation that we will need—and have begun to see—from leading automakers and new market entrants as they increase their share of EVs. For instance, Ford and Sunrun have teamed up to pair the energy storage capabilities of the all-electric F-150 Lightening with rooftop solar. In a similar vein, Rivian has indicated an interest in implementing bi-directional charging—vehicle-to-load—software into their vehicles which would alleviate grid constraints and improve resiliency. This technology turns an EV into a mobile battery. Heavy-duty vehicles in particular have larger battery capacity than light-duty vehicles, and can provide even more power in times of need. This could yield immense benefits to grid resiliency and provide helpful energy storage for commercial buildings and homes. [EPA-HQ-OAR-2022-0985-1652-A2, p. 2]

In addition to hardware solutions to manage grid impacts from electric HDVs, software-based managed charging solutions (sometimes called automated load management or power control systems) serve a similar role to mitigate the need for electrical distribution system upgrades. Fleets comprised of HDVs are well-suited to such managed charging technologies. Fleet vehicle routes and deployment schedules are often fairly predictable, with fleet operators closely monitoring schedules for operational and economic optimization. At the same time, many vehicles often have long dwell times which can help to shift and shape load, thereby reducing impact on the grid. [EPA-HQ-OAR-2022-0985-1652-A2, p. 2]

II. Case Studies

Below are three brief case studies that show how these proven technologies have helped to alleviate grid constraints and benefit consumers. [EPA-HQ-OAR-2022-0985-1652-A2, pp. 2 - 3]

Case Study 1:

Dedicated EVSE companies like FreeWire Technologies are an example of American innovation, which has shown repeatedly that it can keep pace with the demands of the moment. Free Wire's battery-integrated charging technology "solves grid constraints by packaging charging infrastructure, grid infrastructure, and energy storage into a fully-integrated compact solution These ultrafast chargers provide enhanced grid resiliency options during peak demand and can support critical facilities during outages and charge vehicles at 200kW in 15 minutes.4 [EPA-HQ-OAR-2022-0985-1652-A2, p. 3]

3 FreeWire Technologies. (27 April, 2022). FreeWire Technologies Announces $125 Million Series D Financing to Accelerate Deployment and Development of Next-Gen EV Charging Technology and Energy Management Services. https://freewiretech.com/freewire-technologies-announces-125-million-series-d-financing/

4 FreeWire Technologies. (2023). FAQ. https://freewiretech.com/faq/#:~:text=Visit%20the%20Boost%20Charger%20web,200%20miles%20in%2015%20minutes.

Case Study 2:

Octopus Energy has employed a demand response program in the United Kingdom called Intelligent Octopus, which demonstrates the potential for managed charging to reduce grid pressures and the costs associated with overbuilding the distribution system. A customer simply sets their preferences in an app (specifying when they need the EV charged and the state of charge that is needed) and the platform will automatically charge the cars at times where there is abundant, low-cost energy, helping to balance out demand and supply on the grid while saving customers money. Intelligent Octopus enrollment has grown from 600 EVs since it was launched in January 2022 to over 45,000 EVs today, providing 250 MW in shiftable load resources. Intelligent Octopus was launched for EV drivers in Texas in February. [EPA-HQ-OAR-2022-0985-1652-A2, p. 3]

Case Study 3:

Irish Post issued an RFP to electrify 100 parking sites across the country for its mail fleet of trucks, vans, and cars. Understanding that they were working with constrained grid conditions, Irish Post included load management capability as a requirement so as to avoid the cost and time delays of extensive local grid upgrades.

A general contractor and The Mobility House (TMH) won the RFP and deployed 2800 22 kW AC chargers and 180 DC chargers ranging from 22-50 kW while avoiding an estimated 50 MW of utility upgrades across all sites. At a subset of 31 sites using exclusively 32 Amp chargers, TMH's load management technology enabled the team to safely install and operate EVSE nameplate capacity exceeding the main site panel capability by an average of 200-300%. This allowed an average of eight extra EVSEs per site to be installed without upgrading service, saving Irish Post time and money as they electrified their fleet while allowing all EVSEs access to their full nameplate capacity when needed and serving their mobility needs with no adjustments in driver behavior. [EPA-HQ-OAR-2022-0985-1652-A2, pp. 3 - 4]

Case Study 4:

Vehicle-to-grid (V2G) technology allows an electric vehicle (EV) to draw energy from the grid (typically during periods of low cost & low demand) and discharge energy back to the grid (during periods of high cost & high demand). V2G technology also helps reduce energy costs associated with owning and operating EV fleets. An increasing number of electric utilities, like National Grid in Massachusetts, support programs that pay electric fleets and other battery storage resources to discharge energy, turning them into revenue-generating assets without disrupting normal operations. In the summers of 2021 & 2022, Highland Electric Fleets piloted V2G technology in battery storage from electric school buses. 10+ MWh was discharged to the Massachusetts grid across 158 hours, generating $2,300. [EPA-HQ-OAR-2022-0985-1652-A2, p. 4]

Case Study 5:

The San Diego-based company Nuvve is a global leader in vehicle-to-grid (V2G) technology with deployments on five continents. In the US, Nuvve is focused on the school bus market. Electrified school bus fleets represent an excellent candidate for V2G given the large batteries and the long dwell times. School buses are often idle for months at a time during the summer when additional grid capacity is at a premium. The U.S. Environmental Protection Agency (EPA) acknowledges the potential of electrified school bus fleets to provide V2G services.5 [EPA-HQ-OAR-2022-0985-1652-A2, p. 4]

5 See U.S. EPA, What if Electric School Buses Could be Used to Supply Power When Off Duty? Available at https://www.epa.gov/greenvehicles/what-if-electric-school-buses-could-be-used-supply-power-when-duty.

Nuvve is the only company, working collaboratively with San Diego Gas & Electric (SDG&E), to have successfully developed an electric school bus (ESB) V2G pilot program in California. Six 60 kW bidirectional chargers and six V2G capable Lion Electric school buses were deployed at Cajon Valley Union School District. Using Nuvve's GIVe software platform, these buses participated in 10 Emergency Load Reduction Program (ELRP) events from August 17th through September 9th through SDG&E.6 The host school district was paid $2/kWh for V2G exports helping to reduce the total cost of ownership of its ESB fleet. Nuvve has additional V2G deployments totaling over 1 MW under development in California. In addition, Nuvve has multiple projects under development in other states including Oregon, Utah, Nevada, Colorado, Texas, Illinois, Florida, and Rhode Island. [EPA-HQ-OAR-2022-0985-1652-A2, p. 4]

6 See SDG&E and Cajon Valley Union School District Flip the Switch on Region's First Vehicle-to-Grid Project Featuring Local Electric School Buses Capable of Sending Power to the Grid available at https://www.businesswire.com/news/home/20220726006137/en/SDGE-and-Cajon-Valley-Union-School-District-Flip-the-Switch-on-Region%E2%80%99s-First-Vehicle-to-Grid-Project-Featuring-Local-Electric-School-Buses-Capable-of-Sending-Power-to-the-Grid.

III. Technology Impacts

Managed charging with both hardware- and software-based solutions is an essential strategy to reduce infrastructure costs for fleet charging depots. Depot charging is likely to account for nearly 90% of fleet operating needs, with vehicles on average having 14 hours of downtime per day.7 Managing these vehicles' charging load to avoid peak periods can substantially reduce the need to upgrade both the facility's infrastructure and the utility-side infrastructure, compared to an unmanaged charging scenario in which vehicles charge simultaneously during peak periods. A recent NREL study found that managed charging in the MHD sector can reduce distribution system investment costs by up to $1,090 per EV per year.8 [EPA-HQ-OAR-2022-0985-1652-A2, pp. 4 - 5]

7 Perspectives on Charging Medium- and Heavy-Duty Electric Vehicles, NREL, December 2021. https://www.nrel.gov/docs/fy22osti/81656.pdf

8 Electric Vehicle Grid Integration, NREL. https://www.nrel.gov/transportation/project-ev-grid-integration.html

In 2021 testimony filed at the California Public Utilities Commission, Pacific Gas & Electric stated that utilizing these load management technologies could reduce the originally requested capacity by more than 50%, which resulted in cost savings ranging from $30,000 to $200,000 per project.9 [EPA-HQ-OAR-2022-0985-1652-A2, p. 5]

9 PGE testimony 2-9-210 https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2110010/4240/417398449.pdf

Modeling based on New York's existing medium- and heavy-duty electrification indicates that managed charging will yield cost savings that will accrue to all ratepayers. A 2023 report from Synapse Energy Economics, leveraging data and tariffs from ConEd and National Grid, found that managed charging reduced site peak load by 15% and 5% respectively.10 This data reflects the more rigid charging needs and schedules of fleet vehicles, but is significant, nonetheless. The cost savings associated with managed charging are also likely to lead to faster economic return on investment for fleets in the process of electrification. [EPA-HQ-OAR-2022-0985-1652-A2, p. 5]

10 MHDV Integration Costs Report, Synapse, April 2023. https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ab0fd0780-9882-3a25-9ef2-f8c73bd80c92&viewer%21megaVerb=group-discover

The implimentation of managed charging policies are a critical factor to speed overall adoption of medium- and heavy-duty electric vehicles in line with the EPA's rulemaking. As emissions standards steadily increase and EVs proliferate on our roads, it is likely that demand for electricity will rise beyond what managed charging can save. This new demand will call for added transmission capacity and resiliency measures, vehicle-grid integration, smart charging, and bidirectional charging/ V2G, and other innovative solutions. Without proactive planning and buildout of charging infrastructure, the U.S. is at risk of failing to meet its ambitious, and laudable, goals for transportation emissions reductions. A 2021 study by the Brattle Group estimated that investments in transmission would have to reach $25 billion in order to charge 20 million EVs11. To fully unlock these investments, the U.S. will need to undertake permitting reform, to streamline transmission projects and free up interconnection queues. [EPA-HQ-OAR-2022-0985-1652-A2, p. 5]

> 11 Sergici, S., Hagerty, M., & Long, L. (1 June, 2020). Electric Power Sector Investments of $75-125 Billion Needed to Support Projected 20 Million EVs by 2030, According to Brattle Economists. Brattle Group. https://www.brattle.com/insights-events/publications/electric-power-sector-investments-of-75-125-billion-needed-to-support-projected-20-million-evs-by-2030-according-to-brattle-economists/

American innovation has shown repeatedly that it can keep pace with the demands of the moment. There will be stumbling blocks on the road to electrification, but we have the tools to mitigate them. Innovative approaches like bidirectional charging/V2G technology can support the grid when supply is needed. Managed charging and demand response technologies and battery-integrated charging stations help ease peak demand. These types of approaches can facilitate the transition to 100% clean energy, while transmission and distribution capacity are built out. These comments reflect industry concerns, priorities, and above all, solutions. [EPA-HQ-OAR-2022-0985-1652-A2, p. 6.]

Advanced Energy United and its member-companies believe that these recommendations will bolster the effectiveness of the EPA's implementation of this rule and we look forward to further collaboration. [EPA-HQ-OAR-2022-0985-1652-A2, p. 7.]

Organization: Alliance for Vehicle Efficiency (AVE)

According to a recent study, "… the electric grid does not have 'sufficient delivery headroom' for highway charging to meet projected demand and policy targets… Sites with significant charging loads will need 'considerable' electric distribution system upgrades and, in many cases, high-voltage transmission-level interconnection." 23 [EPA-HQ-OAR-2022-0985-1571-A1, p. 8]

> 23 https://www.fleetowner.com/perspectives/running-lights/blog/21255007/us-grid-not-prepared-for-electric-truck-avalanche

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

c. Electricity Grids Will Need Substantial Upgrades Before They Can Support Commercial Fleets

Even if adequate charging stations could be established in the numbers and at the locations needed across the United States, providing those stations with the massive amounts of electricity required to charge heavy-duty vehicles would pose another likely insuperable obstacle on the proposed rule's timeline. Heavy-duty electric vehicles require especially large batteries and charging them will raise electricity demand across the country. See Medium- and Heavy- Duty Vehicle Electrification at 16. For example, a modest-sized fleet of Class 7 and 8 vehicles could consume more than four gigawatt hours of electricity per year and could reach peaks that rival outdoor sports stadiums. Id. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 48 - 49]

Today's electricity grids do not have capacity for such a dramatic increase in demand. See Medium- and Heavy-Duty Vehicle Electrification at 18; Hauke Engel et al., The Potential Impact of Electric Vehicles on Global Energy Systems, McKinsey & Co. (July 2018) ("Potential Impact"). Researchers have emphasized that heavy-duty charging stations "wouldn't be like the charging stations you see around now for cars"; instead, they would "require much more power" that "existing grid connections would not be able to handle." Calculating the Cost of E-Trucking. Others have similarly warned that the integration of electric heavy-duty vehicles "could bring challenges to power systems, such as increased peak load, power quality issues, increased power losses, and shortened life of transformers." Mingzhi Zhang et al., Location Selection of Fast-Charging Stations for Heavy-Duty EVs Using GIS and Grid Analysis, NREL, at 1 (Feb. 2021) (footnotes omitted). [EPA-HQ-OAR-2022-0985-1660-A1, p. 49]

Indeed, one recent study found that electrification of even 11 percent of trucks and buses "could destabilize the transmission grid." Medium- and Heavy- Duty Vehicle Electrification at 18. And local officials and utilities have reportedly halted company plans for electrification over these concerns. See A Heavy Dose of Reality. For example, "[a]fter one trucking company tried to electrify just 30 trucks at a terminal in Joliet, Illinois, local officials shut those plans down, saying they would draw more electricity than is needed to power the entire city," and when "[a] California company tried to electrify 12 forklifts"—not trucks, but forklifts—"[l]ocal power utilities told them that's not possible." Id. Thus, before manufacturers can comply with the proposed rule, there will need to be major upgrades to the nation's electricity grids. [EPA-HQ-OAR-2022-0985-1660-A1, p. 49]

Those upgrades would be expensive—and would take time. Modifications to local electricity-distribution systems can cost between $30,000 (to produce and install electric-vehicle supply equipment) and $35 million (to install a new substation) and can take between three months and four years. See Medium- and Heavy-Duty Vehicle Electrification at 17. In places with highway charging stations, there would also likely be a need for transmission interconnection. See Electric Highways at 6; Potential Impact ("[A] single fast-charging station can quickly exceed the peak-load capacity of a typical feeder-circuit transformer."). That project can take as long as eight years to complete—if it can even be done at all. See Electric Highways at 4, 34 ("It may not be feasible to extend the transmission network to every site, particularly in locations where there would be impacts to local residents and the environment."). Given these long lead times, even if fleet owners, utilities, and others began work on grid improvements today, necessary upgrades might not be completed in time to support the surging demand for electricity distributed across the grid that EPA's proposed rule would require. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 49 - 50]

EPA observed that the precise extent and nature of improvements to the grid that ultimately would be necessary is difficult to predict years in advance— and on that basis declined to model those changes directly. See 88 Fed. Reg. at 25,983 ("[T]here is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners. Therefore, we do not model them directly as part of our infrastructure cost analysis."). That regulate-first, confront-practical-impediments-later approach is backwards. It is irrational to press forward without robust analysis of the changes that are likely to be necessary; if EPA concludes that reliable analysis is impossible, it should stay its hand or pursue a different approach. At a minimum, the acknowledged uncertainty about the potentially massive burdens that grid improvements might necessitate provides further doubt on the proposed rule's feasibility and more reason for caution.7 [EPA-HQ-OAR-2022-0985-1660-A1, p. 50]

7 Relying on other forms of energy would also be infeasible. Researchers have found that “[t]he initial cost for a solar-powered charging site would be between $82 million and $139 million,” “[a] nuclear reactor station would initially cost $141 million,” and “[a] wind power station would initially cost up to $75 million.” Calculating the Cost of E-Trucking. And even if those options were not prohibitively expensive, “[e]ach alternative also comes with its own issues,” making them ill suited for a widespread shift away from internal-combustion-engine vehicles. Id.

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

Critically important to increased ZEV adoption is the infrastructure necessary to operate such vehicles. EPA overlooks this issue in the Proposed Rule. Notably absent from EPA’s analysis is any demonstration that sufficient charging stations, utilities, and other infrastructure needed to support accelerated ZEV implementation will be available by MY27. As engine manufacturers have acknowledged, even as new ZEVs are ready to enter into production, the necessary infrastructure for both electric vehicles and hydrogen vehicles continue to lag, especially when multiple facilities are needed to support the multiple fuel and powertrain technologies EPA contemplates.72 Focusing solely on electric vehicles themselves, EPA has not adequately evaluated or grasped the time and resources required to permit, construct, and operate the necessary infrastructure to power these vehicles. This is particularly concerning in light of the very real risk that the electric grid will not be able to meet the increased demand anticipated by the Proposed Rule.73 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 17 - 18]

72 See Jack Roberts, Truck Tech, “5 Takeaways from ACT Expo 2020,” (May 20, 2022), available at https://www.truckinginfo.com/10172184/5-take-aways-from-act-expo-2022 (citing Cummins CEO Tom Linebarger as warning ACT Expo attendees that the undertaking will cost multiple trillions of dollars to accomplish).

73 North American Electric Reliability Corporation, 2022 Long-Term Reliability Assessment (Dec. 2022), 21, available at https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf. (indicating that increased demand projections may lead to reliability concerns for the electric grid, especially as dual-peaking or seasonal peaking times change with increased electrification)

While a significant percentage of the charging installations deployed today are Level 2 EVSEs, dual charging installations to enable the flexibility of light-duty as well as medium-duty and HDV charging will become increasingly important. Direct current fast charging equipment (“DCFCs”) will enable broader market coverage, even for LDVs used in applications where they cannot sit for 6 hours and charge during off-peak, lower-cost electricity periods. As utility companies gear up to provide infrastructure installations, EPA should not minimize the impact of supply chain shortages/strains on the cost of materials necessary for installing supporting charging infrastructure in the short time ahead to 2032. Beyond EVSE chargers, the cost of grid upgrade projects needed to support the incremental electricity demand growth from transportation is not insignificant and can be quite variable. A particular case study of Southern California illustrated in IOPscience notes: “the total cost of these upgrades will be at least $1 billion and potentially more than $10 billion.” These costs need to be taken into consideration with expected demand growth, within detailed rate base calculations, and in concert with appliance upgrade costs to fully understand their ultimate impacts on annual ratepayer expenditures.” 81 We agree with and support the Proposed Rule’s acknowledgement that “a recent study found power needs as low as 200 kW could trigger a requirement to install a distribution transformer.” Other anecdotal evidence discussed within an RMI report highlights the expensive mistakes that can emerge from insufficient planning and engagement in details.82 Demand charges can be particularly punishing, and in some cases make or break the business case for transition from ICEVs to BEVs, particularly for fleets and vehicles that require DCFC charging. Other considerations for high-reliability use cases should include provisional back-up power system considerations, which likely depend upon back-up generators or expensive stationary energy storage batteries. Absent comprehensive understanding of the dynamics between increased ZEV use and charging infrastructure needs, vehicle manufacturers—as well as consumers—are left in a vulnerable position. Regardless of whether manufacturers even could comply with the Proposed Rule, they would likely be left in a position where there is no consumer demand, and fleet turnover declines because the infrastructure necessary to support the new ZEVs is either at capacity or nonexistent. Indeed, at least one study to date has concluded that, upon ZEVs becoming the norm in California, it could push the total demand for electricity beyond the existing capacity of the state's grid—turning ZEVs into zero electricity vehicles.83 Even more important, meeting the demand in California would likely require construction of new power plants, or electricity purchases from neighboring states—further adding to the infrastructure needs with increased transmission and distribution capabilities.84 Or, in the short term, electricity may come from generators, in which case it makes more sense to leave the ICE in the truck rather than beside it. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 22 – 23]

81 Salma Elmallah et al., IOP SCIENCE, "Can distribution grid infrastructure accommodate residential electrification and electric vehicle adoption in Northern California?" (Nov. 9, 2022) available at https://iopscience.iop.org/article/10.1088/2634-4505/ac949c

82 Alessandra R. Carreon, et al., RMI, "Increasing Equitable EV Access and Charging" (2022) available at https://rmi.org/insight/increasing-equitable-ev-access-charging/.

83 Beth Daley, THE CONVERSATION, "Switching to electric vehicles could save the US billions, but timing is everything" (Dec. 4, 2018), available at https://theconversation.com/switching-to-electric-vehicles-could-save-the-us-billions-but-timing-is-everything-106227.

84 Id.

Despite the potential for increased demands on domestic energy generation and generation capacity,85 EPA offers little to no support that these demands will be sufficiently met. Similarly, EPA's draft Regulatory Impact Analysis86 provides little to no analysis regarding the costs associated with meeting these increased infrastructure and energy generation/capacity needs beyond the flawed reliance on various legislative actions, such as the BIL and IRA.87 Consequently, EPA is pushing a technology at a pace that cannot be adopted within the timeframe of its own proposal. [EPA-HQ-OAR-2022-0985-1659-A2, p. 23]

85 See, e.g., U.S. DRIVE, "Summary Report on Evs at Scale and the U.S. Electric Power System" (Nov. 2019), available at https://www.energy.gov/eere/vehicles/articles/summary-report-evs-scale-and-us-electric-power-system-2019 (summarizing impacts of light-duty vehicles on energy generation and generation capacity alone and acknowledging several potential challenges without including analysis of medium- and heavy-duty ZEVs).

86 DRIA at 15–17, 20–21.

87 See, e.g., Salma Elmallah et al., Can distribution grid infrastructure accommodate residential electrification and electric vehicle adoption in Northern California? (Nov. 9, 2022), available at https://iopscience.iop.org/article/10.1088/2634-4505/ac949c (projecting upgrades needed solely for the PG&E service area in Northern California, which serves 4.8 million electricity customers and is subject to

aggressive targets for both EV adoption and electrification of residential space and water heating will add at least $1 billion and potentially $10 billion to PG&E's rate base).

Organization: American Highway Users Alliance

Significantly, at the same time that EPA has issued this NPRM, it has also issued a major proposal calling for reduced tailpipe emissions of CO2, other GHGs, and other substances from light-duty and medium-duty vehicles. See 88 Fed. Reg. 29184 (May 5, 2023). That proposed rule, similar to the one in this docket, assumes astronomical growth in EVs as a percentage of new light-duty and medium-duty vehicles. That rule faces similar questions regarding feasibility due to, among other uncertainties, the availability of charging infrastructure that is sufficiently fast, the ability of the electric grid to provide electricity to support the growth in light-duty EVs, the ability of the electric utilities to provide connections from the grid to charging facilities, and the availability of critical minerals, processing and related battery components. [EPA-HQ-OAR-2022-0985-1550-A1, p. 3]

Organization: American Petroleum Institute (API)

iv. Stakeholders missing from the discussion – utilities

EPA requested comment on stakeholders that may be missing from the discussion. As noted during the public hearing testimony, of the various stakeholders who testified, representation from the utilities was lacking. We implore the agency to fully engage the utilities in discussion prior to finalizing the Phase 3 rule. Because infrastructure is such an important piece of the program, the main stakeholder group needs to be included in the design of the program to provide EPA guidance. For example, a set of truck chargers of sufficient size to charge a fleet of fully electric trucks requires power enough for a small town.10 If there are National Electric Vehicle Infrastructure (NEVI) charging facilities (i.e., four direct current fast chargers (DCFCs) with the capability to deliver 150 kW simultaneously) located on the same grid, there could be significant challenges to delivering the power without impacting other residential, commercial, and industrial customers. Further, a guidance report by the North American Council for Freight Efficiency (NACFE) and RMI highlights that "[c]harging infrastructure includes not only the chargers themselves, but the interrelated system of vehicles, duty cycles, chargers, and electric utilities."11 [EPA-HQ-OAR-2022-0985-1617-A1, p. 9]

10 "Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet," American Trucking Research Institute, December 2022.

11 "Charging Forward with Electric Trucks," North American Council for Freight Efficiency (NACFE) and RMI, June 2023.

ii. Infrastructure

2. Grid and charging

A robust analysis of the potential for the development and application of ZEV technologies in the HD sector must be conducted by EPA. We have concerns that EPA is overly optimistic about the technology readiness of ZEVs across the HD vehicle classes. Even with the low numbers of vehicles available on which to provide data, numerous studies and reports have been issued noting important concerns regarding ZEV readiness of the HD fleet. For example, a 2022 report by ATRI identified three overarching challenges in the deployment of HD ZEVs: electricity needs, battery materials and technology sourcing, and truck charging and parking infrastructure.16 The report cites the need for up to a 40 percent increase (based on HD vehicle class) in the nation's present electricity generation to fully electrify the U.S. vehicle fleet, and individual states would need 28 to 63 percent to meet vehicle travel needs. ATRI quantified that the truck charging needs at a single rural rest area would be equal to the amount of daily electricity required to power more than 5,000 U.S. households. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 11 - 12]

16 "Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet", American Transportation Research Institute, December 2022.

EPA requested comment on whether certain HD sectors may need alternate standards or timing due to the energy content required for charging. The ATRI study, as well as a study prepared for the Diesel Technology Forum, indicate significant electricity demand and costs associated with HD ZEV charging for larger vehicles as well as for fleets with multiple vehicles. HD vehicle charging may require megawatt-levels of charging, which will require significant buildout of electricity distribution that does not exist today.17 [EPA-HQ-OAR-2022-0985-1617-A1, p. 12]

17 "Environmental Benefits of Medium- and Heavy-Duty Zero Emission Vehicles Compared with Clean Bio- & Renewable-Fueled Vehicles 2022-2032," prepared for Diesel Technology Forum by Stillwater Associates LLC, July 19, 2022.

Organization: American Trucking Associations (ATA)

Grid Availability

Charging sites for depots or large public charging stations for commercial vehicles will require significant energy. The American Transportation Research Institute (ATRI) estimates full commercial vehicle electrification would require a 14 percent increase in energy generation from today's standards.20 In many cases, remote or densely populated areas do not have available power to direct toward commercial vehicle charging sites. The International Council on Clean Transportation (ICCT) recognizes that the electrification of commercial vehicles will significantly burden the current electrical grid and challenge the centralization of where and how charging accommodates trucks in operation today.21 [EPA-HQ-OAR-2022-0985-1535-A1, p. 15-16]

20 American Transportation Research Institute, Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, pg. 17, December 2022.

21 The International Council on Clean Transportation, Near Term Infrastructure Deployment to Support Zero-Emission Medium-and Heavy-Duty Vehicles in the United States, May 2023.

"We find that near-term energy needs will be concentrated in industrial areas in the largest metropolitan areas in the country, including Los Angeles, Phoenix, Houston, Chicago, and Dallas. 1% of U.S. counties will account for 15% of nationwide MHDV charging energy needs in 2030, constituting high-priority areas in which to concentrate near-term deployment of charging and refueling infrastructure of MHDVs." [EPA-HQ-OAR-2022-0985-1535-A1, p.16]

Early adopting fleets are being forced to quickly learn electricity demands and generation requirements as an important external factor that impacts their operations and TCO calculation. One fleet interviewed provided an example of their desire to electrify forklifts. In their mind, it would serve as an early use case to understand electric technology as they explored BEVs for their operations. However, in their discussions with the local utility, they were only allowed to electrify a small percentage of the originally desired forklifts due to limited onsite power. ATA asked fleets about their experiences with local utilities. More than two-thirds of respondents said they had not begun conversations with them. [EPA-HQ-OAR-2022-0985-1535-A1, p. 16]

The multi-state patchwork of energy generation and transmission regulatory bodies has made investment and modernization of the U.S grid even more challenging. Fleets are left with the reality of wading through local utility politics to receive approval for a permit to install minimal chargers on their site today. Addressing these site-specific challenges to build out charging infrastructure is essential to achieving the proposed rule's adoption rates and should begin immediately to accommodate large-scale transportation electrification. Yet, most states have not begun this process. With 168 investor-owned utilities, 1,958 publicly owned utilities and 812 cooperatives providing electricity to customers in the U.S., the scale of this undertaking will be significant and time consuming.22 The planning and oversight associated with hydrogen infrastructure is especially so. EPA should not propose a ZEV-dependent rule prior to ensuring the needed electric and hydrogen infrastructure will be available, including initiating state-wide planning and deployment assessments prior to establishing proposed ZEV adoption rates and timelines. [EPA-HQ-OAR-2022-0985-1535-A1, p. 16]

22 Energy Information Administration, Investor-owned utilities served 72% of U.S. electricity customers in 2017, August 15, 2019, available at http://www.eia.gov/todayinenergy/detail.php?id=40913.

For example, recently the California Public Utilities Commission (CPUC) developed a "Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning" that addresses the need for proactive planning of long lead time utility-side electric infrastructure (i.e., distribution and transmission) needed to support the acceleration of transportation electrification.23 [EPA-HQ-OAR-2022-0985-1535-A1, p. 16]

23 California Public Utilities Commission, Freight Infrastructure Planning, May 22, 2023, available at: http://www.cpucc.ca.gov/industries-and-topics/electricial-energy/infrastructure/transportation-electrification/freight-infrastructure-planning.

CPUC identified several challenges through this process, including:

- Approximately three years of required time to sequence statewide planning efforts and complete infrastructure authorizations. This does not include the time for cost recovery approval.
- Significant market and technology uncertainty affects the state's ability to proactively authorize infrastructure solutions.
- Risks and uncertainties regarding electricity grid load that are dependent on large-scale infrastructure buildout. These have not been adequately quantified within the state's existing planning and forecasting processes.
- The lack of an existing source of information on future fleet charger locations, and the need for long-term grid infrastructure planning to account for fleets' current flexible and economical routes.
- The lack of a coherent planning framework to optimize fleet business needs with electricity sector goals and requirements (i.e., how to cost-effectively upgrade the distribution and transmission system).

- The lack of a process for identifying long-term substation land acquisition needs. [EPA-HQ-OAR-2022-0985-1535-A1, p. 17]

Organization: CALSTART

One interesting example of successful load management strategies comes from EO Charging, a UK company that is expanding its presence in North America. EO currently manages the charging operations for several large fleets, including more than 5,000 Amazon commercial electric vehicles in Europe, primarily delivery vans but including medium-duty trucks. Their site design and operation enable accelerated truck deployments and manage utility capacity delays via smart managed charging and a mix of flexible charging rates to meet fleet operational requirements, site capacity limits, energy storage, and pricing considerations.45 In conversations, the group noted the system has been delivering consistent 99+ percent reliability/uptime. [EPA-HQ-OAR-2022-0985-1656-A1, p. 23]

45 https://www.eocharging.com/stories/eo-unveils-complete-electric-vehicle-fleet-charging-ecosystem

In our study, we assume a wide availability and strategic use of on-site battery storage for managed charging purposes and consider it a near-standard component of sites within certain geographies in the study, and estimate additional average costs per vehicle at a fraction of total charger cost based on industry data and project information available to CALSTART.46 Our assessment shows that significant total cost decreases of deployment compared to a baseline maximum deployment scenario are possible by on-site storage unlocking managed charging and making it available to deployments. Other studies show that managed charging reduces grid operating costs in general.47 [EPA-HQ-OAR-2022-0985-1656-A1, p. 23]

46 https://www.ostigov/pages/servlets/purl/1507680

47 https://www.sciencedirect.com/science/article/pii/S030142151930638X?via%3Dihub

Energy services and markets: CALSTART has witnessed utilities implementing a variety of new strategies to speed interconnection and find optimal places for it within their business, as distribution upgrade costs in general will make up a fraction of the overall annual utility annual revenue requirements.48 Many utilities now plan to work with shared charging service providers since they can create a new market for energy services at the edge of the grid and address the economics of increasing amounts of distributed loads.49 This may allow utilities to support aggregated loads and address interconnection queues more proactively. Others are looking into ways both increasing transactive coordination of services across a more distributed load can provide a hybridized energy resource platform.50 Interconnect queues are therefore managed not just through overcoming physical barriers in capacity and reliability but by developing new business models that realize cost efficiencies. EPA does not factor this growing market for services—critical to the future of the energy market—into its analysis. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 23 - 24]

48 https://www.ethree.com/wp-content/uploads/2021/06/GridLab_2035-Transportation-Dist-Cost.pdf

49 https://rmi.org/insight/economics-load-defection/

50 https://www.pnnl.gov/sites/default/files/media/file/DSOT%20Vol%205%20Study%20Results-Final.pdf

Grid integration: Fleet deployments are often integrated within comprehensive and long-term facility development plans, which afford a managed and phased-in approach to interconnection issues and close coordination with utilities. This approach also allows fleets to integrate electrification within larger sustainability planning efforts in cooperation with utility capabilities to aggregate demand. In addition, supportive public sustainability strategy frameworks and regional emissions regulations increasingly anticipate grid integration and the utilization of these facility-based integration measures as a means for fleet compliance with emissions reduction targets. The California Sustainable Goods Movement Action Plan,51 California's ACF rule regarding drayage vehicles and their traffic near ports,52 and the South Coast Air Quality Management District's Warehouse Indirect Source Rule53 all focus on the phase-in of new infrastructure from a holistic facility approach to managing emissions. Many of these strategies are already being replicated in ACT states. Emerging vehicle-to-grid (V2G) technologies offer methods for integrating fleet, facilities, and the grid directly, and managing demand in real-time and even in advance with utilities through advanced demand response technologies and charging-discharging scheduling. This capability will be a factor during the timeline of EPA's proposed rule. However, assuming infrastructure deployment is a sporadic, unplanned process which is initiated only with the purchase of a new vehicle ignores and possibly undermines these technologies and approaches. [EPA-HQ-OAR-2022-0985-1656-A1, p. 24]

51 https://ww2.arb.ca.gov/our-work/programs/california-sustainable-freight-action-plan

52 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acffroa3.pdf

53 http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/facility-based-mobile-source-measures/warehs-distr-wkng-grp

Interconnect planning services: An array of established service providers enables planned and cost-effective phase-in of infrastructure upgrades. These provide advanced simulation of grid needs for medium-duty fleets as well as many other commercial vehicle applications. In the course of their analyses, they identify and flag grid reliability needs and grid upgrades necessary for a fleet's electrification. Comparable services are now being offered by major firms, including but not limited to Arup, Black and Veatch, Edison Energy, ICF, Microgrid Labs, Siemens, and Parsons. This allows transitions to pace themselves at a rate responsive to the grid's upgrade timelines and fleet needs—and still at a pace that can accommodate many more vehicles than proposed in EPA's stringency assumption. [EPA-HQ-OAR-2022-0985-1656-A1, p. 24]

Organization: Clean Air Task Force et al.

b. Charging and grid infrastructure is capable of supporting HD BEVs in volumes aligned with and in excess of EPA's proposed standards.

Deployment of BEVs is well underway across the U.S. and is already requiring the electric power sector to make plans to reliably and safely integrate these vehicles. The electric power industry is well situated to maintain safe and reliable service that can power an increasing deployment of HD BEVs; utilities, aided significantly through investments from the BIL and IRA, are making important upgrades to the system to integrate higher penetrations of BEVs. Additional third party private investments and public investments are also already committed to building a robust HD BEV charging network. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45.]

When considering infrastructure buildout, it is important to remember that HD ZEVs will enter the total on-road HD fleet gradually and in volumes that pale in comparison to in-use HD combustion vehicles. Modeling using HD TRUCS and MOVeS3.R3188 shows that EPA's proposal, if finalized, would likely result in ZEVs comprising just 1 percent of the total on-road HD fleet by 2027, gradually reaching 8 percent in 2032 and 23 percent in 2040. See Table 4, infra. In other words, a relatively small portion of the HD fleet will be tapping into charging and grid infrastructure over the next decade, and even by 2040, HD ZEVs would comprise less than a quarter of the on-road fleet under this proposal. Infrastructure needs for HD ZEVs will accordingly grow gradually over time. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45. See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 45-46, for Table 4.]

188 HD TRUCS was used to develop ZEV adoption rates (by vehicle classification). MOVES3.R3 was used to translate HD TRUCS-derived ZEV adoption rates to ZEV sales and in-use curves.

For the final rule, we urge EPA to model how the Phase 3 standards will likely affect the composition of the entire on-road HD fleet, not just HD ZEVs' share of new sales. That information would better help the Agency and the public consider infrastructure issues related to this rulemaking. [EPA-HQ-OAR-2022-0985-1640-A1, p. 46.]

i. Economic theory and historical precedent show that infrastructure buildout will occur at the pace and scale needed to support vehicle electrification.

EPA should reject arguments that the buildout of charging and grid infrastructure cannot occur at the pace and scale needed to support expanded vehicle electrification, which are unreasonably pessimistic and inconsistent with both economic theory and historical precedent. These arguments rely on the classic "chicken-and-egg" scenario said to be presented by ZEV sales and charging infrastructure, where each side of the market waits for the other. But EPA need not and should not wait for infrastructure to fully mature before finalizing strong Phase 3 standards. Instead, EPA's standards themselves will send a strong signal to the market to undertake the infrastructure investments needed to accommodate a gradual rise in vehicle electrification,189 such that increased ZEV sales and infrastructure buildout will occur in relative tandem and reinforce each other. As one analyst sums it up: "The chicken-and-egg conundrum is being solved. Investments in the space and the adoption of EVs [a]re happening much faster than many analysts expected, and this is also accelerating the build-out of the charging network."190 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 46 - 47.]

189 Environmental regulation itself, of course, can lead to technology innovation and market development. See generally Jaegul Lee et al., Forcing Technological Change: A Case of Automobile Emissions Control Technology Development in the US, 30 Technovation 249 (2010); Margaret R. Taylor, Edward S. Rubin, & David A. Hounshell, Regulation as the Mother of Innovation: The Case of SO2 Control, 27 Law & Policy 348 (2005); James Lents et al., Chapter II: The regulation of automobile emission: A case study, in Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers (Marika Tatsutani & Praveen Amar eds., 2000) https://www.nescaum.org/documents/rpt000906mercury_innovative-technology.pdf.

190 Gabriela Herculano, Chicken-and-Egg Problem: EV Adoption and Buildout of Charging Networks, Nasdaq (Apr. 18, 2022), https://www.nasdaq.com/articles/chicken-and-egg-problem%3A-ev-adoption-and-buildout-of-charging-networks.

The economic literature on indirect network effects and two-sided markets shows that an increase in BEV sales—a likely effect of the Phase 3 standards, particularly if they are strengthened in the final rule—can be expected to stimulate associated infrastructure development. In a study on flex-fuel vehicles fueled by E85 (85 percent ethanol), Corts (2010) found that growth in sales of flex-fuel vehicles due to government fleet acquisition programs led to an increase in the number of retail E85 stations.191 That relationship held true across all six

Midwestern states analyzed, despite differences in those states' E85 subsidies and tax credits.192 The author concluded that the results "confirm the basic validity" of the theory underlying government fleet purchase requirements: that increasing the "base of alternative fuel vehicles can spur the development of a retail alternative fuel distribution infrastructure."193 [EPA-HQ-OAR-2022-0985-1640-A1, p. 47.]

191 Kenneth S. Corts, Building out alternative fuel retail infrastructure: Government fleet spillovers in E85, 59 J. Env't Econ. & Mgmt. 219, 219-20 (2009).

192 Id.

193 Id. at 231.

Recent economic research has confirmed this relationship in the context of ZEVs and charging infrastructure specifically. An influential study by Li et al. (2017) found that "EV demand and charging station deployment give rise to feedback loops" and that "subsidizing either side of the market will result in an increase in both EV sales and charging stations."194 Similarly, Springel (2021) found "evidence of positive feedback effects on both sides of the market, suggesting that cumulative EV sales affect charging station entry and that public charging availability has an impact on consumers' vehicle choice."195 The BIL and IRA subsidize both sides of the market, offering significant incentives for both HD ZEV purchases and the construction of charging infrastructure. Economic theory therefore supports the proposition that strengthened Phase 3 standards, particularly in combination with the BIL and IRA's large financial incentives, will facilitate expansion of charging and grid infrastructure.196 [EPA-HQ-OAR-2022-0985-1640-A1, p. 47.]

194 Shanjun Li et al., The market for electric vehicles: indirect network effects and policy design, 4 J. Ass'n Env't. & Resources Econ. 89, 128 (2017).

195 Katalin Springel, Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives, 13 Am. Econ. J.: Econ. Pol'y 393, 426 (2021).

196 See id. at 394 (noting that "the presence of positive feedback amplifies the impact of both types of subsidies"), 415 ("positive feedback loops between the charging station network and total all-electric vehicle sales amplify the impact of both types of subsidy").

Economic theory has in fact played out in Norway, where ZEV sales and infrastructure both expanded rapidly over the span of about a decade. There, the "path to charging point saturation started by stimulating more demand for EVs."197 In other words, Norway did not wait for infrastructure to fully mature before beginning its transition to cleaner cars. Rather, rising ZEV sales themselves "helped trigger a spike in demand for charging stations."198 [EPA-HQ-OAR-2022-0985-1640-A1, p. 48.]

197 Whitney Bauck, How Norway Became the World's Electric Car Capital, Nexus Media News (Mar. 7, 2023), https://nexusmedianews.com/how-norway-became-the-worlds-electric-car-capital/.

198 McKinsey & Co, What Norway's Experience Reveals About the EV Charging Market 3 (2023), https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/what-norways-experience-reveals-about-the-ev-charging-market#/.

The concept that charging infrastructure will adequately scale up over time also finds support in an analogous historical example: the buildout of roads and gasoline refueling infrastructure in the early 20th century to serve the United States' growing fleet of automobiles. The country's exponential growth in automobile sales—first exceeding 1,000 in 1899 and growing to 1 million by 1916199—preceded the establishment of an extensive network of both suitable roads200 and filling stations.201 Instead, the buildout of road and refueling infrastructure unfolded over long time horizons and in a variety of ways, adapting to the needs of the automobile fleet as it changed and grew. Paving and other road improvement efforts began on a small scale in cities, where automobiles were initially concentrated; efforts to improve rural roads and construct highways happened a decade or more later, as motorists began to expand their driving beyond cities.202 Similarly, in the case of refueling infrastructure, a network of modern filling stations did not spring up until well after automobiles had grown in popularity.203 Before that, refueling needs were met through varied and dispersed “non-station” methods such as cans of gasoline sold at general stores, barrels at repair garages, mobile fuel carts, curb pumps, and home refueling pumps, which emerged at various times as the demand for gasoline increased.204 Road and refueling infrastructure therefore exhibited a “long-term, adaptive and portfolio approach”205 that, over the span of several decades, satisfied the shifting needs of the growing ranks of automobile owners. [EPA-HQ-OAR-2022-0985-1640-A1, p. 48.]

199 Roads, Encyclopedia.com (May 29, 2018), https://www.encyclopedia.com/science-and-technology/technology/technology-terms-and-concepts/roads.

200 See id. (noting that around 1904, “[o]nly a few hundred miles of roads in the entire country were suitable for motor vehicles”); see also F.W. Geels, The Dynamics of Transitions in Socio-technical Systems: A Multi-level Analysis of the Transition Pathway from Horse-drawn Carriages to Automobiles (1860–1930), 17 Tech. Analysis & Strategic Mgmt. 445, 460, 467-68 (2005) (discussing the gradual expansion and improvement of road infrastructure in the 1910s and 1920s to accommodate growth in and changes to automobile travel).

201 Marc W. Melaina, Turn of the century refueling: A review of innovations in early gasoline refueling methods and analogies for hydrogen, 35 Energy Pol’y 4919, 4922 (2007) (noting that “the takeoff period for gasoline stations occurred between 1915 and 1925, but exponential growth in vehicles began around 1910, so the rise of gasoline filling stations followed rather than preceded the rise of gasoline vehicles”).

202 Geels, at 467-68.

203 Melaina, at 4922.

204 Id. at 4924-27.

205 Id. at 4932 (discussing refueling infrastructure).

That approach holds important lessons for this rulemaking. As detailed above, the introduction of HD ZEVs into the total on-road fleet will occur gradually and, for the first decade or more, in relatively low volumes. As explored in a recent white paper by ICCT,206 successfully meeting the needs of this gradually expanding fleet of heavy-duty ZEVs will not require the overnight nationwide buildout of infrastructure that some have misleadingly claimed. Instead, economic theory and historical precedent show that growth in heavy-duty ZEV sales and infrastructure buildout will occur in relative tandem, with infrastructure responding over time commensurate with the evolving needs of the ZEV fleet. And in finalizing its Phase 3 standards, EPA will send a strong market signal that will facilitate infrastructure development at the pace and scale needed to support compliance with the standards. As explained in the sections below, the nation’s infrastructure is already well-positioned to adapt to increased vehicle electrification. EPA must reject unfounded chicken-and-egg arguments questioning whether infrastructure will respond to rising demand. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 48 - 49.]

206 See generally Pierre-Louis Ragon et al., ICCT, Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States (2023), https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf.

ii. The grid can reliably support significantly increased loads.

The electric industry is well situated to maintain safe and reliable service that can power the increasing deployment of HD BEVs. As detailed below, the projected growth in electricity demand over the coming years, including demand related to BEV deployment in line with strengthened Phase 3 standards as well as additional economy-wide load growth, is well within the range of past historical load growth. Additionally, the industry is already responding to and preparing for increased electrification as more fleets and individuals adopt BEVs and has a wide range of tools, practices, and partnerships in place to continue to maintain a strong and reliable grid. [EPA-HQ-OAR-2022-0985-1640-A1, p. 49]

EPA conducted modeling within the Integrated Planning Model (IPM) to assess the electric sector and emissions impact of the proposal. In this modeling, the Agency utilized baseline projections of electricity demand and generation growth from the Annual Energy Outlook 2021 (AEO2021). DRIA at 321. EPA notes that this forecast "does not include the full forecasted ZEV adoption in the [proposal] reference case," and so it developed further incremental demand estimates to include "the demand of electric vehicles not captured by IPM's defaults," which EPA "calculated from the output of national MOVES runs." Id. While these files are not available to us, we are able to approximate this projected demand growth under the proposal by similarly calculating electric demand utilizing the proposal case in MOVES3.R3. This output reflects demand from all HD BEVs, including those HD BEVs that would be deployed in absence of this rule. In order to combine this with AEO2021 generation values, we converted this demand value to generation using a charging efficiency factor of 95 percent and transmission line loss factor of 5 percent. We then are able to combine this incremental generation calculation with projected generation from AEO2021 Reference Case (net available to grid).207 [EPA-HQ-OAR-2022-0985-1640-A1, p. 49]

207 U.S. Energy Information Administration, Annual Energy Outlook 2021, at Table 8 (Electricity Supply, Disposition, Prices, and Emissions), https://www.eia.gov/outlooks/aeo/data/browser (last accessed, June 13, 2023).

This analysis finds that system-wide increases in generation to meet demand growth, including both increased demand from the proposed Phase 3 standards (assuming EPA finalizes the stringency levels it has proposed) and projected economy-wide load growth, is projected to average 1.2 percent per year between 2028 and 2040. Importantly, this methodology is likely to overestimate generation growth, as the AEO2021 Reference Case already includes some level of transportation electrification.208 Isolating the impact of HD BEVs alone shows load average growth of 0.5 percent per year between 2028 and 2040. Further isolating only the incremental HD BEV generation projected under MOVES3.R3 associated with this proposal (as compared to the baseline) shows average generation growth of 0.4 percent per year between 2028 and 2040. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 49 - 50]

208 U.S. Energy Information Administration, Annual Energy Outlook 2021: Narrative, at 13 (2021), https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf.

Maintaining reliable and safe electric power delivery through this level of demand growth, as well as higher levels of growth resulting from more stringent Phase 3 standards, is within electric utility standard practice as demonstrated through the electric power sector's strong track record of reliability and resiliency. These annual generation increases are well within the range of contemporary, normal operations for the U.S. electric sector (see Figure 1 below). According to data reported to the Energy Information Administration in Form 861, in the 31 years from 1990 to 2021, average annual national growth in electricity sales was 1.1 percent.209 In 15 of those years, growth was 1.5 percent or higher, and in ten years it exceeded 2 percent. The U.S. has also seen previous periods of sustained high demand growth across most states; for example, 1995 to 2007 saw average nationwide growth of approximately 1.9 percent per year. [EPA-HQ-OAR-2022-0985-1640-A1, p. 50.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, page 51, for Figure 1]

209 Note that these data are for statewide demand, not generation. State level demand figures are more meaningful to show local variations in electricity usage as compared to state-level generation, which does not necessarily (or even usually) serve in-state customers. While absolute generation and demand figures (TWh) should not be compared, growth rates between the two, as shown here, should track proportionally. U.S. Energy Information Administration, Historical State Data, EIA-861, Annual Electric Power Industry Report (Mar. 8, 2023), https://www.eia.gov/electricity/data/state/.

Many states saw much higher, sustained levels of growth. In the two decades from 1999 to 2018, North Dakota electric sales more than doubled. Year over year growth averaged nearly 5 percent, and in 2014 electric sales were 14 percent higher than the previous year alone. In Nevada between 1992 and 2007, annual electric sales growth averaged 4.9 percent and fell below 1.5 percent only once. More recently, Virginia has seen strong annual sales growth, with sales increasing 12.3 percent in the five years from 2016 to 2021, or 3 percent on average per year, even accounting for a pandemic dip. [EPA-HQ-OAR-2022-0985-1640-A1, p. 50]

This analysis draws similar conclusions to those of the researchers at the Electrification Futures Study, a multi-year research project to explore potential widespread electrification in the future energy system of the United States. In a report developing an integrated understanding of how the potential for electrification might impact the demand side in all major sectors of the U.S. energy system—transportation, residential and commercial buildings, and industry—this study concluded that "[e]lectrification has the potential to significantly increase overall demand for electricity, although even in the High scenario, compound annual electricity consumption growth rates are below long-term historical growth rates."210 [EPA-HQ-OAR-2022-0985-1640-A1, p. 50]

210 Trieu Mai et al., NREL, Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States (2018), https://www.nrel.gov/docs/fy18osti/71500.pdf.

We further recognize that many parties will nevertheless need to take important steps to manage increased electrification demand. Utilities, public utility commissions and other state regulators, grid operators, charging providers, and others can and have already begun to coordinate and plan for increased vehicle electrification. Examples include:

- The West Coast Clean Transit Corridor Initiative is an ongoing, collaborative effort among 16 utilities to support the development of BEV charging facilities along I-5, from San Diego to British Columbia, for heavy- and medium-duty freight haulers and delivery trucks.211
- The National Charging Experience Consortium (ChargeX) is a collaborative effort between Argonne National Laboratory, Idaho National Laboratory, NREL, BEV charging

industry experts, consumer advocates, and other stakeholders whose mission is "to work together as BEV industry stakeholders to measure and significantly improve public charging reliability and usability by June 2025."212

- The National BEV Charging Initiative brings together automakers, power providers, BEV and charging industry leaders, labor, and public interest groups to "develop a national charging network for light, medium, and heavy-duty vehicles and inspire deeper commitments from state leaders, the administration and each other."213
- The National Association of State Energy Officials and the American Association of State Highway and Transportation Officials partnered with the U.S. Joint Office of Energy and Transportation to hold a series of convenings to coordinate on a range of topics, including ZEV infrastructure and utility planning needs.214 These convenings brought together State Departments of Transportation officials, State Energy Offices, and other key partners.
- PG&E and BMW of North America are testing a "vehicle-to-everything technology that will improve grid reliability and help EV customers lower their electric bills by exporting power back to the grid during peak demand periods." PG&E notes that "[t]he utility and automotive industries are creating a transformative clean energy future together."215
- NREL and Volvo collaborated on a research paper regarding challenges and opportunities of HD and commercial ZEVs, noting: Coordination between disparate and historically unconnected stakeholders, including state agencies, local governments, automotive manufacturers, fleets, energy infrastructure and utility companies, and research and academia will be required to ensure a smooth and timely transition to ZEVs. This paper, a joint research and industry perspective, is one such example of cross-sectoral collaboration.216 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 52 - 53]

211 West Coast Clean Transit Corridor Initiative, https://westcoastcleantransit.com/ (last visited June 13, 2023).

212 Idaho Nat'l Lab'y, National Charging Experience Consortium, https://inl.gov/chargex/ (last visited June 13, 2023).

213 EV Charging Initiative, https://www.evcharginginitiative.com/ (last visited June 13, 2023).

214 Nat'l Ass'n State Energy Officials (NASEO) & the Am. Ass'n State Highway & Transp. Officials (AASHTO), Building a National Electric Vehicle Charging Infrastructure Network: Regional EV Meetings Key Themes, Takeaways, and Recommendations from the States (not dated), https://www.naseo.org/data/sites/1/documents/publications/NASEO_AASHTO_Regional%20EV%20Meetings%20Summary_%20Final.pdf.

215 BMW Group, More Power To You: BMW of North America and PG&E Start V2X Testing in California (May 16, 2023), https://www.press.bmwgroup.com/usa/article/detail/T0417218EN_US/more-power-to-you:-bmw-of-north-america-and-pg-e-start-v2x-testing-in-california.

216 Muratori et al., at 7.

Finally, ICCT has highlighted myriad actions that utilities, local and state agencies and regulators, fleet operators, and property owners can take to help reduce barriers to infrastructure deployment and aid "timely planning and construction to ensure transmission and distribution systems can accommodate the needs of [medium- and heavy-duty vehicle] electrification."217 These examples show that the relevant stakeholders are already stepping up to plan for and accommodate the charging and grid needs associated with greater vehicle electrification. [EPA-HQ-OAR-2022-0985-1640-A1, p. 53]

217 Ragon et al., at 25.

Utilities in particular are also already planning for and deploying solutions to address increased vehicle electrification as their customers adopt BEVs to improve fleet economics and performance. For example, executives at Southern California Edison, which is one of the largest electric utilities in the U.S. and is facing industry-leading levels of electrification, have recently voiced strong support for the ability of the grid to manage, respond to, and benefit from BEVs. Caroline Choi, Edison International and Southern California Edison senior vice president of corporate affairs, noted that “the electric grid is really going to be the backbone of the whole system” for electrified transit, and that “[w]hat we’re seeing are the investments necessary to ensure that the grid is available.”218 Utilities and their customers will benefit from the ability to plan ahead for any significant infrastructure requirements. The regulatory certainty provided by Phase 3 standards can aid this planning. [EPA-HQ-OAR-2022-0985-1640-A1, p. 53]

218 Casey Wian, Transportation Electrification Gains Momentum: Edison International and SCE outline plans to seize the “huge opportunity” of preparing the grid for exponential EV growth, Energized, (Feb. 1, 2023), https://energized.edison.com/stories/transportation-electrification-gains-momentum.

Regulatory certainty can also help ensure that investments not only maintain strong electric service, but improve it while at the same time lowering costs. Southern California Edison President and CEO Steve Powell noted: “if we leverage the electric vehicle load and have that work for consumers as well, that whole idea of vehicle-to-grid, there can be real value in helping alleviate a lot of the infrastructure investments that need to happen,” ultimately lowering overall energy bills for customers.219 Similarly, Seattle City Light, in its Transportation Electrification Strategic Investment Plan, found that the utility received a net benefit of roughly $120,500 per bus or other heavy-duty ZEVs through an increase in new revenue, placing downward pressure on rates.220 It stated that “[w]hile there are system costs associated with increased transportation electrification (e.g., distribution and transmission infrastructure upgrades), with proactive utility planning and intervention, the system benefits (e.g., new revenue) are estimated to outweigh the costs, spreading the economic benefits of transportation electrification to all customers.”221 This will require action from regulators as well to help shape and approve these proactive and critical investments. As RMI recommended, “regulators can fulfil [sic] their responsibility for ensuring prudent and least-cost grid investments while proactively planning by using new information.”222 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 53 - 54]

219 Id.

220 Seattle City Light, Transportation Electrification Strategic Investment Plan 6 (not dated), https://www.seattle.gov/documents/Departments/CityLight/TESIP.pdf.

221 Id.

222 Ari Kahn et al., RMI, Preventing Electric Truck Gridlock: Meeting the Urgent Need for a Stronger Grid 16 (2023), https://rmi.org/insight/preventing-electric-truck-gridlock/.

Third-party analyses have bolstered these statements from utilities that BEVs, if deployed strategically, can improve grid operations. For example, Lawrence Berkeley National Laboratory estimated that enabling “vehicle-to-grid” technology,223 which allows ZEVs to serve as electricity storage and provide power back to the grid during periods of high demand, would save

California utility customers $13-15 billion in stationary battery costs.224 An analysis conducted by Gladstein, Neandross & Associates on behalf of EDF found that managed charging of class 8 trucks combined with strategic deployment of distributed energy resources could provide significant cost savings for fleet operators and "result in significant savings to utilities through avoided grid buildout costs."225 Yet another analysis found that BEVs can "contribute significantly to grid stability" and provide value to the grid through "deferred or avoided capital expenditure on additional stationary storage, power electronic infrastructure, transmission build-out, and more."226 Additionally, utilities can deploy proven and emerging rate designs that ensure utilities recover costs, reliably serve BEV charging load, improve BEV owner experience, and take advantage of grid strengthening services from these vehicles.227 [EPA-HQ-OAR-2022-0985-1640-A1, p. 54]

223 For more information on vehicle to grid and other bidirectional charging technologies, see, e.g. Jason Svarc, Bidirectional Chargers Explained - V2G Vs V2H Vs V2L, Clean Energy Reviews (Apr. 10, 2023), https://www.cleanenergyreviews.info/blog/bidirectional-ev-charging-v2g-v2h-v2l; SAFE & Electrification Coalition, Advancing Vehicle to Grid Technology Adoption Policy Recommendations for Improved Energy Security and Resilience (2022), https://safe2020.wpenginepowered.com/wp-content/uploads/2022/06/Advancing-Vehicle-to-Grid-Technology-Adoption.pdf,

224 Jonathan Coignard et al., Clean Vehicles as an Enabler for a Clean Electricity Grid, Env't Rsch. Letters, May 16, 2018, http://iopscience.iop.org/article/10.1088/1748-9326/aabe97.

225 Gladstein, Neandross & Associates, California Heavy-Duty Fleet Electrification Summary Report (2021), https://blogs.edf.org/energyexchange/files/2021/03/EDF-GNA-Final-March-2021.pdf.

226 Chengjian Xu et al., Electric vehicle batteries alone could satisfy short-term grid storage demand by as early as 2030, Nature Commc'n, Jan. 17, 2023, at 1, https://doi.org/10.1038/s41467-022-35393-0.

227 See e.g., Brittany Blair et al., Smart Electric Power Alliance, Managed Charging Programs: Maximizing Customer Satisfaction and Grid Benefits (2023), https://sepapower.org/resource/managed-charging-programs-maximizing-customer-satisfaction-and-grid-benefits/; Enel-X, Understanding Smart EV Load Management (Apr. 8, 2022), https://info.evcharging.enelx.com/whitepaper-download-ev-load-management-utility-dive; Zachary Needell, Wei Wei & Jessika E. Trancik, Strategies for beneficial electric vehicle charging to reduce peak electricity demand and store solar energy, CELL REPS. PHYSICAL SCI., Mar. 15, 2023, https://www.cell.com/cell-reports-physical-science/fulltext/S2666-3864(23)00046-2; Lily Paul & Maureen Marshall, CALSTART, Not Just Smart: The Importance of Managed Charging (2021), https://calstart.org/wp-content/uploads/2022/01/Managed-Charging-Paper-Final.pdf; Karen Kirk, Yes, the grid can handle EV charging, even when demand spikes, Yale Climate Connections (Mar. 23, 2023), https://yaleclimateconnections.org/2023/03/yes-the-grid-can-handle-ev-charging-even-when-demand-spikes/.

In addition, the historic investments of the BIL and IRA are helping utilities build a stronger, cleaner grid and prepare for advanced electrification while minimizing customer costs. Duke Energy, for example, has stated that "[the BIL] provides an important down payment on the infrastructure and incentives that are needed to electrify transportation and secure the grid," and "[the IRA] can create significant cost savings for our customers."228 New York utilities have indicated that they will be applying for $900 million in grants from the BIL and IRA to advance grid resilience.229 National Grid in particular notes that "EV charging make-ready infrastructure is identical to electric infrastructure that serves other purposes, this is the kind of work electric utilities do every day,"230 and that "areas of the [BIL] funding are enabling increased investment."231 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 54 - 55]

228 Jennifer Loraine, Policy can have a crucial impact on our clean energy future, Duke Energy News Center (Jan. 20, 2023), https://news.duke-energy.com/our-perspective/policy-can-have-a-crucial-impact-on-our-clean-energy-future.

229 John Norris, NY Utilities to Seek $900M from DOE, RTO Insider, (Mar. 28, 2023), https://www.rtoinsider.com/articles/31898-ny-utilities-seek-900m-from-doe.

230 Comments of National Grid to USDOT/FHWA on Docket No. FHWA-2021-0022, at 11 (Jan. 26, 2022), https://downloads.regulations.gov/FHWA-2021-0022-0150/attachment_1.pdf.

231 Id. at 10.

Organization: Consolidated Edison, Inc. (Con Edison)

Con Edison recommends that the Agency identify utility proactive planning as a best practice to support the buildout of grid infrastructure to prepare the grid for the ramp up in EV charging. [EPA-HQ-OAR-2022-0985-1661-A1, p.4]

Organization: Daimler Truck North America LLC (DTNA)

Policies to Promote ZEV Infrastructure Development

- Utility Grid Planning and Identification of High-Priority Charging Sites. To support achievement of ZEV sales targets and climate goals, electric utilities should be required to conduct detailed grid planning and assessments for transportation electrification. Legislation proposed and currently being considered in New York (AB 5052/SB 4830), for example, would require utilities to establish a highway and depot charging action plan, and addresses identification of high priority medium- and heavy-duty vehicle charging sites that are likely to see high traffic from commercial vehicles.15 EPA should consider advocating for legislation of this type in all 50 states to encourage advanced planning to develop the infrastructure needed to support feasibility of the Phase 3 standards. [EPA-HQ-OAR-2022-0985-1555-A1, p. 12]

  15 See New York Assembly Bill A5052 (2023-2024 Legislative Session), available at https://www.nysenate.gov/legislation/bills/2023/A5052; Senate Bill 4830 (2023-2024 Legislative Session), https://legiscan.com/NY/bill/S04830/2023.

- Proactive Grid Upgrades at HD High Priority Sites. Going beyond NY AB 5052/SB 4830, utilities should be required to proactively upgrade the electric grid to support the high priority HD BEV sites identified in the grid planning exercise described above. These proactive grid upgrades are required to bring interconnection timelines in line with the pace that EPA proposes. EPA should consider working with the Federal Energy Regulatory Commission (FERC) and other stakeholders to craft model legislation that requires grid upgrades at the identified high-priority sites and initiation of infrastructure build-outs as needed to support implementation of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 12]
- Align EPA and EIA ZEV Forecasts to Facilitate Utility Demand Planning. Utilities need detailed fleet transition plans in order to update their 5-10 year demand forecasts, and demand must be guaranteed to prompt investment in improved infrastructure. Fleets are unlikely to have detailed transition plans until there is sufficient experience with the use cases, technology maturity, and confidence in the infrastructure. In order to solve this

chicken-and-egg scenario, EPA's ZEV forecast should be aligned with the Energy Information Administration's (EIA) ZEV projections in its Annual Energy Outlook (AEO), and these forecasts should further project ZEV adoption on a geographic basis. Utilities should be required to treat EPA and EIA's aligned ZEV forecasts as sufficient evidence of demand to start the build out of infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 12-13]

- Demand Guarantors for Infrastructure Utilization. When fleets submit interconnection applications to their utility for charging capacity, and the utility makes investments to build up that infrastructure, the applicants (fleets) are responsible for using power at the requested levels in the interconnection application for a minimum of 5 years, or sometimes up to 10 years. If the applicant does not meet the required utilization rate, the applicant and/or ratepayers may be financially responsible for bearing the costs of those infrastructure upgrades. Fleets are not required to take on this type of financial risk in the conventional vehicle market, and DTNA believes it to be a major disadvantage for BEVs. In order to reduce the risk for fleets, utilities, and ratepayers, EPA and/or the Department of Energy (DOE) should consider assuming a portion of the financial liability in the event infrastructure utilization is not met. [EPA-HQ-OAR-2022-0985-1555-A1, p. 13]
- Performance-Based Regulations to Incentivize Faster Interconnection Timelines. The California Public Utilities Commission (CPUC) Resolution E-5247 establishes an interim average service energization timeline of 125 business days for certain EV infrastructure projects, excluding projects with a capacity exceeding two megawatts (MW), projects that need distribution line upgrades, and projects requiring substation upgrades.16 Many fleet charging infrastructure projects will meet these exclusion criteria, however, thus EPA should encourage state utility regulatory commissions to adopt similar resolutions that address depot charging interconnection requests on a standard timeline but that apply to a broader array of projects. We also recommend that EPA encourage state utility regulatory commissions to adopt performance-based regulations (PBRs) to incentivize faster interconnection timelines for commercial vehicle charging needs. Hawaii Public Utilities Commission (HPUC) Decision and Order No. 37787, for example, established new performance mechanisms to incentivize faster interconnection timelines for certain infrastructure projects undertaken by the Hawaiian Electric companies and may serve as a model for similar PBRs that could be established in other states.17 [EPA-HQ-OAR-2022-0985-1555-A1, p. 13]

16 See CPUC, Resolution E-5247 (Dec. 16, 2022), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M500/K043/500043680.PDF.

17 See HPUC, In re Instituting a Proceeding to Investigate Performance-Based Regulation, Decision and Order No. 37787 (May 17, 2021), https://dms.puc.hawaii.gov/dms/DocumentViewer?pid=A1001001A21E17B53226E00118.

- Standardized Processes and Commitments for Interconnection Timing. With more than 3,000 electric utilities in the United States, navigating new service requests poses challenges for fleets. Utilities cite incomplete or inaccurate information on applications from fleets as contributors to transportation electrification delays. Fleets cite lack of communication and firm interconnection timing commitments from utilities as a deterrents to adopting ZEVs, as they are unable to properly plan their fleet operations and vehicle delivery timelines. To mitigate these concerns, EPA could work with DOE and

FERC to standardize the application and review processes for interconnection requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 13]

- Single Application Requests for Site Projects. Today, fleets interested in installing on-site solar and energy storage as part of a depot charging infrastructure project must often submit separate applications to their utility service provider for these project components, in addition to their interconnection request. These three requests are often handled by different teams on different timelines, which do not serve the needs of the fleet's depot site development and deter fleets from incorporating on-site storage and solar to offset peak loads and manage charging. EPA should consider working with FERC to encourage utilities to bundle fleet depot projects so that they may be considered as a single request. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 13-14]
- Clear Track for Third Parties to Support Infrastructure Development. Where utilities are unable to make the infrastructure investments needed for fleet electrification, a clear process should be in place to allow for third-party companies to step in and build out necessary infrastructure capacity, which could be leased or sold back to the utility at a future date. EPA should consider working with FERC to find pathways for third-party infrastructure funding and development, to enable buildout at the pace needed to support implementation of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 14]

Electrical infrastructure buildout pace is a barrier to significant ZEV adoption that should be factored in to Phase 3 CO2 standard levels.

The pace of electrical infrastructure buildout remains the biggest barrier for customer adoption of HD BEVs and poses the greatest threat to successful implementation of the Proposed Rule. As EPA observes, BEV infrastructure is critically important for the success of increasing development and adoption of BEV technologies.108 DTNA thus appreciates the opportunity to respond to EPA's request for comment on the concerns that have already been expressed to EPA regarding the slow growth of ZEV charging and refueling infrastructure. This Proposed Rule is unique in that compliance will rely heavily on the development of infrastructure that manufacturers have no control over, and providers are not obligated to expand infrastructure to support the scope and timing of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

108 See Proposed Rule, 88 Fed. Reg. at 26,000.

DTNA—in partnership with Portland General Electric—is proud to have built the first-of-its-kind public charging island for commercial ZEVs in Portland, Oregon. In addition, DTNA's expert eConsulting team is dedicated to supporting fleets on all aspects of the ZEV transition, including site design and interfacing with utilities. Therefore, DTNA is uniquely positioned to offer insight into the challenges associated with commercial ZEV infrastructure development. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

DTNA has concerns about EPA's treatment of electric infrastructure in the Proposed Rule, and the Agency's assumptions that all suitable vehicle applications and willing customer adopters will have charging infrastructure available, or that such infrastructure can be made available within the timeframes that EPA assumes and at the costs projected in HD TRUCS. In this section, DTNA highlights the unique challenges with HD charging infrastructure (especially with respect to electricity transmission and distribution); explains why EPA significantly underestimates infrastructure costs; discusses specific timing challenges; and highlights case studies from its customer fleets. Finally, DTNA concludes by recommending that EPA use an electric infrastructure scalar to ensure that infrastructure development pace is adequately factored in to EPA's adoption rate projections, as discussed in more detail on Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

EPA projects that modest increases in electric power generation will be required to support the Proposed Rule. Specifically, the Agency estimates that Proposed Rule requirements would increase HD BEV electric power end use by 0.1% over 2021 levels in 2027, increasing to 2.8% over 2021 levels in 2055.109 EPA notes, however, that these figures do not include the electricity increase required to produce hydrogen.110 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 45-46]

109 Id. at 25,983; DRIA at 430, Table 6-1.

110 See DRIA at 431 (noting that EPA's projected electricity consumption increases attributable to the Proposed Rule do 'not include changes in electricity generation to produce hydrogen').

EPA's figures appear to underestimate the increase in electric power generation that will be required to support implementation of the Proposed Rule. As discussed below, according to the Company's calculations, 45 gigawatts of installed charging capacity will be required to support the vehicle volumes in the Proposed Rule from 2027 - 2032. Based on EIA's estimate that there was 1,143,757 megawatts (MW) of total utility-scale electricity generating capacity in the United States at the end of 2021,111 Proposed Rule implementation will require a 3.9% increase in domestic generation capacity (over the 2021 level) by 2032, conflicting with EPA's projection that only a 2.8% increase will be required by 2055. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46]

111 See U.S. Energy Information Administration, 'Electricity explained: Electricity generation, capacity, and sales in the United States,' https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacityand-sales.php.

Further, DTNA is concerned that EIA's commercial vehicle forecast does not align with EPA's ZEV market projections in the Proposed Rule. EIA's AEO 2022 commercial vehicle projections are summarized in Table 15 below EIA projects zero commercial vehicle BEV sales through 2050, and minimal FCEV penetration up to 1,600 vehicles per year per category. It is critical that federal agencies are aligned on these commercial vehicle projections and communicate them clearly to the electric utility industry. Given the misalignment with EIA on ZEV uptake rates, it is likely that EPA underestimates the electricity generation increase needed to support HD BEVs.[EPA-HQ-OAR-2022-0985-1555-A1, p. 46] [Refer to Table 15 on p. 46 of docket number EPA-HQ-OAR-2022-0985-1555-A1].

EPA points to the adoption of residential air conditioners and growth of power-intensive data centers as historical evidence of the electric utility industry's ability to deliver additional power to customers.113 Residential air conditioners provide a reasonable comparison for light-duty vehicle electricity demand levels, as they represent a relatively low load that is evenly distributed across utility service territories. The electricity demands associated with medium- and heavy-duty electrification will, however, be fundamentally different and must be treated as such. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46]

113 See Proposed Rule, 88 Fed. Reg. at 25,983.

Unlike light-duty vehicles, most HD ZEVs cannot charge using existing 120-volt and 240-volt AC electrical infrastructure, and they require dedicated DC infrastructure. HD ZEVs are also disproportionally located in concentrated urban areas, creating highly localized grid capacity addition needs in constrained spaces (see Figure 3 below, showing heat maps of potential future loads). [EPA-HQ-OAR-2022-0985-1555-A1, p. 47] [Refer to Figure 3 on p. 47 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Power-intensive data centers and server farms were rapidly constructed across the United States in the last 20 years and were largely greenfield projects that had the flexibility to be sited where grid capacity was available or could be made available relatively easily. By contrast, the commercial transportation industry is already entrenched and invested in existing logistics facilities. Most of these are located in or around high density urban population centers, often clustered tightly together, where grid capacity is not available, and the process of acquiring land and rights-of-way for upgrades is complex. The use of data centers and server farms as anecdotal examples of electric utility adaptability suggests that EPA is significantly underestimating the demand presented by commercial transportation charging infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 47]

DTNA generally agrees with EPA's assertion that scale-up of electric power generation is not likely to significantly limit the development of BEV electric vehicle charging infrastructure. Rather, the challenge for medium- and heavy-duty charging lies in distribution of that power. As ICCT observed in a recent white paper on near-term medium- and heavy-duty ZEV infrastructure development, 'Most uncertainties regarding infrastructure buildout concern the capacity of distribution systems to bring that energy to the right place in a timely manner and accommodate the highly localized power requirements of [medium- and heavy-duty vehicle] charging.'114 Accordingly, DTNA recommends that EPA engage with electric utilities and their trade associations to further understand the unique challenges that HD ZEVs charging will pose for distribution systems, and how those factors should be accounted for in this rulemaking. [EPA-HQ-OAR-2022-0985-1555-A1, p. 47]

114 See ICCT, 'Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States (May 2023) at 1, https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf (ICCT ZEV Infrastructure White Paper).

Infrastructure Costs

EPA asserts 'there is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners. Therefore, we do not model them directly as part of our infrastructure analysis.'115 DTNA appreciates that there is significant complexity and uncertainty in modeling these costs, but believes that omitting front-of-meter costs is a significant error in the TCO calculation that has major implications for EPA's proposed CO2 standard stringency levels. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

115 Proposed Rule, 88 Fed. Reg. at 25,983.

How fleet owners pay for infrastructure will depend on a variety of factors, including utility structure (investor-owned, municipal, cooperative), existing available grid capacity, project scale, real estate needs, etc. For fleets in cooperative and municipality service territories, including many in critical urban freight hubs, upgrade costs are likely borne directly by the fleet. For fleets working with investor-owned utilities, the cost mechanism will vary. If infrastructure is needed by more than one utility customer, the utility will typically ask the fleet for a pro-rata share of those costs, or in some cases, increase electricity rates to cover those costs. Where fleets do not meet the minimum utilization rates for the contracted time period (5 to 10 years), fleets may be required to reimburse the utility for infrastructure upgrades, or costs are distributed among all ratepayers. One DTNA customer fleet has cancelled an order for 25 Class 8 tractors because of what they viewed as risky contract terms, including requirements for load management and a 10-year commitment to construct capacity for a 3 MW site. Regardless of the pathway, fleets will bear the cost of infrastructure upgrades to support charging needs, and those costs should be included in the proposed rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

DTNA relied on a cost study by the Boston Consulting Group (BCG) to estimate an optimized and non-optimized dollar-per-kilowatt cost figure for grid updates.116 To estimate per-vehicle grid update costs for Class 3 - 8 BEVs, we applied the BCG dollar-per-kilowatt cost estimates to an assumed average daily power need for each vehicle class that would be subject to the Phase 3 CO2 standards, shown in Table 11 ('DTNA Proposed Grid Update Cost Inputs for HD TRUCS') presented in Section II.B.3.b. As reflected in Table 11, these costs are non-negligible, significantly impact the TCO proposition, and must be considered in EPA's HD TRUCS analysis. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

116 See Boston Consulting Group, 'The Costs of Revving Up the Grid for Electric Vehicles' (Dec. 20, 2019), https://www.bcg.com/publications/2019/costs-revving-up-the-grid-for-electric-vehicles.

Using the same average daily power assumptions, DTNA estimated the additional installed capacity that will be needed to support HD BEVs at the adoption rates projected in the Proposed Rule. The Company calculated a 5-year average of commercial vehicle sales in all 50 states from the Polk Automotive database from 2017-2021, applied EPA's projected ZEV volumes for 2027-2032, and calculated the total installed charging capacity that will be required by these vehicles in 2027 - 2032 to be approximately 45 gigawatts. In Appendix C to these comments, DTNA estimates the investments in charging infrastructure and grid upgrades, as well as total installed charging capacity, that will be required in each of the 50 states to support implementation of the Proposed Rule.117 DTNA considers installed capacity in this context to mean the total power available as EVSE to charge commercial vehicle batteries. Using installed capacity is a more appropriate metric for evaluating available charging capacity than the number of chargers alone, as installed capacity better reflects the variability in charging speeds needed to support different vehicle dwell times and truck-to-charger ratios. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 48-49]

This installed capacity must be available at a combination of public and private purpose-built HD-accessible charging stations. To be HD-accessible, public charging stations must include pull-through charging lanes and accommodate wide ingress and egress to support all vehicle types. Commercial vehicles are often unable to utilize existing passenger car charging infrastructure, due to space constraints that are not compatible with HDVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 49] [Refer to graphics on p. 49 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Based on the projected vehicle mix in the Proposed Rule and installed capacity needed to support these vehicles, DTNA estimated the total costs of EVSE charging equipment and necessary supporting grid updates to support Class 3-8 BEVs that would be required under the Proposed Rule. These figures, summarized in Table 16 below, do not include the additional capacities and investments needed to support passenger car electrification. [EPA-HQ-OAR-2022-0985-1555-A1, p. 49] [Refer to Table 16 on p. 49 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Even with incentive funding available, many fleets are unable to make the capital investments required to add BEVs to their fleets. DTNA is currently working with one school bus fleet that has secured Clean School Bus funds from EPA for 23 buses, as well as a payment plan through their utility's Make Ready program, and is still facing a $500,000 funding gap for site construction that threatens to jeopardize the project. Private fleet deployments are likely to face similar gaps, even where some combination of incentive program funding is available. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

Timing for Infrastructure Development

EPA implies that in the next five years, electric infrastructure will be sufficiently built out to support the BEVs required by the Proposed Rule, and that buildout will continue to support substantially higher fleet adoption rates by 2032. Without major regulatory and/or legislative action, DTNA does not believe the infrastructure needed will materialize on the timeline required to enable compliance with the Phase 3 CO2 standards as proposed. New interconnection requests are processed on a first-come-first-serve basis, and transportation electrification competes with all other utility priorities, including decarbonization mandates, resiliency, and other residential and commercial interconnection requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

Utilities are noting extended timelines for installing critical hardware, both in front of and behind the meter, due to supply chain and other constraints. During the ACF rulemaking process, for example, one electric utility commented to CARB that the lead time for transformers was 40 weeks, and that the lead time customer side meter panels/switchgears was 70 weeks.118 In the Company's experience, utilities will wait for this hardware to be received to perform other upgrades, and these types of sequential gating events can add significant time to transportation electrification projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

118 See Comments of Pacific Gas and Electric Company, Proposed Advanced Clean Fleets Regulation (Oct. 17, 2022), https://www.arb.ca.gov/lists/com-attach/370-acf2022-AXEFZFUxUFxRY1Bl.pdf.

In a recent joint presentation by Southern California Edison (SCE), Pacific Gas & Electric (PG&E), and San Diego Gas & Electric (SDG&E) at a California Energy Commission (CEC) workshop, the following table was presented reflecting the utilities' estimations of typical timelines for distribution capacity improvements: [EPA-HQ-OAR-2022-0985-1555-A1, p. 50] [Refer to Table 17 on p. 50 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

As the scope of the necessary distribution capacity improvements is often unknown until detailed site planning is underway, predicting how long fleets will wait for interconnection requests is challenging. DTNA believes many depot electrification projects may require increases in substation capacity, sub-transmission improvements, or new substations to serve the concentrated power demands. One of DTNA's customers cancelled a BEV deployment because their utility returned a 5-8 year lead time for a new substation. Another fleet's initial ZEV deployment at scale required construction of a 6 MW facility, able to charge 32 Class 8 drayage tractors simultaneously.120 Providing these capacities to many sites clustered together, as will be required to support concentrated freight hubs and logistics centers, is likely to require substantial grid upgrades. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 50-51]

120 See ‘Schneider’s Electric Heavy-Duty Trucks Start Off on Regional Routes’ (June 8, 2023) https://www.truckinginfo.com/10200304/new-electric-heavy-duty-trucks-start-off-on-regional-routes.

Because of California’s climate policies, including Executive Order N-79-20 requiring all new passenger car and truck sales to be zero emission by 2035, and CARB’s ACT and ACF regulations, a number of transportation electrification planning procedures and make-ready programs have already been implemented or have begun to develop in California. Thus, it is important to keep in mind that electric utilities in other states may generally be less prepared to respond to transportation electrification requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

In the Company’s experience, fleets typically purchase their vehicles 6 - 12 months ahead of need, and often utilities require proof of purchase to show the fleet is committed to move forward with infrastructure development. DTNA has experienced fleet customers cancelling BEV orders when utilities respond to interconnection requests with multi-year lead times. Many of these cancellations include the return of incentive program funds, such as HVIP or Clean School Bus Program vouchers. Purchasers who apply for and are granted HVIP funds for example, must redeem the voucher within 90 days, or apply for three-month extensions up to 540 total days.121 It is not uncommon for infrastructure projects to exceed the 540 day timeline, which would require the fleet to take delivery of BEVs with no charging infrastructure, resulting in a stranded capital investment and no air quality improvements. One of DTNA’s customers cancelled an order and returned HVIP funding for 20 Class 8 tractors when their utility estimated their site would take 3 years (1,095 days) to energize. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

121 See Implementation Manual for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) (March 15, 2022) at 20, https://californiahvip.org/wp-content/uploads/2022/03/HVIP-FY21-22-Implementation-Manual-03.15.22.pdf.

Furthermore, it is unlikely that fleets will make major investments in long-term infrastructure that require commitments longer than the vehicle trade cycle. For example, if a fleet plans for a 4-year vehicle product cycle, but the infrastructure lead time is 4 years for an increase in substation capacity, by the time the infrastructure is available, the fleet will be working with the next generation of vehicles, which may or may not have the same power needs. Similarly, where utilities have made capital investments in infrastructure, fleets may be required to commit to a certain utilization rates for 5 to 10 years. Fleets working with shorter trade cycles, contracted routes, or leased properties are likely to see operational changes well before they are released from their utilization obligations. Committing to minimum utilization rates may be a major financial risk for fleets, which is unaccounted for in the cost estimates in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

Fleets have also cited the lack of firm interconnection dates as a major deterrent to committing to long-term infrastructure projects. DTNA appreciates that infrastructure buildout projects are difficult to project, and may encounter unanticipated delays, but fleets are unable to make fleet transition plans, place orders for electric vehicles, or apply for funding without firm interconnection timelines. Some of DTNA’s fleet customers committed to ZEV deployment have sought temporary power solutions to address these timeline issues. However, temporary power solutions incur additional costs and generally must be paid up front by the fleet. For instance, SDG&E Rule 13 (‘Temporary Service’) provides that an applicant for temporary service ‘shall pay, in advance or otherwise as required by the utility, the estimated cost installed plus the estimated cost of removal, less the estimated salvage of the facilities necessary for furnishing service.'122 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 51-52]

122 See SDG&E Rule 13, https://www.sdge.com/sites/default/files/elec_elec-rules_erule13.pdf.

In addition to electrical interconnection complexities, fleets must navigate their local building codes and permitting processes. As noted by the Northeast States for Coordinated Air Use Management (NESCAUM) in a 2019 paper on DCFC deployment, 'the permitting process for DCFC stations is sometimes lengthy and fraught with delays due to unfamiliarity with the technology, protracted zoning reviews, and undefined requirements for permitting DCFC. As a result, the DCFC permitting process can be resource-intensive for both applicants and [authorities having jurisdiction (AHJs)].'123 Since the NESCAUM paper was published, DTNA's eConsulting team has encountered many AHJs that lack defined processes for DCFC installation projects and the expertise needed to move projects along quickly. [EPA-HQ-OAR-2022-0985-1555-A1, p. 52]

123 NESCAUM, 'Preparing Our Communities for Electric Vehicles: Facilitating Deployment of DC Fast Chargers' (May 2019), https://www.nescaum.org/documents/dcfc-permit-streamlining-whitepaper-final-5-14-19.pdf.

Fleets may encounter additional complications related to EVSE installation that impact BEV technology adoption rates. For example, when converting vehicles to BEVs, the infrastructure needed for charging equipment takes up physical space that could otherwise be occupied by additional trucks. Figure 4 below illustrates the components needed for combined charging systems (CCS). Megawatt Charging Systems (MCS) require additional space for installation as well. [EPA-HQ-OAR-2022-0985-1555-A1, p. 52] [Refer to Figure 4 on p. 53 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Figure 5 below shows an overhead view of one such fleet operation in Southern California where physical space will limit the number of BEVs that can be deployed. This site will require additional power poles, new transformers, and new switchgears to support only a fraction of the fleet. To convert additional tractors to BEVs, fleets working with constrained spaces like the site shown below will likely be required to purchase additional real estate. Recently, Denver's Regional Transportation District (RTD) announced the cancellation of an $18 million deal for new electric buses, citing space constraints for charging and EVSE equipment.124 RTD officials estimated they would need an additional $85 million to construct a new building to support this deployment. Space constraint issues of this type—and the associated costs—are not accounted for in EPA's cost estimates for the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 53] [Refer to Figure 5 on p. 53 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

124 See Denver Post, 'RTD cancels purchase of 17 electric buses it doesn't have space to maintain—and orders fleet transition strategy' (April 26, 2023), https://www.denverpost.com/2023/04/26/regional-transportation-district-battery-electric-buses-contract/.

DTNA's fleet customers have faced a number of similar challenges, which have resulted in order cancellations or reductions, revealing the following issues :

- Fleet customers have been quoted 1.5 - 8 years for depot site electrification for deployments that are modest compared to the scale of those discussed in the Proposed Rule.

- Depot installation projects are complex and resource intensive for fleets, utilities, and AHJs. DTNA often observes differing views of roles and responsibilities in transportation electrification projects and a lack of expertise in this developing space.
- Infrastructure lead time is not synchronized with funding program lead time, leading fleets to return vouchers they spent resources securing, highlighting that available funding and the calculated TCO is only part of the adoption equation.
- Utilities and fleets sometimes cannot come to agreement on contractual terms, including load restrictions, managed charging, and guaranteed utilization time periods. It is unlikely these issues will be resolved without significant regulatory or legislative changes.
- State and municipal building codes and processes lack transparency and add significant time to depot electrification projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 54]

Utility Long Range Planning vs. Fleet Planning

Utilities today rely on long-range forecasts in the 5 - 10 year timeframe to plan investment and system upgrades. During CARB's ACF rulemaking process, a number of electric utilities submitted comments recommending that CARB facilitate the ongoing sharing of data with utilities about fleet customers' detailed near-term and long-term charging infrastructure needs, including fleet transition plans by year, whether the fleet would need to charge full-time or on peak, what percentage of time fleets would charge on peak and at what level, and if fleets anticipated seasonal peaks. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

As discussed above, fleets typically order their vehicles 6 - 12 months in advance, and it is unlikely fleets are able to make accurate predictions of what the future fleets' energy needs might be, as fleet operations are subject to change with changes in contracted routes, technology maturity, etc. Some fleets rent their depot facilities, and short term leases will prevent the tenant fleet from making long range plans. Where long term leases are in place, the fleet tenant often cannot make substantial changes to the property without the landlord's permission. Even with the landlord's permission, fleets are unlikely to make a long-term investment in sites that they do not own. Landlords could choose to install EVSE if they anticipated a positive business case, but are similarly unable to provide detailed long range forecasts. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

DTNA has made vehicle telematics data available for interested utilities to predict where future loads may occur, but this dataset only represents a subset of the Company's products, and not the market as a whole. Without substantive regulatory and/or legislative intervention to prompt utilities to plan for and buildout for transportation electrification, DTNA does not believe significant buildout of electrical infrastructure will occur on the timeline required to support EPA's proposed CO2 stringency levels. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

Recommendations to Facilitate ZEV Infrastructure Buildout and CO2 Standard Feasibility

While EPA does not have regulatory authority over many of the factors that currently pose challenges to ZEV infrastructure development, the Agency could help to mitigate these challenges by supporting the policies, legislation, and regulatory initiatives that are detailed in Section I.B.4 of these comments, including:

- Align with EIA vehicle uptake estimates, to ensure accurate estimates of real power demand by MHD and HHD ZEVs and net CO2 emissions.

- Work with FERC to direct utilities to incorporate demand projects into both a system-wide transportation electrification electricity forecast and a utility distribution grid capacity requirement forecast, to serve these medium- and heavy-duty transportation electrification loads on a geographic basis.
- Assume financial liability as a demand guarantor for infrastructure buildout that is undertaken based upon EPA's ZEV penetration forecasts.
- Work with FERC to identify high traffic freight hubs that are likely to see rapid increase in BEVs, and direct utilities to proactively upgrade this infrastructure.
- Encourage state utility regulatory commissions to adopt PBRs to incentivize faster interconnection timelines for charging infrastructure projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 57]
- Work with stakeholders to develop model building codes that can be adopted by state and local governments to streamline authorizations for EVSE installation projects and encourage state and local adoption of these model codes.
- Require reporting of medium- and heavy-duty ZEV infrastructure and make this information available to fleets.
- Work with FHWA to revise the NEVI formula program to more actively encourage states to provide HD-accessible public charging infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

Finally, as described in more detail in Sections I.B.3 and II.C. of these comments, EPA should incorporate a scalar to be used in its calculations of appropriate CO_2 standard stringency levels, designed (and regularly updated) to reflect actual installed capacity of HD-accessible charging equipment. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

Organization: Edison Electric Institute (EEI)

EPA notes that several stakeholders have raised concerns that 'slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards.' 88 Fed. Reg. 25,934. EEI member companies have addressed similar infrastructure build out issues in the past. Like those issues, these concerns can be addressed through deliberate effort and collaboration among electric companies, fleet operators, and stakeholders, including planning for increased demand, customer engagement, and fleet electrification. [EPA-HQ-OAR-2022-0985-1509-A2, p. 7]

Electric companies can accommodate increased energy demand.

As EPA notes, the electric power sector has a long history of accommodating growth in electricity demand from the adoption of new technologies, including electric home appliances, residential and commercial air conditioning, and data centers. See id. At 25,983. Electricity use from EVs today is modest. Argonne National Lab estimates the approximately 2.3 million EVs on the road as of the end of 2021 consumed 6.1 terawatt-hours of electricity in that year, or about 0.16 percent of the total electric sales to U.S. customers in that year.18 As EPA also notes, the increase in electricity use resulting from the Proposed Rule also will be modest, increasing electricity end-use by less than 3 percent in 2055. See id. On a macro-level, meeting the increased energy usage from electric truck adoption as contemplated in the Proposed Rule will not be a significant challenge for the electric power sector. Meeting the location-specific power needs of large electric vehicle (EV) charging facilities can be a more pressing challenge. However, this is a challenge that can be addressed with deliberate effort and collaboration among electric companies, fleet operators, and stakeholders. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 7-8]

18 See Gohlke, et al., Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010 – 2021, https://publications.anl.gov/anlpubs/2022/11/178584.pdf and U.S. Energy Information Administration, Electric Power Monthly

Electric companies can accommodate localized power needs at the pace of customer demand, provided appropriate customer engagement and enabling policies are in place. The power required by a customer is essential when considering the infrastructure needed at the facility level, because the capacity of the local distribution circuit is sized to meet the peak power requirements of customers on that circuit. Some large EV charging facilities have power requirements in the tens of megawatts (MW). Electric companies are well accustomed to serving facilities with those types of power needs, but large fleet customers differ from traditional electric customers (e.g., commercial or industrial buildings) in several important aspects. These aspects include, but are not limited to:

- Construction timelines: A new, large commercial building with a multi-MW power demand, for example, will typically have a multi-year construction timeline, giving the local electric company time to plan and make appropriate upgrades to the electric distribution system serving that customer. A fleet operator, in contrast, may be able to procure vehicles and complete construction on a multi-MW charging facility in a matter of months. This creates a potential misalignment between the fleet operators' timeline to procure vehicles and charging equipment and the electric company's timeline for making the necessary system upgrades to provide power to that facility. [EPA-HQ-OAR-2022-0985-1509-A2, p. 8]
- Customer familiarity with procuring electric power: Commercial and industrial electric customers are used to working with electric companies for the operation of their facilities as part of their normal course of business, including working with electric companies as part of the construction process for launching new facilities. In particular, national corporate customers often have long-standing relationships with the electric companies that serve them. Electric companies typically assign these customers an account manager, given their scale and complexity. A fleet operator, in contrast, is used to procuring diesel to operate its vehicles, and may consider procuring electricity in the same paradigm. Fleet operators may be small electricity users today and thus that division may not yet be considered a managed account for the electric company. However, EEI members have identified this issue and are expanding their working relationship with these customers. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 8-9]
- Uncertain and dynamic load profiles: The power usage throughout the day, known as the 'load profile,' of typical commercial and industrial buildings is well understood (e.g., large retail store, data center, or manufacturing facility). Typical load profiles for electric fleet customers are not yet well understood and often hypothetical given the early stage of electric truck commercialization. A fleet charging load profile is the product of many factors, including the routes of the vehicles, the state of charge of the EV when returning to the facility, the number of operating shifts, etc. Unlike a typical commercial building, the load profile of a fleet facility could also drastically change with a change in vehicle

operations (e.g., changing from a one-shift to two-shift operation). This uncertainty adds complexity for electric companies when determining how best to serve the power requirements of a fleet customer. [EPA-HQ-OAR-2022-0985-1509-A2, p. 9]

These factors could result in misalignment between expectations and reality regarding the timing, cost, and complexity of procuring electric power for fleet charging. Electric companies are taking a multi-pronged approach to remedy this potential misalignment, as discussed in the following sections. [EPA-HQ-OAR-2022-0985-1509-A2, p. 9]

Earlier customer engagement through education and coordination will alleviate infrastructure delays.

Early engagement between the relevant fleet customer and electric company is important as it allows planning for the infrastructure to support EV charging to occur much earlier and accommodate longer lead-times. In 2020, EEI began a collaboration with a large, national corporate customer that was planning to electrify a significant portion of its fleet operation. EEI facilitated meetings for this customer to share its conceptual plans with EEI's members and establish points of contact at the customer and each electric company. Over the course of more than a year, the customer identified the locations within each member's territory where it planned to deploy EVs and developed a five-year forecast to inform the electric company how the power demand would increase at each location over time. This unprecedented level of collaboration has resulted in this customer deploying thousands of electric vehicles to date. This includes alternative locations that were identified by the electric company after consulting with the customer. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 9-10]

The extent of collaboration described in this example may not be feasible, or necessary, for every fleet customer. But it does provide a helpful template for how early engagement and planning can streamline fleet electrification. The Electric Power Research Institute (EPRI) is developing a data-sharing platform as part of its EVs2Scale2030 initiative that will formalize and expand this model by allowing fleet customers to upload their forward-looking fleet electrification plans to a common database.19 Electric companies will then be able to access this data to visualize where on its system upgrades will be needed to accommodate growing power needs from fleet customers. [EPA-HQ-OAR-2022-0985-1509-A2, p. 10]

19 See Electric Power Research Institute, EVs2Scale2030, https://www.epri.com/research/products/000000003002025622.

Many electric companies are developing tools and resources to assist fleet customers. These include, but are not limited to:

- Grid capacity evaluation tools: Several electric companies have launched capacity hosting maps that are available on public websites that illustrate local grid capacity in their service territory.20 These maps can be helpful early indicators for fleet customers when considering the level of upgrades that may be required at a particular facility. These maps have limitations, as they are a snapshot in time and do not substitute for a formal engineering study. Even if they have not published such a capacity map, many electric companies have the ability to assist fleet customers by providing an early screen for local grid capacity by location directly. In either case, the outcome is the same: for customers that have the ability to consider multiple locations for their EV deployment plans, pre-screening the local distribution system capacity at these locations allows the fleet to factor grid upgrade timelines into their deployment plans. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 10-11]

20 Examples include: AVANGRID (United Illuminating, NYSEG, Rochester Gas & Electric), Ameren Illinois, Con Edison, Dominion Energy, Eversource, Exelon (Atlantic City Electric, Delmarva Power, Pepco, Comed, PECO), Jersey Central Power & Light, National Grid, Orange & Rockland, Public Service Electric & Gas, San Diego Gas & Electric, and Southern California Edison.

- Fleet assessments and advisory services: Many electric companies have launched programs to provide in-depth consulting services to fleets that are considering electrification, including elements like feasibility studies based on total cost of ownership.21 These programs also may include dedicated staff resources to guide customers through the fleet electrification journey, including choosing the appropriate charging strategy and charging infrastructure to meet their operational needs. These programs help to educate fleet customers about the nuances of procuring power for their fleet operations and allow electric companies to learn more about the expected operations of electric fleets. [EPA-HQ-OAR-2022-0985-1509-A2, p. 11]

21 See Alliance for Transportation Electrification, Fleet Advisory Services (FAS) for Fleet Electrification: Meet Customer Needs and Provide Grid Benefits, https://evtransportationalliance.org/wp-content/uploads/2023/02/PRESS-ATE-EC-White-Paper.pdf, which includes case studies from DTE Energy, Exelon, Portland General Electric, Southern California Edison, and Xcel Energy.

These and other resources being developed and deployed today by electric companies are essential to ensuring that infrastructure plans and efforts are matched to forthcoming electrification efforts from fleets and other operators. [EPA-HQ-OAR-2022-0985-1509-A2, p. 11]

Electric companies are planning for fleet electrification.

Investor-owned electric companies are regulated by state commissions, which approve electric company capital plans to maintain and upgrade the electric grid. While policies vary by state commission, two generally applicable principles have important implications for fleet electrification. First, the ‘used and useful’ standard means that regulators will only approve the electric company to build infrastructure that will be utilized and provide value. The onus is on electric companies to provide evidence that their capital plans will meet this standard. Second is the principle that the customer that incurs the cost must pay for the cost. Typically, a customer seeking new or upgraded electric service must submit a formal service request to the electric company, which prompts the electric company to perform an engineering study to determine the cost of the upgrades needed to provide that service. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 11-12]

The implication for fleet electrification, a potentially fast-growing source of significant new demand on the electric system, is that electric companies are not authorized to upgrade the electric system in anticipation of new demand without robust evidence that those upgrades will be ‘used and useful.’ Only when a fleet customer submits a service request is the electric company permitted to make the upgrades necessary to serve that customer. Electric company forecasts for load growth, including that due to electrification, are typically at a system level, not the local distribution system level for individual fleet facilities. Given the nascent commercialization of fleet electrification, there is a lack of visibility into how, where, and when fleet electrification will appear on the system sufficient evidence to give electric companies (and their regulators) confidence to build for it. [EPA-HQ-OAR-2022-0985-1509-A2, p. 12]

Importantly, electric companies are recognizing the risks of this approach and are getting ahead of the need. Given the long lead times to make distribution upgrades, particularly if the upgrades are significant to extend further upstream to the substation and transmission level, it will increasingly be unacceptable to customers to wait for the customer service request-driven process. There is a risk that fleet customers, facing increased regulatory pressure to electrify their fleets, will be unable to plan their businesses around these infrastructure lead times and fail to meet their electrification goals. Electric companies must find mechanisms to plan and build for these increased loads now, so that the power is available when the customer needs them. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 12-13]

In California, the investor-owned electric companies use the California Energy Commission's Integrated Energy Policy Report (IEPR) as their base forecast. Southern California Edison (SCE) in its recent General Rate Case found a significant gap between the electric transportation load growth in the IEPR forecast and that expected due to the state's policies, specifically the California Air Resources Board's Advanced Clean Cars II, Advanced Clean Trucks, and Advanced Clean Fleets rules.22 SCE developed a Transportation Electrification Grid Readiness (TEGR) analysis to account for this gap in its General Rate Case that will set the electric company's grid investments for the next several years. SCE used a top-down methodology to apply this higher forecast to the circuit level for electric transportation loads, as well as a bottom-up methodology for certain high growth areas. [EPA-HQ-OAR-2022-0985-1509-A2, p. 13]

22 See Southern California Edison, 2025 General Rate Case, WP SCE-02, Vol. 07 Bk. A, TEGR Forecast Development Workpaper.

SCE has deployed a variety of new methods to account for HDV development and deployment, including the Power Service Availability (PSA) initiative to support transportation electrification. The PSA initiative, working in concert with the TEGR analysis, focuses on improving SCE's internal processes to streamline interconnection, engaging fleet operators to better understand their plans for electrification, improving their ability to forecast and assess the impacts of load growth from electrification, and leveraging new technologies as grid infrastructure solutions. Because some projects will require more time than others to build, SCE actively encourages fleet owners to engage with them early in the process so that SCE can better understand and plan for their needs. For grid upgrades that require a longer construction schedule, SCE is developing temporary solutions that can deploy quickly while those upgrades are being built. These solutions may include mobile battery storage or a mobile substation brought in on a semi tractor-trailer. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 13-14]

In New York, the Public Service Commission opened a proceeding in April to address barriers to medium-and heavy-duty electric vehicle infrastructure. In particular, the order recognizes that 'proactive planning for the grid infrastructure needed to serve future electrification load must anticipate the location and magnitude of future demand' and notes an analogy to previous policies in which the commission directed the electric companies in New York to 'develop proactive planning processes to anticipate the need for local transmission and distribution system upgrades to enable the renewable interconnections required to achieve the State's renewable energy goals.' 23 [EPA-HQ-OAR-2022-0985-1509-A2, p. 14]

23 State of New York Public Service Commission, Case 23-E-0070, Proceeding on Motion of the Commission to Address Barriers to Medium- and Heavy-Duty Electric Vehicle Charging Infrastructure.

EPA's assessment that 'there is sufficient time for the infrastructure, especially for depot charging, to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply' is accurate. 88 Fed. Reg. 25,999. As seen above, EEI members actively are planning for and deploying infrastructure today. However, the increased deployment of this infrastructure over the next decade and beyond will not happen on its own. Proactive planning processes, whether initiated by the relevant electric company or state regulatory commission, will be critical to accommodate fleet electrification to meet customer expectations and planning requirements, while also providing affordable and reliable service. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 14-15]

EPA specifically requests comment on 'whether there are additional stakeholders EPA should work with during implementation of the Phase 3 standards.' 88 Fed. Reg. 26,000. EPA, states, engine and truck manufacturers, and fleet operators should work with electric companies on a regional or state level to glean additional insight into their planning processes and help bolster proactive planning and infrastructure investments. As discussed above, electric companies and their regulators benefit from the confidence that fleet electrification load will materialize through additional forward planning and outreach, which also provides visibility into where and when that load will materialize on the system. Final adoption of the Proposed Rule will help provide confidence that fleet electrification will occur through the period of the rule, but at a national level. [EPA-HQ-OAR-2022-0985-1509-A2, p. 15]

Additionally, the States, Congress, EPA, and other federal partners should work with the electric power industry to ensure policies are aligned across the federal government to reduce the cost and timelines associated with building infrastructure to support increased electrification. This includes but is not limited to:

- Investing in domestic manufacturing of critical electrical infrastructure, including efforts to alleviate the labor pool shortage limiting domestic manufacturing of critical electrical infrastructure and provide loan or purchase guarantees to manufacturers. [EPA-HQ-OAR-2022-0985-1509-A2, p. 15]
- Not exacerbating the supply shortage of distribution transformers with unsupported efficiency rules. The U.S. Department of Energy should choose an efficiency standard for transformers that does not require switching to a new type of steel or make a determination that no new standard is needed.24 [EPA-HQ-OAR-2022-0985-1509-A2, pp. 15-16]

24 EEI's comments are attached as Appendix A.

- Reforming permitting, both at the bulk power level with respect to building electricity generation and transmission, and at the state and local levels with respect to building distribution infrastructure. [EPA-HQ-OAR-2022-0985-1509-A2, p. 16]

EEI and its members stand ready to work with our regulatory and legislative partners to ensure these challenges are appropriately addressed. [EPA-HQ-OAR-2022-0985-1509-A2, p. 16]

EPA notes that 'there is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by

BEV or fleet owners' in explaining why it models these costs as part of the infrastructure cost analysis. 88 Fed. Reg. 25,983. In general, the upgrades to the local electric system needed to bring sufficient power to the site may be known as 'electric company-side make-ready' or 'front-of-the-meter' infrastructure and includes but is not limited to poles, vaults, service drops, transformers, mounting pads, trenching, conduit, wire, cables, meters, other equipment as necessary, and associated engineering and civil construction work. Front-of-the-meter infrastructure is distinct from infrastructure on the customer side of the meter ('behind-the-meter'), which includes the supply infrastructure (conduit and wiring to bring power from the service connection to the charging station, and the associated installation costs, sometimes known as 'customer-side make-ready') and the charging equipment, sometimes known as Electric Vehicle Supply Equipment (EVSE). [EPA-HQ-OAR-2022-0985-1509-A2, p. 17]

Front-of-the-meter infrastructure is generally installed, owned, and operated by the electric company. However, the costs associated with front-of-the-meter infrastructure may be borne by the site host customer in full or in part if the costs exceed an allowance as determined by the electric company's line-extension and/or service extension policy. These costs may also be known as 'contributions in aid of construction.' [EPA-HQ-OAR-2022-0985-1509-A2, pp. 17-18]

Modeling these front-of-the-meter infrastructure costs is inappropriate for the following reasons. First, estimating distribution upgrade costs may be beyond the scope of EPA's analysis, as it is not clear that a similar scope of analysis is applied to traditional liquid fuels. For example, the analogous cost comparison for internal combustion engine vehicle would include cost considerations for fleet operators either 1) installing refueling stations at their own facilities, or 2) the embedded cost of fuel retailers' business operations in the cost of diesel or gasoline. [EPA-HQ-OAR-2022-0985-1509-A2, p. 18]

Second, as described above, distribution upgrades are highly location specific. The costs associated with these upgrades are also highly variable, depending on the upgrade requested by the customer and the local distribution capacity. As stated in EEI's Preparing to Plug In Your Fleet guide, 'the grid can expand as needed to accommodate the needs of any customer, but the time and resources needed to make the required upgrades are highly dependent on the specific facility and the circuit that serves it.'27 [EPA-HQ-OAR-2022-0985-1509-A2, p. 18]

27 See EEI, Preparing To Plug In Your Fleet – 10 Things to Consider, https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Electric-Transportation/PreparingToPlugInYourFleet.pdf.

Third, the share of any distribution costs that the customer may bear varies as a matter of policy. Some electric companies have or are seeking approval for line extension allowances to cover some or all of these costs for serving EV charging infrastructure. In California, for example, legislation required electric companies in the state to file tariffs that would authorize them to 'design and deploy all electrical distribution infrastructure on the utility side of the customer's meter for all customers installing separately metered infrastructure to support charging stations, other than those in single-family residences.' This policy prompted tariffs from EEI members Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), and SCE that essentially allow electric companies to invest in more of the electric company-side infrastructure costs as part of the standard distribution system investment. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 18-19]

Organization: Electrification Coalition (EC)

With continued planning efforts, the electric grid can manage the additional load from mass EV adoption, including the EPA forecasted 35-57% of HD EVs, depending on vehicle type, by 2032, in the proposed rule. [EPA-HQ-OAR-2022-0985-1558-A1, p. 9]

The EPA states,

As discussed in Section V, we model changes to power generation due to the increased electricity demand anticipated in the proposal as part of our upstream analysis. We project the additional generation needed to meet the demand of the heavy-duty BEVs in the proposal to be relatively modest (as shown in DRIA Chapter 6.5). As the proposal is estimated to increase electric power end use by heavy-duty electric vehicles by 0.1 percent in 2027 and increasing to 2.8 percent in 2055. The U.S. electricity end use between the years 1992 and 2021, a similar number of years included in our proposal analysis, increased by around 25 percent 449 without any adverse effects on electric grid reliability or electricity generation capacity shortages. Grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with HD BEV charging.'27 [EPA-HQ-OAR-2022-0985-1558-A1, p. 9]

27 See page 25983 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

The EC notes the following additional information for consideration, and overall agrees with the EPA's assessment in terms of the HD EV adoption impact to the electric grid. The May 2023 report from the International Council on Clean Transportation (ICCT), 'Near-Term MHDV Infrastructure Deployment in the United States,' projected an increase in total electricity consumption resulting in MHD electrification by 2030 to be 1 percent.28 A significant share of this projected energy consumption will be concentrated in several states, for example, as well as along key freight corridors, such as the National Highway Freight Network. As such, while MHD electrification may not be constrained by electricity generation, investments will be required at the regional level in additional generation capacity, transmission, and distribution to meet peak electricity loads for electric truck charging along these freight corridors. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 9-10]

28 https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf

In addition, there are many planning efforts underway with utilities, regulators and additional EV stakeholders to prepare for the impending adoption of EVs in the HD sector. For example, in March 2023, the Nevada Public Utilities Commission approved $70 million of NV Energy's proposed $348 million transportation electrification plan (TEP). Of the nearly 20 programs included in the TEP proposal, three programs were approved: the Interstate Corridor Depot Program, the Electric School Bus Vehicle to Grid Trial, and the Inflation Reduction Act Innovation Demonstration Program. All of these programs involve the HD EV sector. [EPA-HQ-OAR-2022-0985-1558-A1, p. 10]

Another example is Pennsylvania. For the past few years, the Pennsylvania General Assembly has considered transportation electrification planning legislation – similar to laws passed in Nevada and New Mexico. This year, new TEP legislation was introduced (HB 1240) that would establish a robust, holistic planning process for electric utilities in the state for EV charging station deployment. The development of TEPs by electric utilities, overseen by the Public Utility Commission, would ensure the electric grid is prepared for future EV adoption by requiring load forecasting, evaluation of the transmission and distribution networks, rates charged to customers, and providing an implementation plan today so we are prepared for tomorrow. Depot charging and large public charging sites would also be a part of the utility's analysis. This analysis will prepare the utilities for added load capacity requests reaching into the in the 2 to 5 MWh range- or for more, depending on the size of the EV charging depot. The TEP legislation would allow utilities to identify where upgrades are needed now, begin installation, and prepare for the impending greater adoption of EVs in the HD sector. [EPA-HQ-OAR-2022-0985-1558-A1, p. 10]

Utilities are also preparing reports and studies that will help with the planning and timely installation of HD EV charging infrastructure. For example, National Grid commissioned a report, "Electric Highways Study," to examine the planning considerations for alternative-fueled corridors with the freight and goods movement in mind.29 This first of its kind study examined the traffic patterns and infrastructure needed to support the transportation decarbonization mandates in NY and MA, the service territories for National Grid. The report looked at 71 sites in both states, with results showing that by 2030, over a quarter of the sites would need more than 5 MW of capacity to meet peak charging demand. National Grid was able to share the results of the whitepaper with MA DOT and NY DOT to help them be aware of the advanced planning that will be required for enabling highway charging for the light-duty and MHD sectors. While some sites may need electric grid upgrades, the planning occurring now will ease any bottlenecks in the future, particularly as future-proofing 'no-regrets' sites/zones will limit the need for retroactive upgrades. Planning ensures that costs are kept low, EV charging station deployment is timely, generation is available, and distribution lines are not strained. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 10-11]

29 https://www.nationalgrid.com/us/EVhighway

Utilities are also planning for the adoption of EVs in the HD sector with fleet advisory services. An issue brief by the Alliance for Transportation Electrification and the Electrification Coalition examined several utilities' fleet advisory services programs.30 These programs are comprised of dedicated utility staff with a suite of tools and assistance offered by the electric company that is designed to educate and enable fleet managers to make informed choices. Ultimately, the programs help the utilities and fleets to work together and begin to think through the best sites for any depot charging, allowing for any grid issues or concerns to be addressed ahead of time. [EPA-HQ-OAR-2022-0985-1558-A1, p. 11]

30 https://electrificationcoalition.org/wp-content/uploads/2023/02/FAS.White-Paper.E.O.task_.force_.FINAL_.2.23.23.pdf

Finally, it should be noted that HD EVs can also be used to enhance grid resiliency and reliability. In January 2023, the EC released a V2X Implementation Guide and Mutual Aid Agreement Template that would encourage V2X-enabled EBS to be used as mobile power units to enhance resilience during emergency response and disaster relief efforts.31 As ESB adoption grows, it is highly likely we will see ESBs deployed in this manner. The report also outlines reasons as to why ESBs represent a great use case for any grid resiliency efforts. [EPA-HQ-OAR-2022-0985-1558-A1, p. 11]

31 https://electrificationcoalition.org/resource/v2x/

The ATE Interconnection brief outlines some of the current challenges and opportunities with the installation of HD EV charging infrastructure, including the three aspects of pre-planning, energization and permitting.33 In terms of the pre-planning, using existing data and considering states that have adopted the Advanced Clean Truck (ACT) rule, utilities should be approved to move forward with the build out of HD EV charging infrastructure, and not need to wait for a lengthy regulatory approval process. For example, the ICCT projects that 85% of the charging needs for long-haul trucking in 2030 will be along the corridors of the National Highway Freight Network.34 Of course, ratepayer advocate concerns must be taken into consideration but balanced with the need for swift deployment of HD EV charging infrastructure if climate targets and public health goals are to be achieved. The EC is also currently developing a set of practical tools and policy solutions as well to speed the installation of HD EV charging infrastructure that we would eagerly share in a meeting with EPA and DOE staff, when completed. [EPA-HQ-OAR-2022-0985-1558-A1, p. 12]

33 https://evtransportationalliance.org/publications/

34 https://theicct.org/publication/infrastructure-deployment-mhdv-may23/

Organization: Energy Strategy Coalition

III. Coalition members are investing in EV charging infrastructure

Members of this Coalition have begun making significant investments in the charging infrastructure needed to support a growing number of electric heavy-duty trucks, vans, and passenger cars. For example, NextEra Energy is pursuing a $650 million joint venture called Greenlane with BlackRock Alternatives and Daimler Truck North America to design, develop, install, and operate a nationwide charging and hydrogen fueling network for medium- and heavy-duty vehicles.19 Coalition members are also making significant investments in the charging infrastructure for electric passenger cars and trucks:

- National Grid recently received approval for a $206 million initiative to enable up to 32,000 additional charging ports in Massachusetts.20
- The New York Power Authority will have up to 400 fast chargers installed or in construction through its EVolve NY program by the end of 2025.21
- The Pacific Gas and Electric Company ("PG&E") has successfully installed through March 2023 over 5,700 charging ports through its EV Charge Network, EV Fleet, EV Fast Charge and EV Schools programs.22
- Austin Energy provides rebates of up to $1,200 and $4,000 for customers installing Level 2 charging stations at their homes and workplaces respectively.23
- The Sacramento Municipal Utility District ("SMUD") offers up to $1,000 toward residential charging equipment and installation costs through its Charge@Home program.24
- Constellation Energy Corporation's venture arm (Constellation Technology Ventures, or "CTV") has invested in portfolio companies focused on EV and charging infrastructure.25 [EPA-HQ-OAR-2022-0985-1626-A1, pp. 4 - 5]

19 Introducing Greenlane: Daimler Truck North America, NextEra Energy Resources and BlackRock Forge Ahead with Public Charging Infrastructure Joint Venture, NEXTERA ENERGY (Apr. 28, 2023), https://newsroom.nexteraenergy.com/2023-04-28-Introducing-Greenlane-Daimler-Truck-North-America,-

NextEra-Energy-Resources-and-BlackRock-Forge-Ahead-with-Public-Charging-Infrastructure-Joint-Venture.

20 NATIONAL GRID, ANNUAL REPORT AND ACCOUNTS 2022/23, at 30 (2023), https://www.nationalgrid.com/document/149701/download.

21 Leading the Way in EV Infrastructure, EVOLVE NY, https://evolveny.nypa.gov/ (last visited June 9, 2023).

22 More information on PG&E's EV charging programs can be found at: https://www.pge.com/en_US/small-medium-business/energy-alternatives/clean-vehicles/ev-charge-network/electric-vehicle-charging/electric-vehicle-programs-and-resources.page.

23 Commercial Charging, AUSTIN ENERGY (last reviewed or modified July 8, 2022), https://austinenergy.com/green-power/plug-in-austin/workplace-charging; Home Charging, AUSTIN ENERGY (last reviewed or modified July 8, 2022), https://austinenergy.com/green-power/plug-in-austin/home-charging.

24 Drive electric and save, SMUD, https://www.smud.org/en/Going-Green/Electric-Vehicles/Residential (last visited June 9, 2023).

25 For instance, CTV invested in Qnovo, which offers a solution suite that uses advanced computation to optimize the chemical reactions within lithium-ion batteries, resulting in faster charging, increased daily run times, and longer battery lifetimes. See Constellation Technology Ventures, https://www.constellationenergy.com/our-work/innovation-and-advancement/technology-ventures.html.

Coalition members are making these investments in part because of the benefits that EVs can provide to grid reliability. EVs' primary near-term grid benefits stem from their enablement of load shifting—whether from periods of higher load demand to periods of lower load demand, or from periods of more carbon-intensive power generation to periods where more renewable energy is available.26 Load shifting can involve both deferral (to avoid charging during periods of peak load) and more targeted scheduling (to take advantage of periods of excess energy supply).27 In addition to enhancing grid reliability, load shifting can also reduce customer electricity rates, increase the value of renewable energy investments (by maximizing usage of excess solar energy produced during the day), and mitigate the need for equipment upgrades (e.g., increased storage capacity to accommodate excess solar energy).28 [EPA-HQ-OAR-2022-0985-1626-A1, pp. 5 - 6]

26 See TIMOTHY LIPMAN ET AL., CAL. ENERGY COMM'N, TOTAL CHARGE MANAGEMENT OF ELECTRIC VEHICLES 5 (CEC-500-2021-055, Dec. 2021), https://www.energy.ca.gov/sites/default/files/2021-12/CEC-500-2021-055.pdf.

27 See id.

28 See Aligning Utilities and Electric Vehicles, for the Greater Grid, NAT'L RENEWABLE ENERGY LAB'Y (Jan. 10, 2022), https://www.nrel.gov/news/program/2022/aligning-utilities-electric-vehicles-for-greater-grid.html (citing Muhammad Bashar Anwar et al., Assessing the value of electric vehicle managed charging: a review of methodologies and results, 15 ENERGY ENV'T SCI. 466 (2022)).

For example, PG&E has partnered with the BMW Group to explore ways to incentivize EV drivers to shift their charging times to support grid reliability.29 This program—called ChargeForward—first kicked off in 2015 and moved into its third phase in 2021.30 Building on the success of the first two phases, phase three expanded the program's scope to 3,000 EV drivers (from prior pilots of 100 and 400 drivers in phases one and two).31 Phase two of ChargeForward demonstrated the ability to shift nearly 20% of charging from a particular hour to another time and to shift up to 30% of charging to a particular hour.32 SMUD is also engaged in a managed charging pilot program with BMW, Ford, and GM, and is planning to add Tesla vehicles to the pilot as well, targeting participation of around 2,000 vehicles through 2024.33 [EPA-HQ-OAR-2022-0985-1626-A1, p. 6]

29 PG&E Corporate Sustainability Report 2022, PG&E CORPORATION 105 (2022), https://www.pgecorp.com/corp_responsibility/reports/2022/assets/PGE_CSR_2022.pdf.

30 CLARION ENERGY CONTENT DIRECTORS, PG&E and BMW kick off 3rd phase of ChargeForward for clean, smart EV charging, POWERGRID INTERNATIONAL (Mar. 23, 2021), https://www.power-grid.com/der-grid-edge/pge-and-bmw-kick-off-3rd-phase-of-chargeforward-for-clean-smart-ev-charging/#gref.

31 PG&E Corporate Sustainability Report 2022, PG&E CORPORATION 105 (2022), https://www.pgecorp.com/corp_responsibility/reports/2022/assets/PGE_CSR_2022.pdf.

32 See Timothy Lipman et al., Total Charge Management of Electric Vehicles, CALIFORNIA ENERGY COMMISSION iii (CEC-500-2021-055, Dec. 2021), https://www.energy.ca.gov/sites/default/files/2021-12/CEC-500-2021-055.pdf.

33 2030 Zero Carbon Plan Progress Report, SMUD 21 (Apr. 2023), https://www.smud.org/-/media/Documents/Corporate/Environmental-Leadership/ZeroCarbon/2030-ZCP-Progress-Report---April-2023_FINAL.ashx.

Coalition members are also exploring Vehicle-to-Grid (“V2G”) technology, through which EVs can send power back to load sources (e.g., homes) and the grid from their batteries. While still in the early stages of development, V2G technology can offer reliability benefits by serving as a grid resource during periods of peak demand.34 PG&E and BMW recently extended their ChargeForward partnership until March 2026 and, as part of that program, will conduct a field trial of V2G-enabled vehicles in order to explore their potential to increase grid reliability.35 In addition, PG&E has announced vehicle-grid integration (“VGI”) pilot programs with Ford36 and General Motors to test the ability of EVs to provide backup power to homes.37 SMUD is also in the process of conducting an electric school bus V2G demonstration project with the Twin Rivers Unified School District.38 SMUD is planning to expand the program to additional school districts and is also pursuing other projects to explore V2G capabilities for light-duty EVs.39 [EPA-HQ-OAR-2022-0985-1626-A1, pp. 6 - 7]

34 See Value Assessment of DC Vehicle-to-Grid Capable Electric Vehicles: Analytical Framework and Results, EPRI (May 24, 2023), https://www.epri.com/research/programs/053122/results/3002026772.

35 More Power To You: PG&E and BMW of North America Start V2X Testing in California, PG&E CORPORATION (May 16, 2023), https://investor.pgecorp.com/news-events/press-releases/press-release-details/2023/More-Power-To-You-PGE-and-BMW-of-North-America-Start-V2X-Testing-in-California/default.aspx.

36 PG&E and Ford Collaborate on Bidirectional Electric Vehicle Charging Technology in Customers' Homes (Mar. 11, 2022), https://investor.pgecorp.com/news-events/press-releases/press-release-details/2022/PGE-and-Ford-Collaborate-on-Bidirectional-Electric-Vehicle-Charging-Technology-in-Customers-Homes/default.aspx.

37 A. Vanrenen, PG&E and General Motors Collaborate on Pilot to Reimagine Use of Electric Vechiles as Backup Power Sources For Customers (Mar. 8, 2022), https://www.pgecurrents.com/articles/3410-pg-e-general-motors-collaborate-pilot-reimagine-use-electric-vehicles-backup-power-sources-customers.

38 2030 Zero Carbon Plan Progress Report, SMUD 22 (Apr. 2023), https://www.smud.org/-/media/Documents/Corporate/Environmental-Leadership/ZeroCarbon/2030-ZCP-Progress-Report---April-2023_FINAL.ashx.

39 Id.

IV. EPA should work closely with state and local partners to ensure deployment of the resources and infrastructure needed to accelerate transportation electrification while maintaining grid reliability

EPA's HDV Proposal will help support deployment of the charging and generation resources needed to meet anticipated demand from vehicle electrification. Yet effective and efficient deployment of these resources will require coordination among electric utilities, state public utility commissions, and local governments to ensure loads from EVs are factored into long-range resource planning and to permit distribution and transmission system upgrades and siting of new generation and storage resources. To ensure these resources are deployed on the pace and scale needed to support vehicle electrification and grid reliability, EPA should play a leadership role in ensuring coordination occurs among relevant federal, state and local agenices to remove barriers, emphasizing the benefits to the electricity grid, public health, and climate that will be achieved as a result. [EPA-HQ-OAR-2022-0985-1626-A1, p. 7]

Organization: Environmental Defense Fund (EDF)

4. The benefits of bi-directional charging from buses should also be considered

EPA's rulemaking should consider the potential benefits of using school buses for bi-directional charging. Electric school buses can function as large batteries to support the power grid, providing energy to municipalities through the use of vehicle-to-grid (V2G) technologies. According to WRI, at least 15 utilities across 14 states have committed to pilot electric school bus V2G programs, which allow electricity to be stored in the bus batteries and later discharged onto the grid.128 The bus batteries' stored power "can help stabilize fluctuating energy conditions, alleviate the need to start up additional power generation sources by shaving peak energy needs and provide mobile emergency power to shelters and other essential facilities. Because school buses operate on set daily schedules and often sit idle in the summer and during portions of the school day when electricity demand is high, they are ideal for this purpose. The power they can provide to the grid or buildings could offer revenue to help pay for the buses, a win-win for schools and the utility or other entity using the electricity."129 [EPA-HQ-OAR-2022-0985-1644-A1, p. 52]

128 Norma Hutchinson and Greggory Kresge, "3 Design Considerations for Electric School Bus Vehicle-to-Grid Programs," World Resources Institute (February 14, 2022). https://www.wri.org/insights/electric-school-bus-vehicle-grid-programs

129 Id.

b) The electric grid can support widespread HD ZEV adoption

The U.S. electric grid has provided reliable, cheap, instantaneous power to millions of homes and businesses every second of every day for well over a century. For so many end uses, electrification represents the cheapest and most attainable decarbonization pathway. [EPA-HQ-OAR-2022-0985-1644-A1, p. 65]

Growing the electric grid to meet increased demand is nothing new. Since 1960, about a third of the year over year increases in state electricity sales have been higher than 5% with 7% of those years having increases higher than 10% annual growth.166 The compound annual growth rate for the entire grid since 1960 is 2.8%. The total increase in electricity consumption as a result of the proposed rule is expected to be 1.3%, less than half of the average annual increase that has occurred since 1960. Research shows that, with planning, utilities will meet the demand for additional electricity needed to charge our nation's fleet of heavy-duty vehicles, and those vehicles may improve the reliability of the grid. [EPA-HQ-OAR-2022-0985-1644-A1, p. 65] [See Figure 11 on p. 66 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

166 U.S. Energy Information Administration, EIA-861: Annual Electric Power Industry Report, 1960-2021, https://www.eia.gov/electricity/data/state/

EDF commissioned a report by Analysis Group to understand how the expected growth in HDV charging will impact the grid and what processes are in place or need to be added to enable the grid to meet the increased demand.167 Their main findings include:

1. The overall magnitude of growth in demand that would result from EPA's proposed rule is very small relative to historic periods of growth in the electric industry, and will not pose a challenge from the perspectives of power system generation or transmission infrastructure needs.
2. Charging station needs that may result from EPA's proposed rule range greatly in size and location; most counties and utilities in the U.S. analyzed in ICCT's report will likely not face new distribution system infrastructure needs due to charging load different from past experience.
3. Some utilities will need to plan for the development of new distribution system infrastructure to accommodate fairly large point sources of new charging station demand.
4. Adding significant new distribution system infrastructure is not a new experience for states, public utility commissions, or electric companies, and there are long-standing policies and practices in place to process development of infrastructure needed to ensure system reliability.
5. The need for a high level of certainty around the timely integration of charging stations and associated distribution system infrastructure at the scale and speed needed for HDV electrification warrants – and has already prompted – proactive action on behalf of some states and utilities to engage and expand planning and regulatory practices at the scale necessary to ensure timely readiness of the power system.
6. There are many emerging technologies, ratemaking practices, and distributed resource solutions that have the potential to significantly and efficiently reduce the expected impacts on distribution systems associated with vehicle electrification. [EPA-HQ-OAR-2022-0985-1644-A1, p. 66-67]

167 Paul Hibbard et al. Heavy Duty Vehicle Electrification: Planning for and Development of Needed Power System Infrastructure. 2023. Analysis Group, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files//Analysis-Group-HDV-Charging-Impacts-Report.pdf. Analysis Group, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files//Analysis-Group-HDV-Charging-Impacts-Report.pdf. (Attachment W).

Evolution of distribution systems to meet the potential increase in charging station demand associated with EPA’s proposed Phase 3 rule for HDVs is eminently achievable. [EPA-HQ-OAR-2022-0985-1644-A1, p. 67]

Additionally, they found that 83% of utility service territories would not see more than 5 MW of increased load from HDV charging based on a study done by ICCT. The localized nature of the expected growth of HDV charging demand presents unique challenges but also allows for focused action. [EPA-HQ-OAR-2022-0985-1644-A1, p. 67]

ii. Robust solutions exist and are being implemented to ensure rapid interconnection and widespread vehicle electrification

The main concern that has been raised by OEMs and other parties related to the grid is the ability to build out infrastructure quickly enough to meet demand.177 In addition to the existing policies and practices around upgrading distribution systems that have served to build things like data centers which have high load requirements, additional practices have been developed and are being implemented in some areas to address specific challenges around HD ZEV charging. [EPA-HQ-OAR-2022-0985-1644-A1, p. 68]

177 https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={D05A8E88-0000-CE16-8EA2-97D9432AAEE9}

These include practices and policies that maximize the existing grid capacity, proactively building the grid, and updating planning procedures. [EPA-HQ-OAR-2022-0985-1644-A1, p. 69]

By maximizing the existing grid capacity, fleet owners can transition to ZEVs without requiring immediate grid upgrades allowing more time for utilities to build out infrastructures. Techniques such as leveraging non-wires alternatives (managed charging, onsite storage and generation, and energy efficiency programs) have had great success in minimizing the upgrades required, and allowing for continued load growth while waiting for a necessary upstream grid upgrade. One clear example of this is Con Edison’ BQDM program which resulted in a 7-year grid upgrade deferral.178 A report by the Smart Electric Power Alliance (SEPA) found a wide range of non-wires alternatives succeeded at enabling rapid interconnection and HDV electrification.179 [EPA-HQ-OAR-2022-0985-1644-A1, p. 69]

178 Coley Girouard. BQDM program demonstrates benefits of non-traditional utility investments. 2019. Utility Dive, https://www.utilitydive.com/news/bqdm-program-demonstrates-benefits-of-non-traditional-utility-investments/550110/

179 Brenda Chew et al. Non-Wires Alternatives: Case studies from leading U.S. projects. 2018, Smart Electric Power Alliance, https://sepapower.org/resource/non-wires-alternatives-case-studies-from-leading-u-s-projects/

Where fleets install managed charging software and/or onsite storage and solar generation to minimize charging costs including demand charges, their net load can be significantly lower than the utility-assigned capacity requirements for the site. To connect to the grid, they may be required to undergo site and utility upgrades to provide significantly higher capacity than what is actually needed and in some cases these solutions result in some sites never exceeding the existing capacity on their site making the upgrades unnecessary. Flexible interconnection, where customers agree to limit their peak load to a specified level below that of the cumulative nameplate capacity of their equipment, is one solution to energize chargers while those grid upgrades are ongoing. This mitigates any site and upstream grid upgrades in the short term in exchange for early energization of their charging equipment, and can even lower long-term upgrade needs. EPRI has shown the benefits of flexible interconnections for broader grid decarbonization.180 [EPA-HQ-OAR-2022-0985-1644-A1, p. 69]

180 Chris Warren. Can allowing curtailment speedup DER growth? EPRI Journal, https://eprijournal.com/getting-flexible-about-interconnection/

States are working towards allowing utilities, with guardrails in place to protect ratepayers, to proactively build the grid to need ahead of interconnection requests for new load, such as EV charging. [EPA-HQ-OAR-2022-0985-1644-A1, p. 70]

There are legislative efforts that are paving the way for this solution. California's AB 2700, which in addition calls for the collection of fleet electric vehicle deployment plans, also allows for utilities to submit pro-active grid expansion proposals to the utility commission in areas with identified future congestion using fleet deployment data.181 SB 410 in California would take this a step further, setting requirements for utilities to have their grid ready for interconnection requests and calls for utilities to plan and evaluate potential grid impact of Advanced Clean Fleets (ACF) and Advanced Clean Trucks (ACT) rules as well as submit plans to address potential areas of congestion to meet energization timelines. This bill also requires utilities to report interconnection requests and delays to better track progress and hold utilities accountable.182 [EPA-HQ-OAR-2022-0985-1644-A1, p. 70]

181 Transportation electrification: electricial distribution grid upgrades. AB2700. 2021-2022 Regular Session, (California 2022) https://legiscan.com/CA/bill/AB2700/2021

182 Powering Up Californians Act, SB410, 2023-2024 Regular Session, (California, 2023) https://legiscan.com/CA/text/SB410/id/2813946

Other states have also taken steps to ensure utilities are able to proactively build infrastructure. New York senate bill S4830, which recently passed both houses of the New York legislature, directs the New York State Energy Research and Development Authority (NYSERDA) to identify the number and location of fleet charging zones and highway charging hubs where significant demand from EV charging, including electric HDVs, is expected in line with meeting state and federal transportation sector emissions regulations, and the associated grid impact of that charging.183 [EPA-HQ-OAR-2022-0985-1644-A1, p. 70]

183 Establishing a highway and depot charging action plan, Senate Bill S4830A, 2023-2024 Legislative Session. (New York, 2023) https://www.nysenate.gov/legislation/bills/2023/S4830

Efforts to update planning processes have also improved the ability for the grid to meet demand from HDV charging. If utilities have accurate forecasts well in advance of when grid needs arise, they can complete needed upgrades without as great of a need for mitigating solutions like grid deferment and flexible interconnection. In a recent article, Southern California Edison (SCE) emphasized the importance of planning for utilities: "On the forecasting and planning side, utilities and energy system planners must adapt planning efforts to reflect expected EV growth, including impacts from proposed and adopted policies and incentives. For example, to account for the new developing needs of the Advanced Clean Cars II and Advanced Clean Fleets policies in California, SCE and the other California investor-owned utilities were recently approved to use higher forecasts for transportation electrification than previously used."184 [EPA-HQ-OAR-2022-0985-1644-A1, p. 70-71]

184 Pamela MacDougall and Katie Sloan, As the electric truck transition shifts into high gear, utilities must lead the charge. 2022. Utility Dive, https://www.utilitydive.com/news/electric-truck-bus-ev-utilities-sce-edison-edf/634214/

The New York Joint Utilities' Coordinated Grid Planning Process and California PUC's Freight Infrastructure Planning Framework, both currently under development, also represent examples of improved planning processes to enable accelerated HDV electrification and grid interconnection.185 186 [EPA-HQ-OAR-2022-0985-1644-A1, p. 71]

185 https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=20-e-0197&CaseSearch=Search

186 Zero-Emissions Freight Infrastrucutre Planning. California Public Utilities Commission, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/freight-infrastructure-planning

iii. Upgrade costs for charging HD ZEVs can help more efficiently use the grid and drive down costs

Large-scale electrification of medium- and heavy-duty vehicles will require grid upgrades, largely at the distribution grid level, to support the added load from charging. But, research shows that EVs can help strengthen the grid, and the costs of the needed upgrades can be covered by the additional revenue from fleets charging without raising consumers' electricity rates.187 [EPA-HQ-OAR-2022-0985-1644-A1, p. 71]

187 Lucy Metz, Melissa Whited, Paul Rhodes and Ellen Carlson. Distribution System Investments to Enable Medium- and Heavy-Duty Vehicle Electrification: A Case Study of New York, Synapse Energy Economics, Inc., prepared for EDF. (April 2023). (Attachment X) https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ab0fd0780-9882-3a25-9ef2-f8c73bd80c92&viewer%21megaVerb=group-discover

According to electricity company executives, EVs can boost grid reliability.188 EVs are schedulable loads that typically charge off peak (at night). Utilities can encourage EV owners to charge when and where they want, leading to more efficient use of existing grid infrastructure.189 [EPA-HQ-OAR-2022-0985-1644-A1, p. 72]

188 Tomlinson, Chris. "Will electric vehicles crash the Texas grid? It's not complicated." Houston Chronicle (April 10, 2023). https://www.houstonchronicle.com/business/columnists/tomlinson/article/electric-vehicles-ercot-grid-reliabilty-17880578.php

189 Jennifer Chen. 2023. Leveraging Locational and Temporal Flexibility in Transportation Electrification to Benefit Power Systems. Energy Systems Integration Group. https://www.esig.energy/leveraging-locational-and-temporal-flexibility-in-transportation-electrification-to-benefit-power-systems/

EV charging can also finance and justify needed grid updates. Recent analysis conducted by Synapse Energy Economics for EDF finds that if U.S. utilities rate-base the cost of infrastructure upgrades needed for fleet charging, the utilities will see increased revenue without the need to raise consumers' electricity rates.190 The analysis used two New York State utilities as case studies and found that if utilities cover the "make-ready" cost for both private and municipal medium- and heavy-duty fleets at the pace necessary for 100 percent electrification by 2045, the investment will pay off for utilities and have a positive to neutral impact on ratepayers in both utility service areas. The analysis' findings are applicable beyond New York to states across the country due to the varying grid costs, geography and electricity demand profiles of the utilities studied. Con Edison primarily serves New York City, while National Grid provides electricity to portions of upstate New York. [EPA-HQ-OAR-2022-0985-1644-A1, p. 72]

190 Metz et al Distribution System Investments to Enable Medium- and Heavy-Duty Vehicle Electrification: (April 2023).

The study finds that if fleets are assumed to engage in modest managed charging (shifting charging times by only two hours at night), Con Edison's make-ready program could generate $690 million in net revenue between 2023-2045, while National Grid's program could generate $89 million in the same time period. Even without managed charging, investing in make-ready programs was shown to have a positive to neutral impact on ratepayers in both utility service areas. As more fleets are incentivized to plug in - and therefore spend more of their operating budget on electricity and less on diesel - utilities can invest a portion of that revenue on grid upgrades elsewhere that would have otherwise been paid for by all ratepayers. [EPA-HQ-OAR-2022-0985-1644-A1, p. 72-73]

iv. Managed charging represents an opportunity for fleet owners to reduce their costs and to increase grid benefits from HDV electrification

Medium- and heavy-duty fleets can experience short but high energy demand events that can significantly increase their grid impact and energy bills. When these fleets go beyond merely managing charging to leveraging onsite distributed energy resources (DERs) such as solar and battery storage, they can benefit from an even more powerful lever for reducing charging costs. A GNA study examined two types of clean DERs: on-site solar panels and batteries. When combined with managed charging, DERs produced additional annual electric savings of $625,000 (Schneider) and $835,000 (NFI) for fleets of 40-50 electric HDVs. Moreover, managed charging and DERs together reduced annual on-peak load by 611 kW for the Schneider fleet and 4 MW for the NFI fleet.191 Thus, such techniques would not only reduce costs for the truck companies, but the utility and ratepayers as a whole as well owing to the reduced need for grid buildout. If scaled to all trucks in a utility's territory, these load reductions could drastically decrease the amount of grid upgrades needed to accommodate electric fleets. [EPA-HQ-OAR-2022-0985-1644-A1, p. 73]

191 Gladstein, Neandross & Associates, California Heavy-Duty Fleet Electrification Summary Report, March 2021, http://blogs.edf.org/energyexchange/files/2021/03/EDF-GNA-Final-March-2021.pdf Gladstein, Neandross & Associates, California Heavy-Duty Fleet Electrification Summary Report, March 2021, http://blogs.edf.org/energyexchange/files/2021/03/EDF-GNA-Final-March-2021.pdf. (Attachment Y)

A recent New Jersey study evaluated the statewide grid impact of meeting ACT, as well as the grid savings when implementing managed charging and utilizing on-site solar and storage for all Class 3-7 vehicles in the state. Avoided peak load ranges from ~8,400 MW for managed charging, to ~10,000 MW for managed charging with solar + battery. Total avoided infrastructure costs are between $320 million and $1.80 billion for managed charging, and between $382 million and $2.15 billion for managed charging with solar + battery.192 [EPA-HQ-OAR-2022-0985-1644-A1, p. 73-74]

192 Jeffery Greenblatt. New Jersey Medium Duty Fleet Electrification Infrastructure Summary Report. 2022. Emerging Futures, https://blogs.edf.org/energyexchange/files/2022/05/New_Jersey_Medium_Duty_Fleet_Elecrtification_Infrastructure_Summary_Report.pdf Emerging Futures,

https://blogs.edf.org/energyexchange/files/2022/05/New_Jersey_Medium_Duty_Fleet_Elecrtification_Infrastructure_Summary_Report.pdf (Attachment Z)

Furthermore, these largely avoided infrastructure costs are sure to be an underestimate for HDV electrification as a whole for the state since they do not account for the benefits of electrifying Class 8 vehicles with managed charging or managed charging with solar + battery. [EPA-HQ-OAR-2022-0985-1644-A1, p. 74]

The flexibility associated with vehicle charging is also extremely valuable to the grid operator. A study by the Midwest ISO shows the untapped potential of EV load flexibility as a DER resource in the wholesale markets. This study evaluated the impact of expected electrification of both MHDVs as well as LDVs in the MISO footprint. A key factor in this study was determining the potential flexibility of these vehicles when applying managed and bidirectional charging tactics to mitigate ramp and peak load. It showed that at any given hour this additional load can provide a minimum of 10 GW of combined ramp up capacity and just under 10 GW of ramp down or generation capacity using the flexibility of EV charging alone. To reiterate, this ramp capacity was based on vehicle charging alone and would be even greater if combined with other on-site DERs.193 [EPA-HQ-OAR-2022-0985-1644-A1, p. 74]

193 Greenblatt, Jeff and Margaret McCall, Exploring enhanced load flexibility from grid-connected electric vehicles on the Midcontinent Independent System Operator grid (Feb. 2021), available at https://cdn.misoenergy.org/Exploring%20enhanced%20load%20flexibility%20from%20grid%20connected%20EVs%20on%20MISO%20grid543291

Of critical importance, this load flexibility also comes at a fraction of the cost of traditional fixed battery storage. A study by Lawrence Berkeley National Lab shows that managed charging of EVs—modulating when and at what rate the EVs are charged— can provide reliable storage at approximately a tenth of the cost of equivalent storage provided by single-purpose, stationary batteries. When scaled to California's projected 1.5 million light-duty EVs by 2025, the storage potential of managed charging alone is 1 GW, resulting in savings of approximately $1 billion compared to investments needed for equivalent stationary storage. This number also does not include the thousands of MHDVs such as buses and trucks expected to be electrified in the near future.194 By leveraging the flexibility of newly electrified resources, stakeholders can significantly reduce grid management costs ultimately, resulting in savings for end-customers and mitigating grid upgrade needs, further supporting accelerated HDV electrification. [EPA-HQ-OAR-2022-0985-1644-A1, p. 74-75]

194 Jonathan Coignard et al., Clean vehicles as an enabler for a clean electricity grid, 13 Environmental Research Letters 54031 (2018).

Organization: International Council on Clean Transportation (ICCT)

Utilities have many options to provide timely delivery of grid capacity to support these charging needs. ICCT has identified actions that (1) require no regulatory approval or pre-authorization (2) require regulator consent or notification, or (3) require regulatory approval or state legislation. [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

Utilities have the greatest flexibility to meet charging infrastructure needs in a timely fashion when actions can be taken without regulator notification or approval. These actions include short-term load rebalancing, the use of non-firm distribution capacity, the incorporation of smart charging into feeder ratings and load forecasting, the deployment of temporary distribution, generation and storage, and public-private partnerships that allow for third-party funding, design, and construction of infrastructure. This list is not comprehensive but demonstrates that options do exist for utilities to meet the most acute needs of fleets. [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

As the trend toward truck electrification grows, utilities will need to take actions to adapt to a new market environment in their service area. Any adaptation in programs and planning will require the notification, if not consent, of state regulatory agencies. For example, utility regulators can consent to periodic adjustments to transportation electrification programs to better respond to market trends. Utilities can also request consent to explicitly incorporate transportation electrification load forecasts into their distribution system planning and related investments. These modifications to existing programs and planning processes reflect the type of adaptation most utilities serving freight zones will need to perform. [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

Finally, utilities may need to take certain actions that increase their responsiveness to freight charging needs beyond what state utility regulation permits them to do. For example, authorization to pre-build distribution capacity infrastructure in 'no-regrets' freight zones will require either state legislation or explicit regulation where it does not already exist. Examples of such policies under development in California include SB410 passed by the California State Senate on 25 May 2023.(Powering Up Californians Act, n.d.) Another example includes the Zero-Emissions Freight Infrastructure Planning proposal made by the staff of the California Public Utilities Commission on 22 May 2023. (Gruendling, 2023.) Similar examples exist in New York State, including a new proceeding opened by the New York Public Service Commission to address barriers to Medium- and Heavy-Duty Charging Infrastructure.4 [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

4 https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=23-E-0070&CaseSearch=Search

Power Up Californians Act. Retrieved June 15, 2023, from https://legiscan.com/CA/text/SB410/id/2813946

Gruendling, P. (2023). Freight Infrastructure Planning. California Public Utilities Commission. https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportationelectrification/freight-infrastructure-planning

In response to EPA's request for comment on how to engage infrastructure stakeholders, we suggest EPA consider infrastructure needs tbroadly, starting from the transmission grid and downstream to the charger that connects to the vehicle. Many players exist in each segment of this chain. [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

Key stakeholders include electric utilities (IOU, POU, NRECA, EPRI), EVSE manufacturers, CharIN (MCS), CPO (Charge Point Operators/Network Service Providers), Bundled Service Providers (charging-as-a-service, trucking-as-a-service), public charging hub owner/operators (such as the Daimler/NextEra/Blackrock JV, WattEV, Terawatt, bp Pulse, etc), engineering/construction firms (Black & Veatch, Burns MacDonnell, Schneider Electric, etc), fleets (including NACFE) and depot owners. EPA can engage these stakeholders individually and facilitate dialogue across these groups to support the data collection, planning, and coordinated deployment to support the objectives of the greenhouse gas standards. A regular meeting, such as an annual summit, is one strategy EPA could use to gather information on challenges and solutions in the zero-emission vehicle transition. [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

While EPA does not have jurisdictional authority over electric utilities, interagency collaboration with the Department of Energy, Department of Transportation, and the Joint Office of Energy and Transportation would ensure EPA has a voice in federal infrastructure policy these other agencies may be responsible for developing. [EPA-HQ-OAR-2022-0985-1553-A1, p. 12]

Organization: MEMA

EPA appears to be over optimistic with regard to both electricity generation growth and wide dispersal needed to assure charging across the roads of the U.S. Similarly, many heavy trucks must operate off road away from infrastructure. Today they are capable of doing this, as fuel can be topped-off before leaving the road or brought to the job site. EVs do not have this luxury and would require a large generator to replicate this scenario, which would be counterproductive. Oversizing a fuel tank is a cost-effective way to guarantee sufficient energy for asset flexibility across the full range of applications and locations. Oversizing batteries or pressurized hydrogen tanks is more costly. [EPA-HQ-OAR-2022-0985-1570-A1, p. 8]

Opportunity to Build a Resilient and Sustainable EV Infrastructure

The American Transportation Research Institute (ATRI) has released a study’ on the challenges facing the U.S. infrastructure for EV, which we urge the EPA to incorporate alongside the other ATRI studies noted in the DRIA. It projects significant grid expansion is needed in each state if all vehicle applications are electrified; see Appendix 3. [EPA-HQ-OAR-2022-0985-1570-A1, p. 9]

7 https://truckingresearch.org/2022/12/new-atri-research-evaluates-charging-infrastructure-challenges-for-the-us-electric-vehicle-fleet/

Organization: Missouri Farm Bureau (MOFB)

Further, MOFB is greatly concerned that the proposed rule contains zero language regarding what impact it will have on the severely aged and inadequate electric grid. In 2020, the U.S. experienced 180 major electrical disruptions, up from fewer than two dozen in 2000.9 In this proposed rule, EPA fails to illustrate how electricity will actually be delivered to thousands of new charging stations that will be built in the near future, and what impact this action will have upon every other aspect of our lives, much of which relies on the constant delivery of electricity. [EPA-HQ-OAR-2022-0985-1584-A1, p. 2]

9 America’s Power Grid Is Increasingly Unreliable - WSJ, accessed June 14, 2023.

In addition, but not separable from this conversation, MOFB is especially concerned with the future buildout of electric transmission lines that will be needed to carry the proposed rule’s mandates into fruition. Unfortunately, and all too often, farmers and ranchers hear others say that their land is needed for the ‘public’s benefit.’ Government agencies and renewable energy advocates often forget that farmers and ranchers are part of the ‘public’ as well, and need to be fairly compensated for the continued buildout of transmission lines through their private property which will take away the critical farm and ranch land necessary to run their businesses for generations to come. [EPA-HQ-OAR-2022-0985-1584-A1, p. 3]

Organization: Moving Forward Network (MFN) et al.

7.2. The ability of electric trucks to reduce emissions compared to diesel vehicles

The benefits of an electric drayage truck compared to its diesel-powered equivalent change between today and 2035 based predominantly on the improvement in the electric grid. Figure 4 shows the relative greenhouse gas emissions benefits resulting from the two different timeframes. Figure 5 shows the relative public health impact, as indicated by the Public Health Score defined earlier through aggregated mortality. While today's diesel vehicles are the benchmark for the public health scores, the 2035 diesel truck public health score in Figure 5 reflects a Phase 2 diesel truck meeting the 2027 NO X and PM 2.5 standards finalized last year. [EPA-HQ-OAR-2022-0985-1608-A1, p. 44]

Electric trucks powered by electricity supplied from the U.S. grid production average today would lead to more than a two-thirds reduction in greenhouse gas emissions compared to their diesel counterpart. By 2035, under a scenario consistent with the administration's goals for the power sector and analysis of what is needed to decarbonize by 2050, that achieves a 95 percent reduction compared to diesel. [EPA-HQ-OAR-2022-0985-1608-A1, p. 44]

However, the story is more complicated when it comes to public health impacts. It underscores the tremendous importance of eliminating fossil fuels across the electricity sector and in transportation. 102 On average, an electric drayage truck powered by today's grid would reduce premature deaths by nearly 57 percent compared with current diesel trucks. Nearly all regional electricity grids, covering 97 percent of the U.S. population, result in net benefits today. However, there are some subregions where, if the average grid powered the truck, an electric truck could lead to more net harm as the result of substantial particulate emissions from fossil fuel power: in Alaska, diesel generators continue to be utilized in remote areas, especially as a backup source to hydropower, and make up more than one-quarter of generation in the AKMS subregion and 10 percent of generation in the AKGD subregion; in Hawaii (HIOA and HIMS subregions), while there has been significant growth in both rooftop and utility-scale solar power, more than two-thirds of grid-supplied electricity in the state comes from petroleum power plants; and in rural Missouri/Illinois (SRMW subregion), approximately two-thirds of the grid remains coal-powered. 103 [EPA-HQ-OAR-2022-0985-1608-A1, p. 44] [Refer to Figure 4, Greenhouse gas emissions reductions for an electric drayage truck compared to a diesel drayage truck on p. 45 of docket number EPA-HQ-OAR-202-1608-A1.] [Refer to Figure 5, Public health impact for an electric drayage truck compared to a diesel drayage truck on p. 46 of docket number EPA-HQ-OAR-202-1608-A1.]

102 See footnote 7. An electric truck is not inherently a zero emission vehicle (ZEV) – zero-emission solutions must minimize impacts when accounting for upstream and downstream impacts. If the full lifecycle is not considered, we risk trading pollution for more pollution, and the same frontline and fenceline communities are left to suffer.

103 All current values come from EPA's eGRID 2021 dataset, the most recent available. It is worth noting, however, that this dataset excludes net metered, distributed solar production (i.e. it only reflects utility-delivered electricity).

By 2035, an electric truck would have public health benefits compared to today's diesel everywhere, even when powered by the average grid. In the country's most remote areas, where petroleum and diesel power is expected to remain a significant share of the grid, electric trucks may continue to have unhealthy public health impacts. However, it is unlikely that such a grid would be used to fuel electric trucks given the high cost of fossil power in this instance, so it is more probable that electric trucks would accelerate the adoption of cleaner energy sources to augment the renewable energy in the Alaskan and Hawaiian grids and/or be preferentially charged on more renewable sources than the average grid in such a future. [EPA-HQ-OAR-2022-0985-1608-A1, p. 46]

Importantly, the difference in time for the two grids is short enough to be within the anticipated lifespan of a given truck—any electric truck sold today is still likely to be on the road in 2035. Unlike a combustion vehicle, which gets dirtier over time due to aging of emissions controls, mal-maintenance, and tampering, electric trucks get cleaner over the vehicle's lifespan as the grid continues to incorporate more renewable sources of electricity. [EPA-HQ-OAR-2022-0985-1608-A1, p. 47]

In addition, the California Senate recently voted 32-to-8 to advance new legislation (Senate Bill 410, "Powering Up Californians Act") that builds upon existing law to accelerate short-term energization timelines for EV charging and to ensure timely grid investments needed to electrify "light-duty, medium-duty, and heavy-duty vehicles and off-road vehicles, vessels, trains, and equipment" consistent with state law requiring economy-wide carbon neutrality by 2045, and "federal, state, regional, and local air quality and decarbonization standards, plans, and regulations." 241 The legislation also establishes a balancing account to recover associated costs, which would ensure Pacific Gas & Electric (PG&E) and San Diego Gas & Electric (SDG&E) do not have to wait several years for their next General Rate Cases to propose investments such as those recently proposed by SCE (and it would also allow SCE to propose subsequent investments before its next rate case that could not be predicted when its current rate case was filed). [EPA-HQ-OAR-2022-0985-1608-A1, p. 109]

241 California Senate Bill 410. (2023). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB410

Grid operators around the country are also beginning to incorporate EV planning into existing planning structures. For example, the Minnesota Public Utilities Commission has shifted investor-owned utility transportation electrification planning and reporting requirements to the integrated distribution planning process to account for increasing linkages between EV planning and distribution system planning. 242 Incorporating robust EV planning in existing planning structures can help ensure those processes account for EV adoption, even where the utility business units responsible for those areas of planning may be distinct. Furthermore, combined planning processes can create administrative efficiencies that help expedite time-sensitive planning needs. On the transmission planning side, regional grid operators, such as the Midcontinent Independent System Operator, have already begun to think about how transportation electrification will affect total energy needs and the timing of annual peaks in electricity demand. 243 Strong vehicle standards give grid operators a reliable EV forecast against which to plan in processes that are already underway. [EPA-HQ-OAR-2022-0985-1608-A1, p. 109]

242 Minnesota Public Utilities Commission ORDER. (December 8, 2022). I n the Matter of a Commission Inquiry into Electric Vehicle Charging and Infrastructure (Docket No. E999/CI-17-879), In the Matter of Minnesota Power's 2021 Integrated Distribution System Plan (Docket No. M-21-390), In the matter of Distribution System Planning for Otter Tail Power Company (Docket No. 21-612), In the matter of Xcel Energy's 2021 Integrated Distribution System Plan (Docket No. (21-694).

https://www.edockets.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={30E7F284-0000-C810-9E0A-266C1B8B4815}&documentTitle=202212-191192-01

243 MISO Electrification Insights. (April 2021). https://cdn.misoenergy.org/Electrification%20Insights538860.pdf.

12.4. EPA's Conclusion that HDV Charging Will Not Compromise the Reliability of the Electric Grid is Supported by Empirical Data

EPA observes HDV charging is not anticipated to impact electric grid reliability adversely:

U.S. electric power utilities routinely upgrade the nation's electric power system to improve grid reliability and to meet new electric power demands. For example, when confronted with rapid adoption of air conditioners in the 1960s and 1970s, U.S. electric power utilities successfully met the new demand for electricity by planning and building upgrades to the electric power distribution system. Likewise, U.S. electric power utilities planned and built distribution system upgrades required to service the rapid growth of power-intensive data centers and server farms over the past two decades. U.S. electric power utilities have already successfully designed and built the distribution system infrastructure required for 1.4 million battery electric vehicles. Utilities have also successfully integrated 46.1 GW of new utility-scale electric generating capacity into the grid. 245 [EPA-HQ-OAR-2022-0985-1608-A1, p. 110]

245 88 FR 25983

And:

Our assessment is that grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with HD BEV charging and thus was not considered to be a constraining consideration. 246 [EPA-HQ-OAR-2022-0985-1608-A1, p. 111]

246 88 FR 26003.

These conclusions are supported by empirical evidence from California, which already has more than 1.3 million EVs on the road. While some pundits have claimed EV charging is already straining the grid, triggering the need for service disruptions, those claims have been debunked. 247 And root cause analysis from the California Independent System Operator (California ISO) showed that EVs are not what has strained the grid. 248 Indeed, empirical evidence shows that EV charging has been accommodated with minimal required grid upgrades and that EV charging can be shifted to hours of the day when there is plenty of spare grid capacity. Since 2011, the California Public Utilities Commission has required the utilities it regulates to report annually on costs associated with accommodating EV charging and on the charging patterns of EVs on different utility rates. 249 While the vast majority of those EVs are passenger vehicles, the real-world data on charging patterns and associated grid impacts gathered by the largest utilities in the state is still relevant, especially considering that the "Level 2" equipment used to charge those passenger vehicles is the same equipment that is used to meet the daily charging needs of most of the categories of vehicles subject to the Proposed Rule. As summarized by Synapse Energy Economics, utility grid upgrades required to accommodate EV charging to this point in those service territories are essentially rounding errors compared to the costs of maintaining the electrical grid:

Even in the service territories with the most EVs of any, the observed costs have been minor. For instance, in California where EV adoption has been markedly higher than other states, EV-related distribution upgrade costs appear minor compared to total distribution costs. Despite the fact EVs are often more concentrated in many neighborhoods and distribution circuits, California utilities collectively spent less than 0.03% of their total distribution-related expenses on distribution system upgrades associated with residential EV adoption. 250 [EPA-HQ-OAR-2022-0985-1608-A1, p. 111 - 112]

247 Dustin Gardiner. No, Newsom's push for electric cars isn't the cause of potential blackouts in California. San Francisco Chronicle. (Sep. 7, 2022). https://www.sfchronicle.com/politics/article/No-Newsom-s-push-for-electric-cars-isn-t-the-17426102.php.

248 California ISO. Root Cause Analysis: Mid-August 2020 Extreme Heat Waive. (January 13, 2021). http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

249 Alliance for Automotive Innovation. Electric Vehicle Sales Dashboard. https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard; Joint IOU Electric Vehicle Load Research and Charging Infrastructure Cost Report 10th Report, Filed on March 31, 2022, available at: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/10th-joint-iou-ev-load-report-mar-2022.pdf (Last accessed: May 30, 2023).

250 Melissa Whited, Tyler Fitch, Jason Frost, Eric Borden, Courtney Lane, Ben Havumaki Sarah Shenstone- Harris, and Elijah Sinclair. Electric Vehicles Are Driving Rates Down. (June 2023). https://www.synapse-energy.com/sites/default/files/Electric%20Vehicles%20Are%20Driving%20Rates%20Down%20Factsheet.pdf

And costs associated with integrating both light- and heavy-duty EV charging onto the grid can also be minimized with effective load management programs, as described immediately below. [EPA-HQ-OAR-2022-0985-1608-A1, p. 112]

12.5. Time-of-Use Electric Rates Are Extremely Effective at Pushing EV Charging to Hours of the Day When there is Plenty of Spare Grid Capacity

Real-world data from hundreds of thousands of EVs reveals that time-of-use (TOU) electricity rates work. At the time the data described below was collected, SCE estimated there were 329,940 EVs in its service territory (through December 31, 2021). 251 Figure 32 shows the load profile of households in SCE territory with EVs, with a readily discernible uptick in electricity demand after 9PM (when the on-peak period ends on the time-of-use rates) as a result of EV charging that increases until just before midnight and trails off in the early morning hours as those EVs complete their charging. [EPA-HQ-OAR-2022-0985-1608-A1, p. 112.] [See Figure 32 Load Profile of Households with EVs on a TOU Rate in SCE Territory located on p. 113 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

251 Joint IOU Electric Vehicle Load Research and Charging Infrastructure Cost Report 10th Report. Filed on March 31, 2022. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/10th-joint-iou-ev-load-report-mar-2022.pdf

252 Id.

The impact of TOU rates is even more self-evident in Figure 33, which isolates EVs on separate meters, demonstrating that EVs charge almost exclusively after 9 PM on that TOU rate. [EPA-HQ-OAR-2022-0985-1608-A1. p. 113.] [See Figure 33 Load Profile of EVs on a Separately Metered TOU Rate in SCE Territory located on p. 114 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

253 Id.

The figures above represent real-world data collected from hundreds of thousands of households with EVs. There is no need to test the proposition that simple TOU rates designed for EVs work. If they work for LDVs parked at home for long periods of time, they should also work for HDVs parked at depots, homes, or other locations for long periods of time. Given EPA expects the vast majority of charging for the HD EVs contemplated in its Proposed Rule will occur at depots and other locations where EVs are typically parked for long periods of time, often overnight, the real-world data described above remains relevant. And TOU rates are often the default option for commercial and industrial customers in the U.S. (whereas residential customers typically need to opt-into a TOU rate), and commercial and industrial customers are generally more sensitive to price signals than residential customers. [EPA-HQ-OAR-2022-0985-1608-A1, p. 114]

The combination of TOU rates and more active means of managing EV charging can yield even greater benefits. Researchers from NRDC, Lawrence Berkeley National Laboratory, and Pacific Gas & Electric found that well-designed TOU rates could allow the utility's system to accommodate universal light-duty EV adoption with minimal associated costs. 254 This peer-reviewed study used real-world data on the distribution grid and EVs to simulate what would happen if every household in a major metro area had an EV and found that, if just 30 percent of light-duty EVs were on TOU rates, the required grid upgrades were reduced by a factor of four and that more comprehensive load management could essentially prevent all otherwise necessary grid upgrades. 255 The potential impacts of generally higher-powered HD EV charging, some of which may need to occur during hours when overall demand for electricity is greater, could be more extensive, but the demonstrated efficacy of TOU rates and other load management strategies is still relevant. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 114 - 115]

254 Jonathan Coignard et al. Will Electric Vehicles Drive Distribution Grid Upgrades?: The Case of California. 7 IEEE 2. (June 5, 2019). p. 46-56

255 Id.

12.6. EVs Can Lower the Cost of Managing an Increasingly Dynamic Electric Grid

Researchers from Lawrence Berkeley National Laboratory estimate that using smart charging of light-duty EVs as a means to comply with California's energy storage procurement mandate (designed to facilitate the integration of renewable energy) would save utility customers $1.5 billion because it is cheaper to use batteries customers have already purchased on four wheels than it is to pay private companies to deploy standalone battery storage. 256 The same study also found enabling so-called "vehicle-to-grid" (V2G) technology, allowing EVs to supply power back to the grid during times of stress, could save $13-15 billion in stationary battery costs. 257 "By displacing the need for construction of new stationary grid storage, EVs can provide the dual benefit of decarbonizing transportation while lowering the capital costs for widespread renewables integration," the researchers concluded. 258 [EPA-HQ-OAR-2022-0985-1608-A1, p. 115]

256 Jonathan Coignard, Samveg Saxena, Jeffery Greenblatt, and Dai Wang. Clean Vehicles as an Enabler for a Clean Electricity Grid. Environmental Research Letters. V. 13, No. 5. (May 2018). http://iopscience.iop.org/article/10.1088/1748-9326/aabe97. (last checked September 14, 2022).

257 Id.

258 Id.

Focusing on the Midwest to underscore the point, researchers conclude very high levels of renewable energy penetration in the Midcontinent Independent System Operator (MISO) region could result in “negative valleys” (requiring excess renewable energy to be exported or curtailed) but “[c]ontrolled (EV) charging (both smart charging and smart discharging back onto the grid) is able to reduce these negative valleys, and with sufficient numbers of EVs can eliminate them altogether, obviating the need for either export of excess renewable generation or curtailment.” 259 This would provide both increased environmental benefits by facilitating the integration of high levels of renewable generation and significant customer benefits. [EPA-HQ-OAR-2022-0985-1608-A1, p. 115]

259 Jeffery Greenblatt, Cong Zhang, Samveg Saxena. Quantifying the Potential of Electric Vehicles to Provide Electric Grid Benefits in the MISO Area: Final report to the Midcontinent Independent System Operators. Lawrence Berkeley National Laboratory. https://cdn.misoenergy.org/Quantifying%20the%20Potential%20of%20Electric%20Vehicles%20to%20Provide%20Electric%20Grid%20Benefits%20in%20the%20MISO%20Area354192.pdf. (last checked September 14, 2022).

Put simply, it is cheaper to pay individual utility customers to use batteries on wheels they have already bought-and-paid-for than it is to pay corporations to buy big batteries and park them on the grid. And that simple proposition holds true for both individual passenger vehicle drivers and for fleet managers whose HD EVs have even bigger batteries and higher power intake and output potential (meaning they can potentially both absorb more excess renewable energy when available and put more power back onto the grid when needed). [EPA-HQ-OAR-2022-0985-1608-A1, pp. 115 - 116]

Moreover, the revenues from participating in vehicle-grid integration programs and markets can create value streams that reduce the total cost of ownership of EVs for the driver or fleet operator. HD EVs have a variety of duty cycles and vehicle characteristics, including battery size and charging power. A particular vehicle segment or vocation may be better suited to providing power or other grid services than others. The California Joint Agencies Vehicle-Grid Integration Working Group found that a large number of vehicle use cases could provide value now in a variety of different vehicle-grid integration applications, including V2G applications. 260 [EPA-HQ-OAR-2022-0985-1608-A1, p. 116]

260 Final Report of the California Joint Agencies Vehicle-Grid Integration Working Group. (June 30, 2020). https://gridworks.org/wp-content/uploads/2020/09/GW_VehicleGrid-Integration-Working-Group.pdf

While many types of HD EVs could potentially provide V2G services, school buses are already doing so in the real world. They have defined duty-cycles during the school year that include significant portions of the day when they are sitting idle while solar generation peaks in the afternoon and when wind generation often peaks overnight. In the summer months, they can often be fully dedicated to providing energy storage and grid services. Many V2G school bus demonstration projects have been conducted or are in progress. A pair of early examples in California demonstrates how different approaches to power export can create revenue streams for school districts or school bus operators and support the grid in the process. A project in Torrance Unified School District uses energy stored in two electric school buses to power on-site electrical loads. This behind-the-meter solution saved the school district about $10,000 per year, by reducing power usage and demand charges. 261 A project in Rialto Unified School District is taking a different approach, using a front-of-the-meter grid interconnection to allow eight electric buses to generate revenue by participating as a distributed energy resource in the CAISO market. 262 [EPA-HQ-OAR-2022-0985-1608-A1, p. 116]

261 Nicole Schlosser. California district to receive first electric school bus in conversion project. (July 14, 2015). https://www.schoolbusfleet.com/10042977/california-district-to-receive-first-electric-school-bus-in-conversion-project; Kevin Matthews. V2B Background on EV V2G School Bus Demonstration Programs CEC Workshop on V2B for Resilient Backup Power. (January 2021). https://efiling.energy.ca.gov/getdocument.aspx?tn=236550

262 Kuba Szczypiorski. Blue Bird Electric School Bus. (Nd). https://cleanairnortheast.epa.gov/pdf/v2g/blue-bird-electric-bus-k-szczypiorski.pdf

Dominion Energy in Virginia has the largest electric school bus V2G program in the country. 263 In 2020, the utility program already had 50 electric school buses on the road. To date, the program has tested and verified V2G functionality on one bus and is deploying and testing firmware capability on the balance of the 50 bus fleet. 264 Over time, the program is designed to scale to 1,000 buses that will be able to provide 105 megawatt-hours of energy storage, enough to power 10,000 homes. 265 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 116 - 117]

263 Dominion Energy. Electric School Buses. Dominion Energy. https://www.dominionenergy.com/virginia/save-energy/electric-school-buses. (Last accessed: September 21, 2022).

264 DISTRIBUTECH International Conference. Insights from the Nations Largest V2G Electric School Bus Pilot. (February 7, 2023). slide 18. https://www.distributech.com/2023-distributech-international-conference-sessions/insights-from-the-nations-largest-v2g-electric-school-bus-pilot

265 Dominion Energy. Dominion Energy moves forward with electric school bus program. Dominion Energy. (2020). https://news.dominionenergy.com/2020-01-16-Dominion-Energy-Moves-Forward-with-Electric-School-Bus-Program; PJM Inside Lines. V2G Hits the Big Time with Dominion Electric School Bus Project. PJM Inside Lines. (2019). https://insidelines.pjm.com/dominion-to-roll-out-largest-electric-school-bus-deployment-in-u-s/

Organization: National Association of Clean Air Agencies (NACAA)

EPA also requests comment on the readiness of ZEV charging and refueling infrastructure. Specifically, EPA writes in the proposal that '. . .important early actions and market indicators suggest strong growth in charging and refueling ZEV infrastructure in the coming years. Furthermore, as described in Section II of this document, our analysis of charging infrastructure needs and costs supports the feasibility of the future growth of ZEV technology of the magnitude EPA is projecting in this proposal's technology package. EPA has heard from some representatives from the heavy-duty vehicle manufacturing industry both optimism regarding the heavy-duty industry's ability to produce ZEV technologies in future years at high volume, but also concern that a slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards. Several heavy-duty vehicle manufacturers have encouraged EPA to consider ways to address this concern both in the development of the Phase 3 program, and in the structure of the Phase 3 program itself. EPA requests comment on this concern, both in the Phase 3 rulemaking process, and in consideration of whether EPA should consider undertaking any future actions related to the Phase 3 standards, if finalized, with respect to the future growth of the charging and refueling infrastructure for ZEVs.'16 [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

16 Supra note 1, at 25,934

For reasons we explain earlier in these comments, NACAA does not share the concerns expressed by some representatives of the heavy-duty vehicle manufacturing industry about the ability of electric utilities and/or charging equipment and service providers to continuously meet the incremental rollout needs for ZEV charging and refueling infrastructure. NACAA firmly opposes an 'off-ramp' from the standards or any similar measure. Likewise, anything akin to a mid-term evaluation is unnecessary and inappropriate given the program will begin in just a few years, span the course of only five years and starts from a demonstrated baseline of vehicle and charging technology. NACAA strongly urges EPA to reject any such provisions. [EPA-HQ-OAR-2022-0985-1499-A1, p. 6]

There is a great deal of evidence, including what NACAA provides at the beginning of this section on our comments and recommendations, that points to the coming readiness of the charging and fueling infrastructure needed to support strong Phase 3 standards. The federal government has demonstrated its deep commitment to accelerating the transition to ZEVs by providing historic levels of funding and monetary incentives including for timely infrastructure. NACAA notes that given the importance of this federal funding to achieving meaningful nationwide reductions in GHG emissions, including from heavy-duty vehicles and engines, EPA should ensure that these funds are allocated equitably across the country. In addition to federal action, states and local areas are demonstrating leadership by undertaking their own infrastructure initiatives. These are helping to drive private investment to capitalize on these opportunities. The following a few examples. [EPA-HQ-OAR-2022-0985-1499-A1, pp. 6-7]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

Another substantial challenge is the generation and supply of electricity to charging stations. Every market participant that our membership communicates with is extraordinarily skeptical that electricity providers will be able to increase generation and transmission activity to service the kind of load necessary to provide charging infrastructure for this volume of HD trucks at scale within ten years. A recent analysis of grid upgrades necessary for HD electrification found that a single highway fast-charging site will require the same amount of electricity as a sports stadium or a small town.10 This will require the development of dedicated substations and significant energy resources behind the meter. EPA's Proposed Rule largely assumes that, with an increase in EV production, there will be a sufficient increase in electricity generation and transmission to meet those EV needs. Even when HD charging sites are financed, more than 50% of fleet operators already operating HD EVs report that building a charging site takes over a year on average.11 [EPA-HQ-OAR-2022-0985-1603-A1, p. 5]

10 Gideon Katsh, et al., CALSTART et al., 'Electric Highways: Accelerating and Optimizing Fast-Charging Deployment for Carbon-Free Transportation' (November 11, 2022) available at https://calstart.org/electric-highways-study/.

11 Saral Chauhan, et al., McKinsey & Co., 'Fleet decarbonization: Operationalizing the transition' (Dec. 20, 2022) available at https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/fleet-decarbonization-operationalizing-the-transition?stcr=5E41D3E4A0E44A8AB1251119CEF46775&cid=other-eml-alt-mip-

mck&hlkid=cf69cd78c86a42938ccdc7806b06c93d&hctky=14495856&hdpid=4eb1e872-7192-48d7-b6cb-0642d205d4c5.

On top of these challenges, the overarching structure of wholesale and retail electricity markets is not designed for—and is currently incompatible with—the retail diesel market. Currently, electric utilities monopolize both generation and access, and they experience shifts in supply and demand with little to no risk as they are able to pass on costs to ratepayers. These electric utilities routinely impose demand charges on commercial users of electricity added to a monthly utility bill. These charges are not based on the amount of electricity used by that business, but on the highest rate of usage the business has during the two fifteen-minute periods in a month in which the business draws electricity from the grid at the highest pace. EV fast chargers—a must-have for on-the-go charging such as those found at a truck stop or convenience store—draw extensive electricity from the grid to charge an EV quickly. To power HD diesel trucks, this would result in inordinate charges to a refueling location's monthly utility bill that it likely could not recover. There is simply no business case for electric truck charging in the United States. The Associations are actively working with state and federal policymakers to enhance this business case, but until there is a clearer light at the end of that tunnel, it makes little sense to put all of our heavy-duty decarbonization eggs in one basket. [EPA-HQ-OAR-2022-0985-1603-A1, pp. 5-6]

Organization: National Association of Manufacturers

Infrastructure Needed

According to the Department of Energy's draft National Transmission Needs Study released in February 2023, the national electric transmission infrastructure would need to grow 57% by 2035 to reach the administration's clean energy goals as it relates to the growing light-,medium- and heavy-duty vehicle industries.1 Yet at the historical pace of approximately 1% annual growth for these projects,2 the transmission system would require more than half a century to achieve the goals the administration hopes to achieve in little more than a decade. As such, the rulemaking must recognize the realities and limitations of current infrastructure, even as manufacturers urge administration officials and congressional leaders to prioritize policies that would strengthen transmission systems and infrastructure, including critical permitting reforms. [EPA-HQ-OAR-2022-0985-1649-A2, p. 1 - 2]

1 https://www.energy.gov/gdo/national-transmission-needs-study

2 https://repeatproject.org/docs/REPEAT_IRA_Transmission_2022-09-22.pdf

Organization: National Rural Electric Cooperative Association (NRECA)

EPA Should Account for Grid-side Investments in Proposed Rule's Analysis

Bearing these realities in mind, we write to express our significant concern that EPA has failed to adequately account for the costs associated with serving the new load that will be created via heavy-duty highway vehicle (HDV) electrification as outlined in this proposed rule. While EPA accounts for the cost to purchasers for the hardware and installation of charging equipment, EPA fails to include the electric grid-side upgrades that will likely be needed, if not now, certainly in the future as electrification spreads and this could have serious negative consequences to American consumers. Specifically, within the proposed rule section on

Charging Infrastructure Costs, EPA states:1 "there may be additional infrastructure needs and costs beyond those associated with charging equipment itself. While planning for additional electricity demand is a standard practice for utilities and not specific to BEV charging, the buildout of public and private charging stations (particularly those with multiple high-powered DC fast charging units) could in some cases require upgrades to local distribution systems." [EPA-HQ-OAR-2022-0985-1515-A1, p. 2]

1 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3, 88 Fed. Reg. 25,982 (April 27, 2023)

It is important for EPA to correct this failure in the proposed rule stage by updating its analysis with inclusion of a range of expected costs associated with serving the new load from the HDV fleet created by EPA's proposal. Failure to do so will likely result in unrealistic expectations on the part of fleet operators and possibly delay plans for electrification as they learn of the full costs that will be required to serve this new load from their electric cooperatives or other electric utilities. Neither these HDV fleet operators, nor the EPA, should expect that electric cooperatives can bear the burden of these new costs alone, particularly when these costs will ultimately need to be passed on to the end of the line consumer-members of the cooperative.[EPA-HQ-OAR-2022-0985-1515-A1, p. 2]

Overall, it is important for EPA to recognize that electrification of the transportation sector, and the increased flexibility of this newly electrified demand, will require substantial distribution infrastructure investment over time to meet increased average local electric demand and to meet increased demand in new locations (e.g., EV charging stations). Significant transmission infrastructure investment may also be required to meet increased average electric demand and changes in the spatial distribution of electric demand among load centers. According to the National Academy of Sciences, to transition the transportation sector through increased electrification, electric utilities will need to increase generation by up to 170% and see a three-fold expansion of the transmission grid by 2050. Over time, electrification of the transportation sector will require additional generation investment to ensure resource and energy adequacy to meet increased average electric demand and changing consumption profiles. Unfortunately, this investment challenge is becoming more complex due to several recent EPA actions that are jeopardizing flexible, dispatchable always available generation resources.2 These actions would require increased reliance on intermittent energy sources. Particular attention will be needed to ensure that generation investment is adequate in amount and in operational characteristics to meet the demands of electrification while ensuring grid stability, security, and reliability. [EPA-HQ-OAR-2022-0985-1515-A1, pp. 2-3]

2 These actions include: Supplemental Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 88 FR 18824 (March 29, 2023); National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 88 FR 24854 (April 24, 2023); Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Legacy CCR Surface Impoundments, 88 FR 31982 (May 18, 2023; New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, 88 FR 33240 (May 23, 2023); and Federal Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards, 88 FR 36654 (June 5, 2023).

Specific Costs for EPA to Consider Incorporating in the Proposed Rule's Analysis

Again, we urge EPA to update its analysis to account for the costs needed to make updates to the grid to support HDV electrification. Grid upgrade costs for EV charging will vary by region, neighborhood, cooperative, circuit, and feeder. However, to illustrate the types and ranges of costs that EPA should account for, we provide the following costs sourced from four different cooperative regions, broken down by charge level:

- Residential (Level 1 and Level 2): One out of three households will need an expanded electric panel to accommodate 240 V Breakers. If a household purchases two electric vehicles, then four slots on a breaker will be needed to accommodate this load. The average cost will be approximately $4,000 for a Level 2 residential charger with a panel upgrade.
    - Upgrading panel (20% of panels must be upgraded) ¡V can start around $600
    - Transformer upgrades - $2,600 and climbing
    - Service wire gauge upgrades to accommodate higher amperage - $3,000
- Public (Level 2 and DC Fast Charging (DCFC)): For commercial sites, transformer upgrade needs will vary. Most sites will already have three-phase power available; however, in very rural locations single-phase power will need to be upgraded to three-phase. If transformers do need to be upgraded on a three-phase line, then three transformers will need to be upgraded.
    - Level 2 charger including panel - approx. $4,000 on average
    - National EV Infrastructure Program (NEVI)-Compliant DCFC - approx. $25,000-$150,000
        - Transformer - $25,000 - $40,000 (reflects current prices for three transformers)
        - Service entrance - $3,000-$4,000
        - Metering package (including instrumentation, voltage transformers (PT) and current transformers (CT) - $2,000
        - Line extension, if required (site dependent) - $50,000 - $75,000 [EPA-HQ-OAR-2022-0985-1515-A1, pp. 3-4]

Circumstances vary across cooperatives, but some of these costs will be borne directly by the consumer-members and others will be paid for by the cooperative. Regardless, these costs help to illustrate more accurately the investment it will take to implement on EPA’s proposed rule. [EPA-HQ-OAR-2022-0985-1515-A1, p. 4]

We note that these costs reflect a snapshot estimate in time and are likely to increase, particularly due to the significant challenges and delays utilities are facing in their supply chains, which are contributing to an unprecedented shortage of the most basic machinery and components essential to ensure the continued reliability of the electric grid. Electric cooperatives are waiting a year, on average, to receive distribution transformers. Additionally, lead times for large power transformers have grown to more than three years. And orders for electrical conduit have been delayed five-fold to 20 weeks with costs ballooning by 200 percent year-over-year. As a result, new projects are being deferred or canceled, and electric cooperatives are concerned about their ability to respond to major storms due to depleted stockpiles. We expect these supply chain challenges to persist with the increased demand for electrification projects being incentivized by the U.S. federal government. All these delays will likely impact the cost and timing of charging infrastructure buildout needed to support the HDV fleet electrification envisioned in this proposed rule. [EPA-HQ-OAR-2022-0985-1515-A1, p. 4]

Organization: NTEA - The Association for the Work Truck Industry

MY 2027 Target - EV Infrastructure Needs

The proposal calls for 20% of vocational trucks be a ZEV by MY 2027. This time frame does not seem possible given the resources needed to achieve such a goal in a compressed amount of time. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

As an industry, companies involved in the manufacture and distribution of work trucks (manufacturers of truck chassis, bodies, equipment and final assembly) will require EV charging equipment and power that has not previously been required for their facilities. While these producers of work trucks may not need the recharging capacity of a major truck fleet, they will need to provide charging for all of the EV chassis at their facility for assembly or alteration. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Much like truck dealers who will need EV charging infrastructure, anecdotally, NTEA has been informed that one of the biggest initial challenges is the availability of electricity from local utilities. In some cases, EV charging equipment is available but they can't yet be installed without agreement for power from the utility company, which appears could in some cases be multiple years away. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Based on the current statutory and regulatory landscape, it is assumed that the highest initial energy needs for medium- and heavy-duty vehicle charging is likely to occur in those states that have adopted California's Advanced Clean Trucks rule. While prioritizing charging infrastructure along freight corridors within these states may be a prudent approach, many vocational trucks are not necessarily involved in moving freight but rather accomplishing work tasks at whatever location is required – whether it be along a freight corridor or on a side street or in a rural area. [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Given the long lead times involved in building power generation capacity and electric transmission systems, the NTEA questions if the aggressive time frames being mandated for the phase-in of medium and heavy-duty vocational trucks is possible. Will the operators of the wide variety of work trucks have access to charging when and where they will need it in order to complete their vocational missions within the existing timeframe? [EPA-HQ-OAR-2022-0985-1510-A1, p. 4]

Organization: RMI

Electric Grid

One of the key challenges to truck electrification is about the ability for the grid to meet electric charging infrastructure demand and this is commonly cited as a key concern in electrifying fleets. Fully electrifying trucking would increase current national electricity consumption by almost 10% and create uneven, local impacts. The electric distribution system will require new infrastructure to support electric truck load.19 By 2035 our grid must be prepared to add 230 TWh of new truck electricity demand, including power for nearly 150,000 fast public chargers and 860,000 depot chargers.20 Building this new infrastructure requires time and costs that are or will soon be the limiting factor in truck decarbonization. Forward-looking fleets, utilities, and regulators are beginning to reimagine business practices, infrastructure planning, and building decisions [EPA-HQ-OAR-2022-0985-1529-A1, p. 8]

19 'Use of electricity,' U.S. Energy Information Administration (EIA), Accessed April 27, 2023, https://www.eia.gov/energyexplained/electricity/use-of-electricity.php.

20 Kahn et al., The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, RMI, August 25, 2022, https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

There are not that many electric trucks compared with the 750,000 electric passenger cars on the road, but adoption of electric trucks does not look the same as the adoption of electric passenger vehicles.21 While utilities generally support and facilitate electric car adoption, e-truck adoption will be more rapid than what utilities have seen so far due to the fleet nature of trucks. Once a fleet is convinced of e-trucks' reliability, capability, and economics, it will be ready to purchase vehicles. Fleet managers, as professional consumers, can act more decisively than consumers hindered by unfamiliarity and range anxiety, if they are not limited by either the grid or vehicle availability.22 [EPA-HQ-OAR-2022-0985-1529-A1, p. 8]

21 Zachary Shahan, 'US Electric Car Sales Increased 65% In 2022,' CleanTechnica, February 25 2022, https://cleantechnica.com/2023/02/25/us-electric-car-sales-increased-65-in-2022/.

22 Kahn et al., Preventing Electric Truck Gridlock, RMI, 2023 https://rmi.org/insight/preventing-electric-truck-gridlock/?utm_medium=email&utm_source=spark&utm_content=spark-a&utm_campaign=2023_06_01

The truck depots need megawatts of power at a scale that utilities aren't yet mobilized to address. And while providing new power in new places is a big challenge for utilities, it is at least an extension of their core business. For fleets, electrifying a depot can be foreign, an additional new requirement on top of understanding how e-trucks operate differently in the field. The economics of procuring power, installing chargers, and managing charging power and time are just some of the new skills fleets need to succeed with electric trucks. [EPA-HQ-OAR-2022-0985-1529-A1, p. 8]

There are some 'no regrets' actions that can make the process better, but there is no getting around the fact that utilities, regulators, and fleets will need to change their business practices to electrify trucking.23

1. Determine where load growth will be to plan accordingly
2. Streamline procedures with updated regulatory requirements
3. Provide utilities with regulatory incentives to update the grid
4. Embrace proactive grid planning [EPA-HQ-OAR-2022-0985-1529-A1, p. 8]

23 Kahn et al., Preventing Electric Truck Gridlock, RMI, 2023 https://rmi.org/insight/preventing-electric-truck-gridlock/?utm_medium=email&utm_source=spark&utm_content=spark-a&utm_campaign=2023_06_01

Organization: Schneider National Inc.

Grid side improvements do not appear to be factored into the Proposed Rule's costs. The EPA's Proposed Rule assumes grid updates are going to be paid by utility.

- The upfront capital costs for the grid improvements may be paid by the utilities; however, the utilities will undoubtedly seek to recoup the costs via rate recovery. As a result, the costs will ultimately be borne by the utility's customers via rate increases and higher utility bills.
- The costs to upgrade infrastructure at the ZEV charging sites will be solely borne by the owner or user of the site, whether it is an owned site or leased site. [EPA-HQ-OAR-2022-0985-1525-A1, pp. 2 - 3]

Organization: State of California et al. (2)

Our States and Cities do not anticipate significant concerns about the electrical grid's ability to support the additional energy needs created by vehicle electrification. A case study shows that in 2040, battery-electric truck energy needs represent 3 percent of electricity production in the United States in 2021; however, the International Council on Clean Transportation notes that a "3 [percent] increase in grid capacity will not necessarily be needed, since the existing infrastructure can be leveraged through demand management and minor distribution network upgrades."205 There are also efforts underway by utilities and transmission organizations to put electrified vehicles to work for the grid. For example, the public power utilities in Austin, Texas conducted a pilot project with the US Department of Energy that incorporated use of electric vehicles as a way to add stability to the power grid via vehicle-to-grid, or V2G, charging,206 as has San Diego Gas and Electric.207 Ultimately, the decisions needed to respond to a modest increase in energy demand required by increasing numbers of electric vehicles will take place at the state public utility commission, grid operator, and utility level, as they are appropriately situated to plan for and respond to those changes in demand. These are routine plans and adjustments that these entities make as a matter of course. Indeed, utilities may be uniquely well situated to make the "distribution level" updates, and "smart charging and pricing schemes" that will respond to the changing energy needs of increasing electric vehicles.208 And, as EPA correctly notes, the power sector and its regulators have responded to much larger changes in demand—including from increased use of electrical equipment—over similar (or smaller) timeframes.209 [EPA-HQ-OAR-2022-0985-1588-A1, pp.28-29]

205 ICCT, Charging Solutions for Battery-Electric Trucks (Dec. 22, 2022), https://theicct.org/publication/charging-infrastructure-trucks-zeva-dec22/; see also Grid Modernization Laboratory Consortium, Electric Vehicles at Scale – Phase I Analysis: High EV Adoption Impacts on the Western U.S. Power Grid (July 2020), https://www.pnnl.gov/sites/default/files/media/file/EV-AT-SCALE_1_IMPACTS_final.pdf.

206 Austin Energy, Final Deliverable Reports, Austin SHINES Research for the U.S. Dep't of Energy (July 31, 2020), https://austinenergy.com/green-power/austin-shines/final-deliverable-reports.

207 Robert Walton, California OKs $100M SDG&E commercial EV charging plan, testing electric buses as grid assets, Utility Dive (Aug. 16, 2019), https://www.utilitydive.com/news/california-oks-100m-sdge-commercial-ev-charging-plan-testing-electric-bu/561071/.

208 ICCT, Charging Solutions for Battery-Electric Trucks (Dec. 22, 2022), https://theicct.org/publication/charging-infrastructure-trucks-zeva-dec22/, at 15.

209 88 Fed. Reg. at 25,983.

Organization: Truck Renting and Leasing Association (TRALA)

The annual rate at which U.S. grid infrastructure needs to expand to maximize the potential of the new clean-energy tax breaks under the Inflation Reduction Act (IRA) of 2022 is 2.3%.2 If expansion continues at the current rate of around 1% a year, 80% of the emissions-reduction potential of those incentives will be lost and CO2 emissions will be 800 million tons a year higher in 2030.3 The advancement of transmission infrastructure will make or break America's energy transition for the freight sector. [EPA-HQ-OAR-2022-0985-1577-A1, p. 4]

2 Jenkins, J.D., Farbes, J., Jones, R., Patankar, N., Schivley, G., 'Electricity Transmission is Key to Unlock the Full Potential of the Inflation Reduction Act,' REPEAT Project, Princeton, NJ (September 2022).

3 Id.

Organization: Valero Energy Corporation

Significant investments in charging/fueling infrastructure will also be needed. The CEC has projected that an additional 157,000 chargers will be needed to support California's anticipated electric HD population in 2030—all of these will be DCFC, representing 9,100 additional job-years of dedicated workforce requirements, compounding timeline feasibility challenges. CEC further projects that the HDV charging network will see loads "in excess of 2,000 MW around 5 p.m. on a typical workday," further exacerbating the existing gap between net peak energy demand and existing generation. [EPA-HQ-OAR-2022-0985-1566-A2, p. 41.]

195 https://www.nytimes.com/2022/09/01/us/california-heat-wave-flex-alert-ac-ev-charging.html

Twelve states expressed concerns regarding electrical grid and utility impacts in their DOT-approved state EV Infrastructure Deployment Plans, as summarized below. While the plans primarily focus on infrastructure to be installed along designated alternative fuel corridors, the concerns relating to grid and utility impacts are similarly applicable to depot and truck parking stations. EPA has not accounted for these concerns in its analysis. [EPA-HQ-OAR-2022-0985-1566-A2, p. 41.] [See the table of State Concern on page 41 of docket number EPA-HQ-OAR-2022-0985-1566-A2.]

Additionally, within California there are significant challenges to be overcome in order to build the infrastructure necessary to support freight electrification under the CARB Advanced Clean Trucks and Advanced Clean Fleets rules. The California Public Utilities Commission (CPUC) recently identified the need for an accelerated electrical infrastructure deployment as a challenge for forecasting and planning, with approximately three years lead time needed for statewide planning efforts to be completed and infrastructure authorized.208 Indeed, in the six priority corridors alone, which doesn't account for more rural routes, California would need between 556 and 1,832 public BEV charging stations by 2040.209 For comparison, California currently has approximately 5,000 retail diesel stations statewide as of 2021.210 As a result, there are risks that could negatively impact MD and HD adoption including uncertainty regarding long-term electricity rate, delayed construction of distribution/transmission infrastructure, and differences in charging behavior from what was assumed in the planning stages (which would result in an infrastructure buildout that doesn't align with actual charging behavior).211 Clearly, there will be significant shortfall in resources in California alone to meet the needs of the freight electrification push, let alone the entire nation, as contemplated by the instant proposed rule. [EPA-HQ-OAR-2022-0985-1566-A2, p. 43

208 California Public Utilities Commission, Energy Division Webinar, "Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning" at 22 (May 22, 2023), https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/fip-draft-staff-proposal_5_22_23-webinar-final_ver2.pdf.

209 Id. at p. 60.

210 Id.

211 Id. at p. 28.

Organization: Volvo Group

Nevertheless, governance of the electricity industry is exceedingly fractured in terms of geography, purview, and governing entities, with more than 3,000 separate power/electric utilities across the United States. California stakeholders have had years to gain experience and prepare for this transition. Other states with much less experience and more resistant stakeholders will make it virtually impossible to successfully extend the ZEV penetration rates of the Advanced Clean Truck Regulation to a national level. [EPA-HQ-OAR-2022-0985-1606-A1, p. 7]

Finally, utilization of medium and heavy-duty ZEVs, together with the continued growth in electric passenger vehicles will place unprecedented demand on the grid, particularly during peak hours. While all ZEV owners will be sensitive to charging prices, the elasticity of demand for commercial ZEVs is much more sensitive to electricity price and reliability than for light-duty vehicles. Significant expansion of transmission lines and distribution infrastructure (circuits/feeders) will require utility investment; however current industry norms enable utilities to build additional capacity only after increased demand is assured. This process, while logical for meeting residential and commercial building needs, undermines the assurance fleets will demand before ordering more than a couple of pilot trucks. [EPA-HQ-OAR-2022-0985-1606-A1, p. 8]

Organization: Zero Emission Transportation Association (ZETA)

c. Electricity Generation and Grid Readiness

Transitioning to zero-emission transportation offers a unique challenge to the energy companies that will need to ensure they have ample electricity supply to match EV-driven demand. At minimum, this will require investments in the electricity distribution system to enable the deployment of electric vehicle charging equipment. In some instances, this may also require investing in new energy generation sources and associated distribution system infrastructure to accommodate major EV centers like heavy-duty vehicle depots or co-locate other necessary amenities. [EPA-HQ-OAR-2022-0985-2429-A1, p. 29]

However, this is not the first time electricity providers have navigated increases in electricity demand brought on by new technologies: similar spikes accompanied the mass adoption of now-standard appliances like refrigerators and in-home air conditioners. Still, it will be important to ensure that providers and government agencies can work within their regulatory frameworks to test solutions and upgrade the grid to prepare for future demand increases accompanying greater EV adoption. [EPA-HQ-OAR-2022-0985-2429-A1, p. 29]

This section will discuss the growing energy demands of widespread EV adoption and new potential hotspots for energy demand. It will also use case studies to highlight how electricity providers are preparing for this transition. These case studies showcase solutions that have the potential to revolutionize energy consumption and highlight how electricity providers support customer EV adoption through incentive programs, building infrastructure, and other initiatives. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 29 - 30]

The grid's ability to handle millions of additional EVs hinges on utilities' proactive planning capacity. Granting utilities the flexibility to make proactive upgrades to the electrical grid and facilitate transportation electrification will require careful planning and coordination between regulators and stakeholders. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

Regulatory certainty will allow utilities to make the investments necessary to facilitate a smooth EV transition. To invest proactively, rather than in response to firm load, energy providers will need clear insight into multi-year schedules for customer electrification, approval from regulators to recover costs, and/or flexibility to serve loads with non-wire alternatives. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

Robust EPA emission standards will provide the regulatory certainty needed to not only ensure vehicle manufacturers continue to invest in EV technologies, but that the entire supply chain supporting the transition to electrification will have a clearer picture of how to plan capital expenditures today to meet the increased demand over the coming years. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

i. Anticipated impacts to electricity providers from increased EV deployment

In 2021, the U.S. fleet of electric vehicles used 6.1 terawatt hours (TWhs) of electricity to travel 19.1 billion miles.125 That accounted for just 0.15% of the total national energy generation that year.126 In 2022, the United States produced 4,243 TWhs of electricity.127 To meet the demand of transportation electrification, more generation will be needed to service EVs and electrified vehicle technologies. One estimate suggests it would take roughly 800 to 1,900 TWh of electricity to power all vehicles if they were electric.128 It is important to remember, however, that this new demand will not occur all at once but rather more gradually as EVs continue to displace ICEVs. While achievable, meeting this increase in electricity demand will require significant strategy as electric providers transition to renewable, carbon free resources. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

125 "Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010–2021," Argonne National Lab, November 2022 https://publications.anl.gov/anlpubs/2022/11/178584.pdf

126 "Monthly Energy Review May 2023," EIA, https://www.eia.gov/totalenergy/data/monthly/pdf/sec7_3.pdf

127 Id.

128 "How much electricity would it take to power all cars if they were electric?," USAFacts, (May 15, 2023) accessed June 13, 2023 https://usafacts.org/articles/how-much-electricity-would-it-take-to-power-all-cars-if-they-were-electric/

The key to meeting these energy requirements will be the expansion of renewable energy resources but also the addition of new, zero-emission and low-emission load-following resources like advanced nuclear, carbon capture, long-term energy storage, and green hydrogen. In

2022, electricity generated from renewable sources surpassed coal for the first time in U.S. history.129 At the same time, electricity providers are looking at ways to add low-cost energy storage to increase the availability of non-dispatchable renewable generation such as solar and wind. Currently, renewable energy generates about 20% of all electricity production in the U.S, and renewable sources like solar and wind are expected to account for the majority of new utility-scale electricity generation going forward.130,131 Already, available renewable energy resources in the U.S. are estimated to amount to more than 100 times the nation's current electricity needs.132 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 30 - 31]

129 "U.S. renewable electricity surpassed coal in 2022," Associated Press, (March 28, 2023), accessed June 4, 2023 https://apnews.com/article/renewable-energy-coal-nuclear-climate-change-dd4a0b168fe057f430e37398615155a0

130 "Renewable Energy," Department of Energy, accessed June 4, 2023 https://www.energy.gov/eere/renewable-energy

131 "Solar power will account for nearly half of new U.S. electric generating capacity in 2022," EIA, (January 10, 2022) https://www.eia.gov/todayinenergy/detail.php?id=50818

132 "Renewable Energy Resource Assessment Information for the United States," Department of Energy, accessed June 4, 2023 https://www.energy.gov/eere/analysis/renewable-energy-resource-assessment-information-united-states

133 "Yes, the grid can handle EV charging, even when demand spikes," Yale Climate Connections, (March 23, 2023) accessed June 4, 2023 https://yaleclimateconnections.org/2023/03/yes-the-grid-can-handle-ev-charging-even-when-demand-spikes/

Power generation is only one of the considerations when preparing for 100% transportation electrification. In particular, the industry needs to develop its ability to precisely manage demand in real time, including by accurately predicting when and where increases in demand will occur. [EPA-HQ-OAR-2022-0985-2429-A1, p. 31]

It is important to note that energy demand is not constant. Instead, it consists of relatively predictable peaks and troughs throughout the day. High demand consistently occurs between 5:00 PM and 8:00 PM each day, as customers return home, turn up their climate control systems, begin cooking dinner, and turn on other devices.133 System demand peak is typically between 5:00-6:00 PM during the summer, and 7:00-8:00 AM in the winter. As such, EV charging poses minimal impacts to the winter peak hours but could increase summer peaks without managed charging. [EPA-HQ-OAR-2022-0985-2429-A1, p. 31]

ii. Utility-specific planning underway

The following collection of case studies demonstrates how electricity providers in ZETA's membership are preparing for the EV transition and highlights some of their groundbreaking initiatives to support EV adoption in the United States. It should be noted that each provider operates within a regulatory framework that is unique to the state in which it serves. The cases outlined below do not represent the entire portfolio of EV-related products and services offered by these providers. [EPA-HQ-OAR-2022-0985-2429-A1, p. 31]

These examples include programs that exist across the EV supply chain, with earlier examples covering infrastructure planning programs and later examples focusing on programs to engage with EV drivers on their charging needs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

1. Pacific Gas & Electric

As California's largest electric provider, PG&E continues to play an important role in advancing electric vehicle adoption in support of the state's broad climate goals. PG&E works in collaboration with the California Energy Commission and California Public Utilities Commission to plan and approve grid infrastructure upgrades to support this shift to zero-emission transportation. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

With nearly 500,000 EVs sold in its service area—one in every seven of all EVs on the road throughout the nation—expansion of PG&E's EV charging network in Northern and Central California is critical to support the State's transition to a clean transportation future. Over the last half-decade, the provider has deployed more than 5,000 EV charging ports across its service area. Additionally, it offers a variety of resources to help accelerate EV adoption among customers, and PG&E is working collaboratively with vehicle manufacturers to develop vehicle grid-integration technologies. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

Grid planning requires precise forecasts to ensure electric infrastructure is available to support future demand. Pre-existing electricity demand (load) forecasts did not provide the geographical granularity needed to best plan for grid investments. PG&E could allocate the load to residential charging locations; however, larger charging loads that are often not associated with existing service points—such as public charging systems—lacked a methodology to be accounted for in long-term forecasting efforts. Without the ability to identify future EV demand with geographic and temporal accuracy, PG&E was limited in its ability to plan future grid capacity. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

Lacking a long-term geospatial forecasting methodology, PG&E was primarily dependent on customer requests for service to inform where EV load would materialize. This reliance on customer requests led PG&E to reactively develop capacity solutions to serve load requests. Given the long lead times often associated with capacity projects and the relatively fast pace at which customers wish to build EV charging infrastructure, there would be instances where energization timelines exceeded the requested energization date from customers. This can occur with large load applications associated with public DCFC charging stations or large fleets, which have the potential to exceed the maximum capacity of existing electrical infrastructure in those areas. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

Identifying a need for a more proactive approach, PG&E set out to improve its forecasting abilities to increase the clarity of where and when EV loading is most likely to materialize. This enables PG&E to build capacity in advance of service applications being received. Although research indicates that customer preference for EVs is increasing, and there are many regulations and incentives which further support the transition to EVs, there are still uncertainties around the pace of adoption. This impacts how the EV load will manifest on the electric grid. For this reason, a solution capable of supporting a variety of forecast scenarios was necessary for success. PG&E commissioned a multi-faceted project focused on three common categories of EV charging load: 1) public DCFC & Level 2 charging stations, 2) residential EV charging, and 3) fleet charging. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 32 - 33]

Detailed analysis and machine learning modeling and testing were applied to each of these focus areas to predict where EV charging is most likely to occur. These analyses were performed at the premise level and resulted in over 5 million potential growth points across PG&E's service territory that were integrated into existing distribution planning software. This created a dynamic tool that can adapt to a variety of forecast inputs, such as system-level adoption forecasts, EV charging behaviors, and charging infrastructure assumptions. These scenarios can be integrated into PG&E's distribution planning processes. [EPA-HQ-OAR-2022-0985-2429-A1, p. 33]

Developing a solution that was easily integrated into existing distribution planning processes and software was critical for successful implementation. Involving PG&E forecasting and asset planning teams in the development of the EV forecasting tool, as well as reviewing and approval of the major inputs and assumptions used to develop forecast scenarios, ensured alignment in the scenarios generated. [EPA-HQ-OAR-2022-0985-2429-A1, p. 33]

In figure 7 above, the difference in magnitude of localized EV load in the year 2035 can be seen in a relatively low EV adoption scenario (2020 California Energy Commission (CEC) Integrated Energy Policy Report (IEPR Mid)) and a higher policy-based scenario based on the California Air Resources Board (CARB) Multiple Source Strategy (MSS) forecast. Grid planners can use this tool to investigate and solve for circuit level impacts of EV load growth. [EPA-HQ-OAR-2022-0985-2429-A1, p. 34.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 34, for Figure 7. This Figure was redacted]

Using varying EV forecast scenarios, PG&E was able to assess the localized grid impacts from high EV adoption scenarios that are better aligned with state transportation electrification goals and policies. PG&E assessed how various levels of EV adoption, as well as the impacts that changing charging behaviors (such as on vs. off-peak charging), can have on grid needs. Early analysis has indicated that off-peak charging can reduce near-term grid constraints. In the future, this may lead to new circuit peaks and capacity constraints that must be addressed. [EPA-HQ-OAR-2022-0985-2429-A1, p. 34]

Results from these analyses were helpful in advocating for approval of higher transportation electrification forecasts with regulators and the state energy commission, which are ultimately used for electric grid planning. PG&E has also used these forecasts to produce directional assessments of the resources needed to support capacity investments included in their long-term capital planning. PG&E continues to work to improve its forecasting and planning capabilities. Still, the solutions implemented to date have enabled a more robust approach that will allow PG&E to continue to support its customers' electrification transition. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 34 - 35]

2. Vistra

Electricity generators are making the transition to low- and no-carbon-emitting sources of energy as quickly as possible in response to investor, regulator, policymaker, and customer expectations. This transition is backed by a strong business case for doing so, as renewables and battery storage systems are able to compete effectively with fossil fuel generation and provide benefits to the power grid. The International Energy Agency expects renewable energy resources to provide 18% of the world's power by 2030, up from 11.2% in 2019.134 However, certain renewable energy sources—such as solar and offshore/onshore wind—are dependent on weather conditions and the time of day. This means deploying these resources at scale will require accompanying battery technology to ensure electric grid reliability. [EPA-HQ-OAR-2022-0985-2429-A1, p. 35]

134 “Modern renewables,” IEA, accessed June 4, 2023 https://www.iea.org/reports/sdg7-data-and-projections/modern-renewables

Energy storage allows for the integration of more intermittent resources by storing electricity until it is needed. It also augments existing energy generation by allowing excess energy to be produced when low demand is stored until demand peaks. Energy storage can provide benefits beyond emissions reduction, including cost-savings for consumers, reliability, and backup and startup power during extreme events. [EPA-HQ-OAR-2022-0985-2429-A1, p. 35]

Vistra operates the Moss Landing Energy Storage Facility in California, the largest of its kind in the world, and is pursuing an expansion that will bring 750 MW online in the second quarter of 2023.135 This facility is particularly valuable in California, where the swift transition to renewable energy, paired with a constantly growing demand for electricity, illustrates the need for reliability in the electric grid and the role energy storage can play. As of 2021, non-hydroelectric renewables provide approximately 35% of California’s electricity, and electricity demand has increased due to a variety of factors, including severe weather events, widespread electrification, and electric vehicle deployment.136 This combination was put to the test in September 2022, when the state faced its most extreme September heat event in recorded history. This weather event put unprecedented strain on the electric grid and set records for electricity demand. To the surprise of many, the lights stayed on. During that event, batteries, including Vistra’s Moss Landing facility, provided about 4% of supply—over 3,360 MW, more than the Diablo Canyon nuclear power plant (the state’s largest electricity generator)—during the peak demand, averting rolling blackouts. A report from the California Independent System Operation (CAISO) following the September 2022 event specifically highlighted the increase in energy storage resources as a key factor that supported the grid’s reliability.137 As a comparison, the August 2020 heat wave, which occurred when California’s energy storage resources were few and far between, resulted in rolling blackouts over multiple days. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 35 - 36]

135 “Vistra Announces Expansion of World’s Largest Battery Energy Storage Facility,” Vistra, accessed June 4, 2023 https://investor.vistracorp.com/2022-01-24-Vistra-Announces-Expansion-of-Worlds-Largest-Battery-Energy-Storage-Facility

136 “2021 Total System Electric Generation,” California Energy Commission, accessed June 5, 2023 https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation

137 “California ISO posts analysis of September heat wave,” California ISO, accessed June 5, 2023 http://www.caiso.com/Documents/california-iso-posts-analysis-of-september-heat-wave.pdf

Recognizing that the replacement of fossil fuel-powered assets with zero-carbon resources is not a one-to-one exchange, Vistra is working to maintain reliability by using energy storage and installing zero-carbon investments on the sites of retired or soon-to-be-retired fossil fuel plants. This also ensures that communities do not lose key energy supplies or ongoing tax revenue. Vistra is also focused on ensuring that existing zero-carbon generation remains online, such as the Comanche Peak Nuclear Power Plant in Texas, which is currently going through the Nuclear Regulatory Commission’s relicensing process to continue operations through 2053. This high-performing plant is able to produce power—rain, snow, or shine—increasing grid reliability for Texans and making it a keystone generator for the Electric Reliability Council of Texas (ERCOT) grid. Alongside the transition to cleaner generation resources, Vistra has been able to maintain reliability for its consumers and ensure that individuals and businesses are able to keep their lights on, even during extreme weather events. During Winter Storm Uri in Texas in 2021, Vistra's plants produced between 25-30% of the power on the grid during the storm, far beyond its ~18% market share. [EPA-HQ-OAR-2022-0985-2429-A1, p. 36]

As the energy supply mix shifts toward low- and zero-carbon resources, energy storage will fill the reliability gap and allow that mix to evolve more reliably and flexibly. The Inflation Reduction Act provides new tax incentives for investment in energy storage technologies and resources to support the R&D of advanced and long-duration energy storage technologies. These investments will enable the deployment of utility-scale energy storage and add reliability to the grid, no matter what the future energy generation mix looks like. It is crucial that the United States continues to make the transition to a carbon-neutral economy and electric grid in a way that ensures the continued reliability of the grid at a reasonable cost to consumers. [EPA-HQ-OAR-2022-0985-2429-A1, p. 36]

3. Southern California Edison: Preparing the Grid for EV Adoption

About 40% of the nation's electric vehicles, more than 1.3 million, have been sold in the state of California. More than 430,000 of those are in SCE's service area alone. Many have expressed doubts that the grid is ready for the energy demand created by the need to charge so many EVs, but electric power companies, including SCE, are keeping up with increasing levels of adoption. [EPA-HQ-OAR-2022-0985-2429-A1, p. 36] In anticipation of growing EV demand in Southern California, SCE is continuously taking the steps to upgrade the grid and promote customers' transition to electric transportation and proactively solve near-term issues, while also undertaking long-term investments to ensure the grid is ready for all levels of anticipated electrification adoption. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

Solving near-term challenges

One way SCE is addressing the near-term issues is its Power Service Availability (PSA) initiative for Transportation Electric service

- SCE is focusing on (1) improving its internal processes to streamline interconnection, (2) engaging fleet operators to better understand their plans for electrification, (3) improving its ability to forecast and assess the impacts of transportation electrification (TE) growth, and (4) leveraging new technologies as grid infrastructure solutions
- Because some projects require more time than others to build, SCE is encouraging fleet owners to engage with the utility early in the process so that SCE can better understand and plan for the fleets' needs [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

SCE is also improving how we partner with customers to meet their needs.

- This includes streamlining buildout, developing deeper customer engagements that include rate planning and load management education, and right-sizing grid solutions to meet the expected charging demand growth in both the near and long term. These efforts will provide more innovative and customer-focused solutions. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

In addition to customer project deployment, SCE has also pushed to accelerate EV adoption through customer-side infrastructure programs such as Charge Ready for light-duty vehicles.

- Through its Charge Ready program, SCE installs, maintains, and covers installation costs for charging infrastructure while participants own, operate, and maintain the charging stations. For those ready to invest in EV charging for medium- and heavy-duty vehicles, SCE's Charge Ready Transport program similarly offers low- to no-cost site upgrades to support the installation. The program provides funding to help electrify semi-trucks, buses, and delivery vehicles, among others. Through its Charge Ready programs, SCE has installed more than 3,000 charging ports throughout its service area and is targeting 30,000 charging ports by 2026. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

SCE's Transportation Electrification Advisory Services program is also available for commercial customers considering electric transportation options.

- On top of offering educational webinars and workshops, the program also offers to develop site-specific EV-readiness studies to help determine the feasibility of proposed projects and grant writing assistance to help customers secure zero-emission vehicle grants. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

Long-term Planning and investing in the grid for TE

SCE is improving the value of EV adoption forecasts used for grid planning by assessing where, when, and how much EVs are likely to charge.

- SCE led the West Coast Clean Transit Corridor Initiative, composed of nine other electric utilities and two agencies representing more than two dozen municipal utilities, to conduct a multi-phase and multi-year research study to forecast EV truck populations and determine the proper number and size of highway charging sites. Subsequent phases of this initiative are supporting internal planning operations across the participating utilities.
- SCE developed a new forecasting approach for Medium-Duty / Heavy Duty (MDHD) vehicles for the recent General Rate Case (GRC) Application.
    - Because MDHD electrification is still nascent, current forecasting methodologies that are based (in part) on historical adoption are insufficient
    - For the GRC, SCE's new forecasting methodology leverages MDHD fleet industry data to more accurately predict MDHD electrification adoption and corresponding grid needs
    - SCE (and the IOUs) are collaborating with CPUC on a new "Freight Infrastructure Planning" (FIP) Framework to further address planning for MDHD
- SCE is working to expand the current distribution planning forecast window from 10 years to 20 years. Developing and implementing an interagency-sponsored forecast that spans 20 years for distribution will bring benefits, such as:
    - Identifying long lead time projects that are needed beyond the 10-year horizon
    - Identifying important land acquisition needs
    - Informing how the development of infrastructure may need to be levelized to practically achieve the scale of development required by achieving state ZEV policies and GHG targets
- SCE has proposed robust investments in its GRC application to support TE adoption and load growth.
    - The investments proposed are designed to ensure long-lead infrastructure projects (such as new or expanded substations) will be completed when load growth

arrives. The plan especially focuses on high TE locations: freight corridors, fleet hubs, Port of Long Beach, etc.

- Specific TE-focused projects include: [EPA-HQ-OAR-2022-0985-2429-A1, p. 38.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, pages 38-39, for Figure of TE-focused projects]

4. Con Edison

Con Edison is helping to accelerate New York State's transition to clean transportation and EV adoption through grid and customer investments that support buildout of a widespread charging network. The Company's PowerReady Program provides incentives to connect thousands of new public and private charging stations to the electric grid. Authorized by the New York State Public Service Commission's July 2020 Order Establishing Electric Vehicle Infrastructure Make-Ready Program and Other Programs, the program offsets the electric infrastructure costs associated with installing chargers for light-duty EVs, including cars and small vans. To date, nearly 4,000 Level 2 and 175 DCFC chargers have been installed under the program, with the goal of installing 18,539 Level 2 and 457 DCFC chargers by 2025, with the potential for significant expansion of the program budget and goals as recently recommended by the New York State Department of Public Service Staff. The Company provides a similar pilot program for medium- and heavy-duty (MHD) vehicles, and a full-scale program is being considered in the recently launched New York State proceeding to address barriers to MHD charging infrastructure (MHD Proceeding). [EPA-HQ-OAR-2022-0985-2429-A1, p. 39]

Along with these infrastructure incentive programs, Con Edison also offers the SmartCharge New York managed charging program that provides incentives for personal drivers to charge outside of grid peak periods and the Company is launching a commercial managed charging program later this year including eligibility for all fleets, public stations, and multi-unit dwellings. SmartCharge New York is discussed below as an example of how managed charging can help mitigate the impact of EV charging on the grid. [EPA-HQ-OAR-2022-0985-2429-A1, p. 39]

An essential step in EV charger buildout is interconnection with the grid. Con Edison has developed dedicated teams that support the growing number of EV charging interconnections, including those that provide load evaluation, engineering review, project queue management, and incentive deployments. The Company is implementing multiple efforts to improve the customer experience and speed interconnection timelines and will continue to identify and implement efficiencies and improvements. For example, the Company provides pre-application advisory services for fleets and other customers to evaluate site feasibility and understand electric fueling costs, automates internal processes such as service rulings for smaller stations, and is coordinating with permitting agencies to identify and resolve challenges. Con Edison provides load-serving capacity maps to help those seeking to install EV charging infrastructure identify suitable sites with adequate grid capacity. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 39 - 40]

While Con Edison is supporting installation of increasing numbers of EV chargers under its programs today, the Company is also working to evolve its robust planning processes to prepare for the ramp in clean transportation loads. These loads are expected to drive significant grid impacts in New York State and ambitious emissions regulations will further accelerate an already rapidly growing EV market, with the exact timing in the inflection point unknown. The timeline to install EV chargers is relatively short compared to that of other new customer infrastructure, such as a new building, while the buildout of utility-side grid infrastructure to meet the significant increase in demand from EV chargers requires longer timelines, sometimes of 5 to 7 years. A proactive grid planning process to meet near-term needs and build out the grid in advance to support long-term growth in the deployment of EVs is being considered in the New York State MHD Proceeding. Con Edison, along with other NY State Utilities, filed comments proposing a proactive utility infrastructure planning framework to prepare the grid in advance of future transportation electrification needs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 40]

SmartCharge New York Managed Charging Case Study

In 2017, Con Edison launched SmartCharge New York program with the goal of instilling gridbeneficial charging behavior in parallel with the upswing in electric vehicle adoption. The goal was to influence driver behavior at the inflection point of transitioning from combustion-engine fueling to electric battery charging and have drivers default to grid-optimizing charging activity. Program participants received a free cellular-enabled device that plugs into the vehicle's diagnostic port that allowed Con Edison to track time, energy, and power consumed when charging in the utility's service territory. Incentives encourage drivers to 1) avoid charging during the system peak (2 PM to 6 PM) during summer weekdays from June to September, and 2) charge overnight from 12 AM to 8 AM. Incentives were initially paid off-bill through gift cards to the customer's business of choice, such as Amazon, Starbucks, or Home Depot. [EPA-HQ-OAR-2022-0985-2429-A1, p. 40]

As electric vehicle adoption continues to rise, managing charging behavior will grow increasingly important in maintaining a healthy and reliable grid. Since its inception, the SmartCharge New York program has evolved to meet customer needs and program objectives. Starting in 2023 for example, the program was overhauled to allow participation through a mobile application and payments are now issued through Venmo or Paypal, in line with participant feedback. This shift also changed the way the program collects data, favoring more cost-effective vehicle onboard telematics or networked electric vehicle supply equipment such as a Wi-Fi-enabled charger or charging cable. This enables the program to scale efficiently with the market and give a greater number of drivers insight into their behavior and how that activity translates to incentive earnings. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 40 - 41]

In light of the EPA announcement of its heavy-duty and light/medium-duty proposed emissions standards, Con Edison released the following statement:

"Con Edison applauds the Environmental Protection Agency's efforts to rev up the market for electric vehicles, which will improve the air in the communities we serve and help in the fight against climate change. A rapid shift to mass EV adoption looks more achievable all the time, with vehicle options expanding and new charging stations being built across New York City and Westchester County, including locations that serve the needs of disadvantaged communities. Con Edison will continue to support the EV market's development through investment in the grid and by offering a range of programs, from incenting new chargers to managing the grid impact by rewarding drivers for charging overnight."138 [EPA-HQ-OAR-2022-0985-2429-A1, p. 41]

138 "Con Edison Supports Effort to Encourage Electric Vehicle Adoption," Con Edison Media Relations, (April 12, 2023) accessed June 5, 2023 https://www.coned.com/en/about-us/media-center/news/2023/04-12/con-edison-supports-effort-to-encourage-electric-vehicle-adoption

5. SRP

When EVs were still in the early stages of adoption, SRP recognized the importance of exploring ways to identify EV households and analyze their charging behavior in order to help prepare for greater EV uptake in the future. It was also important to begin engaging customers who were EV drivers in order to understand their interests and their charging patterns and assess ways to influence charging behaviors. [EPA-HQ-OAR-2022-0985-2429-A1, p. 41]

In 2014, SRP launched "EV Community" (EVC)—a program that offers customers a $50 bill credit for each EV they register (up to two vehicles per household)—as a means to incentivize EV drivers to identify themselves and engage with SRP. Participants provide basic information about the electric vehicle and the type of charger they use. This provides a way for SRP to learn more about EV customers and their charging behavior and needs while offering them an incentive to help support EV growth in the region. There are currently more than 7,500 customers enrolled in the program. [EPA-HQ-OAR-2022-0985-2429-A1, p. 41]

While EVC members only account for a small number of total EV households, they are a fair overall representation of the EV customer base since all price plans are included, as well as households with one vs. two EVs. The program offers SRP a good platform for analysis, including the type of cars they drive (PHEV, BEV, brand, etc.) and the charge levels they use. In addition, SRP found that EVC members are willing to share information and are eager to participate in future pilot programs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

The EVC program also provides SRP with a method and channel to promote their Electric Vehicle Price Plan, a special time-of-use pricing plan which offers EV drivers the most opportunity to save on EV charging costs by charging during super off-peak times (between 11 PM and 5 AM). Load research has shown that this program has been highly effective at shifting EV charging loads away from peak periods. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

The EVC program has helped SRP plan and prepare the grid for widespread EV adoption by enabling them to:

- Anticipate load growth. A pilot study with EVC members that monitors their EV driving and charging behavior through data telematics devices enables SRP to estimate typical consumption and charging load profiles per EV.
- Understand the impacts of EV charging on the grid. EVC data is used to model the impacts of EV charging on the electric grid, identify when transformers and wires may need to be upgraded, and understand when and how customers need to charge.
- Recruit for Managed Charging pilot programs. The EVC program and channel have enabled SRP to recruit participants for additional Managed Charging pilot programs to test other active control technologies to control EV charging load on the grid.
- Survey participants for insights. EVC members are surveyed regularly to get more data on their charging behaviors, including their use of home, workplace, and public charging and their satisfaction with EVs overall.
- Engagement. EVC participants receive regular newsletters and other communications with EV-related information. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

6. Duke Energy

Electric fleet commitments are increasing as companies with ambitious sustainability goals work to decarbonize operations. Fleet owners are also seeking ways to take advantage of the cost savings available by transitioning to EVs. However, programs for fleet electrification and managed charging options are still limited to date. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

When transitioning to an electric fleet, it is important that fleet managers understand the full scope of charging multiple vehicles while maintaining fleet operations and that larger MHDVs bring with them additional factors to consider. Fleet owners who have electrified fleets without consulting experts or an electric provider have likely been experiencing avoidable operational and technological issues. Long-term energy cost and performance risk are also potential issues for fleets and can hinder mainstream fleet electrification technology development if not managed correctly. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 42 - 43]

Duke Energy's significant experience and large customer base make it well-positioned to design and implement fleet electrification and charging programs. Duke Energy is building a first-of-its-kind performance center that will model and accelerate the development, testing, and deployment of zero-emission light-, medium-, and heavy-duty commercial electric vehicle EV fleets. The site will be located in North Carolina at Duke Energy's Mount Holly Technology and Innovation Center and incorporate microgrid integration. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

The fleet electrification center will provide a commercial-grade charging experience for fleet customers evaluating or launching electrification strategies—reinforcing reliability, clean power, and optimization by integrating solar, storage, and microgrid controls software applications. The center will be connected to both the Duke Energy grid—charging from the bulk electric system—and to 100% carbon-free resources through the microgrid located at Mount Holly. This project is the first electric fleet depot to offer a microgrid charging option. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

In addition to fleet charging, the site will also function as an innovation hub, allowing Duke Energy to collect data around charger use, performance, management, and energy integration with various generation resources. It will also allow for the development of managed charging algorithms for fleets connected to the bulk power system or integrated with renewables and storage—which can be utilized to minimize the upgrades needed to the distribution system, easing the transition to electrifying fleets. Identifying EV charging technologies and how they may be used to power any type of fleet with vehicles (ranging from class 1) will help develop a model to show the industry a clear, integrated, and cost-effective path to fleet electrification. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

Duke Energy is teaming up with Daimler Truck North America and Electrada on this importantwork. Electrada, an electric fuel solutions company, is providing funding for research and demonstration efforts. For fleets seeking to electrify, Electrada invests all required capital "behind the meter" and delivers reliable charging to the fleet's electric vehicles through a performance contract, eliminating the complexity and risk that fleets face in transitioning to this new source of fuel. Electrada's investment in the depot allows Duke Energy to focus on programs that simplify adoption for electric fleet customers and distribution system performance to support the predictable addition of electric load over time. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

By the end of 2023, fleet operators will be able to experience a best-in-class, commercial-grade fleet depot integrated with energy storage, solar, and optimization software. Moving to zero-emission vehicles in this sector allows North Carolina to seize the large economic potential of the transition and generate billions in net benefits for the state. Projects like Duke Energy's fleet performance center will be key for fleet owners across the state to take advantage of the cost savings of transitioning to electric vehicles. That said, fleet owners exploring electrification should engage their electricity provider early and often to identify and address site-specific considerations. As fleet electrification accelerates, it will be important for electricity providers and policymakers to identify best practices to proactively plan for fleet electrification, including readying the distribution grid. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 43 - 44]

7. Xcel Energy

Xcel Energy is committed to electrifying all of its light-duty fleet and 30% of its medium and heavy-duty fleet by 2030, equating to over 2,500 EVs. It's part of their vision to be a net-zero energy provider by 2050 and enable one out of five vehicles to be electric in the areas they serve by 2030. This will save customers $1 billion annually on fuel by 2030 and deliver cleaner air for everyone. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

With a fleet that includes iconic bucket trucks, all-terrain service vehicles, and a host of pickup trucks and pool cars across eight states, achieving these goals will be no small feat, but an important one. There are notable hurdles, yet evolving technology presents solutions. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

Electrifying the Marquee Fleet Vehicle

Xcel Energy is the first electric provider in the nation to add an all-electric bucket truck to its fleet. The truck features two electric sources: one for the drivetrain and one for the lift mechanism. It has a 135-mile driving range and can operate the bucket for an entire workday on a single charge. Crews are collecting data from real working conditions in Minnesota and Colorado that will be used to inform further improvement to the vehicle's technology and operation. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

Optimizing Charging to Minimize Grid Impacts

To support a growing electric fleet, over 1,200 EV chargers must be brought into service by 2030, which will result in an electric load increase of 71 megawatts. Charge management techniques enable low-cost charging for this growing electric fleet. It's a sophisticated approach to optimize charging times by using time-of-day and grid demand efficiencies and builds on the expertise Xcel Energy has developed through offering managed charging programs to customers in multiple states. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

For fleets, overnight charging schedules make the most sense. Demand and rates are lower, and renewable wind sources are ample at that time. Yet, fast charging outside of these time periods may be required to help larger vehicles make it through a workday. This is when charging schedules need to be customized and highly specific. [EPA-HQ-OAR-2022-0985-2429-A1, p. 45]

Enabling Cleaner Service Calls Through Bucket Truck Technology

Xcel is also taking immediate action on other high-impact emission reduction opportunities, using technologies such as electric power take-off, idle mitigation, and solar systems to power jobsite tools.

- Electric power take-off (ePTO) - An ePTO system is a device that uses battery power. It's similar to an EV, but instead of moving the vehicle down the road, it powers equipment and tools to avoid engine idling at the job site. These devices are recharged by plugging into the same chargers that EVs use.
- Idle mitigation - An idling truck can consume 1.5 gallons of gas each hour. Idle mitigation on Xcel Energy's utility bucket trucks works by automatically shutting down the gas-powered engine when the vehicle is not in use or when the engine is idling for too long. This helps to reduce emissions and conserve fuel. [EPA-HQ-OAR-2022-0985-2429-A1, p. 45]

Fleet Electrification Solutions for Customers

Xcel Energy's experience and expertise with fleet electrification doesn't stop with their own fleet. They have developed a mix of customer programs across service areas to support fleet electrification for businesses and communities. These customer-centric solutions enable sophisticated planning, lower upfront costs with various rebates and incentives, and minimize impacts to the grid. [EPA-HQ-OAR-2022-0985-2429-A1, p. 45]

Xcel's approach for commercial EV fleet development includes:

- Advisory services: Xcel offers a "white-glove service" to meet customers where they are on their electrification journey by guiding them through customized planning for their infrastructure needs. For fleet operators, this includes a free assessment to help them determine the best path to electrify their fleet and advise them on future electric fleet considerations such as charging best practices.
- Infrastructure installation: Xcel designs and builds EV supply infrastructure to support charging station installations at minimal to no cost to customers.
- Equipment recommendations and rental options: Xcel also provides recommendations for charging equipment and offers customers the option to purchase their own qualifying vehicle chargers or rent them at a monthly fee that includes installation and maintenance.
- Grid continuity: Xcel designs long-term clean energy resource and distribution plans to consider the future impact of new EV load to ensure ongoing grid stability, reliability and affordability.
- Equitable opportunities: Xcel supports EV adoption in higher emissions communities and income-qualified neighborhoods through rebates and incentives. This includes facilitating the electrification of carshare, refuse trucks, school buses, paratransit vehicles, and other fleets operating in these disproportionately impacted communities. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 45 - 46]

Fleet electrification is a key component of Xcel Energy's larger vision, which includes enabling zero-carbon transportation by 2050 across our eight-state service footprint. This long-term strategy balances affordability with sustainability across the entire grid. It's why Xcel is dedicated to assisting fleet managers across the ecosystem in providing fleet electrification solutions that empower and inspire a clean energy future while also leading by example. [EPA-HQ-OAR-2022-0985-2429-A1, p. 46]

iii. Transmission

A critical part of ensuring a smooth transition to an electrified heavy-duty sector will be a robust build out of high-voltage transmission lines. Doing so will also enable increased penetration of renewables into the grid mix, helping to further improve the environmental and climate benefits of electric vehicles. While progress in this space has historically been slow and bogged down by procedural delays, there are some signs of progress. In April 2023, the U.S. Bureau of Land Management approved a 732-mile transmission line, which will carry wind energy from Wyoming through to Nevada.139 Also in April 2023, a Maine court granted approval to restart work on the 145-mile New England Clean Energy Connect project, which will carry hydropower from Canada to New England.140 The line is expected to carry up to 1,200 megawatts of power. [EPA-HQ-OAR-2022-0985-2429-A1, p. 46]

139 "US approves $3bn Wyoming-Nevada power line," (April 12, 2023) accessed May 15, 2023 https://www.power-technology.com/news/us-approves-3bn-wyoming-nevada-power-line/#:~:text=The%20US%20BLM%20has%20given,blustery%20Wyoming%20through%20to%20Nevada.&text=US%20officials%20on%20Tuesday%20gave,running%20from%20Wyoming%20to%20Nevada

140 "Maine court greenlights embattled $1B transmission line," (April 17, 2023) accessed May 17, 2023 https://subscriber.politicopro.com/article/eenews/2023/04/21/maine-court-greenlights-embattled-1b-transmission-line-00093087

Electricity transmission is also a key focus of the Biden-Harris Administration. In May 2023, the administration published its plan to decrease permitting timelines for new transmission projects, among other key items.141 Also in May 2023, the U.S. Department of Energy proposed a rule on designating National Interest Electric Transmission Corridors.142 There will also be a role for Congress to play in improving transmission permitting times and this is a policy area where some bipartisan support exists. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 46 - 47]

141 "FACT SHEET: Biden-.Harris Administration Outlines Priorities for Building America's Energy Infrastructure Faster, Safer, and Cleaner," (May 2023) https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/10/fact-sheet-biden-harris-administration-outlines-priorities-for-building-americas-energy-infrastructure-faster-safer-and-cleaner/

142 88 FR 30956

EPA Summary and Response – Feasibility of Timing[466]:

Summary:

EPA received comments regarding the ability of the grid to grow and supply the power needed to charge HD BEV. General concerns with grid capability (based on current hardware or its age) and timely grid build out were voiced by American Free Enterprise Chamber of Commerce (AmFree), American Highway Users Alliance, American Petroleum Institute (API), American Trucking Associations (ATA), Dana Incorporated (Dana), Transfer Flow, Inc., MEMA, and Missouri Farm Bureau (MOFB). American Fuel and Petrochemical Manufacturers (AFPM) and AmFree stated that EPA should analyze the changes required and demonstrate that the grid can grow sufficiently to support this policy. Additionally, Clean Fuels Development Coalition and AFPM state that EPA has not accounted for the time and resources required to permit, site, construct (with usual delays), and operate the grid improvements required for both HD and LD. (We note that AFPM's comments on the LD rule driving level 2 charger load in neighborhoods pertains to a different rulemaking; however, we are addressing here the question

[466] Note that issues relating to timing and adequacy of hydrogen infrastructure are addressed separately in RTC 8.1.

of the combined effect of the HD and LD rules on the grid). Comments by National Association of Manufacturers put the time needed for infrastructure transmission build out at half a century based on their assumption of 57% growth required by 2035. Comments expressing concern regarding location - specific power distribution for HD BEV, such as highways (including alternative fuel corridors), rural areas, remote areas, and densely populated areas, were received from Alliance for Vehicle Efficiency (AVE), American Trucking Associations (ATA), Daimler Truck North America LLC (DTNA), MEMA, RMI, and Valero. These comments stated that more detailed regional information is required to understand the grid distribution build out challenges. Specific concerns were identified with remote areas with minimal power that may not have sufficient excess power available as well as densely populated industrial areas that, although they already have significant power available, they do not have sufficient excess available power. MEMA shares a concern that heavy trucks operating away from infrastructure will require generators on site if they are switched to BEV.

AFPM noted that one supercharger equals the power need of 70 air conditioners which points out how the HD BEV need may drive a grid distribution shortfall. AmFree echoes this concern when they state that a modest fleet of HD BEV would require 4 GWh/year that existing grid connections would not be able to handle. They also point out that high energy stations could require a new substation requiring 4 years to install or they could require a transmission interconnection taking 8 years to complete. Daimler Truck North America LLC (DTNA) calls electrical infrastructure build out the biggest barrier for adoption of HD BEV. Manufacturers like DTNA shared their concern that they don't control the infrastructure buildout and there is nothing that obligates the utilities to deliver. DTNA does not believe the infrastructure build out will happen quickly enough without major regulatory and/or legislative action. One of DTNA's concerns is that utility infrastructure planning is in the 5-10 year timeframe, much farther out than fleets planning on adopting HD BEV, making alignment difficult.

Comments by AVE, Arizona State Legislature, NACS, and Delek US Holdings, Inc., and Valero focused on the challenge of delivering the large amount of power required for any individual charging station. NACS focused concern on charging stations possibly requiring 10 MW of power. ASL shared a similar concern in that a charging station could require the power of a data center or small town. Valero shared concern on the grid capability based on comments by California Energy Commission regarding peak demand at 5 pm and based on input from 12 states in their state EV Infrastructure plans.

Other comments focused concern on the complexity and number of stakeholders required to implement grid buildout. Volvo states that the large number of utilities, compounded with different geography and governing bodies, will make it impossible to extend ACT adoption rates to the nation. API points out the critical nature of the grid infrastructure and that the utilities must be fully engaged. ATA comments that the infrastructure plans should be site and state specific to address the large number and varying types of utilities.[467] ATA shares that having almost 3,000 utilities as well as individual energy regulatory entities will hamper investment and modernization of the grid. They further state that the different utility types (investor owned

[467] We note here that ATA's reference that ICCT, "recognizes that the electrification of commercial vehicles will significantly burden the current electrical grid" is misleading as ICCT stated that the relatively small share of the electricity demand attributable to the Phase 3 proposed rule (which was more stringent than that finally adopted) as not being a constraint. See Comments of ICCT, June, 2023, Comment 1553, at pp. 10-11 (estimating demand from proposed Phase 3 rule at 1% of national electric retail sales in 2021).

(IOU), publicly owned (POU), and cooperatives), will add to these challenges. They reference input from California Public Utility Commission (a state wide planning and development organization) regarding challenges including: time (3 years) to align statewide efforts and complete infrastructure authorizations; market and technology uncertainty making it unclear what infrastructure actions should be supported; the quantity of infrastructure build out needed not having been adequately quantified within the states planning process; lack of detail on fleet charger needs; lack of planning for enroute stations, no coherent planning framework; and, finally, no process for identifying the land needed for substations. The concerns relating to availability of critical minerals raised by American Highway Users Alliance are addressed in RTC 17.2.

Supply chain concerns were mentioned by DTNA such as 40 weeks for transformers and 70 weeks for side meter panels /switch gears. DTNA added that the long lead times could be as much as vehicle cycle time. Plans made for aligning HD BEV vehicles with charging needs could become obsolete as the fleet changes by the time charging infrastructure is finally available. National Rural Electric Cooperative Association (NRECA) states that supply chain issues are causing shortages of basic machinery needed to ensure grid reliability. They also share that cooperative utilities are waiting a year on average for distribution transformers and that the lead time for large transformers is over 3 years. NTEA, The Association for the Work Truck Industry is concerned with their work truck manufacturers getting required power and states that in some cases the equipment required for power delivery is available but the agreement from the utility to supply power has not been received and could be multiple years away. Comments were also received (DTNA) that truck customers had cancelled orders when utility timing for depot supply came in at 5-8 years. Other buildout estimates were shorter (3 years) but were deemed unacceptable as the fleet needs had to be proven through an order such that the HD BEV would be available but would sit idle for 2 years before the grid buildout. EEI recognizes this potential misalignment between the time of obtaining HD BEV and the time required for buildout of supporting infrastructure. EEI also shared the related issue that fleet customers are not familiar enough with the process of obtaining grid buildout. As mentioned before, their investor-owned utility members are strengthening their relationship with fleet customers to address this. Comments by EEI show that utilities are working to deliver power when needed, understand critical detail like load profiles, and share information such as hosting capacity maps. They note that utilities are adding account managers for fleets that will engage early and help plan successful implementation. EEI also shares the utility challenge that many are not authorized to make proactive upgrades but rather must wait until they have a customer request. Energy Innovation commented that more states are authorizing utility investments to support widespread and equitable access.

DTNA shared that some customers looked at temporary power solutions but those would have increased upfront costs borne by their fleet. Related comments by ATA shared that a company wanting to electrify forklifts was only able to change over a small percentage of their original plan due to power availability.

Comments were received from Clean Air Task Force, CalStart, Edison Electric Institute (EEI), Electrification Coalition (EC), Environmental Defense Fund (EDF), and National Association of Clean Air Agencies (NACAA) supporting that the electrical distribution grid and its buildout will be sufficient for the adoption rates analyzed by EPA in its projected compliance pathway. The Edison Electric Institute (EEI), the trade association for all of the nation’s investor-owned utilities supported the proposal, indicating that needed infrastructure buildout can be accommodated within a MY 2027-2032 timeframe. CalStart and EDF commented that even more aggressive standards, posited on a higher ZEV adoption rate, would not be precluded by grid reliability concerns. EDF shared that grid buildout since 1960, as shown by electricity sales, has averaged 2.8%, well above what the proposed Phase 3 rule would necessitate, assuming every OEM chose to comply using the compliance pathway projected by EPA. CalStart and Clean Air Task Force stated that buildout will be possible and HD BEV adoption will be supported since the fleet turnover will happen gradually allowing needed buildout to be phased in over time rather than built all at once. Clean Air Task Force emphasizes that the HD fleet composition, not just annual sales, should be presented to show the small portion of the fleet that will be adding load to the grid (again, assuming that every OEM adopts the projected compliance pathway). CalStart comments that investment in key nodes and then corridors will drive efficient infrastructure implementation and greater availability than EPA assumes. ICCT made the same point and provided quantified analysis of freight corridors that would be the likely candidates for immediate buildout, noting that infrastructure buildout outside of these areas would not be necessitated in the early years of a Phase 3 regime. CATF commented that historical precedent shows that infrastructure buildout will occur as needed (see the further summary in the following paragraph). They specifically reject the 'chicken-egg conundrum' raised in a number of comments whereby utilities require guaranteed demand before building out, but ZEV purchasers require assurance of infrastructure before purchasing a ZEV.

CATF states that utilities are planning and deploying solutions. EDF notes that there are a number of State legislative initiatives to allow or to force proactive buildout by utilities. EDF and EEI agree with the need for states, regulators, and utilities to improve planning and regulatory practices and provide instances of where this process has already commenced. MFN shares positive planning and reporting actions taken by the Minnesota PUC. EEI shares positive actions by SCE and NY PSC. They reiterate that longer term buildout (10 year) will require proactive planning processes between the utilities and regulators. MFN shares that California legislation establishes a balancing account to recover associated costs, which would ensure utilities do not have to wait several years for their next General Rate Cases to propose investments. EDF, ICCT, and MFN share proposed California legislation that would drive or even require utilities to be ready for connection requests. EC shares thoughts on expediting grid buildout but suggests that utilities in ACT States should be approved to move forward with grid buildout without a time-consuming regulatory approval process. DTNA recognizes the need for government, utilities and other industries to work together. They share proposals for grid planning responsibilities, legislation to require key grid updates, aligned adoption plans to properly support utility forecasts, process to protect fleets from financial burden if planned energy use isn't met, encouraging state regulators to adopt performance based regulations regarding buildout, standardized application and review process for upgrade requests, encourage utilities to bundle requests for grid upgrades with DER and stationary battery, process to allow third parties to deliver and profit from infrastructure for HD BEV. ICCT comments that EPA should engage other federal agencies and provide input on federal infrastructure policy. In public comments, and in a contemporaneous May 2023 White Paper, ICCT provided quantified estimates of electricity demand that could be needed for a regulatory program predicated on some electrification, analysis of where demand might be heaviest potentially creating need for some buildout, and means by which the buildout could be effectuated considering actions utilities can take without need for regulatory approval, actions necessitating regulatory approval, and actions requiring authorizing legislation.

RMI recognizes in their comments that the infrastructure build-out time and cost can be limiting factors for ZEV adoption. RMI and ZETA share practical enablers such as identifying where grid growth is needed, streamlining regulatory processes, providing regulatory incentives, and embracing proactive grid planning. Energy Strategy Coalition, CARB, EDF, and ZETA referenced the certainty a federal regulation would provide for needed planning relating to the grid. CATF shares economic theory supporting that an increase in HD BEV sales will spur infrastructure development. Like EDF, CATF notes that BIL and IRA support both HD ZEV and infrastructure such that they will clearly support grid buildout. They use Norway as proof that BEV sales and infrastructure can expand rapidly. They point to our US infrastructure buildout of roads and service stations as automobile use expanded as another example of markets and support infrastructure growing together. Comments supporting that grid reliability and grid distributive buildout would not be impediments to achieving the proposed Phase 3 standards were received from CalStart, CATF, EDF, EEI, the thrust of these comments being that implementation will be supported by federal, state, public entities, utilities, charging providers, and fleets working together proactively on the required plans, policy, and funding. CalStart also identified service providers that simulate grid needs for commercial vehicles and identify required grid upgrades.

Electrification Coalition (EC), EEI, RMI and ICCT made comments that success will require funding and cooperative actions between the transport and utility sectors and provided specific examples of actions required. Consolidated Edison recommends that utility proactive planning should be a best practice. EC comments highlighted studies by utilities that help identify and communicate the issues that require proactive planning,while EDF highlights that NY State has passed statutes requiring such studies. ICCT went into detail regarding what utilities can implement on their own, those that need regulator notification, and those that require approval. They assert that utilities can get started implementing change and do not require approval for every helpful action.

EEI recognized that the grid buildout needs to support large charging stations capable of supplying tens of megawatts. EEI states that “[e]lectric companies can accommodate localized power needs at the pace of customer demand, provided appropriate customer engagement and enabling policies are in place”, that servicing HDV BEV demand posed some new issues for the utility sector – notably rapid construction timelines, reduced customer familiarity with procuring electric power, and uncertainty of load profiles, but went on to explain how the utility sector is addressing these potential challenges.

Many of these comments stated how BEV purchasers could mitigate electricity demand. AEU, State of California, and EDF provided examples of hardware enablers such as DER, V2G, and stationary batteries. AEU, State of California, and EDF also shared software solutions that manage power requested from the grid to optimize charging with grid temporal supply. AEU focuses their input on the cost savings of managed charging, but they make it clear that, “Managing these vehicles’ charging load to avoid peak periods can substantially reduce the need to upgrade both the facility’s infrastructure and the utility-side infrastructure”. EDF shares that these hardware and software enablers can, in some cases, eliminate the need for grid buildout. Another means of mitigating demand mentioned in comments was for users and utilities to agree that demand would remain a given percentage below nameplate capacity (EDF, AEU.). MFN shares evidence that time-of-use rates push electric demand (HD BEV charging) to times when power is plentiful and less expensive.

Other commenters spoke positively to the issue of regional impacts. The Energy Strategy Coalition noted that both Regional Transmission Organizations (RTO) and Independent System operators (ISO) engage in long range planning and are doing so in anticipation of increased demand posed by both light and heavy-duty electrification. Commenter EDF noted the work of its contractor Analysis Group showing that 83% of demand posed by the HD rule would be less than 5MW. MFN cited to a recent study of the Lawrence Berkeley National Laboratory (September 2022) which centered on the MISO (midwest) grid and found the EVs could smooth out the "negative valley" sometimes resulting from difficulties storing excess capacity from renewables. CATF and EC provided multiple examples of regional stakeholders coming together to coordinate and plan for increased electrification.

Comments were received that EPA should monitor and review charging infrastructure and grid capacity. Other comments (NACAA) opposed ongoing evaluation as unnecessary and inappropriate.

Response:

EPA has carefully considered the comments regarding the distribution infrastructure for charging HD BEVs, including issues of feasibility, lead-time, and costs. In this response, we discuss the feasibility and lead-time of distribution infrastructure; subsequent responses discuss costs and other issues related to distribution infrastructure, as well as grid reliability and resiliency. The agency has conducted comprehensive analyses of distribution infrastructure needed to support HD ZEV charging, including in close coordination with the Department of Energy and informed by the extensive public engagement on this issue. We find that there will be sufficient lead-time to develop the necessary distribution infrastructure associated with HD ZEV uptake under the modeled potential compliance pathway for the final standards. We note that the final standards themselves, as discussed in section II of the preamble, provide significant additional lead-time relative to the proposal, which also means additional lead-time to build and connect distribution infrastructure. Our conclusion as to the sufficiency of distribution infrastructure is supported by numerous comments and analyses, including those from the stakeholders most intimately familiar with building and operating distribution infrastructure: the utility industry and state utility and energy regulatory agencies. Below, we highlight several key lines of evidence.

Because the need for distribution infrastructure is associated with increases in electricity demand, EPA evaluated demand increases at the national, regional, and local levels. We found only modest increases in demand associated with the Phase 3 Rule at all of these levels. Assuming manufacturers follow the modeled potential compliance pathway—which focuses on increasing penetrations of HD ZEVs[468]—the Phase 3 rule would account for less than 1%

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[468] We emphasize that the final rule does not require manufacturers to adopt any particular technological pathway; nor does it force consumers to buy ZEVs, including because we anticipate that a large number of ICE vehicles will continue to be produced and sold during the timeframe of this rule. Whether in response to potential charging infrastructure or other constraints, manufacturers and consumers may choose to adopt a wide range of technologies not dependent on charging infrastructure.

increase in transportation-sector electricity demand in MY 2027, the first year of the program, rising to slightly over 9% in MY 2032. From the perspective of total utility demand for all sectors, the increase by 2035 attributable to the rule is just slightly over 2.5%. These are modest increases and consistent with historical increases in demand, such as accompanying the introduction of refrigerators, air conditioners, and data centers, which the electric utilities have successfully managed.

With respect to regional demand, we concentrated our analysis on the high freight corridor areas identified as the most likely candidates for electrified infrastructure during the Phase 3 rule's timeframe. We found that demand associated with the Phase 3 rule in each of these areas remains low, especially at the commencement of the Phase 3 rule in 2027, when issues of lead time are most critical.

At the local level, our analysis is informed by the recent Department of Energy Transportation Electrification Impact Study (TEIS), which found that only a small amount of new infrastructure would be needed as a result of the rule. The TEIS evaluated five States susceptible to increased infrastructure needs, including due to high concentrations of freight corridors necessitating additional infrastructure, dense urban areas with less space for infrastructure buildout, and rural areas with relatively little existing infrastructure. The study evaluated the combined effects of both the Phase 3 Rule and the Light- and Medium-Duty Multi-Pollutant Rule. It found only minor increases in peak demand associated with the incremental impact of the rule in 2027 and 2032 (+0.1 to +3.0%) and that even those minor increases could be reduced, in some cases to below zero (i.e., decreases in peak demand), through basic, easily implemented, demand management strategies (-1.8% to +0.5%). The study estimated that the peak demand increases could be accommodated by a small volume of additional infrastructure; for example, in 2027 with basic management strategies, it found the need for zero new substations, five new feeders, and 2,400 transformers across the five states evaluated. Based on our assessment of the time needed to build different kinds of infrastructure, EPA determined that the level of buildout identified by the TEIS could be achieved within the timeframe available.

We also carefully evaluated programs and funding to support charging infrastructure, including at the Federal, State, local, and utility levels, for both depot and public charging. The Federal government continues to provide significant funds for developing charging infrastructure, including through the Charging and Fueling Infrastructure Discretionary Grant Program. Many States have also developed programs to support such infrastructure; we anticipate much of the needed charging infrastructure would be developed in States that have adopted the Advanced Clean Trucks program, which mandates increasing levels of HD ZEVs, and that also have especially supportive policies for developing such infrastructure. Many localities and utilities also are actively developing innovative strategies to build and support additional charging infrastructure; for example, Edison Electric Institute, the trade group for the nation's investor owned utilities, identified numerous such strategies and concluded that needed infrastructure could be timely developed. The final rule provides beneficial regulatory certainty to support the development of these programs and of charging infrastructure generally.

Finally, we underscore the potential for numerous innovative strategies to mitigate distribution infrastructure demands. As noted regarding the TEIS study, even basic mitigation strategies for HD BEV charging can significantly ameliorate or even reduce peak demand. A panoply of potential strategies—including short-term load rebalancing, smart charging contracts, flexible interconnections, hosting capacity maps, managed charging software, vehicle-to-grid technologies, distributed energy generation, onsite battery storage, and more—provides many opportunities for mitigating the impacts of additional demand, and in some cases, for providing benefits back to the grid as the volume of BEV charging increases.

The balance of this response details the above factors.

EPA found at proposal that "there is sufficient time for the infrastructure, especially for depot charging, to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply." 88 FR at 25999. We reiterate that conclusion here. Addressing the question of availability of supporting electrification infrastructure in the rule's 2027-2032 MY timeframe necessitates a predictive judgment by the agency. In making this type of prediction, EPA follows the same template as in developing emission standards under Title II generally: EPA must identify the steps necessary for deployment of the needed amount of infrastructure, and provide plausible reasons as to how these steps can be effectuated in the lead time provided.[469] In making these projections, EPA has consulted repeatedly with the Department of Energy (DOE), and has benefitted greatly from the Department's expertise.[470] EPA also met with the North American Electric Reliability Corporation (NERC) staff on the two rules for on-highway vehicles, the light- and medium-duty vehicle multipollutant standards proposal, and the heavy-duty vehicle Greenhouse Gas (GHG) emissions standards .[471]

We estimate a modest annual generation increase attributable to the Phase 3 rule.[472] In consideration of lead time concerns raised by commenters (on both infrastructure and vehicle developments), we are finalizing CO2 emission standards for heavy-duty vehicles that include a lower increase in stringency of standards for many HD vehicle categories in MY 2027, a slower phase-in of standards through MYs 2028 and 2029, and a phase-in of standards from MYs 2030 through 2032 that, for many of the subcategories, achieves similar levels of stringency in MY 2032 as proposed

In 2027, the Phase 3 rule is projected to increase demand for electricity posed by the transportation sector by a modest 0.666%.; that is, of the demand for electricity posed by the transportation sector, well less than 1% is attributable to the Phase 3 rule. In 2032, this is projected to increase demand from that sector by 9.232%. [473] We note that the modelling associated with these estimates assumed somewhat higher electricity demand than the demand

[469] NRDC v. EPA, 655 F. 2d 318, 333 (D.C. Cir. 1983).
[470] See *Shafer & Freeman Lakes Env't Conservation Corp. v. FERC*, 992 F.3d 1071, 1090 (D.C. Cir. 2021) (deference to agency determination supported where agency consulted with outside experts regarding that determination). See also *Intelligent Transportation Soc'y of Am. v. Fed. Commc'ns Comm'n*, 45 F.4th 406, 413–14 (D.C. Cir. 2022) (Federal Communications Commission properly rejected challenge relating to its findings involving transportation safety by utilizing analysis from the Department of Transportation).
[471] Jung, Zoltan. "North American Electric Reliability Corporation (NERC) Grid Reliability Discussion". January 26, 2024
[472] Murray, Evan "Calculations of the Final Standards at Various Geographic Scales" (February, 2024).

[473] Murray, Evan "Calculations of the Impacts of theFinal Standards at Various Geographic Scales" (February, 2024).(National Demand tab)

ultimately reflected in the final rule.[474] The final rule adoption scenario and associated electricity needs were not finalized when inputs were required for this analysis. Our interim scenario was used for input as it was the most accurate data available when inputs were required. The modelling also includes needed electricity generation for the hydrogen necessary to fuel FCEVs produced using grid electrolysis (as a simplifying assumption). The power supply for electrolysis is assumed to be available or made available while the electrolysis facility is built so the related electricity distribution build out is not a critical factor for timing. EPA thus regards this modeling as conservative.

Furthermore, since this demand is only that portion attributable to the transportation sector, the demand as a percentage of total demand on a utility would be less, since it would be in effect diluted by all other sources of demand. Thus, in 2030 and 2035 (the only years for which we are able to generate these values), increases in generation are only 0.41% and 2.59% of total demand.[475]

Furthermore, there is near consensus that charging infrastructure needed to meet this demand in the time frame of the rule will be centered in a sub-set of states and counties where freight activity is concentrated and where many have supportive ZEV polices. See RTC section 6.1 above. These likely areas of high concentration include Texas (Harris, Dallas, and Bexar counties); southern California (Los Angeles, San Bernadino, San Diego and Riverside counties); New York State (Bronx, New York, Queens, Kings, and Richmond counties); Massachusetts (Suffolk county); Pennsylvania (Philadelphia county); New Jersey (Hudson county); and Florida (Miami-Dade county).[476] These areas are projected to experience either higher aggregate demand or higher energy demand per unit area attributable to HD BEV adoption. The projected increases from baseline transportation sector demand are especially modest in 2027, the initial year of the phase 3 program, when there is the shortest amount of lead time:

- Boston-Cambridge-Newton (Mass/New Hampshire) 0.093%
- Chicago-Napierville-Elgin (Illinois-Indiana-Wisconsin) 0.836%
- Dallas -Fort Worth-Arlington (Texas) 0.866%
- Houston -The Woodlands-Sugar Land (Texas) 0.847%
- Los Angeles-Long Beach-Anaheim (California) 0.002%

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[474] Murray, Evan. Memorandum to Docket EPA-HQ-OAR-2022-0985. “Modeling Inputs for IPM Modeling in the Final Rulemaking Inventory Analysis”. February , 2024.

[475] Murray, Evan “Calculations of the Impacts of the Final Standards at Various Geographic Scales” (February, 2024).(Generation National Demand tab)

[476] Comments of ICCT, July 2023 at 11. These comments reflect Ragon, Kelly, et al., 2023 (“ICCT May 2023 White Paper”). The ICCT May 2023 White Paper combines trucking operational data and route information with locational factors to estimate the types quantity and approximate location of new charging capacity that may be needed due to electrification requirements and growth on HDV BEVs. These estimates reflect BEV adoption in the heavy duty fleet slightly greater than EPA projects in its estimated compliance pathway for MY 2032, and so constitute conservative estimates. See Hibbard et al. “Heavy Duty Vehicle Electrification: Planning for and Development of Needed Power System infrastructure” (Analysis Group, June 2023) at Table 1 (“Analysis Group HDC Electrification Paper”), available at Analysis Group, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/Analysis-Group-HDV-Charging-Impacts-Report.pdf.

- Miami-Ft. Lauderdale-West Palm Beach (Florida) 0.830%
- New York City-Newark-Jersey City (New York/NJ) 0.007%
- Philadelphia-Camden-Wilmington (PA -NJ-DE-MD) 0.531%
- Phoenix-Mesa-Scottsdale (Arizona) 0.878%
- Riverside-San Bernadino-Ontario (California) 0.002%
- San Antonio-New Braunfels (Texas) 0.870%
- San Diego-Carlsbad (California) 0.002%[477]

These estimates are conservative. The projected increases represent increased electricity demand attributable to both the heavy-duty rule and demand from the light duty sector absent the final rule . EPA did not disaggregate these data, and they reflect the aggregate increase demand associated with both rules that utilities would face. However, the portion of electricity demand attributable to the Phase 3 rule as finalized would be less.

We estimate that electricity demand in these critical freight corridors attributable to the transportation sector would increase in 2032, reflecting increased standard stringency, including standards for sleeper cab tractors and heavy heavy-duty vocational vehicles which commence in later years of the program:

- Boston-Cambridge-Newton (Mass/New Hampshire) 1.157%
- Chicago-Napierville-Elgin (Illinois-Indiana-Wisconsin) 10.95%
- Dallas -Fort Worth-Arlington (Texas) 12.285%
- Houston -The Woodlands-Sugar Land (Texas) 11.715%
- Los Angeles-Long Beach-Anaheim (California) 0.014%
- Miami-Ft. Lauderdale-West Palm Beach (Florida) 10.597%
- New York City-Newark-Jersey City (New York/NJ) 0.077%
- Philadelphia-Camden-Wilmington (PA -NJ-DE-MD) 6.545%
- Phoenix-Mesa-Scottsdale (Arizona) 12.053%
- Riverside-San Bernadino-Ontario (California) 0.014%
- San Antonio-New Braunfels (Texas) 12.580%
- San Diego-Carlsbad (California) 0.014%[478]

[477]Murray, Evan "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February, 2024).(MSA Demand tab). We note that the differences in demand reflect ACT implementation in some of the states

[478] Murray, Evan "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February 2024).(MSA Demand tab)

EPA regards these projected increases as modest. The projected increases in 2027, when there is the shortest lead time for buildout, are small. As expected, demand is projected to increase in 2032 but there is considerably more available lead time in which buildout can be accommodated. Moreover, these increases are modest compared to total electricity demand on utilities within the States in these freight corridors. Thus, looking at the dominant state in each freight corridor which in 2032 showed incremental transportation sector increases greater than 1.1%, the effect on total in-state demand (in 2035) is low: Arizona is 2.85%, Florida 2.39%; Illinois 0.91%, Pennsylvania 1.04%, and Texas 2.34 %.[479] The National Zero-Emission Freight Corridor Strategy described above identifies many of these areas in its phasing of a national network, which will help focus timely planning for and investment in the deployment of refueling and utility infrastructure in advance of the regulatory period.[480]

The Department of Energy Study, "Transportation Electrification Impact Study" ("TEIS") supports this conclusion.[481] This is a first-of-its-kind study which performs thermal capacity analysis (at the substation, feeder, and service transformer levels) compared to cumulative LMHD vehicle demand (i.e., demand from both the light- and heavy-duty sectors) enabling location-specific estimates of potential buildout capacity needs and costs. This is the first study to be bottom up, comparing parcel level LMHD demand to parcel supply by PV (photo voltaic) and grid capacity at each examined parcel.[482] Previous studies made estimates of how the new demand from BEV might align with the existing grid capacity or studied the parcel level grid needs for a smaller area (as compared to this 5 state analysis). The TEIS is especially valuable, in fact unique, in assessing both a large area (5-State) coupled with parcel-level analysis.[483] The study focuses on five study States (California, Illinois, New York, Oklahoma, and Pennsylvania), and extrapolates those results nationwide. The five states were intentionally chosen to address geographic concerns such as freight corridors, crowded urban areas, and rural areas with widely distributed demand sources. These states represent 30-35% of the costs of the extrapolated results in the TEIS.[484] They also account for nearly 20% of 2021 nationwide utility peak demand and account for 25 % of electricity customers nationwide.[485] The study also incorporates public charging such that the corresponding high power needs are reflected, addressing a concern of

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[479] Murray, Evan "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February 2024) (State generation tab). We recognize that generated electricity can cross state lines, so that these corridors could be serviced by multiple states. However, increased total electric demand in states in the freight corridors other than those mentioned in the text above remains low. Incremental impact on Indiana electricity demand, for example, is 1.90 %. Id.

[480] U.S. Joint Office of Energy and Transportation, "National Zero-Emission Freight Corridor Strategy," DOE/EE-2816 2024. Available online: https://driveelectric.gov/files/zef-corridor-strategy.pdf

[481] National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, Kevala Inc., and U.S. Department of Energy. "Multi-State Transportation Electrification Impact Study: Preparing the Grid for Light-, Medium-, and Heavy-Duty Electric Vehicles". DOE/EE-2818. U.S. Department of Energy. March 2024. ("TEIS").

[482] A "parcel", as used in TEIS, means "a real estate property or land and any associated structures that are the property of a person with identification for taxation purposes." TEIS at 2.

[483] TEIS at 6-7.

[484] TEIS at 66. EPA agrees with the TEIS that these States' results are sufficiently representative to allow for national extrapolation. See TEIS App B for description of the extrapolation methodology in the Study.

[485] TEIS at 72 .

many comments. . The study estimates overload at the substation level (100% criteria)[486], feeder level (100% criteria), and at the residential service transformer per feeder level (125% criteria). [487] Scenarios examined are no action case (baseline without EPA light-duty or heavy-duty emission standards), and action case with EPA light- and heavy-duty rules), using as an Action case the same case EPA used for its national and regional estimates presented above.), Both action and no action cases are analyzed with and without mitigation resulting in four scenarios generated. The study examines the same four scenarios for both 2027 and 2032.[488] The TEIS unmanaged (without mitigation) case simply distributes the BEV demand over the vehicle dwell time available for charging. The BEV charging is ignorant to non BEV loads. Charging could still occur on top of, and increasing, peak demand. As an example, if the peak load due to existing homes and business occurs at 7 pm and the BEV dwell time runs from 6 pm to 6 am, the unmitigated charging would apply peak power charging at 7 pm, exacerbating peak demand. The mitigated scenario assumes a lower power level and uses the available dwell time -- it lasts until the vehicle leaves the charging venue.[489] The peak power demand increases but at a lower level.

Consistent with the national demand and high freight corridor regional demand estimates above, the TEIS projects minimal increase in demand (energy consumption) and minimal increase in peak demand for the LMHD action case relative to no action for both 2027 and 2032, even without considering any management. In 2027, incremental energy consumption across the five states attributable to the light- and heavy-duty rules ranged from 0.1-0.3%.[490] In 2032, that incremental increase ranged from 1.6% to 2.7%.[491] Incremental impact on 5 state peak demand, again from the unmanaged case, was 0.1-0.2% in 2027 and 0.6-3.0% in 2032.[492]

If ZEV users engage in non-optimized "conservative" management –shifting charging times so that vehicles minimize charging power such that the charging session starts on arrival and finishes when the vehicle departs the charging location[493] – not only do these estimates of peak demand impacts decrease, but in some instances, peak demand is projected to decrease in absolute terms, that is, to be less than in the no action unmanaged case. Just by engaging in easy-to-implement time of day charging adjustments, overall demand to the grid is reduced (demand relative to the no action case), smoothing out overall demand and allowing for more efficient distribution. Thus, for 2027, incremental peak demand is reduced in four of the five states, and unchanged in the fifth.[494] . For 2032, incremental peak demand is positive in two of

[486] Criteria level is showing if the peak loads are directly applicable to the design capacity of the system as is the case for the 100% criteria level. Criteria level of 125% for service transformer shows that many individual noncoincident peaks exist. See TEIS at 47-49 for additional detail.
[487] TEIS at 47 (substation), 47 (feeder), and 49 (transformer).
[488] TEIS at Executive Summary vi-vii. The No Action case includes current state and federal policies and regulations as of April 2023. Id. at vi.
[489] TEIS at 4: "A managed scenario is applied in which vehicles arriving at select charging locations will intentionally minimize charging power suych that the session is completed just prior to the vehicle's departure time from that location."
[490] TEIS at 63.
[491] TEIS at 63.
[492] TEIS at 76
[493] TEIS at 4.
[494] TEIS at 62.

the states but the increase is only 0.1% and 0.5%, and *reduced* in the other states by 0.5%-1.8% potentially obviating the need for any incremental buildout at all.[495]

These minor increases reflect low numbers of transformers, feeders, and substations estimated to be needed (again, for the five states studied and for both light and heavy-duty rules together). In 2027, the TEIS projects need for only a single incremental substation, and zero in the managed case. In 2032, the TEIS projects that only 8 incremental substations would be needed in the unmanaged case, 4 if conservative mitigative measures are utilized.[496] Of these, all but one would be upgrades to an existing substation.[497] Projections for incremental feeders are 9 in 2027 (5 in the managed case), and 125 in 2032 (75 if managed). In 2027, the TEIS projects an incremental need of 2800 transformers (2,400 if managed), and 30,000 in 2032 (21,000 in the managed case). [498] Compare this to the estimated 1 million transformers sold domestically each year, and the estimated 50 million transformers associated with the U.S. electric grid.[499]. Industry is also responding with actions such as Prolec GE's $30 million expansion at its Shreveport, Louisiana transformer plant, their $85 million new plant in Monterrey, Mexico, and Siemens Energy investing $150 million to build their first transformer production facility in the US in Charlotte, North Carolina.[500].

EPA finds that this projected amount of buildout attributable to the Phase 3 rule can be accommodated in the rule's time frame. Indeed, the TEIS finds that "[n]otably, substation, transformer bank and service transformers built by 2027 mostly cover 2032 needs based off size assumptions for existing and new substations; feeder upgrades are still triggered in 2032." [501] Realistic estimates for time needed to install infrastructure components have been studied and are shared here (and see also RIA Chapter 1.6.5 for further discussion):

[495] TEIS at 62.
[496] TEIS at 75.
[497] TEIS at 77-81 .

[498] TEIS at 75.
[499] Power Technology Research, "The U.S. Distribution Transformer Market: A Replacement and Expansion Story" (June, 2022) at https://ptr.inc./the-u-s-distribution-transformer-market-continues-to-be-replacement-driven; and Environmental and Energy Study Inst, "Driven to Be More Energy Efficient, Distribution Transformers Are More than Meets the Eye" (August 25, 2023) at https://www.eesi.org/articles/view/driven-to-be-more-energy-efficient-distribution-transformers-are-more-than-meets-the-eye.
[500] "Siemens Energy addresses the shortage of U.S. power transformers and invests in new factory". Siemens Energy press release. February 14, 2024. Available online: https://www.siemens-energy.com/global/en/home/press-releases/siemens_energy_addresses_shortage_US_powertransformers_invests_new_factory.html#:~:text=Siemens%20Energy%20addresses%20the%20shortage%20of%20U.S.,and%20invests%20in%20new%20factory&text=Siemens%20Energy%20is%20addressing%20the,creating%20almost%20600%20local%20jobs
[501] TEIS at 74.

		Time to Implement (months)	
Component	**Capacity per Borlaug**	**Borlaug et al. 2021**[502]	**EPRI**[503]
Substation New	3 – 10+ MW	24–48	36–60
Substation Upgrade	3 – 10+ MW	12–18	24–36
Feeder New	5+ MW		12–24
Feeder Upgrade	5+ MW	3–12	6–12
Transformer New	200+ kW	3 - 8	3 - 8

Although new substations are a significant undertaking that can take multiple years as shown in the Table above, as noted, the TEIS finds that, for the 5-state analysis, only 4 substations (incremental to the no action case) are required for the managed scenario and 8 for unmanaged in 2032. In 2027, the TEIS found that only a single additional upgraded substation (or none in the managed case), and, as just noted, finds that substations built by 2027 can "mostly cover 2032 needs". We note further that the estimates in the TEIS Study of the amount of distributive buildout needed are conservative with respect to the Heavy-duty Phase 3 rule – indeed, the estimates are almost certainly overstated. First, the TEIS Study considered both the light/medium duty standards and the Phase 3 heavy-duty emission standards together and did not disaggregate the results. Second, the Action scenario considered was more stringent with respect to electricity demand for Phase 3 than the rule ultimately finalized. In addition as noted above, the "unmanaged" scenario presented above considers no mitigation efforts at all. If conservative, simple charging level adjustments in the TEIS managed scenarios estimated impacts decrease sharply. The action managed case is projected to *reduce* peak loads in all 5 States in 2027, and to reduce peak loads in 3 of the 5 States in 2032.

EPA recognizes that from the standpoint of timing, one may consider not only incremental increases in demand attributable to the Phase 3 rule but also other demand from the transportation sector that might occasion the need for distributive grid buildout. That is, buildout can be needed with respect to HD BEVs in the EPA reference case as well as to those reflected in the analysis supporting the Phase 3 rule. We continue to find that this overall demand can be accommodated within the timeframe of the rule for the following reasons.

As discussed above, buildout need not occur everywhere and all at once. In the rule's time frame, as shown in particular in the ICCT White Paper, it can be centered in a discrete number of high freight corridors.

In the early model years of the program, when lead time is the shortest, projected demand remains low.[504] When accounting for the increase from all vehicles (light-duty and heavy-duty), we find the portion of demand attributable to the entire heavy-duty vehicle sector (including ACT) increases by only 2.6% between 2024 and 2027. [505] That is, the increase in demand

[502] Borlaug, B., Muratori, M., Gilleran, M. et al. "Heavy-duty truck electrification and the impacts of depot charging on electricity distribution systems". Nat Energy 6, 673–682 (2021). Available online: https://www.nature.com/articles/s41560-021-00855-0

[503] EPRI. "EVs2Scale2030TM Grid Primer". August 29, 2023. Available online: https://www.epri.com/research/products/000000003002028010

[504] Murray, Evan, "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February 2024).

[505] Murray, Evan "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February , 2024) (Demand National tab.)

attributable specifically to electric heavy-duty vehicles (including ACT), and therefore the infrastructure buildout necessary to support those vehicles, is small compared to other factors.

We further project that a substantial majority of these ACT-compliant ZEVs would be light and medium heavy vocational vehicles which would be the least likely to require additional buildout. RIA Chapter 4.2.2. For example, the TEIS projects no need for new and upgraded substations in 2027 nationally, and need for only approximately 24-48 (managed and unmanaged cases) nationally in 2032).[506]

Most of the demand comes from the states which have adopted ACT: California, Oregon, Washington, New Jersey, New York, Massachusetts, and Colorado.[507] In adopting ACT, these States have considered the means to successfully implement the program and in some cases taken additional legislative or regulatory action specifically to support needed infrastructure. This is reflected in the administrative record here. For example, the California Public Utility Commission is developing a Zero-Emission Freight infrastructure planning framework to identify distribution, substation and transmission needs under high transportation electrification scenarios.[508] Similarly, in New York, the State Department of Public Services has ordered seven utilities within the state to develop a Coordinated Grid Planning Process which requires utilities to proactively identify potential barriers to incremental new load, including from HDV charging, and to identify near-term solutions for any such identified barriers.[509] Eversource, New England's largest energy delivery company, has published an Integrative System Planning Approach per the order of the Massachusetts Department of Public Utilities.[510] See also the legislative actions undertaken in California and New York, cited in the comments of the Environmental Defense Fund. CARB, EMA, and the HDV OEMs have also reached agreement to "actively promote further needed infrastructure development."[511]

With respect to non-ACT states, most of the demand in these states is attributable to the Phase 3 rule itself. See RIA Chapter 4.2.2 (sales ratio for HD BEVs in non-ACT states is approximately 0.2). As shown above with respect to high freight corridors in non-ACT states (including Pennsylvania, Texas, Arizona, and Illinois), incremental demand is low, especially in the critical initial year of the program. State-by state results show similar small percentages of increased demand. [512] We note that Florida (a non-ACT state) has experienced a dramatic load growth since 2012 (10 percent overall), but has accommodated that growth, including building

[506] TEIS at 65 and using the TEIS analysis showing that the 5 states analyzed account for approximately one third of national costs (TEIS at 66).
[507] Murray, Evan "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February 2024) (Demand by State tab.) . At the time we performed the inventory modeling analysis, seven states had adopted ACT in addition to California. Oregon, Washington, New York, New Jersey, and Massachusetts adopted ACT beginning in MY 2025 while Vermont adopted ACT beginning in MY 2026 and Colorado in MY 2027. Three other states, New Mexico, Maryland, and Rhode Island adopted ACT (beginning in MY 2027) in November and December of 2023, but there was not sufficient time for us to incorporate them as ACT states in our modeling.
[508] Analysis Group Heavy Duty Vehicle Electrification at 29.
[509] Analysis Group Heavy DutyVehicle Electrification at 31.
[510] "Integrated Distribution System Planning Approach". www.mass.gov/doc/eversource-integrated-distribution-system-planning-approach/download#:~ (May 8, 2023).
[511] Final Agreement between CARB, EMA, and Manufacturing Members of EMA, App. D item G (June 2023).
[512] Murray, Evan "Calculations of the Impacts of the Final Standards at Various Geographic Scales" (February 2024) (Demand by State tab).

new substations, feeders (9 percent increase), and transformers, all between 2013 and 2021.[513] This is far more buildout than will be occasioned by heavy-duty BEVs within the Phase 3 rule's timeframe.

We further note the comments of the Edison Electric Institute (trade association of the nation's investor owned utilities) ("EEI") that the degree of anticipated buildout is similar to increases experienced historically by the utility industry, and can be accommodated within the Phase 3 rule's timeframe. EEI Comments at 7, 8. The Analysis Group reached a similar conclusion.[514] Some commenters were concerned that interactions with utilities and their regulatory commissions vary state-by-state, and that this balkanized regime adds to grid buildout deployment timing difficulties.[515] Other commenters, however, persuasively maintained that this localized system is actually a plus. Each potential buildout is a localized decision, best handled by the local utility and grid operator.[516] As discussed in the following section, there are also many mitigative measures which BEV users can utilize to reduce demand, and the localized process provides a ready means to best develop optimized local mitigative measures.

Finally, we expect that the Phase 3 rule itself will serve as a strong signal to the utility industry to make proactive investments and otherwise proactively analyze and plan for potential buildout needs.[517] This is a partial answer to the chicken-egg conundrum voiced in the comments (see discussion in the following section).

Putting this together, EPA finds that the increases in national electricity demand associated with the Phase 3 Rule are very low in 2027 and increase to modest and manageable levels in later years of the program. At a regional and local level, we expect some areas to see small increases in peak demand, while other areas may see small decreases in peak demand associated with basic managed charging strategies. The resulting level of needed infrastructure buildout is small and manageable given the lead-time available. We now consider the specific situations of depot charging and en route (public) charging.

A. Depot Charging

We consider first the situation of a centralized depot accommodating multi-vehicle fleets, the typical situation for most of the HD BEVs considered in our modelled compliance pathway. As noted above, a number of commenters pointed out, accommodating the increased demand for this type of depot is not unprecedented, or even unusual, for utilities to timely accommodate. Charging infrastructure needs for a depot housing a large fleet would be similar to those of a data center or of a large commercial building, which demand even greater power at a centralized

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[513] Analysis Group Heavy Duty Vehicle Electrification at 22.
[514] Analysis Group Heavy Duty Vehicle Electrification at 27 ("Adding significant new distribution system infrastructure is not a new experience for states, public utility commissions, or electric companies, and there are long-standing policies and practices in place to ensure timely planning for and development of the infrastructure needed to endure system, reliability. And for most states and electric companies in the country. The magnitude and pace of system demand growth associated with the rollout of the EPA's proposed Phase 3 rule neither different from past periods of economically-driven demand growth, nor unusual with respect of the processes of forecasting, planning and development required.")
[515] Comments of DTNA at 47; see also Comments of Environmental Defense Fund at 67.
[516] Comments of State of California at 29.
[517] See Comments of CATF at 48; Comments of EDF at 75; Comments of ICCT at 10; Comments of Moving Forward Network at 114.

location.[518] Utilities successfully connected more than 1,000 MW of new data center loads in 2023.[519] In Virginia alone, the data center industry's load has increased 500 MW annually for the past three years and been accommodated.[520]

The final standards are structured to minimize demand for electrification infrastructure distributive buildout in the initial years of the program, the critical years for this purpose given the shorter lead time. The standards for MYs 2027-2029 are less stringent than proposed. The standards for the HDVs which pose the highest demand, heavy heavy-duty vocational vehicles and sleeper cab tractors, do not take effect until MYs 2029 and 2030, respectively.

We further have demonstrated a compliance pathway whereby almost all of the HDV BEVs utilize Level 2 or DC-50 kW chargers for depot EVSE, rather than higher rated chargers.[521] These lower rated chargers will not pose the types of electricity demand potentially requiring distributive buildout upgrades as the higher-rated chargers posited by some of the commenters.[522]

We have carefully considered the public comments and see that utilities and fleets have both the means to address issues of timing of buildout and are already utilizing them. EPA recognizes the various comments about leadtime. For example, a commenter states that "at the distribution system level it is not sufficient to simply compare potential charging station demand growth to system capacities."[523] Some commenters pointed to a chicken-egg conundrum, whereby potential fleet purchasers contemplating BEVs will not purchase without an assurance of adequate electrical supply, but utilities cannot build out without having assurance of demand. They say that utilities can be required to demonstrate that any buildout will be utilized in order to obtain regulatory approval for the buildout,[524] and state that infrastructure buildout needs can be heightened by the current practice of establishing capacity to handle nameplate power, the theoretical maximum power delivered when all users demand maximum load at once. Commenters note that related issues can arise from misalignment of timing of purchasing

[518] North America Data Center Trends H1 2022, "CBRE, September 9, 2022, available at https://www.cbre.com/insights/reports/north-america-data-center-trends-h1-2022.

[519] North America Data Center Trends H2 2023, CBRE, March 6, 2024, available at https://www.cbre.com/insights/reports/north-america-data-center-trends-h2-2023.. See also Analysis Group Heavy Duty Vehicle Electrification at pp. 23-24 for additional examples of utilities' timely accommodation of high demand data centers. See also Comments of EEI at 8: "Some large EV charging facilities have power requirements in the tens of megawatts (MW). Electric companies are well accustomed to serving facilities with those type of power needs".

[520] Wilson, J., and Z. Zimmerman. 2023. *The Era of Flat Power Demand is Over*. Grid Strategies. See pp. 11 at https://gridstrategiesllc.com/wp-content/uploads/2023/12/National-Load-Growth-Report-2023.pdf#:~:text=Over%20the%20past%20decade%2C%20grid%20planners%20have%20been,data%20centers%2C%20industrial%20facilities%2C%20and%20other%20near-term%20investments

[521] RIA chapter 2 at Table 2-73. The only exceptions are for tour tractors projected to utilize DC-150kW chargers (HD TRUCS vehicles 30, 31, 83, and 101), and one additional tractor and one transit bus projected to utilize DC-350kW chargers (HD TRUCS vehicles 80 and 87).

[522] The ICCT White Paper likewise finds that "trucks with smaller batteries can charge overnight with 50 kW CCS chargers or 19 kW Level 2 chargers in some cases." ICCT White Paper at p. 6.

[523] Analysis Group Heavy Duty Vehicle Electrification at 10.

[524] Comment of EEI at 11:"While policies vary by state commission, two generally applicable principles have important implications for fleet electrification. First, the 'used and useful' standard means that regulatory will only approve the electric company to build infrastructure that will be utilize and provide value." EEI further documents that a number of large utilities are finding ways to move away from this model so as to provide infrastructure readiness in advance of individual applications. EEI comments at 12-14. (described more fully in text above).

decisions and distributive grid buildout, including that utilities need to account for the fact that a BEV purchasing decision is on a shorter timeline than building construction. Commenters also note that a major distributive buildout requiring new substations would require significant lead time; for example, buildouts entailing new substations could take years for construction and for obtaining regulatory approvals.[525]

EPA has thoroughly considered these issues, including in consultation with experts at the Department of Energy. While we acknowledge the leadtime concerns raised by these commenters, the agency believes there is sufficient leadtime. We have identified solutions to each of these issues, many of which are already being implemented. First, as demonstrated above, we have projected a compliance pathway whereby there will be limited need for any grid distributive buildouts. Those buildouts that we project largely involve transformers or feeders, and a small number of expanded substations. Few new substations are projected to be needed , even when considering national demand (i.e. BEVs in EPA's reference case plus those attributable to the Phase 3 rule, in the potential compliance pathway). We emphasize again that this analysis is conservative in that we do not consider ameliorative measures available to utilities to apportion demand (discussed below), and consider only conservative mitigative measures on the part of depot owners (limited time-of-day charging assumptions).

Second, utilities can and are acting proactively to provide added capacity when needed. As stated by EEI, "EPA's assessment that 'there is sufficient time for the infrastructure, especially for depot charging, to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply' is accurate. As seen above, EEI members actively are planning for and deploying infrastructure today."[526] EEI documents that a number of large utilities are finding ways to move away from a business model requiring demonstration of concrete demand so as to provide infrastructure readiness in advance of individual applications. EEI comments at 12-14 (actions of California and New York State investor owned utilities, and their respective regulatory bodies); see also Analysis Group Heavy Duty Vehicle Electrification at 31 and n. 75 (rate orders allowing utilities to include adjustment clauses in tariffs, whereby utility buildout expansions need not wait upon the outcome of a full rate case).

There are means for utilities to ameliorate demand which do not require regulatory approval at all. Utilities can engage in short-term load rebalancing by optimizing use of existing distributive infrastructure. This can accommodate new HDV demand while maintaining overall system reliability.[527] In addition, because depot charging often occurs over nighttime hours corresponding to reduced system demand, utilities have the flexibility to use otherwise extra grid capacity for those hours (excess capacity being inherent in constructing to nameplate capacity).[528] Utilities also can reduce needed demand by incorporating so-called smart charging

[525] Approximately 3 years for planning and authorization in California. California Public Utilities Commission Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning May 22, 2023 Available online: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/fip-draft-staff-proposal_5_22_23-webinar-final_ver2.pdf

[526] EEI Comments at 14.

[527] ICCT White Paper at 18-19.

[528] https://www.forbes.com/sites/bradtempleton/2022/09/12/evs-wont-overload-the-power-grid-in-fact-evs-and-ice-are-its-salvation/?sh=61f3269949c5

into feeder ratings and load forecasting whereby the utility need not provide capacity based on annual peak load, but can differentiate by daily and seasonal times.[529] An available variant of this practice is use of flexible interconnections (discussed in more detail below), whereby customers agree to limit their peak load to a specified level below the cumulative nameplate capacity of their equipment (in this case, their EVSEs).[530]

Many utilities also provide hosting capacity maps. Utilities, developers, and other stakeholders can use these maps to better plan and site energy infrastructure. Hosting capacity maps provide greater transparency about where new loads such as EV chargers, can be readily connected. Specifically, hosting capacity maps identify where power exists and at what level, where distributed energy resources (DERs) can alleviate grid constraints, or where an upgrade may be required. For example, EV charging companies can use the maps to identify new areas to expand their charging station networks more quickly and cost-effectively. While the information in hosting capacity maps does not address all the interconnection questions for individual sites, they can indicate relative levels of investment needed. DOE has identified 39 unique hosting capacity maps currently available covering 24 States and the District of Columbia.[531] Similarly, utilities have developed tools providing detailed information on electrification fueling requirements, site preparation and depot needs, the process of interconnection, total cost of ownership calculation mechanisms, maintenance and operations issues associated with both vehicles and infrastructure.[532] ERCOT (the grid operator for most of Texas) has in place a method and process to forecast EV loads at the substation level, and has commenced using these estimates as part of its near-term transmission planning studies.[533]

Third, there are many mitigative measures open to fleet owners utilizing depots. Readily available practices include use of managed charging software, energy efficiency measures, and onsite battery storage and solar generation.[534] Other solutions include bi-directional charging and V2G (vehicle to grid) whereby vehicles can return electricity to the grid during peak hours while drawing power at low demand times.[535] Solar DER allows on site electricity generation that reduces the energy demand on the grid. As discussed in the RIA, battery-integrated chargers can reduce the need for distribution upgrades by limiting the peak power draw of high-powered charging stations. On-site distributed generation can similarly be deployed to reduce the amount of power needed from the grid, and allow for faster interconnection. Mainspring Energy has deployed its linear generators to accelerate interconnection for heavy-duty EV charging for

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[529] ICCT Comment at 12.

[530] Comments of EDF at 69; Electric Power Research Institute (EPRI), “Understanding Flexible Interconnection” (September 2018) (describing flexible interconnection generally, and detailing its possibilities for reducing demands on time – and location-dependent hosting capacity).

[531] See US Department of Energy Atlas of Electric Distribution System Hosting Capacity Maps, available at https://www.energy.gov/eere/us-atlas-electric-distribution-system-hosting-capacity-maps.

[532] Alliance for Transportation Electrification and the Electrification Coalition , “Fleet Advisory Services for Fleet Electrification: Meet Customer Needs and Provide Grid Benefits” (February 2023), available at https://electrificationcoalition.org/wp-content/uploads/2023/02/FAS.White-Paper.E.O.task_.force_.FINAL_.2.23.23.pdf.

[533] Analysis Group Heavy Duty Vehicle Electrification at 28. See also additional instances of hosting capacity maps and their benefits in Alliance for Transportation Electrification ”ATE: Interconnection Task Force” (March 2023) at https://evtransportationalliance.org/publications/

[534] Comments of EDF at 69.

[535] Comments of Advanced Energy United, EPA-HQ-OAR-2022-0985-1652-A2 at 4; Comments of Clean Air Task Force, EPA-HQ-OAR-2022-0985-1640-A1 at 54; Analysis Group Heavy Duty Vehicle Electrification at 33-4. .

Prologis in California.[536] The TEIS captures existing solar energy in its analysis but did not consider the potential for increased future on-site solar generation at charging locations. All of these can reduce demand below what would otherwise be nameplate capacity. See the summaries in the following section on distribution costs further documenting additional mitigative possibilities. We note that EPA's cost estimates do not expressly consider these mitigative measures. However, standard available Level 2 chargers have power/amperage control that would enable basic charge management such as used in the TEIS. Others had features allowing charge start time control which is the next level of charge management to mitigate distribution buildout cost and timing. These chargers have low enough price points that total cost with installation is expected within our cost assumptions.[537] This demonstrates that additional cost for managed charging is not required, and that some measure of managed charging is already encompassed within our cost analysis under the potential compliance pathway. There thus exist multiple available measures to reduce demand and need for distribution buildout, and consequently provide further support for finding that there are reasonable means of providing needed distribution buildout in the rule's timeframe when there is a need to do so. See RIA Chapter 1.6.4 for additional examples.

As many commenters noted, the question of availability of supporting electrification infrastructure is not in the control of the regulated entity here, the OEM, nor is it in the direct control of prospective vehicle purchasers. See, e.g., Comments of EMA summarized above. As all agree, this necessitates some measure of coordination between a range of stakeholders and utilities. Many such means of coordination are described in the comments by utility associations like EEI, [538] and the transportation industry coalition ZETA[539] Additional examples and strategies are set out in RIA Chapter 1.6.4 and in the following discussion of public charging network availability. OEMs and regulators likewise can contribute to this coordination, as in the agreement between CARB, EMA, and OEMs to "promote future infrastructure development" noted earlier in this response.

We note further that this is not an unprecedented situation with CAA section 202 standards. For example, when EPA required the removal of lead from gasoline, an entire new parallel fuel distribution system was developed to dispense the new unleaded gasoline. See Preamble section I. Other examples where new distribution systems arose to ensure delivery of fuels necessary to vehicular pollution control include the infrastructure to supply diesel exhaust fluid (used to support selective catalytic reduction) and ultra-low sulfur diesel fuel (used to support diesel particulate filters). We thus see that there can be successful market responses to demand created by a section 202 standard, including successful responses from unregulated entities.

Utilities, of course, are motivated to continue investment in the distribution system for reasons other than demand from the transportation sector, and so could be building out in some cases for

[536] Mainspring Energy. "Clean, on-site EV charging infrastructure and prime power generation for a global leader in logistics real estate." Available at https://cdn.sanity.io/files/m8z36hin/production/e7132d4b2c726044a24820343e825136c2ee0c04.pdf.

[537] FoxESS, https://www.aliexpress.us/item/3256805996960006.html; Hwisel, https://www.google.com/shopping/product/5400666075669586382; 54 energy, https://54energy.net/products/32a-evse-wallbox-charger-type2-cable-7-6-11-22kw-power-and-app-control-for-electric-vehicle-charging.

[538] Comments of EEI pp. 10-16.

[539] Comments of ZETA pp. 32-46.

their own purposes.[540] In addition, as noted at the end of this section, the utility industry has a strong financial incentive to service the HDV sector, and to do so expeditiously. That is to say, the increased demand due to BEV charging presents a significant positive business opportunity for utilities to increase their revenues and profits, and it is reasonable to believe that utilities will successfully capitalize on these opportunities. Utilities are thus themselves pursuing innovative solutions to address the issue of needed buildout. One approach is for utilities to make non-firm capacity available immediately as they construct distribution system upgrades. In California, Southern California Edison (SCE) is running a two-year Automated Load Control Management Systems (LCMS) Pilot. The program would use third-party owned LCMS equipment approved by SCE to accelerate the connection of new loads, including new EVSE, while "SCE completes necessary upgrades in areas with capacity constraints." SCE would use the LCMS to require new customers to limit consumption during periods when the system is more constrained, while providing those customers access to the distribution system sooner than would otherwise be possible. Once SCE completes required grid upgrades, the LCMS limits will be removed, and participating customers will gain unrestricted distribution service. SCE hopes to evaluate the extent to which LCMS can be used to "support distribution reliability and safety, reduce grid upgrade costs, and reduce delays to customers obtaining interconnection and utility power service." .[541]

Plans like SCE's to use LCMS to connect new EV loads faster in constrained sections of the grid will be bolstered by standards for load control technologies. UL, an organization that develops standards for the electronics industry, drafted the UL 3141 Outline of Investigation (OOI) for Power Control Systems (PCS). Once finalized, manufacturers will be able to use this standard for developing devices that utilities can use to limit the energy consumption of BEVs. The OOI identifies five potential functions for PCS. One of these functions is to serve as a Power Import Limit (PIL) or Power Export Limit (PEL). In these use cases, the PCS controls the flow of power between a local electric power system (local EPS, most often the building wiring on a single premises) and a broader area electric power system (area EPS, most often the utility's system). Critically, the standardized PIL function will enable the interconnection of new BEV charging stations faster by leveraging the flexibility of BEVs to charge in coordination with other loads at the premise. With this standard in place and manufacturer completion of conforming products, utilities will have a clear technological framework available to use in load control programs that accelerate charging infrastructure deployment for their customers.[542]

Finally, as a number of commenters noted, the utility industry has a strong financial incentive to service the HDV sector, and to do so expeditiously. For example, the study conducted by Synapse Energy Economics for EDF showed significant financial opportunity. Con Edison's

[540] TEIS at 99-100, noting the need to replace aging assets, and other planned maintenance .
[541] Southern California Edison. "Southern California Edison Company's Comments on the California Energy Commission's Draft 2023 Integrated Energy Policy Report". November 2023. Available online: file:///C:/Users/mlandgra/OneDrive%20-%20Environmental%20Protection%20Agency%20(EPA)/Documents%20-%20HD%20GHG%20Ph.3/05%20-%20FRMDocket/To%20be%20docketed/Landgraf/TN253452_20231201T140710_SCE%20Comments%20on%202023%20IEPR%20Comments%20-%20SCE%20Comments%20on%202023%20IEPR%20(1).pdf.
[542] UL LLC. January 11, 2024. "UL 3141: Outline for Investigation of Power Control Systems." Available online: *https://www.shopulstandards.com/ProductDetail.aspx?productId=UL3141_1_O_20240111*.

make ready program could generate net revenue of $690 million and National Grid could generate $89 million over the years of 2023 – 2045.

In sum, we project that distribution systems to meet the potential increase in charging station demand associated with depot charging under the Phase 3 rule will be available in the rule's timeframe. Quantified demand attributable to the rule is relatively modest, and there are ways—many on-going—to accommodate demand. Where buildout might be needed, it can be met for the most part with the least time-intensive forms of infrastructure buildout. We have also considered further potential issues, including the chicken-egg paradigm, and described means that are reasonably available to resolve these issues in the lead time provided by the rule. That the trade association of the investor-owned utility industry agrees provides further support for our finding. Comments of EEI at 14.

B. Public Charging Infrastructure Availability

Commenters from both industry and NGO sectors agreed that EPA's assumption of depot charging as the exclusive charging mode for the 2027-2032 MY standards was inadequate for certain long-haul applications. EPA agrees and has revised its projected compliance pathway accordingly such that sleeper cab tractors and certain day cab tractors are projected to utilize public (en-route) charging networks rather than depot charging. See generally, Preamble section II.D.5. We find here that there will be adequate supporting public charging infrastructure for sleeper cab tractors in the lead time afforded by the rule.

First, as documented in the ICCT White Paper, and as discussed above, there is no need to build out all at once. It is reasonable to project that activity will center on the busiest long-haul freight routes and corridors. The White Paper further finds that in MY 2030, up to 85% of long-haul truck charging needs in the country will concentrate on discrete corridors of the National Highway Freight Network.[543] Assuming an average of 50 miles between stops, this would mean a need for 844 public charging stations. Id. In a supplemental analysis assuming 100 mile intervals between stations, ICCT refined that estimate to needing between 100-210 electrified truck stops, assuming a given level of BEV long-haul tractors. ICCT Supplemental Comment (January 2024.) We note that the ICCT estimates in both the White Paper and the supplemental comment assume more long-haul tractor BEV adoption than in EPA's projected compliance pathway for 2030, and also assume public charging rather than depot charging for some short-haul tractors and vocational vehicles. From that standpoint, the White Paper estimates can be viewed as conservative. [544]

This level of public charging is doable. First, under the final standards, there would be no need for public charging until MY 2030. One reason for the extra lead time in the final rule is to provide more time for the public infrastructure development. See RIA Chapter 2.8.7.3.

Second, manufacturers, charging network providers, energy companies and others are investing in high-power public or other stations that will support en-route charging. See RIA Chapter 1.6.2.2 and 1.6.5. As noted there, a recent assessment by Atlas Public Policy

[543] ICCT White Paper at 14. This estimate reflects total need, not just an increment attributable to Phase 3 standards. Id. at 10.. .

[544] See Analysis Group "Heavy Duty Vehicle Electrification" at Table 1 (showing ICCT long-haul tractor estimates for 2030: 16% (ICCT) v. 6% (EPA final rule potential compliance pathway)).; ICCT White Paper at 10, 23 (showing projections for all MHDVs).

estimated that $30 billion in public and private investments had been committed as of the end of 2023 specifically for charging infrastructure for medium- and heavy-duty BEVs.[545] The U.S. government is making large investments in charging infrastructure through the BIL[546] and the IRA,[547] as discussed in RIA Chapter 1.3.2. This includes extending and modifying a tax credit that could cover up to 30% of the costs for procuring and installing certain charging infrastructure (subject to a $100,000 per item cap) and billions of dollars in funding programs that could support charging infrastructure either on its own or alongside the purchase of a HD BEV. In the past year, for example, the States of California, Colorado, New Mexico, New York, and Washington have received a total of approximately $166 million in grants under the Charging and Fuel Infrastructure federal program for designated alternative fuel corridors. See RTC section 6.1.

Private investments will also play a critical role in meeting future infrastructure needs. Much of this will likely be charging infrastructure purchased by individual BEV or fleet owners for depot charging. This is occurring already. Over a billion dollars have been announced for projects to support electric truck or other commercial vehicle charging in the United States and Europe.[548] For example, Daimler Truck North America is partnering with electric power generation company NextEra Energy Resources and BlackRock Renewable Power to collectively invest $650 million to create a nationwide U.S. charging network for commercial vehicles with a later phase of the project also supporting hydrogen fueling stations.[549] Volvo Group and Pilot recently announced their intent to offer public charging for medium- and heavy-duty BEVs at priority locations throughout the network of 750 Pilot and Flying J North American truck stops and travel plazas[550]. One Energy plans a 30 MW charging facility in Ohio. It is located next to a 138kV transmission line to benefit from reduced connection cost and time needed for development. The size and capacity are such that 90 trucks can charge at 300 kW.[551] This example shows that, with proper planning, even the largest charging facilities can potentially be accommodated without significant new distribution infrastructure buildout. See RIA Chapter 1.6.2.2 describing additional existing and projected efforts among vehicle manufacturers, fleets, charging providers, and other public and private sources to support HDV

545 Lepre, Nicole. "Estimated $30 Billion Committed to Medium- and Heavy-Duty Charging Infrastructure in the United States." Atlas Public Policy. January 26, 2024. Available online: https://www.atlasevhub.com/data_story/estimated-30-billion-committed-to-medium-and-heavy-duty-charging-infrastructure-in-the-united-states/.

546 Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021). Available online: https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf.

547 Inflation Reduction Act, Pub. L. No. 117-169, 136 Stat. 1818 (2022). Available online: https://www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf

548 BloombergNEF. "Zero-Emission Vehicles Factbook A BloombergNEF special report prepared for COP27." November 2022. Available online: *https://www.bloomberg.com/professional/download/2022-zero-emissions-vehicle-factbook/*.

549 NextEra Energy. News Release: "Daimler Truck North America, NextEra Energy Resources and BlackRock Renewable Power Announce Plans to Accelerate Public Charging Infrastructure for Commercial Vehicles Across The U.S." January 31, 2022. Available online: *https://newsroom.nexteraenergy.com/news-releases?item=123840*.

550 Adler, Alan. "Pilot and Volvo Group add to public electric charging projects." FreightWaves. November 16, 2022. Available online: *https://www.freightwaves.com/news/pilot-and-volvo-group-add-to-public-electric-charging-projects*.

551 BusinessWire. October 9, 2023. "One Energy Energizes the Largest Electric Semi-Truck Charging Site in US at 30 MW Megawatt Hub Site in Ohio". Available Online: https://www.businesswire.com/news/home/20231009589668/en/

BEV public charging. And, of particular import, the TEIS included public charging in its analysis and identified no barriers to implementation.[552]

As described in RIA Chapter 1.6.2.2, states and utilities are also engaged. Seventeen states plus the District of Columbia (and the Canadian province Quebec) developed a "Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Action Plan," which includes recommendations for planning for, and deploying, charging infrastructure. California is investing $2.9 billion through 2026 in BEV charging and hydrogen fueling infrastructure (and related projects), including $1.7 billion specific to infrastructure for medium- and heavy-duty vehicle applications. Actions such as these are required to address DTNA and similar concerns that utility infrastructure planning is 5-10 year timeframe, much farther out than fleets. This coordination and communication will allow utilities to determine future infrastructure needs, align with regulators on the need and cost, and implement on time. The Edison Electric Institute estimates that electric companies are investing about $4 billion to advance charging infrastructure and fleets. The National Electric Highway Coalition, a group that includes more than 60 electric companies and cooperatives that serve customers in 48 states and D.C. aims to provide fast charging along major highways in their service areas. Other utilities, like the Jacksonville Electric Authority (JEA) are supporting infrastructure through commercial electrification rebates. JEA is offering rebates of up to $30,000 for DCFC stations and up to $5,200 for Level 2 stations. In the west, Nevada Energy is supporting fleets by offering rebates for up to 75% of the project costs for Level 2 ports and up to 50% of the project costs for DCFC stations (subject to caps and restrictions. For supporting citations, please see RIA Chapter 1.6.2.2.

Thus, we see coordinated responses at the federal,[553] state, utility, fleet, and vehicle manufacturer level to meet evident market demand. EPA agrees with commenters that all these entities may play a role in facilitating public charging infrastructure, and that is what we see already happening. We note further that numerous comments by varied stakeholders reinforced that this EPA rule will provide clear direction and help infrastructure plans move forward. See RTC section 2.4 (Theme: Federal standards themselves will provide regulatory certainty for investment in ZEVs, critical materials, and infrastructure). We view the Phase 3 rule as providing the vital regulatory certainty for supporting the development of charging infrastructure.

Putting this together, we believe that there will be adequate public charging infrastructure within the Phase 3 rule's timeframe. The standards are structured to provide extra lead time until 2030 for commencing public charging. Substantial sums are being invested in creating a public charging network for HD BEVs, and there is coordinated activity across the public and private sectors, including the utility sector, to successfully implement a network. EPA's rule will provide regulatory certainty to support further investment. Accordingly, we find that the rule affords adequate lead time for public charging.

We discuss the issue of cost in the following RTC section, but note here the conclusion that costs associated with distributive grid buildouts attributable to the potential compliance pathway

[552] TEIS at 23 (overall methodology) and 73 (incremental number of public charging ports estimated).
[553] As noted above, the National Zero-Emission Freight Corridor Strategy is part of this federal response.

used to support the standard’s feasibility are modest both absolutely and as a percentage of total grid investment.

EPA Summary and Response – Distribution Cost:

Summary:

EPA received many comments regarding the cost needed for upgrading the grid to deliver the power required for HD BEV (AFPM, AmFree, NACS). AmFree states that a new substation can cost $35M and take 4 years to implement. AFPM highlights the cost magnitude by sharing a Southern California case study where the infrastructure upgrades were at least $1B and possibly over $10B. International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW) comments that the standards should better reflect that federal incentives will take time to mature, and that market demand will lag behind that timing. RMI recognizes in their comments that the infrastructure buildout time and cost can be limiting factors for ZEV adoption.

Commenters provided input on various cost aspects driven by or related to Phase 3 standards. Some shared external factors that would drive up electric prices. One (CFDC) expects that new power plant regulations will increase costs as the demand for power from HD BEV increases. Zero Emission Transportation Association (ZETA) provided comment on investments being required for distribution systems and possibly energy generation and associated distribution. Other comments like those from DTNA and EEI focused on the cost of the infrastructure build out and how that cost is passed on to consumers. They share that the HD fleets may cover buildout costs directly when power is supplied by utility coops or by municipal service. NRECA mirrored this thought and added that costs will be region, neighborhood, cooperative, circuit, and feeder dependent and must be passed to their coop members. DTNA and Schneider National similarly stated that, when power is from an investor-owned utility, the costs will be covered by rate increases that impact the fleets or all electric customers. EMA likewise noted that there are different mechanisms for allocating costs of distributive grid buildout, but agreed that it was reasonable to consider that the cost would be reflected in the overall rate base. EMA further suggested what this cost should be, based on analytic work of the ICCT.

DTNA utilized analysis by BCG to estimate an optimized and non-optimized electric rate increase driven by grid infrastructure. DTNA calculated and shared grid build out cost estimates for each of the 50 states. DTNA’s calculation shows a price tag of $36B for grid buildout in support of HD BEV Phase 3 standards. NACS indicated that pricing could be based on peak demand, rather than on actual use, and also shared concern that HD BEV en route charging stations would incur high demand charges as HD BEV at these facilities would require immediate, high power charging.

Clean Air Task Force pointed out that revenue would be generated by additional electricity supply with existing systems such that rates could decrease. This possibility to lower rates for all users, due to the increased revenue from HD BEV, was also found in a study of NY State conducted for EDF. EDF goes on to state that HD BEV users can decrease their own rates by implementing managed charging and save even more with stationary batteries and DER. Valero shares that if fleets add stationary batteries to keep distribution upgrade cost low, the cost of the stationary batteries must go into the analysis. Clean Air Task Force and Moving Forward Network (MFN) comments offered that using V2G technology would provide significant savings such as $13-15 billion in stationary battery costs in CA. Comments on related costs like the charging equipment taking up physical space and possibly adding parking lot size and cost were made by DTNA. Clean Fuels Development Coalition shared that HD BEV charging stations will require more space since the large trucks will remain at the station longer as charging takes longer than filling the tank of an ICE vehicle. If the infrastructure upgrade requires land, MOFB states that land owners need fair compensation for any land they relinquish.

Comments were received that distribution upgrades and their cost can be minimized through load management and Time of Use charging (AEU, CALSTART, MFN). They shared that TOU works for residential customers and they expect HD BEV users to be even more cost sensitive and, for depot charging situations, potentially having more latitude about scheduling off-peak charging times. MFN also shared that LBNL studies showing TOU and load management reduce grid investment needs. Comments by EDF cover a NJ study where grid buildout savings (i.e., avoided costs) were up to $2.15B when managed charging was combined with solar and battery hardware. AEU shared NREL data that managed charging can save a fleet $1,090 per EV per year. They also shared PGE testimony that managed charging can reduce capacity request 50% and save $30,000 to $200,000 per project. CALSTART shared information on EO Charging, a UK company that has made managed charging, energy storage, and flexible rates a way to accelerate BEV deployment and deliver reliable charging while working around grid capacity constraints. CALSTART shared other new business models that, although possibly supporting HD BEV adoption, are outside of the scope of this rule. Energy Strategy Coalition and NACAA noted massive subsidies at the federal and State level supporting grid improvements, including specific instances of funding directed at the heavy-duty sector. Commenter DTNA, however, included an Appendix B documenting that most states have not yet given specific consideration to HD infrastructure needs in their plans for disposition of NEVI subsidies for public charging EVSE. Energy Innovation shared that private investment has grown from $200 million to $13 billion in the 5 years ending in 2023. It was not made clear if this investment was distribution or EVSE or both. This commenter further notes that total approved utility investment for transportation electrification was $5.230 billion as of March 2023.

<u>Response:</u>

EPA recognizes that grid distribution upgrade costs will be present when existing capacity is not sufficient for HD BEV loads. We have considered the costs of distribution buildout in the RIA costs analysis. The below discussion supplements our prior response as well as the analysis in RIA Chapter 2.4.4.2.

In order to better understand potential distribution upgrade costs associated with the combined BEV demand under potential compliance pathways for this rulemaking and for the proposed Multipollutant Emissions Standards for Model Years 2027 and Later Light-Duty Medium-Duty Vehicles, EPA and DOE supported a first of its kind Transportation Electrification Impact Study (TEIS). To reiterate, the TEIS was conducted by a team of researchers at NREL, LBNL, and Kevala. The study focuses on 5 states (California, New York, Illinois, Oklahoma, and Pennsylvania) to capture diversity in population density (urban and rural areas), freight demand, BEV demand, state EV policies, utility type (i.e., investor owned, municipality, or cooperative) and distribution grid composition. The TEIS used these states to extrapolate a national demand for where and when upgrades will be needed to the electricity distribution system—including substations, feeders, and service transformers—due to increased BEV load associated with an approximation of the EPA light- and heavy-duty rules, referred to in the Study as the EPA policy case, and under a no action case. The research team also assessed the potential impact of "conservative " [554]managed EV charging to reduce the needs and associated costs of distribution upgrades. The 5 State portion of the TEIS for the year 2027 shows incremental distribution grid capital investment of $195 million for the unmanaged scenario. When managed, this drops to $82 million.[555] The 5 state portion of the TEIS for the year 2032 shows incremental distribution grid capital investment of $2.3 billion for the unmanaged action scenario. When managed, the $2.3 billion drops to $1.0 billion.[556] The savings is driven by the reduction in peak incremental load achieved by the basic load management applied in this study. More effective load management is expected to be utilized in practice.[557] Incremental distribution grid investment to enable BEV charging ($2.3 billion across five states over 6 years) was found to be approximately 3% of existing utility distribution system investments (2027-2032).[558] In 2027, when there is the least lead time, projected incremental distribution capital investment is only $195 million (82 million managed), an even smaller percentage.[559] The study moreover finds that "[m]anaged charging techniques can decrease incremental distribution grid investment needs by 30%, illustrating the potential for significant cost savings by optimizing PEV charging and other loads at the local level."[560] These values are inclusive of effects for LMHD and so overstate the amount of grid investment associated with the Phase 3 rule.

A 3% increase in distribution system build out correlates to a small increase in manufacturing output so concerns regarding supply chain timing and cost are minimal. The total costs are modest both in and of themselves, as a percentage of grid investment even without considering mitigation strategies. Based on utility reports to the Federal Energy Regulatory Commission, data from electric co-ops, and extrapolation for the remaining utilities, the TEIS estimated that the national investment in distribution systems exceeded $60 billion annually as of 2021.[561] A high-level approach for scaling the national distribution system investment to the five states under study was applied to estimate that $15 billion of distribution system investment occurred in 2021. The TEIS estimated that the incremental investment in distribution networks (to accommodate PEV growth due to EPA's rulemaking) as an additional $2.3 billion of grid investment for PEVs relative to a no action case. Annualizing this between 2027 and 2032 results in an annual cost from the EPA light- and medium duty rule combined with the heavy-duty phase 3 rule of $0.4 billion, or approximately 3% of existing annual distribution investments, across the five states.[562]

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[554] TEIS at 4.
[555] TEIS Table 26.
[556] TEIS Table 26.
[557] As noted in the previous section, even in 2032, peak demand is projected to decrease in three of the five states, and increase only minimally in the other two. TEIS at 76. . Consistent with the small increase in load and peak load, total costs are modest as well.
[558] TEIS at 75 ..
[559] TEIS at 75.
[560] TEIS at 76. PEV refers to Plug-in electric vehicles. Since the TEIS is considering effects of both rules, it includes plug-in hybrid vehicles as part of its analysis. Breaking this down further, the TEIS finds that "managing charging could substantially reduce incremental grid components needs, including for substations by 50%, feeders by 40%, and service transformers by 30%." Id.
[561] TEIS Executive Summary at ix.
[562] TEIS Executive Summary at ix.

The TEIS grid buildout cost results were extrapolated to all IPM regions in order to estimate impacts on electricity rates using the Retail Price Model. There is no difference in retail electricity prices between the No action/unmanaged and action/mitigated case in 2030 and the difference in 2055, is only 2.5 percent and we estimate that the 2.5 percent difference is primarily due to distribution-level costs. The net cost of distribution-level upgrades are included within our analysis of costs and benefits for the final rule along with other grid-related costs modeled by IPM, and is reflected in electricity rates estimated using the Retail Price Model. EPA thus believes that the costs associated with distributive grid buildout attributable to the Phase 3 rule are reasonable. The relative small cost increases further support our conclusion in the prior response that there is sufficient lead-time to upgrade distribution infrastructure.[563]

As noted, based on utility reports to the Federal Energy Regulatory Commission, data from electric co-ops, and extrapolation for the remaining utilities, the TEIS estimated that the national investment in distribution systems exceeded $60 billion annually as of 2021. A high-level approach for scaling the national distribution system investment to the five states under study was applied to estimate that $15 billion of distribution system investment occurred in 2021. The TEIS estimated that the incremental investment in distribution networks (to accommodate PEV growth due to EPA's rulemakings) as an additional $2.3 billion of grid investment for PEVs relative to a no action case. Annualizing this between 2027 and 2032 results in an annual cost from the EPA light- and medium duty rule combined with the heavy-duty phase 3 rule of $0.4 billion, or approximately 3% of existing annual distribution investments, across the five states. The TEIS results were extrapolated to all IPM regions in order to estimate impacts on electricity rates using the Retail Price Model (see RIA Chapter 2.4.4.2). There is no difference in retail electricity prices between the No action/unmanaged and action/mitigated case in 2030 and the difference in 2055, is only 2.5 percent and we estimate that the 2.5 percent difference is primarily due to distribution-level costs. Note also that this is comparable to the 3% increase in distribution-level investments estimated for the 5 states within the TEIS.[564] The net cost of distribution-level upgrades are included within our analysis of costs and benefits for the final rule along with other grid-related costs modeled by IPM, and is reflected in electricity rates estimated using the Retail Price Model. See RIA Chapter 2.4.4.2.

Land Acquisition Costs

A number of commenters stated that grid distribution buildout would require additional space, sometimes necessitating acquisition of land. They noted that freight depots are often located in densely populated areas where land is either not available, or at a premium. See, e.g. Comments of DTNA at 47. The ATA (at 17) gave the example of when a new substation is a specific situation where more land would be needed. If land is available, there would be a cost which should be reflected in EPA's analysis.

With respect to public charging, EPA agrees that there may be additional costs associated with land acquisition that should be considered in our modeling. In many cases, the public charging stations will be new facilities, see RIA Chapter 1.6.1.5, and so will not be utilizing an existing footprint. Our estimate of electricity rate for public charging includes an amortized cost of land acquisition. RIA Chapter 2.4.4.2. We agree with commenters that HDV public charging

[563] See Preamble section II.D.2.iii.c at n. 452.
[564].TEIS at 74.

will in many cases require more parking and other space, as well as higher rates chargers, than public facilities servicing light duty vehicles. See RIA Chapter 1.6.1.4 noting this concern, and RIA Chapter 1.6.2.2 describing various means of sizing to accommodate HD BEVs. The fact that much of the heavy-duty public charging network will be new facilities allows this extra space to be included in the facility design.

With respect to depot charging, we are not including a cost for land acquisition. First, these are typically not greenfield sites (i.e., new facilities), but will be utilizing existing footprints. Second, we believe that the early targets of electrification will be facilities where it is most cost effective to do so, which would include considerations of available space. In this regard, as noted throughout the Preamble and RIA, the majority of HDV in our potential compliance pathway remain ICE vehicles, leaving fleet owners flexibility as to where to electrify.

In addition, our modeled potential compliance pathway shows that depot charging needs for most HDVs can be met with level 2 chargers. RIA Chapter 2.6.2.2. This type of charger would generally not require power cabinets or other behind-the-meter equipment for which higher-power stations need extra space. In confirmation (and in response to the comment of ATA), the TEIS Study finds that in 2032, only 8 substations would be required in its 5-State study area even in the unmanaged case (i.e. without any mitigation), and only 4 substations would be required if "conservative " mitigation is utilized, of which only 1 would be new, the rest being upgrades to existing substations which would not add to an existing footprint.[565] Nationally, the number of substations in 2032 is projected at from 24-48 (managed and unmanaged) of which most would be upgrades.[566] Moreover, as discussed in the responses above, there are many other mitigative measures readily available to reduce the need for buildout at all, or for the type of buildout that would occasion the need for additional land.

Daimler cites two instances where space constraints have precluded BEV purchases by fleet owners, one in California and one in Denver, Colorado. Daimler Comment at Fig. 4 and 5. These instances both involved situations where grid buildout was needed. It is not clear from the comment if Level 2 or other chargers were being utilized, if any mitigative measures for reducing demand were considered, or otherwise why buildout was involved. Given the lack of specificity provided by the commenter, EPA cannot respond further to this individual instance, which in any case would not be generalizable to national conditions years hence.

Total Cost (DTNA Appendix C)

DTNA estimated the additional installed capacity that will be needed to support HD BEVs at the adoption rates projected in the Proposed Rule. They calculated a 5-year average of commercial vehicle sales in all 50 states from the Polk Automotive database from 2017-2021, applied EPA's projected ZEV volumes for 2027-2032, and calculated the total installed charging capacity that will be required by these vehicles in 2027 - 2032 to be approximately 45 gigawatts. In Appendix C of its comments, DTNA then estimated the investments in charging infrastructure and grid upgrades, as well as total installed charging capacity, that will be required in each of the 50 states, state by state, to support implementation of the Proposed Rule. They project a 50-State cost of $36 billion.

[565] TEIS at 75.
[566] TEIS at 65 , and see text at n. 501 above for further explanation.

First, DTNA used sales estimates and BEV (their analysis assumes no FCEVs) adoption rates reflecting the proposed rule, and so based its estimates on nearly 1,500,000 BEVs.[567] This is almost three times the number of BEVs projected under the final Phase 3 standards; 525,0000.[568] DTNA also used its own cost estimates for charging and installation, which are higher than EPA's. In addition, although they present state-by-state estimates of amount of charging and distributive infrastructure needed, there is no breakdown of either charger type or the nature of the grid buildout. There is also no discussion of mitigation to reduce need for buildout, but as EPA explained above, we think it is very likely that mitigation strategies will be employed, and that even the most rudimentary of such strategies can greatly reduce the need for infrastructure buildout. For all these reasons, it is difficult to evaluate DTNA's estimate, although it is clearly higher than the final rule's costs given the difference between the proposed and final standards.

The TEIS does provide an estimate of 5-State costs for charging ports and charging infrastructure capital investment (for substations, feeders and transformers). The basis for these quantified estimates of individual asset type is well documented in the TEIS.[569] Over 2027-2032 the TEIS estimates a cost of $12 billion (unmitigated), and $10.7 billion (managed). These estimates are for both light and heavy-duty action cases, so the portion attributable to the heavy-duty sector would be less. The five states in the TEIS represent 30-35% of nationally extrapolated costs[570],. This yields extrapolated costs of roughly $33 billion to $39 billion, but these reflect costs from both light duty and heavy duty sectors. We consequently believe that DTNA's cost estimates for the Phase 3 rule are significantly overstated.

<u>IOP study cited by AFPM</u>

AFPM states that "[B]eyond EVSE chargers, the cost of grid upgrade projects needed to support the incremental electricity demand growth from transportation is not insignificant and can be quite variable. A particular case study of Southern California illustrated in IOPscience notes: 'the total cost of these upgrades will be at least $1 billion and potentially more than $10 billion.'" The commenter mischaracterizes the study. It considered electrification not just of heavy-duty vehicles, but of light and medium duty vehicles, and of residential electrification.[571] The study is thus not directly comparable here.

<u>Time for Interconnection</u>

Certain commenters (e.g. AFPM, DTNA) noted that even if no distributive buildout is needed, it can sometimes take two years or longer just to be connected to the grid and that this would dissuade fleets from purchasing BEVs given that purchase decisions are generally made 6-12 months in advance (meaning that timetables of purchase and connection will not synchronize).

As an initial matter, we note that even if we accepted two years or longer as the time for grid connection, there is sufficient lead-time. The standards phase in from MY 2027 through 2032, which is 2-8 years from now.

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567 DTNA App. C p. 1.
568 RIA Chapter 10.2.3.
569 TEIS at 16-25 ("Charging Demand for Heavy-Duty Vehicles).
570 TEIS at 66 .
571 "Can distribution grid infrastructure accommodate residential electrification and electric vehicle adoption in Northern California?" https://iopscience.iop.org/article/10.1088/2634-4505/ac949c at Abstract.

More importantly, we do not agree that two or more years is generally representative of the time for interconnection. The timeline for EVSE deployment—even without distribution upgrades—is very site specific and also has considerable variability based on the jurisdiction, but there are certainly documented instances already of connection occurring in considerably less than two years. . As noted in RIA Chapter 1.6.5, an EPRI survey of distribution utilities with 18 respondents from different areas of the country found the typical interconnection time was under six months where no distribution buildout was needed.

Commenters also note the measures being taken by utilities and BEV purchasers to speed the connection process. A report by the Smart Electric Power Alliance (SEPA) found a wide range of non-wires alternatives succeeded at enabling rapid interconnection and HDV electrification.[572] CALSTART cites instances of utilities implementing a variety of new strategies to speed interconnection by planning to work with shared charging service providers since they can create a new market for energy services at the edge of the grid and address the economics of increasing amounts of distributed loads.[573] This may allow utilities to support aggregated loads and address interconnection queues more proactively and rapidly.

Finally, we note FERC Order 2023, which relates to interconnection reforms. Order 2023 requires grid operators to adopt certain interconnection practices with the goal of reducing interconnection delays. These practices include a first-ready, first-served interconnection process that requires new generators to demonstrate commercial readiness to proceed, and a cluster study interconnection process that studies many new generators together.[574]

Reflecting Front-of-the Meter Costs

EPA agrees that it is appropriate to account for distributive grid buildout costs attributable to the Phase 3 rule. There are different ways of assessing this cost. Utilities often spread the cost of buildout over their rate base, and we have chosen this method. See RIA Chapter 2.6.4. Members of both the utility industry and HDV manufacturing industry agreed that this was a reasonable approach. See Comments of EEI and DTNA.

Substation Cost and Lead Time

Commenter AmFree stated that new substations could cost $35 million and take 4 years to install, raising issues of both lead time and cost. The commenter does not provide data or estimates of numbers of substations needed to service demand posed by the Phase 3 rule, however. AmFree's cost estimate is at the very high end of literature estimates for the cost of a new substation, and far higher than literature estimates for substation upgrades. See RIA Chapter 1.6.5. Their estimate of timing for a new substation are similar to other literature values, but again, higher than literature values for an upgraded substation. Id. The TEIS shows that few if any substations (new or upgraded) will be needed in 2027, and only a small number in 2032, almost all of which are upgrades. It further finds, for the 5 States in the study, that "substation

[572] Brenda Chew et al. Non-Wires Alternatives: Case studies from leading U.S. projects. 2018, Smart Electric Power Alliance, https://sepapower.org/resource/non-wires-alternatives-case-studies-from-leading-u-s-projects/

[573] "The Economics Of Load Defection". RMI. https://rmi.org/insight/economics-load-defection/

[574] See generally FERC Order 2023, 184 FERC ¶ 61,054 (July 28, 2023) (Docket No. RM22-14-000).

[and] transformer bank … built by 2027 mostly cover 2032 needs."[575] So we do not believe that the few projected substations not needed until 2032 would pose issues as to reasonableness of cost or adequacy of lead time to install. (Note further that both the comment and this response are referring to the potential compliance pathway supporting the final standards. Alternative available means of compliance involving non-ZEV vehicles would not pose this issue at all.)

AmFree Comment Relating to Total Demand Summary and Response

Commenter AmFree states that "today's electric grids do not have the capacity for such a dramatic increase in demand", referring to demand posed by "a modest-size fleet of Class 7 and 8 vehicles", and further quotes a "recent study" finding that "electrification of even 11 percent of trucks and buses 'could destabilize the transmission grid'", citing Spiller et al. "Medium – and Heavy-Duty Vehicle Electrification: Challenges, Policy Solutions, and Open Research Questions" (Resources for the Future, 2023). (Incidentally, this is a Report, not a Study, and so does not provide references for the statements it makes.)

First, the modelled compliance pathway used to support the Phase 3 standards does not posit anything like electrifying 11 per cent of the nation's trucks and buses. The standard applies to new vehicles only where the overwhelming percentage of vehicles will remain ICE for years to come. Second, depot charging with lower power chargers, as EPA analyzes and costs in its modelled compliance pathway, significantly reduces grid demand. RIA Chapter 2.10.3.

Third, with respect to public charging networks, there is already an instance of a public charging facility accommodating more demand than posited by the commenter without need for buildout. As described above, One Energy plans a 30 MW charging facility in Ohio located next to a 138kV transmission line to benefit connection cost and timing. The size and capacity is such that 90 trucks can charge at 300 kW. This is an example of how public charging networks, being for the most part greenfield sites, can site optimally in relation to available grid capacity. Generally, businesses building public charging facilities have strong incentives to make cost-minimizing decisions that take full advantage of existing infrastructure, and we fully expect them to do so going forward.

Finally, as discussed in RTC section 7.1, total demand on the grid posed by the Phase 3 rule is modest and does not pose issues as to grid reliability, even considered out to 2055 when projected HD BEV utilization would be greatest due to fleet turnover.

Response to Comment of National Rural Electrical Cooperative Association (NRECA)

NRECA states, correctly, that EPA did not assess the need for distributive grid buildout at proposal, and needs to do so. We agree, and have analyzed the issue in detail, informed by the public comments, including this one. See Preamble section II.D.2.iii.c and response above in this section 7.

The commenter also projects the need for additional service transformers in rural area because of the need to convert power to three-phase in very rural locations with only single-phase power. In the rural state analyzed in the TEIS (Oklahoma), transformer costs between the no action and action cases (both unmanaged and managed) are virtually none in 2027, and minimal in 2032.[576]

[575] TEIS at 74.
[576] TEIS at 80 .

Our modeled compliance pathway also projects availability of ICE vehicles for all HDV applications, and we have noted elsewhere that ICE vehicles may remain a norm in rural areas.

The commenter notes current delays in obtaining transformers due to supply chain irregularities, and that these irregularities have led to price spikes. We do not anticipate supply chains to remain disrupted years into the future but have structured the standards to reduce demand in the program's initial years when there is the least lead time. We also address transformer supply chain delays and costs in our earlier response in this RTC 7.

With respect to costs to NRECA member utilities for adding infrastructure, we note that those costs are recoverable via inclusion in the rate base, or by direct recovery from users. See RIA Chapter 2.4.4.2. HDV demand consequently can be a source of income to cooperative utilities, and from that standpoint, can be viewed as a positive development for the utilities.

7.1 Generation and Transmission

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

2. The Proposed Rule Requires Deployment of Technology Not Feasible within the Timeframe Contemplated.

Section 202(a) of the Clean Air Act does not mandate that EPA set standards to drive pollutant emissions down to zero; rather, EPA must balance benefits to health and welfare against costs of compliance to reflect "the greatest degree of emission reduction achievable through the application of technology which the [EPA] determines will be available" during the relevant model year.71 Here, the Proposed Rule forces a transition from ICEVs to ZEVs in the MY27–32 timeframe without demonstrating that such a transition is feasible, let alone necessary. [EPA-HQ-OAR-2022-0985-1659-A2, p. 17]

71 42 U.S.C. § 7521(a)(3)(A)(i).

Critically important to increased ZEV adoption is the infrastructure necessary to operate such vehicles. EPA overlooks this issue in the Proposed Rule. Notably absent from EPA's analysis is any demonstration that sufficient charging stations, utilities, and other infrastructure needed to support accelerated ZEV implementation will be available by MY27. As engine manufacturers have acknowledged, even as new ZEVs are ready to enter into production, the necessary infrastructure for both electric vehicles and hydrogen vehicles continue to lag, especially when multiple facilities are needed to support the multiple fuel and powertrain technologies EPA contemplates.72 Focusing solely on electric vehicles themselves, EPA has not adequately evaluated or grasped the time and resources required to permit, construct, and operate the necessary infrastructure to power these vehicles. This is particularly concerning in light of the very real risk that the electric grid will not be able to meet the increased demand anticipated by the Proposed Rule.73 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 17 - 18]

72 See Jack Roberts, Truck Tech, "5 Takeaways from ACT Expo 2020," (May 20, 2022), available at https://www.truckinginfo.com/10172184/5-take-aways-from-act-expo-2022 (citing Cummins CEO Tom Linebarger as warning ACT Expo attendees that the undertaking will cost multiple trillions of dollars to accomplish).

73 North American Electric Reliability Corporation, 2022 Long-Term Reliability Assessment (Dec. 2022), 21, available at https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf. (indicating that increased demand projections may lead to reliability concerns for the electric grid, especially as dual-peaking or seasonal peaking times change with increased electrification)

Even assuming sufficient ZEVs can be manufactured with the corresponding consumer demand to buy them, EPA has not fully considered the uncertainty around the grid being able to support them. Grid resiliency is at risk of further deterioration due to increasing power demand from electrification, not just in transportation. Combined with other issues, such as a disorderly transformation of the generation base as conventional units are replaced with intermittent resources, increased electrification raises questions about the grid's ability to reliably meet consumer demand on a regional basis. The regional operation of the power grid is managed by entities called Regional Transmission Organizations ("RTO") or Independent System Operators ("ISO"). These authorities are not only responsible for transmission, but also balancing a regional power system to ensure that supply constantly matches demand. The grids in some RTOs are already under various degrees of stress. For example, the North American Electric Reliability Corporation's ("NERC") recent summer assessment shows roughly two-thirds of the U.S. faces increased resource adequacy risk in the summer of 2023.74 [EPA-HQ-OAR-2022-0985-1659-A2, p. 18]

74 North American Electric Reliability Corporation, "2023 Summer Reliability Assessment" (May 2023).

EPA's projections of ZEV sales are on a national basis, but the ability to charge the vehicles is driven by the ability to manage regional or local power grids to supply electricity on demand. EPA's national data thus disguises important problems that increasing EV penetration will cause. By 2022, over 50% of BEVs were concentrated in California, Florida, and Texas. The distribution of the BEV fleet across RTOs can be seen in Figure 1, in which state shares of EV registrations are allocated across RTOs.75 EPA barely pays lip-service to this issue. Even without increased demand on the grid from transportation electrification, today's grid is fragile. EPA should discuss the costs of power outages from weather events that could preclude truck recharging and put fleets out of operation for days at a time. Reduced utilization from grid dependency is an important issue that EPA failed to quantify. [EPA-HQ-OAR-2022-0985-1659-A2, p. 18.] [See Figure 1, EV Registrations by RTO, on page 19 of docket number EPA-HQ-OAR-2022-0985-1659-A2.]

75 There are several states that are covered by more than one RTO. For this high-level assessment, our consultants have allocated the state's EV sales by roughly the geographic footprint of each RTO within the state.

Potential stress on the grid within any given RTO is not just a function of EVs on the road, but also power generation capacity within the region. As seen in Figure 2, the greatest stress is not in California (though the California's stress is significant), but rather in the southwestern U.S. [EPA-HQ-OAR-2022-0985-1659-A2, p. 19. See Figure 2, EV Power Requirement by RTO, on page 20 of docket number EPA-HQ-OAR-2022-0985-1659-A2.]

This figure is based on EPA's estimate of EV electricity demand in 2032, allocated to RTOs, under the assumption that no reserve capacity is added over the next eight years. If an RTO wanted to fill incremental EV electricity demand and keep its reserve margin constant, the required capacity investment depends on the source of generation and that source's availability (i.e., expected load factor) specific to that region. For the U.S., the total investment cost could range from $15 to $100 billion, not including up to an additional $80 billion for storage to improve ratability of intermittent sources. [EPA-HQ-OAR-2022-0985-1659-A2, p. 20]

RTOs face another complication with the times of day likely to see greater EV charging. Sparsely available data suggest most EV charging currently occurs during daytime. However, if a growing EV fleet were to switch to overnight charging, it would put much less stress on a grid. EPA should work with other federal entities to ensure the growth in power demand stemming from an expanding EV fleet in the Proposed Rule can be safely and reliably supplied. Furthermore, EPA should provide a comprehensive analysis on how the light- and medium-duty multipollutant and the HD Phase 3 GHG proposed rules will jointly impact these demands on the grid. [EPA-HQ-OAR-2022-0985-1659-A2, p. 20]

Power generation using traditional fuels has an advantage in the capacity being located near demand centers. Except for nuclear, any low-carbon power generation capacity must be located at the energy source (e.g., where the wind blows, water flows, sun shines). Supplying low-carbon electricity to charge EVs also needs to resolve the transmission of that power to the demand center. Installation of transmission capacity in a timely manner is not a guarantee. The Bureau of Land Management ("BLM") recently issued its record of decision for the SunZia Southwest Transmission Project more than 15 years after the project was proposed.76 Once this incremental power is transmitted from supply location to a load center, there are potentially additional distribution transmission constraints before the electrons reach charging stations and homes. One supercharger equals the launch of 70 air-conditioning units at once. Such an instant change in the power demand profile is a significant problem for the local distribution grid. And EPA's ambitious light-duty proposal compounds this problem as Level 2 EV chargers, typically used in a home, can increase a home's peak load by 40% to 100%, which can stress neighborhood transformers and compromise reliability. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 20 - 21]

76 Emma Peterson, INSIDE CLIMATE NEWS, "SunZia Southwest Transmission Project Receives Final Federal Approval" (May 29, 2023) available at https://insideclimatenews.org/news/29052023/sunzia-transmission-project-approval/.

The intensity is further complicated in that the capacity factor (percentage of time a plant is likely to be available for generation) of solar (28%) and wind (36%) plants is so much lower than dispatchable (typically 90+%) generation capacity. To put the intensity of effective generation capacity in perspective, solar and wind farms require almost three times as much copper to meet the load of a typical (combined cycle gas turbine) natural gas plant. For EPA to achieve its GHG reduction aspirations in the Proposed Rule, all three of these challenges must be met: (1) sufficient materials to manufacture the required EVs, (2) consumer willingness to substitute EVs for incumbent ICEVs currently for sale, and (3) a low-carbon power generation grid capable of reliably supply energy for this mode of transportation. [EPA-HQ-OAR-2022-0985-1659-A2, p. 21]

Relatedly, it is unlikely that the grid can be upgraded quickly enough to overcome the constraints referenced above. A recent DOE-funded study finds that: "[o]nly ~21% of projects (14% of capacity) requesting interconnection from 2000-2017 reached commercial operations by the end of 2022"; "[c]ompletion rates are even lower for wind (20%) and solar (14%); and "[t]he average time projects spent in queues before being built has increased markedly. The typical project built in 2022 took 5 years from the interconnection request to commercial operations."77

Moreover, EPA has failed to account for the direct effect its new carbon dioxide standards for fossil-fuel fired power plants, proposed shortly after the Proposed Rule, will have on the grid including how the increased demand for baseload and peaking power as a result of the Proposed Rule can be met as affordable base-load generators are rapidly phased out.78 Even in California, where renewable energy is a priority, daily evening peak load is still routinely supplied by approximately 70 percent fossil fuels.79 [EPA-HQ-OAR-2022-0985-1659-A2, p. 21]

77 See LAWRENCE BERKELEY NATIONAL LABORATORY, “Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2022”, available at https://emp.lbl.gov/sites/default/files/queued_up_2022_04-06-2023.pdf.

78 Proposed Rule at 33,240. Notably, EPA’s electric generating unit rule is not referenced in the proposed rule. Nor does the electric generating rule’s mere one-page assessment of grid reliability considerations even address EPA’s parallel efforts to push mass adoption of electric vehicles. Id. at 33,415.

79 See, e.g., CALIFORNIA ISO, “Today’s Outlook” (accessed June 13, 2023), available at https://www.caiso.com/TodaysOutlook/Pages/supply.html#section-supply-trend (showing data from Aug. 4, 2022, indicating more than 70 percent of energy from natural gas, coal, and imports).

Beyond the normal approximately four-year lead time for vehicle manufacturers to make incremental changes to their production, the typical duration of an electricity transmission system capital project timeline would need to be accelerated from approximately ten-years to have a chance to support the proposed ZEV demand, while current large-scale electric generation and storage projects are increasingly backlogged year-on-year due to long lead times for permitting and approvals, supply chain shortages, and shortage of skilled workers. While government programs have recently been put in place to help overcome some of these hurdles, they will take time for the benefits to be realizable.80 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 21 - 22]

80 Gracie Brown, et al., MCKINSEY AND COMPANY, “Upgrade the grid: Speed is of the essence in the energy transition” (Feb. 1, 2022) available at https://www.mckinsey.com/capabilities/operations/our-insights/global-infrastructure-initiative/voices/upgrade-the-grid-speed-is-of-the-essence-in-the-energy-transitionl; DELOITTE, “2023 power and utilities industry outlook” available https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-eri-power-utilities-outlook-2023.pdf.

Organization: American Trucking Associations (ATA)

Grid AvailabilityCharging sites for depots or large public charging stations for commercial vehicles will require significant energy. The American Transportation Research Institute (ATRI) estimates full commercial vehicle electrification would require a 14 percent increase in energy generation from today’s standards.20 In many cases, remote or densely populated areas do not have available power to direct toward commercial vehicle charging sites. The International Council on Clean Transportation (ICCT) recognizes that the electrification of commercial vehicles will significantly burden the current electrical grid and challenge the centralization of where and how charging accommodates trucks in operation today.21 [EPA-HQ-OAR-2022-0985-1535-A1, p.15-16]

20 American Transportation Research Institute, Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, pg. 17, December 2022.

21 The International Council on Clean Transportation, Near Term Infrastructure Deployment to Support Zero-Emission Medium-and Heavy-Duty Vehicles in the United States, May 2023.

“We find that near-term energy needs will be concentrated in industrial areas in the largest metropolitan areas in the country, including Los Angeles, Phoenix, Houston, Chicago, and Dallas. 1% of U.S. counties will account for 15% of nationwide MHDV charging energy needs in 2030, constituting high-priority areas in which to concentrate near-term deployment of charging and refueling infrastructure of MHDVs.” [EPA-HQ-OAR-2022-0985-1535-A1, p.16]

Early adopting fleets are being forced to quickly learn electricity demands and generation requirements as an important external factor that impacts their operations and TCO calculation. One fleet interviewed provided an example of their desire to electrify forklifts. In their mind, it would serve as an early use case to understand electric technology as they explored BEVs for their operations. However, in their discussions with the local utility, they were only allowed to electrify a small percentage of the originally desired forklifts due to limited onsite power. ATA asked fleets about their experiences with local utilities. More than two-thirds of respondents said they had not begun conversations with them. [EPA-HQ-OAR-2022-0985-1535-A1, p. 16]

The multi-state patchwork of energy generation and transmission regulatory bodies has made investment and modernization of the U.S grid even more challenging. Fleets are left with the reality of wading through local utility politics to receive approval for a permit to install minimal chargers on their site today. Addressing these site-specific challenges to build out charging infrastructure is essential to achieving the proposed rule’s adoption rates and should begin immediately to accommodate large-scale transportation electrification. Yet, most states have not begun this process. With 168 investor-owned utilities, 1,958 publicly owned utilities and 812 cooperatives providing electricity to customers in the U.S., the scale of this undertaking will be significant and time consuming.22 The planning and oversight associated with hydrogen infrastructure is especially so. EPA should not propose a ZEV-dependent rule prior to ensuring the needed electric and hydrogen infrastructure will be available, including initiating state-wide planning and deployment assessments prior to establishing proposed ZEV adoption rates and timelines. [EPA-HQ-OAR-2022-0985-1535-A1, p. 16]

22 Energy Information Administration, Investor-owned utilities served 72% of U.S. electricity customers in 2017, August 15, 2019, available at http://www.eia.gov/todayinenergy/detail.php?id=40913.

For example, recently the California Public Utilities Commission (CPUC) developed a “Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning” that addresses the need for proactive planning of long lead time utility-side electric infrastructure (i.e., distribution and transmission) needed to support the acceleration of transportation electrification.23 [EPA-HQ-OAR-2022-0985-1535-A1, p. 16]

23 California Public Utilities Commission, Freight Infrastructure Planning, May 22, 2023, available at: http://www.cpucc.ca.gov/industries-and-topics/electricial-energy/infrastructure/transportation-electrification/freight-infrastructure-planning.

CPUC identified several challenges through this process, including:Approximately three years of required time to sequence statewide planning efforts and complete infrastructure authorizations. This does not include the time for cost recovery approval.Significant market and technology uncertainty affects the state’s ability to proactively authorize infrastructure solutions.Risks and uncertainties regarding electricity grid load that are dependent on large-scale infrastructure buildout. These have not been adequately quantified within the state’s existing planning and forecasting processes.The lack of an existing source of information on future fleet charger locations, and the need for long-term grid infrastructure planning to account for fleets’ current flexible and economical routes.The lack of a coherent planning framework to optimize fleet business needs with electricity sector goals and requirements (i.e., how to cost-effectively upgrade the distribution and transmission system).The lack of a process for identifying long-term substation land acquisition needs. [EPA-HQ-OAR-2022-0985-1535-A1, p. 17]

Organization: Arizona State Legislature

EPA estimates that the additional electricity generation needed to meet the demand of heavy-duty battery electric vehicles is 'relatively modest.' 88 Fed. Reg. 25,983. According to EPA's estimates, the proposed rule will 'increase electric power end use by heavy-duty electric vehicles by 0.1 percent in 2027 and increase to 2.8 percent in 2055.' Id. EPA argues that the electric grid supported adoption of air conditioners and data processing centers successfully. Id. EPA concludes that '[g]rid reliability is not expected to be adversely affected by the modest increase in electricity demand' from the proposed rule. Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 28]

The electric grid is already stretched to the breaking point before implementing the proposed rule. According to the North American Electric Reliability Corporation's 2023 Summer Reliability Assessment, numerous sectors of the electric grid face shortfalls during peak demand this summer:

- Midcontinent ISO (MISO): 'MISO can face challenges in meeting above-normal peak demand if wind generator energy output is lower than expected. Furthermore, the need for external (non-firm) supply assistance during more extreme demand levels will depend largely on wind energy output.'55 [EPA-HQ-OAR-2022-0985-1621-A1, pp. 28-29]
- NPCC-New England: 'Operating procedures for obtaining emergency resources or non-firm supplies from neighboring areas are likely to be needed during more extreme demand or low resource conditions.'56
- SERC-Central: 'Compared to the summer of 2022, forecasted peak demand has risen by over 950 MW while growth in anticipated resources has been flat. The assessment area is expected to have sufficient supply for normal peak demand while demand-side management or other operating mitigations can be expected for above-normal demand or high generator-outage conditions.'57
- Southwest Power Pool (SPP): 'Reserve margins have also fallen in SPP as a result of increasing peak demand and declining anticipated resources. Like MISO, the energy output of SPP's wind generators during periods of high demand is a key factor in determining whether there is sufficient electricity supply on the system.'58
- Texas (ERCOT): 'Resources are adequate for peak demand of the average summer; however, dispatchable generation may not be sufficient to meet reserves during an extreme heat-wave that is accompanied by low winds.'59
- U.S. Western Interconnection: 'However, wide-area heat events can expose the WECC assessment areas of California/Mexico (CA/MX), Northwest (NW), and Southwest (SW) to risk of energy supply shortfall as each area relies on regional transfers to meet demand at peak and the late afternoon to evening hours when energy output from the area's vast solar PV resources are diminished.'60 [EPA-HQ-OAR-2022-0985-1621-A1, p. 29]

55 North American Electric Reliability Corporation, 2023 Summer Reliability Assessment, May 2023, 5, available at
https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2023.pdf.

56 Id.

57 Id.

58 Id.

59 Id.

60 Id.

Almost all of these sectors are projected to have fewer resources than demand during extreme heat conditions.61 Power outages reached an all-time high in 2020, and the average person went seven hours without power in 2021.62 [EPA-HQ-OAR-2022-0985-1621-A1, p. 29]

61 Id. at 11 Table 1.

62 Catherine Morehouse, Power grid can't handle Biden's climate rule, industry groups say, POLITICO, May 12, 2023, available at https://www.politico.com/news/2023/05/12/biden-power-rule-fossil-fuels-00096536.

Other observers recognize significant issues with the current electric grid's reliability. A commissioner to the Federal Energy Regulatory Commission recently testified to a U.S. Senate committee, 'The United States is heading for a reliability crisis.'63 Another commissioner echoed this warning, testifying, 'We know that there is a looming resource adequacy crisis.'64 The commissioner predicted that 'there will be, in time, a catastrophic reliability event.'65 [EPA-HQ-OAR-2022-0985-1621-A1, pp. 29-30]

63 Oversight of the Federal Energy Regulatory Commission: Hearing before the Sen. Comm. on Energy and Natural Resources, 118th Cong. 1 (May 4, 2023) (statement of FERC Commissioner Mark C. Christie), available at https://www.energy.senate.gov/services/files/0A896B12-2895-4F68-A367-74009F2975C4.

64 Oversight of the Federal Energy Regulatory Commission: Hearing before the Sen. Comm. on Energy and Natural Resources, 118th Cong. 2 (May 4, 2023) (statement of FERC Commissioner James P. Danly), available at https://www.energy.senate.gov/services/files/0A896B12-2895-4F68-A367-74009F2975C4.

65 Id.

EPA has only exacerbated the threats to grid reliability by proposing new carbon pollution standards for coal and natural-gas fired power plants in May 2023.66 The National Rural Electric Cooperative Association is 'concerned the proposal could disrupt domestic energy security, force critical, always-available power plants into early retirement and make new natural gas plants exceedingly difficult to permit, site and build.'67 This is consistent with a FERC commissioner's concern that '[t]he problem generally is not the addition of intermittent resources, primarily wind and solar, but the far too rapid subtraction of dispatchable resources, especially coal and gas.'68 As the Electric Power Supply Association observed upon release of the proposed power plant rule, 'For the EPA to issue proposed rules that are likely to drive power plant retirements while simultaneously undertaking separate actions to significantly increase demand for electricity due to electrification of the nation's vehicle fleet creates the conditions for a reliability failure. . . . We are not slow walking into a reliability crisis – if this rule is finalized, we will be choosing to run toward that outcome.'69 [EPA-HQ-OAR-2022-0985-1621-A1, p. 30]

66 U.S. EPA, 'EPA Proposes New Carbon Pollution Standards for Fossil Fuel-Fired Power Plants to Tackle the Climate Crisis and Protect Public Health,' May 11, 2023, available at https://www.epa.gov/newsreleases/epa-proposes-newcarbon-pollution-standards-fossil-fuel-fired-power-plants-tackle.

67 National Rural Electric Cooperative Association, 'Electric Co-ops: EPA's Power Plant Proposal Would Further Jeopardize Reliability,' May 11, 2023, available at https://www.electric.coop/electric-co-ops-epas-power-plantproposal-would-further-jeopardize-reliability.

68 Statement of FERC Commissioner Mark C. Christie, supra note 71, at 1 (emphasis original).

69 Electric Power Supply Association, 'Proposed EPA Power Plant Rules Could Intensify Reliability Challenges,' May 11, 2023, available at https://epsa.org/proposed-epa-power-plant-rule-could-intensify-reliability-challenges/.

Into the face of these EPA-exacerbated grid reliability issues come EPA's electric vehicle rules, and many electricity requirement estimates are far less optimistic than EPA's. Before the electric vehicle rules, the U.S. Energy Information Administration was forecasting that 'electricity consumption by the transportation sector will increase by more than a factor of 12 between 2021 and 2050 (from 12 billion kWh in 2021 to more than 145 billion kWh in 2050).'70 The American Research Transportation Institute estimates that full electrification of the country's freight trucks will require a 14 percent increase in existing electricity generation.71 When combined with the needs for electricity generation for passenger cars and trucks, which EPA is separately proposing, the country needs to increase its existing electricity generation by more than 40%.72 California needs to increase its existing electricity generation by more than 57%.73 [EPA-HQ-OAR-2022-0985-1621-A1, p. 30]

70 North American Electric Reliability Corporation et al., Electric Vehicle Dynamic Charging Performance Characteristics during Bulk Power System Disturbances, Apr. 11, 2023, 2, available at https://www.nerc.com/comm/RSTC/Documents/Grid_Friendly_EV_Charging_Recommendations.pdf.

71 American Transportation Research Institute, supra note 50, at 1.

72 Id.

73 Id.

EPA's mandate could require automobile manufacturers to sell 10-12 million electric vehicles in calendar year 2035 alone.74 Millions more would be sold in the years before that. According to a study conducted for the Department of Energy that modeled grid impacts in 2028 from electric vehicles, 'The results indicated that the first issues would occur between 30 and 37 million EVs, at which point load could not be reliably met.'75 [EPA-HQ-OAR-2022-0985-1621-A1, p. 31]

74 Todd Lassa, Can Automakers Sell 10-12 Million EVs Here By 2032?, AUTOWEEK, Apr. 10, 2023, available at https://www.autoweek.com/news/industry-news/a43555049/epa-announcing-zero-emissions-targets-for-newvehicles/.

75 M. Kintner-Meyer et al., Electric Vehicles at Scale – Phase I Analysis: High EV Adoption Impacts on the Western U.S. Power Grid, PNNL Report 29894, July 2020, available at https://www.pnnl.gov/sites/default/files/media/file/EVAT-SCALE_1_IMPACTS_final.pdf.

Organization: California Air Resources Board (CARB)

D. ZE Fueling Infrastructure147

Affected pages: 25982-25984, 25996-25998, and 26000-26006

147 CARB staff worked collaboratively with CEC team to provide this comment.

The NPRM states that the projected additional generation needed to meet demand of the HD BEVs in the proposal will be relatively modest. This is consistent with California's finding with regard to energy generation needed to meet MD and HD fleet electrification needs. As modeled by the CEC, California expects that LDV, MDV, and HDV charging will account for less than 5 percent of California's total system electric load during peak hours.148 [EPA-HQ-OAR-2022-0985-1591-A1, p.45]

148 California Energy Commission Revised Staff Report Zero-Emission Vehicle Infrastructure Plan (ZIP), last accessed June 5, 2023. https://www.energy.ca.gov/sites/default/files/2022-12/600-2022-054-REV.pdf

The NPRM points out that the responsibility for delivering reliable electrical service is a shared responsibility between private utilities and government entities. CARB staff agrees with this finding. California works closely with utilities to forecast electrical demand and plan for load growth from all sectors. Working with the Public Utilities Commission, investor-owned utilities develop rate cases and investment plans that consider expected growth of electrical load from all sectors of the economy and take into account needed grid upgrades to account for climate change and maintenance. Planning for further truck electrification can be analyzed and rolled into forecasting even before fleets apply for service upgrades and interconnection associated with specific infrastructure installations, much as that planning occurs for other anticipated changes in demand.

Organization: Clean Air Task Force et al.

b. Charging and grid infrastructure is capable of supporting HD BEVs in volumes aligned with and in excess of EPA's proposed standards.

Deployment of BEVs is well underway across the U.S. and is already requiring the electric power sector to make plans to reliably and safely integrate these vehicles. The electric power industry is well situated to maintain safe and reliable service that can power an increasing deployment of HD BEVs; utilities, aided significantly through investments from the BIL and IRA, are making important upgrades to the system to integrate higher penetrations of BEVs. Additional third party private investments and public investments are also already committed to building a robust HD BEV charging network. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45.]

When considering infrastructure buildout, it is important to remember that HD ZEVs will enter the total on-road HD fleet gradually and in volumes that pale in comparison to in-use HD combustion vehicles. Modeling using HD TRUCS and MOVeS3.R3188 shows that EPA's proposal, if finalized, would likely result in ZEVs comprising just 1 percent of the total on-road HD fleet by 2027, gradually reaching 8 percent in 2032 and 23 percent in 2040. See Table 4, infra. In other words, a relatively small portion of the HD fleet will be tapping into charging and grid infrastructure over the next decade, and even by 2040, HD ZEVs would comprise less than a quarter of the on-road fleet under this proposal. Infrastructure needs for HD ZEVs will accordingly grow gradually over time. [EPA-HQ-OAR-2022-0985-1640-A1, p. 45. See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, pages 45-46, for Table 4.]

188 HD TRUCS was used to develop ZEV adoption rates (by vehicle classification). MOVES3.R3 was used to translate HD TRUCS-derived ZEV adoption rates to ZEV sales and in-use curves.

For the final rule, we urge EPA to model how the Phase 3 standards will likely affect the composition of the entire on-road HD fleet, not just HD ZEVs' share of new sales. That information would better help the Agency and the public consider infrastructure issues related to this rulemaking. [EPA-HQ-OAR-2022-0985-1640-A1, p. 46.]

i. Economic theory and historical precedent show that infrastructure buildout will occur at the pace and scale needed to support vehicle electrification.

EPA should reject arguments that the buildout of charging and grid infrastructure cannot occur at the pace and scale needed to support expanded vehicle electrification, which are unreasonably pessimistic and inconsistent with both economic theory and historical precedent. These arguments rely on the classic “chicken-and-egg” scenario said to be presented by ZEV sales and charging infrastructure, where each side of the market waits for the other. But EPA need not and should not wait for infrastructure to fully mature before finalizing strong Phase 3 standards. Instead, EPA’s standards themselves will send a strong signal to the market to undertake the infrastructure investments needed to accommodate a gradual rise in vehicle electrification,189 such that increased ZEV sales and infrastructure buildout will occur in relative tandem and reinforce each other. As one analyst sums it up: “The chicken-and-egg conundrum is being solved. Investments in the space and the adoption of EVs [a]re happening much faster than many analysts expected, and this is also accelerating the build-out of the charging network.”190 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 46 - 47.]

189 Environmental regulation itself, of course, can lead to technology innovation and market development. See generally Jaegul Lee et al., Forcing Technological Change: A Case of Automobile Emissions Control Technology Development in the US, 30 Technovation 249 (2010); Margaret R. Taylor, Edward S. Rubin, & David A. Hounshell, Regulation as the Mother of Innovation: The Case of SO2 Control, 27 Law & Policy 348 (2005); James Lents et al., Chapter II: The regulation of automobile emission: A case study, in Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers (Marika Tatsutani & Praveen Amar eds., 2000) https://www.nescaum.org/documents/rpt000906mercury_innovative-technology.pdf.

190 Gabriela Herculano, Chicken-and-Egg Problem: EV Adoption and Buildout of Charging Networks, Nasdaq (Apr. 18, 2022), https://www.nasdaq.com/articles/chicken-and-egg-problem%3A-ev-adoption-and-buildout-of-charging-networks.

The economic literature on indirect network effects and two-sided markets shows that an increase in BEV sales—a likely effect of the Phase 3 standards, particularly if they are strengthened in the final rule—can be expected to stimulate associated infrastructure development. In a study on flex-fuel vehicles fueled by E85 (85 percent ethanol), Corts (2010) found that growth in sales of flex-fuel vehicles due to government fleet acquisition programs led to an increase in the number of retail E85 stations.191 That relationship held true across all six Midwestern states analyzed, despite differences in those states’ E85 subsidies and tax credits.192 The author concluded that the results “confirm the basic validity” of the theory underlying government fleet purchase requirements: that increasing the “base of alternative fuel vehicles can spur the development of a retail alternative fuel distribution infrastructure.”193 [EPA-HQ-OAR-2022-0985-1640-A1, p. 47.]

191 Kenneth S. Corts, Building out alternative fuel retail infrastructure: Government fleet spillovers in E85, 59 J. Env’t Econ. & Mgmt. 219, 219-20 (2009).

192 Id.

193 Id. at 231.

Recent economic research has confirmed this relationship in the context of ZEVs and charging infrastructure specifically. An influential study by Li et al. (2017) found that “EV demand and charging station deployment give rise to feedback loops” and that “subsidizing either side of the market will result in an increase in both EV sales and charging stations.”194 Similarly, Springel (2021) found “evidence of positive feedback effects on both sides of the market, suggesting that cumulative EV sales affect charging station entry and that public charging availability has an impact on consumers’ vehicle choice.”195 The BIL and IRA subsidize both sides of the market, offering significant incentives for both HD ZEV purchases and the construction of charging infrastructure. Economic theory therefore supports the proposition that strengthened Phase 3 standards, particularly in combination with the BIL and IRA’s large financial incentives, will facilitate expansion of charging and grid infrastructure.196 [EPA-HQ-OAR-2022-0985-1640-A1, p. 47.]

194 Shanjun Li et al., The market for electric vehicles: indirect network effects and policy design, 4 J. Ass’n Env’t. & Resources Econ. 89, 128 (2017).

195 Katalin Springel, Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives, 13 Am. Econ. J.: Econ. Pol’y 393, 426 (2021).

196 See id. at 394 (noting that “the presence of positive feedback amplifies the impact of both types of subsidies”), 415 (“positive feedback loops between the charging station network and total all-electric vehicle sales amplify the impact of both types of subsidy”).

Economic theory has in fact played out in Norway, where ZEV sales and infrastructure both expanded rapidly over the span of about a decade. There, the “path to charging point saturation started by stimulating more demand for EVs.”197 In other words, Norway did not wait for infrastructure to fully mature before beginning its transition to cleaner cars. Rather, rising ZEV sales themselves “helped trigger a spike in demand for charging stations.”198 [EPA-HQ-OAR-2022-0985-1640-A1, p. 48.]

197 Whitney Bauck, How Norway Became the World’s Electric Car Capital, Nexus Media News (Mar. 7, 2023), https://nexusmedianews.com/how-norway-became-the-worlds-electric-car-capital/.

198 McKinsey & Co, What Norway’s Experience Reveals About the EV Charging Market 3 (2023), https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/what-norways-experience-reveals-about-the-ev-charging-market#/.

The concept that charging infrastructure will adequately scale up over time also finds support in an analogous historical example: the buildout of roads and gasoline refueling infrastructure in the early 20th century to serve the United States’ growing fleet of automobiles. The country’s exponential growth in automobile sales—first exceeding 1,000 in 1899 and growing to 1 million by 1916199—preceded the establishment of an extensive network of both suitable roads200 and filling stations.201 Instead, the buildout of road and refueling infrastructure unfolded over long time horizons and in a variety of ways, adapting to the needs of the automobile fleet as it changed and grew. Paving and other road improvement efforts began on a small scale in cities, where automobiles were initially concentrated; efforts to improve rural roads and construct highways happened a decade or more later, as motorists began to expand their driving beyond cities.202 Similarly, in the case of refueling infrastructure, a network of modern filling stations did not spring up until well after automobiles had grown in popularity.203 Before that, refueling needs were met through varied and dispersed “non-station” methods such as cans of gasoline sold at general stores, barrels at repair garages, mobile fuel carts, curb pumps, and home refueling pumps, which emerged at various times as the demand for gasoline increased.204 Road and refueling infrastructure therefore exhibited a "long-term, adaptive and portfolio approach"205 that, over the span of several decades, satisfied the shifting needs of the growing ranks of automobile owners. [EPA-HQ-OAR-2022-0985-1640-A1, p. 48.]

199 Roads, Encyclopedia.com (May 29, 2018), https://www.encyclopedia.com/science-and-technology/technology/technology-terms-and-concepts/roads.

200 See id. (noting that around 1904, "[o]nly a few hundred miles of roads in the entire country were suitable for motor vehicles"); see also F.W. Geels, The Dynamics of Transitions in Socio-technical Systems: A Multi-level Analysis of the Transition Pathway from Horse-drawn Carriages to Automobiles (1860–1930), 17 Tech. Analysis & Strategic Mgmt. 445, 460, 467-68 (2005) (discussing the gradual expansion and improvement of road infrastructure in the 1910s and 1920s to accommodate growth in and changes to automobile travel).

201 Marc W. Melaina, Turn of the century refueling: A review of innovations in early gasoline refueling methods and analogies for hydrogen, 35 Energy Pol'y 4919, 4922 (2007) (noting that "the takeoff period for gasoline stations occurred between 1915 and 1925, but exponential growth in vehicles began around 1910, so the rise of gasoline filling stations followed rather than preceded the rise of gasoline vehicles").

202 Geels, at 467-68.

203 Melaina, at 4922.

204 Id. at 4924-27.

205 Id. at 4932 (discussing refueling infrastructure).

That approach holds important lessons for this rulemaking. As detailed above, the introduction of HD ZEVs into the total on-road fleet will occur gradually and, for the first decade or more, in relatively low volumes. As explored in a recent white paper by ICCT,206 successfully meeting the needs of this gradually expanding fleet of heavy-duty ZEVs will not require the overnight nationwide buildout of infrastructure that some have misleadingly claimed. Instead, economic theory and historical precedent show that growth in heavy-duty ZEV sales and infrastructure buildout will occur in relative tandem, with infrastructure responding over time commensurate with the evolving needs of the ZEV fleet. And in finalizing its Phase 3 standards, EPA will send a strong market signal that will facilitate infrastructure development at the pace and scale needed to support compliance with the standards. As explained in the sections below, the nation's infrastructure is already well-positioned to adapt to increased vehicle electrification. EPA must reject unfounded chicken-and-egg arguments questioning whether infrastructure will respond to rising demand. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 48 - 49.]

206 See generally Pierre-Louis Ragon et al., ICCT, Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States (2023), https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf.

ii. The grid can reliably support significantly increased loads.

The electric industry is well situated to maintain safe and reliable service that can power the increasing deployment of HD BEVs. As detailed below, the projected growth in electricity demand over the coming years, including demand related to BEV deployment in line with strengthened Phase 3 standards as well as additional economy-wide load growth, is well within the range of past historical load growth. Additionally, the industry is already responding to and preparing for increased electrification as more fleets and individuals adopt BEVs and has a wide range of tools, practices, and partnerships in place to continue to maintain a strong and reliable grid. [EPA-HQ-OAR-2022-0985-1640-A1, p. 49]

EPA conducted modeling within the Integrated Planning Model (IPM) to assess the electric sector and emissions impact of the proposal. In this modeling, the Agency utilized baseline projections of electricity demand and generation growth from the Annual Energy Outlook 2021 (AEO2021). DRIA at 321. EPA notes that this forecast “does not include the full forecasted ZEV adoption in the [proposal] reference case,” and so it developed further incremental demand estimates to include “the demand of electric vehicles not captured by IPM’s defaults,” which EPA “calculated from the output of national MOVES runs.” Id. While these files are not available to us, we are able to approximate this projected demand growth under the proposal by similarly calculating electric demand utilizing the proposal case in MOVES3.R3. This output reflects demand from all HD BEVs, including those HD BEVs that would be deployed in absence of this rule. In order to combine this with AEO2021 generation values, we converted this demand value to generation using a charging efficiency factor of 95 percent and transmission line loss factor of 5 percent. We then are able to combine this incremental generation calculation with projected generation from AEO2021 Reference Case (net available to grid).207 [EPA-HQ-OAR-2022-0985-1640-A1, p. 49]

207 U.S. Energy Information Administration, Annual Energy Outlook 2021, at Table 8 (Electricity Supply, Disposition, Prices, and Emissions), https://www.eia.gov/outlooks/aeo/data/browser (last accessed, June 13, 2023).

This analysis finds that system-wide increases in generation to meet demand growth, including both increased demand from the proposed Phase 3 standards (assuming EPA finalizes the stringency levels it has proposed) and projected economy-wide load growth, is projected to average 1.2 percent per year between 2028 and 2040. Importantly, this methodology is likely to overestimate generation growth, as the AEO2021 Reference Case already includes some level of transportation electrification.208 Isolating the impact of HD BEVs alone shows load average growth of 0.5 percent per year between 2028 and 2040. Further isolating only the incremental HD BEV generation projected under MOVES3.R3 associated with this proposal (as compared to the baseline) shows average generation growth of 0.4 percent per year between 2028 and 2040. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 49 - 50]

208 U.S. Energy Information Administration, Annual Energy Outlook 2021: Narrative, at 13 (2021), https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf.

Maintaining reliable and safe electric power delivery through this level of demand growth, as well as higher levels of growth resulting from more stringent Phase 3 standards, is within electric utility standard practice as demonstrated through the electric power sector’s strong track record of reliability and resiliency. These annual generation increases are well within the range of contemporary, normal operations for the U.S. electric sector (see Figure 1 below). According to data reported to the Energy Information Administration in Form 861, in the 31 years from 1990 to 2021, average annual national growth in electricity sales was 1.1 percent.209 In 15 of those years, growth was 1.5 percent or higher, and in ten years it exceeded 2 percent. The U.S. has also seen previous periods of sustained high demand growth across most states; for example, 1995 to 2007 saw average nationwide growth of approximately 1.9 percent per year. [EPA-HQ-OAR-2022-0985-1640-A1, p. 50.] [See Docket Number EPA-HQ-OAR-2022-0985-1640-A1, page 51, for Figure 1]

209 Note that these data are for statewide demand, not generation. State level demand figures are more meaningful to show local variations in electricity usage as compared to state-level generation, which does not necessarily (or even usually) serve in-state customers. While absolute generation and demand figures (TWh) should not be compared, growth rates between the two, as shown here, should track proportionally. U.S. Energy Information Administration, Historical State Data, EIA-861, Annual Electric Power Industry Report (Mar. 8, 2023), https://www.eia.gov/electricity/data/state/.

Many states saw much higher, sustained levels of growth. In the two decades from 1999 to 2018, North Dakota electric sales more than doubled. Year over year growth averaged nearly 5 percent, and in 2014 electric sales were 14 percent higher than the previous year alone. In Nevada between 1992 and 2007, annual electric sales growth averaged 4.9 percent and fell below 1.5 percent only once. More recently, Virginia has seen strong annual sales growth, with sales increasing 12.3 percent in the five years from 2016 to 2021, or 3 percent on average per year, even accounting for a pandemic dip. [EPA-HQ-OAR-2022-0985-1640-A1, p. 50]

This analysis draws similar conclusions to those of the researchers at the Electrification Futures Study, a multi-year research project to explore potential widespread electrification in the future energy system of the United States. In a report developing an integrated understanding of how the potential for electrification might impact the demand side in all major sectors of the U.S. energy system—transportation, residential and commercial buildings, and industry—this study concluded that "[e]lectrification has the potential to significantly increase overall demand for electricity, although even in the High scenario, compound annual electricity consumption growth rates are below long-term historical growth rates."210 [EPA-HQ-OAR-2022-0985-1640-A1, p. 50]

210 Trieu Mai et al., NREL, Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States (2018), https://www.nrel.gov/docs/fy18osti/71500.pdf.

We further recognize that many parties will nevertheless need to take important steps to manage increased electrification demand. Utilities, public utility commissions and other state regulators, grid operators, charging providers, and others can and have already begun to coordinate and plan for increased vehicle electrification. Examples include:

- The West Coast Clean Transit Corridor Initiative is an ongoing, collaborative effort among 16 utilities to support the development of BEV charging facilities along I-5, from San Diego to British Columbia, for heavy- and medium-duty freight haulers and delivery trucks.211
- The National Charging Experience Consortium (ChargeX) is a collaborative effort between Argonne National Laboratory, Idaho National Laboratory, NREL, BEV charging industry experts, consumer advocates, and other stakeholders whose mission is "to work together as BEV industry stakeholders to measure and significantly improve public charging reliability and usability by June 2025."212
- The National BEV Charging Initiative brings together automakers, power providers, BEV and charging industry leaders, labor, and public interest groups to "develop a national charging network for light, medium, and heavy-duty vehicles and inspire deeper commitments from state leaders, the administration and each other."213
- The National Association of State Energy Officials and the American Association of State Highway and Transportation Officials partnered with the U.S. Joint Office of Energy and Transportation to hold a series of convenings to coordinate on a range of topics, including ZEV infrastructure and utility planning needs.214 These convenings

brought together State Departments of Transportation officials, State Energy Offices, and other key partners.

- PG&E and BMW of North America are testing a "vehicle-to-everything technology that will improve grid reliability and help EV customers lower their electric bills by exporting power back to the grid during peak demand periods." PG&E notes that "[t]he utility and automotive industries are creating a transformative clean energy future together."215
- NREL and Volvo collaborated on a research paper regarding challenges and opportunities of HD and commercial ZEVs, noting: Coordination between disparate and historically unconnected stakeholders, including state agencies, local governments, automotive manufacturers, fleets, energy infrastructure and utility companies, and research and academia will be required to ensure a smooth and timely transition to ZEVs. This paper, a joint research and industry perspective, is one such example of cross-sectoral collaboration.216 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 52 - 53]

211 West Coast Clean Transit Corridor Initiative, https://westcoastcleantransit.com/ (last visited June 13, 2023).

212 Idaho Nat'l Lab'y, National Charging Experience Consortium, https://inl.gov/chargex/ (last visited June 13, 2023).

213 EV Charging Initiative, https://www.evcharginginitiative.com/ (last visited June 13, 2023).

214 Nat'l Ass'n State Energy Officials (NASEO) & the Am. Ass'n State Highway & Transp. Officials (AASHTO), Building a National Electric Vehicle Charging Infrastructure Network: Regional EV Meetings Key Themes, Takeaways, and Recommendations from the States (not dated), https://www.naseo.org/data/sites/1/documents/publications/NASEO_AASHTO_Regional%20EV%20Meetings%20Summary_%20Final.pdf.

215 BMW Group, More Power To You: BMW of North America and PG&E Start V2X Testing in California (May 16, 2023), https://www.press.bmwgroup.com/usa/article/detail/T0417218EN_US/more-power-to-you:-bmw-of-north-america-and-pg-e-start-v2x-testing-in-california.

216 Muratori et al., at 7.

Finally, ICCT has highlighted myriad actions that utilities, local and state agencies and regulators, fleet operators, and property owners can take to help reduce barriers to infrastructure deployment and aid "timely planning and construction to ensure transmission and distribution systems can accommodate the needs of [medium- and heavy-duty vehicle] electrification."217 These examples show that the relevant stakeholders are already stepping up to plan for and accommodate the charging and grid needs associated with greater vehicle electrification. [EPA-HQ-OAR-2022-0985-1640-A1, p. 53]

217 Ragon et al., at 25.

Utilities in particular are also already planning for and deploying solutions to address increased vehicle electrification as their customers adopt BEVs to improve fleet economics and performance. For example, executives at Southern California Edison, which is one of the largest electric utilities in the U.S. and is facing industry-leading levels of electrification, have recently voiced strong support for the ability of the grid to manage, respond to, and benefit from BEVs. Caroline Choi, Edison International and Southern California Edison senior vice president of corporate affairs, noted that "the electric grid is really going to be the backbone of the whole system" for electrified transit, and that "[w]hat we're seeing are the investments necessary to ensure that the grid is available."218 Utilities and their customers will benefit from the ability to plan ahead for any significant infrastructure requirements. The regulatory certainty provided by Phase 3 standards can aid this planning. [EPA-HQ-OAR-2022-0985-1640-A1, p. 53]

218 Casey Wian, Transportation Electrification Gains Momentum: Edison International and SCE outline plans to seize the "huge opportunity" of preparing the grid for exponential EV growth, Energized, (Feb. 1, 2023), https://energized.edison.com/stories/transportation-electrification-gains-momentum.

Regulatory certainty can also help ensure that investments not only maintain strong electric service, but improve it while at the same time lowering costs. Southern California Edison President and CEO Steve Powell noted: "if we leverage the electric vehicle load and have that work for consumers as well, that whole idea of vehicle-to-grid, there can be real value in helping alleviate a lot of the infrastructure investments that need to happen," ultimately lowering overall energy bills for customers.219 Similarly, Seattle City Light, in its Transportation Electrification Strategic Investment Plan, found that the utility received a net benefit of roughly $120,500 per bus or other heavy-duty ZEVs through an increase in new revenue, placing downward pressure on rates.220 It stated that "[w]hile there are system costs associated with increased transportation electrification (e.g., distribution and transmission infrastructure upgrades), with proactive utility planning and intervention, the system benefits (e.g., new revenue) are estimated to outweigh the costs, spreading the economic benefits of transportation electrification to all customers."221 This will require action from regulators as well to help shape and approve these proactive and critical investments. As RMI recommended, "regulators can fulfil [sic] their responsibility for ensuring prudent and least-cost grid investments while proactively planning by using new information."222 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 53 - 54]

219 Id.

220 Seattle City Light, Transportation Electrification Strategic Investment Plan 6 (not dated), https://www.seattle.gov/documents/Departments/CityLight/TESIP.pdf.

221 Id.

222 Ari Kahn et al., RMI, Preventing Electric Truck Gridlock: Meeting the Urgent Need for a Stronger Grid 16 (2023), https://rmi.org/insight/preventing-electric-truck-gridlock/.

Third-party analyses have bolstered these statements from utilities that BEVs, if deployed strategically, can improve grid operations. For example, Lawrence Berkeley National Laboratory estimated that enabling "vehicle-to-grid" technology,223 which allows ZEVs to serve as electricity storage and provide power back to the grid during periods of high demand, would save California utility customers $13-15 billion in stationary battery costs.224 An analysis conducted by Gladstein, Neandross & Associates on behalf of EDF found that managed charging of class 8 trucks combined with strategic deployment of distributed energy resources could provide significant cost savings for fleet operators and "result in significant savings to utilities through avoided grid buildout costs."225 Yet another analysis found that BEVs can "contribute significantly to grid stability" and provide value to the grid through "deferred or avoided capital expenditure on additional stationary storage, power electronic infrastructure, transmission build-out, and more."226 Additionally, utilities can deploy proven and emerging rate designs that ensure utilities recover costs, reliably serve BEV charging load, improve BEV owner experience, and take advantage of grid strengthening services from these vehicles.227 [EPA-HQ-OAR-2022-0985-1640-A1, p. 54]

223 For more information on vehicle to grid and other bidirectional charging technologies, see, e.g. Jason Svarc, Bidirectional Chargers Explained - V2G Vs V2H Vs V2L, Clean Energy Reviews (Apr. 10, 2023), https://www.cleanenergyreviews.info/blog/bidirectional-ev-charging-v2g-v2h-v2l; SAFE & Electrification Coalition, Advancing Vehicle to Grid Technology Adoption Policy Recommendations for Improved Energy Security and Resilience (2022), https://safe2020.wpenginepowered.com/wp-content/uploads/2022/06/Advancing-Vehicle-to-Grid-Technology-Adoption.pdf,

224 Jonathan Coignard et al., Clean Vehicles as an Enabler for a Clean Electricity Grid, Env't Rsch. Letters, May 16, 2018, http://iopscience.iop.org/article/10.1088/1748-9326/aabe97.

225 Gladstein, Neandross & Associates, California Heavy-Duty Fleet Electrification Summary Report (2021), https://blogs.edf.org/energyexchange/files/2021/03/EDF-GNA-Final-March-2021.pdf.

226 Chengjian Xu et al., Electric vehicle batteries alone could satisfy short-term grid storage demand by as early as 2030, Nature Commc'n, Jan. 17, 2023, at 1, https://doi.org/10.1038/s41467-022-35393-0.

227 See e.g., Brittany Blair et al., Smart Electric Power Alliance, Managed Charging Programs: Maximizing Customer Satisfaction and Grid Benefits (2023), https://sepapower.org/resource/managed-charging-programs-maximizing-customer-satisfaction-and-grid-benefits/; Enel-X, Understanding Smart EV Load Management (Apr. 8, 2022), https://info.evcharging.enelx.com/whitepaper-download-ev-load-management-utility-dive; Zachary Needell, Wei Wei & Jessika E. Trancik, Strategies for beneficial electric vehicle charging to reduce peak electricity demand and store solar energy, CELL REPS. PHYSICAL SCI., Mar. 15, 2023, https://www.cell.com/cell-reports-physical-science/fulltext/S2666-3864(23)00046-2; Lily Paul & Maureen Marshall, CALSTART, Not Just Smart: The Importance of Managed Charging (2021), https://calstart.org/wp-content/uploads/2022/01/Managed-Charging-Paper-Final.pdf; Karen Kirk, Yes, the grid can handle EV charging, even when demand spikes, Yale Climate Connections (Mar. 23, 2023), https://yaleclimateconnections.org/2023/03/yes-the-grid-can-handle-ev-charging-even-when-demand-spikes/.

In addition, the historic investments of the BIL and IRA are helping utilities build a stronger, cleaner grid and prepare for advanced electrification while minimizing customer costs. Duke Energy, for example, has stated that "[the BIL] provides an important down payment on the infrastructure and incentives that are needed to electrify transportation and secure the grid," and "[the IRA] can create significant cost savings for our customers."228 New York utilities have indicated that they will be applying for $900 million in grants from the BIL and IRA to advance grid resilience.229 National Grid in particular notes that "EV charging make-ready infrastructure is identical to electric infrastructure that serves other purposes, this is the kind of work electric utilities do every day,"230 and that "areas of the [BIL] funding are enabling increased investment."231 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 54 - 55]

228 Jennifer Loraine, Policy can have a crucial impact on our clean energy future, Duke Energy News Center (Jan. 20, 2023), https://news.duke-energy.com/our-perspective/policy-can-have-a-crucial-impact-on-our-clean-energy-future.

229 John Norris, NY Utilities to Seek $900M from DOE, RTO Insider, (Mar. 28, 2023), https://www.rtoinsider.com/articles/31898-ny-utilities-seek-900m-from-doe.

230 Comments of National Grid to USDOT/FHWA on Docket No. FHWA-2021-0022, at 11 (Jan. 26, 2022), https://downloads.regulations.gov/FHWA-2021-0022-0150/attachment_1.pdf.

231 Id. at 10.

Organization: Clean Fuels Development Coalition et al.

H. The proposed rule neglects the impact of EPA's many other proposed rules on these rules.

Finally, the proposed rule is made even more infeasible when EPA's other proposed rules are considered. On the same day EPA announced this proposed rule it also announced the corresponding rule for light-and medium-duty vehicles. That proposed rule, "Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles," 88 Fed. Reg. 29,184 (May 5, 2023), would require nearly 70 percent of light-duty vehicles to be electrified by 2032. These light-duty vehicles will compete with heavy-duty vehicles for minerals, batteries, charging infrastructure, and more. But there is little mention of this competition. [EPA-HQ-OAR-2022-0985-1585-A1, p. 30]

EPA has also proposed new carbon pollution standards for coal and natural gas-fired power plants. See "New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule," 88 Fed. Reg. 33,240 (May 23, 2023). Among other things, this proposal assumes it would lead all coal facilities to close by 2040 or implement—largely unproven—carbon capture and storage technology with at least a 90 percent capture rate. The proposal would also require the use of hydrogen blending or carbon capture in all natural gas plants. These new rules will drive up electricity costs—by adding large new expenses to the coal and gas the currently provides a majority of our nation's electricity—and reduce grid reliability by driving offline the large thermal generation sources that provide most of our electric grid's reliable power. [EPA-HQ-OAR-2022-0985-1585-A1, p. 30]

This grid reliability is a serious concern. A decline in steady thermal sources like coal makes our grid susceptible to the "fatal trifecta": "overreliance on weather-dependent solar and wind, just-in-time natural-gas backstops, and imports of electricity from neighboring states." Michael Buschbacher & Taylor Myers, FERC Gaslights America, American Conservative (Sep. 6, 2022), https://www.theamericanconservative.com/ferc-gaslights-america/. The effects of decreasing baseload power are already being felt. The North American Electric Reliability Corporation's ("NERC") most recent Long-Term Risk Assessment found that found that most of the country is already at elevated risk of blackouts, with some regions being at high-risk during even normal peak conditions. 2022 Long-Term Reliability Assessment, North American Electric Reliability Corporation (Dec. 2022), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf . These problems are exacerbated by rules like EPA's new power plant rules because those rules drive the adoption of less reliable intermittent resources like solar and wind. NERC explained that "[a]s solar decreases as sunset approaches, the total of all available resources can fall short of the demand, especially [during] higher demand levels." Id. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 30 - 31]

These reliability concerns are exacerbated by the deployment of electric vehicles. A recent NERC report explained that when up-ticks in electrical vehicle charging coincide with increasingly frequent grid disturbances in the bulk power system. Electric Vehicle Dynamic Charging Performance, North American Electric Reliability Corporation (Apr. 10, 2023), https://www.nerc.com/comm/RSTC/Documents/Grid_Friendly_EV_Charging_Recommendations.pdf. When these events coincide they could "have catastrophic consequences for grid reliability if left unchecked (i.e., cascading blackouts and widespread power interruptions)." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 31]

But the proposal waves away concerns about grid reliability by explaining that "U.S. electric power utilities routinely upgrade the nation's electric power system to improve grid reliability and to meet new electric power demand." 88 Fed. Reg. 25,983. This is inadequate. If the Biden Administration is going to adopt a "whole of government" approach to rulemaking, it must consider the interaction of all these rules. [EPA-HQ-OAR-2022-0985-1585-A1, p. 31]

Organization: Daimler Truck North America LLC (DTNA)

Electrical infrastructure buildout pace is a barrier to significant ZEV adoption that should be factored in to Phase 3 CO2 standard levels.

The pace of electrical infrastructure buildout remains the biggest barrier for customer adoption of HD BEVs and poses the greatest threat to successful implementation of the Proposed Rule. As EPA observes, BEV infrastructure is critically important for the success of increasing development and adoption of BEV technologies.108 DTNA thus appreciates the opportunity to respond to EPA's request for comment on the concerns that have already been expressed to EPA regarding the slow growth of ZEV charging and refueling infrastructure. This Proposed Rule is unique in that compliance will rely heavily on the development of infrastructure that manufacturers have no control over, and providers are not obligated to expand infrastructure to support the scope and timing of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

108 See Proposed Rule, 88 Fed. Reg. at 26,000.

DTNA—in partnership with Portland General Electric—is proud to have built the first-of-its-kind public charging island for commercial ZEVs in Portland, Oregon. In addition, DTNA's expert eConsulting team is dedicated to supporting fleets on all aspects of the ZEV transition, including site design and interfacing with utilities. Therefore, DTNA is uniquely positioned to offer insight into the challenges associated with commercial ZEV infrastructure development. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

DTNA has concerns about EPA's treatment of electric infrastructure in the Proposed Rule, and the Agency's assumptions that all suitable vehicle applications and willing customer adopters will have charging infrastructure available, or that such infrastructure can be made available within the timeframes that EPA assumes and at the costs projected in HD TRUCS. In this section, DTNA highlights the unique challenges with HD charging infrastructure (especially with respect to electricity transmission and distribution); explains why EPA significantly underestimates infrastructure costs; discusses specific timing challenges; and highlights case studies from its customer fleets. Finally, DTNA concludes by recommending that EPA use an electric infrastructure scalar to ensure that infrastructure development pace is adequately factored in to EPA's adoption rate projections, as discussed in more detail on Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 45]

EPA projects that modest increases in electric power generation will be required to support the Proposed Rule. Specifically, the Agency estimates that Proposed Rule requirements would increase HD BEV electric power end use by 0.1% over 2021 levels in 2027, increasing to 2.8% over 2021 levels in 2055.109 EPA notes, however, that these figures do not include the electricity increase required to produce hydrogen.110 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 45-46]

109 Id. at 25,983; DRIA at 430, Table 6-1.

110 See DRIA at 431 (noting that EPA's projected electricity consumption increases attributable to the Proposed Rule do 'not include changes in electricity generation to produce hydrogen').

EPA's figures appear to underestimate the increase in electric power generation that will be required to support implementation of the Proposed Rule. As discussed below, according to the Company's calculations, 45 gigawatts of installed charging capacity will be required to support the vehicle volumes in the Proposed Rule from 2027 - 2032. Based on EIA's estimate that there was 1,143,757 megawatts (MW) of total utility-scale electricity generating capacity in the United States at the end of 2021,111 Proposed Rule implementation will require a 3.9% increase in domestic generation capacity (over the 2021 level) by 2032, conflicting with EPA's projection that only a 2.8% increase will be required by 2055. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46]

111 See U.S. Energy Information Administration, 'Electricity explained: Electricity generation, capacity, and sales in the United States,' https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacityand-sales.php.

Further, DTNA is concerned that EIA's commercial vehicle forecast does not align with EPA's ZEV market projections in the Proposed Rule. EIA's AEO 2022 commercial vehicle projections are summarized in Table 15 below EIA projects zero commercial vehicle BEV sales through 2050, and minimal FCEV penetration up to 1,600 vehicles per year per category. It is critical that federal agencies are aligned on these commercial vehicle projections and communicate them clearly to the electric utility industry. Given the misalignment with EIA on ZEV uptake rates, it is likely that EPA underestimates the electricity generation increase needed to support HD BEVs.[EPA-HQ-OAR-2022-0985-1555-A1, p. 46] [Refer to Table 15 on p. 46 of docket number EPA-HQ-OAR-2022-0985-1555-A1].

EPA points to the adoption of residential air conditioners and growth of power-intensive data centers as historical evidence of the electric utility industry's ability to deliver additional power to customers.113 Residential air conditioners provide a reasonable comparison for light-duty vehicle electricity demand levels, as they represent a relatively low load that is evenly distributed across utility service territories. The electricity demands associated with medium- and heavy-duty electrification will, however, be fundamentally different and must be treated as such. [EPA-HQ-OAR-2022-0985-1555-A1, p. 46]

113 See Proposed Rule, 88 Fed. Reg. at 25,983.

Unlike light-duty vehicles, most HD ZEVs cannot charge using existing 120-volt and 240-volt AC electrical infrastructure, and they require dedicated DC infrastructure. HD ZEVs are also disproportionally located in concentrated urban areas, creating highly localized grid capacity addition needs in constrained spaces (see Figure 3 below, showing heat maps of potential future loads). [EPA-HQ-OAR-2022-0985-1555-A1, p. 47] [Refer to Figure 3 on p. 47 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Power-intensive data centers and server farms were rapidly constructed across the United States in the last 20 years and were largely greenfield projects that had the flexibility to be sited where grid capacity was available or could be made available relatively easily. By contrast, the commercial transportation industry is already entrenched and invested in existing logistics facilities. Most of these are located in or around high density urban population centers, often clustered tightly together, where grid capacity is not available, and the process of acquiring land and rights-of-way for upgrades is complex. The use of data centers and server farms as anecdotal examples of electric utility adaptability suggests that EPA is significantly underestimating the demand presented by commercial transportation charging infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 47]

DTNA generally agrees with EPA's assertion that scale-up of electric power generation is not likely to significantly limit the development of BEV electric vehicle charging infrastructure. Rather, the challenge for medium- and heavy-duty charging lies in distribution of that power. As ICCT observed in a recent white paper on near-term medium- and heavy-duty ZEV infrastructure development, 'Most uncertainties regarding infrastructure buildout concern the capacity of distribution systems to bring that energy to the right place in a timely manner and accommodate the highly localized power requirements of [medium- and heavy-duty vehicle] charging.'114 Accordingly, DTNA recommends that EPA engage with electric utilities and their trade associations to further understand the unique challenges that HD ZEVs charging will pose for distribution systems, and how those factors should be accounted for in this rulemaking. [EPA-HQ-OAR-2022-0985-1555-A1, p. 47]

114 See ICCT, 'Near-Term Infrastructure Deployment to Support Zero-Emission Medium- and Heavy-Duty Vehicles in the United States (May 2023) at 1, https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf (ICCT ZEV Infrastructure White Paper).

Infrastructure Costs

EPA asserts 'there is considerable uncertainty associated with future distribution upgrade needs, and in many cases, some costs may be borne by utilities rather than directly incurred by BEV or fleet owners. Therefore, we do not model them directly as part of our infrastructure analysis.'115 DTNA appreciates that there is significant complexity and uncertainty in modeling these costs, but believes that omitting front-of-meter costs is a significant error in the TCO calculation that has major implications for EPA's proposed CO2 standard stringency levels. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

115 Proposed Rule, 88 Fed. Reg. at 25,983.

How fleet owners pay for infrastructure will depend on a variety of factors, including utility structure (investor-owned, municipal, cooperative), existing available grid capacity, project scale, real estate needs, etc. For fleets in cooperative and municipality service territories, including many in critical urban freight hubs, upgrade costs are likely borne directly by the fleet. For fleets working with investor-owned utilities, the cost mechanism will vary. If infrastructure is needed by more than one utility customer, the utility will typically ask the fleet for a pro-rata share of those costs, or in some cases, increase electricity rates to cover those costs. Where fleets do not meet the minimum utilization rates for the contracted time period (5 to 10 years), fleets may be required to reimburse the utility for infrastructure upgrades, or costs are distributed among all ratepayers. One DTNA customer fleet has cancelled an order for 25 Class 8 tractors because of what they viewed as risky contract terms, including requirements for load management and a 10-year commitment to construct capacity for a 3 MW site. Regardless of the pathway, fleets will bear the cost of infrastructure upgrades to support charging needs, and those costs should be included in the proposed rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

DTNA relied on a cost study by the Boston Consulting Group (BCG) to estimate an optimized and non-optimized dollar-per-kilowatt cost figure for grid updates.116 To estimate per-vehicle grid update costs for Class 3 - 8 BEVs, we applied the BCG dollar-per-kilowatt cost estimates to an assumed average daily power need for each vehicle class that would be subject to the Phase 3 CO2 standards, shown in Table 11 ('DTNA Proposed Grid Update Cost Inputs for HD TRUCS') presented in Section II.B.3.b. As reflected in Table 11, these costs are non-negligible, significantly impact the TCO proposition, and must be considered in EPA's HD TRUCS analysis. [EPA-HQ-OAR-2022-0985-1555-A1, p. 48]

116 See Boston Consulting Group, 'The Costs of Revving Up the Grid for Electric Vehicles' (Dec. 20, 2019), https://www.bcg.com/publications/2019/costs-revving-up-the-grid-for-electric-vehicles.

Using the same average daily power assumptions, DTNA estimated the additional installed capacity that will be needed to support HD BEVs at the adoption rates projected in the Proposed Rule. The Company calculated a 5-year average of commercial vehicle sales in all 50 states from the Polk Automotive database from 2017-2021, applied EPA's projected ZEV volumes for 2027-2032, and calculated the total installed charging capacity that will be required by these vehicles in 2027 - 2032 to be approximately 45 gigawatts. In Appendix C to these comments, DTNA estimates the investments in charging infrastructure and grid upgrades, as well as total installed charging capacity, that will be required in each of the 50 states to support implementation of the Proposed Rule.117 DTNA considers installed capacity in this context to mean the total power available as EVSE to charge commercial vehicle batteries. Using installed capacity is a more appropriate metric for evaluating available charging capacity than the number of chargers alone, as installed capacity better reflects the variability in charging speeds needed to support different vehicle dwell times and truck-to-charger ratios. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 48-49]

This installed capacity must be available at a combination of public and private purpose-built HD-accessible charging stations. To be HD-accessible, public charging stations must include pull-through charging lanes and accommodate wide ingress and egress to support all vehicle types. Commercial vehicles are often unable to utilize existing passenger car charging infrastructure, due to space constraints that are not compatible with HDVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 49] [Refer to graphics on p. 49 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Based on the projected vehicle mix in the Proposed Rule and installed capacity needed to support these vehicles, DTNA estimated the total costs of EVSE charging equipment and necessary supporting grid updates to support Class 3-8 BEVs that would be required under the Proposed Rule. These figures, summarized in Table 16 below, do not include the additional capacities and investments needed to support passenger car electrification. [EPA-HQ-OAR-2022-0985-1555-A1, p. 49] [Refer to Table 16 on p. 49 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Even with incentive funding available, many fleets are unable to make the capital investments required to add BEVs to their fleets. DTNA is currently working with one school bus fleet that has secured Clean School Bus funds from EPA for 23 buses, as well as a payment plan through their utility's Make Ready program, and is still facing a $500,000 funding gap for site construction that threatens to jeopardize the project. Private fleet deployments are likely to face similar gaps, even where some combination of incentive program funding is available. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

Timing for Infrastructure Development

EPA implies that in the next five years, electric infrastructure will be sufficiently built out to support the BEVs required by the Proposed Rule, and that buildout will continue to support substantially higher fleet adoption rates by 2032. Without major regulatory and/or legislative action, DTNA does not believe the infrastructure needed will materialize on the timeline required to enable compliance with the Phase 3 CO2 standards as proposed. New interconnection requests are processed on a first-come-first-serve basis, and transportation electrification competes with all other utility priorities, including decarbonization mandates, resiliency, and other residential and commercial interconnection requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

Utilities are noting extended timelines for installing critical hardware, both in front of and behind the meter, due to supply chain and other constraints. During the ACF rulemaking process, for example, one electric utility commented to CARB that the lead time for transformers was 40 weeks, and that the lead time customer side meter panels/switchgears was 70 weeks.118 In the Company's experience, utilities will wait for this hardware to be received to perform other upgrades, and these types of sequential gating events can add significant time to transportation electrification projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 50]

118 See Comments of Pacific Gas and Electric Company, Proposed Advanced Clean Fleets Regulation (Oct. 17, 2022), https://www.arb.ca.gov/lists/com-attach/370-acf2022-AXEFZFUxUFxRY1Bl.pdf.

In a recent joint presentation by Southern California Edison (SCE), Pacific Gas & Electric (PG&E), and San Diego Gas & Electric (SDG&E) at a California Energy Commission (CEC) workshop, the following table was presented reflecting the utilities' estimations of typical timelines for distribution capacity improvements: [EPA-HQ-OAR-2022-0985-1555-A1, p. 50] [Refer to Table 17 on p. 50 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

As the scope of the necessary distribution capacity improvements is often unknown until detailed site planning is underway, predicting how long fleets will wait for interconnection requests is challenging. DTNA believes many depot electrification projects may require increases in substation capacity, sub-transmission improvements, or new substations to serve the concentrated power demands. One of DTNA's customers cancelled a BEV deployment because their utility returned a 5-8 year lead time for a new substation. Another fleet's initial ZEV deployment at scale required construction of a 6 MW facility, able to charge 32 Class 8 drayage tractors simultaneously.120 Providing these capacities to many sites clustered together, as will be required to support concentrated freight hubs and logistics centers, is likely to require substantial grid upgrades. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 50-51]

120 See 'Schneider's Electric Heavy-Duty Trucks Start Off on Regional Routes' (June 8, 2023) https://www.truckinginfo.com/10200304/new-electric-heavy-duty-trucks-start-off-on-regional-routes.

Because of California's climate policies, including Executive Order N-79-20 requiring all new passenger car and truck sales to be zero emission by 2035, and CARB's ACT and ACF regulations, a number of transportation electrification planning procedures and make-ready programs have already been implemented or have begun to develop in California. Thus, it is important to keep in mind that electric utilities in other states may generally be less prepared to respond to transportation electrification requests. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

In the Company's experience, fleets typically purchase their vehicles 6 - 12 months ahead of need, and often utilities require proof of purchase to show the fleet is committed to move forward with infrastructure development. DTNA has experienced fleet customers cancelling BEV orders when utilities respond to interconnection requests with multi-year lead times. Many of these cancellations include the return of incentive program funds, such as HVIP or Clean School Bus Program vouchers. Purchasers who apply for and are granted HVIP funds for example, must redeem the voucher within 90 days, or apply for three-month extensions up to 540 total days.121 It is not uncommon for infrastructure projects to exceed the 540 day timeline, which would require the fleet to take delivery of BEVs with no charging infrastructure, resulting in a stranded capital investment and no air quality improvements. One of DTNA's customers cancelled an order and returned HVIP funding for 20 Class 8 tractors when their utility estimated their site would take 3 years (1,095 days) to energize. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

121 See Implementation Manual for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) (March 15, 2022) at 20, https://californiahvip.org/wp-content/uploads/2022/03/HVIP-FY21-22-Implementation-Manual-03.15.22.pdf.

Furthermore, it is unlikely that fleets will make major investments in long-term infrastructure that require commitments longer than the vehicle trade cycle. For example, if a fleet plans for a 4-year vehicle product cycle, but the infrastructure lead time is 4 years for an increase in substation capacity, by the time the infrastructure is available, the fleet will be working with the next generation of vehicles, which may or may not have the same power needs. Similarly, where utilities have made capital investments in infrastructure, fleets may be required to commit to a certain utilization rates for 5 to 10 years. Fleets working with shorter trade cycles, contracted routes, or leased properties are likely to see operational changes well before they are released from their utilization obligations. Committing to minimum utilization rates may be a major financial risk for fleets, which is unaccounted for in the cost estimates in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 51]

Fleets have also cited the lack of firm interconnection dates as a major deterrent to committing to long-term infrastructure projects. DTNA appreciates that infrastructure buildout projects are difficult to project, and may encounter unanticipated delays, but fleets are unable to make fleet transition plans, place orders for electric vehicles, or apply for funding without firm interconnection timelines. Some of DTNA's fleet customers committed to ZEV deployment have sought temporary power solutions to address these timeline issues. However, temporary power solutions incur additional costs and generally must be paid up front by the fleet. For instance, SDG&E Rule 13 ('Temporary Service') provides that an applicant for temporary service 'shall pay, in advance or otherwise as required by the utility, the estimated cost installed plus the estimated cost of removal, less the estimated salvage of the facilities necessary for furnishing service.'122 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 51-52]

122 See SDG&E Rule 13, https://www.sdge.com/sites/default/files/elec_elec-rules_erule13.pdf.

In addition to electrical interconnection complexities, fleets must navigate their local building codes and permitting processes. As noted by the Northeast States for Coordinated Air Use Management (NESCAUM) in a 2019 paper on DCFC deployment, 'the permitting process for DCFC stations is sometimes lengthy and fraught with delays due to unfamiliarity with the technology, protracted zoning reviews, and undefined requirements for permitting DCFC. As a result, the DCFC permitting process can be resource-intensive for both applicants and [authorities having jurisdiction (AHJs)].'123 Since the NESCAUM paper was published, DTNA's eConsulting team has encountered many AHJs that lack defined processes for DCFC installation projects and the expertise needed to move projects along quickly. [EPA-HQ-OAR-2022-0985-1555-A1, p. 52]

123 NESCAUM, 'Preparing Our Communities for Electric Vehicles: Facilitating Deployment of DC Fast Chargers' (May 2019), https://www.nescaum.org/documents/dcfc-permit-streamlining-whitepaper-final-5-14-19.pdf.

Fleets may encounter additional complications related to EVSE installation that impact BEV technology adoption rates. For example, when converting vehicles to BEVs, the infrastructure needed for charging equipment takes up physical space that could otherwise be occupied by additional trucks. Figure 4 below illustrates the components needed for combined charging systems (CCS). Megawatt Charging Systems (MCS) require additional space for installation as well. [EPA-HQ-OAR-2022-0985-1555-A1, p. 52] [Refer to Figure 4 on p. 53 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Figure 5 below shows an overhead view of one such fleet operation in Southern California where physical space will limit the number of BEVs that can be deployed. This site will require additional power poles, new transformers, and new switchgears to support only a fraction of the fleet. To convert additional tractors to BEVs, fleets working with constrained spaces like the site shown below will likely be required to purchase additional real estate. Recently, Denver's Regional Transportation District (RTD) announced the cancellation of an $18 million deal for new electric buses, citing space constraints for charging and EVSE equipment.124 RTD officials estimated they would need an additional $85 million to construct a new building to support this deployment. Space constraint issues of this type—and the associated costs—are not accounted for in EPA's cost estimates for the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 53] [Refer to Figure 5 on p. 53 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

124 See Denver Post, 'RTD cancels purchase of 17 electric buses it doesn't have space to maintain—and orders fleet transition strategy' (April 26, 2023), https://www.denverpost.com/2023/04/26/regional-transportation-district-battery-electric-buses-contract/.

DTNA's fleet customers have faced a number of similar challenges, which have resulted in order cancellations or reductions, revealing the following issues :

- Fleet customers have been quoted 1.5 - 8 years for depot site electrification for deployments that are modest compared to the scale of those discussed in the Proposed Rule.
- Depot installation projects are complex and resource intensive for fleets, utilities, and AHJs. DTNA often observes differing views of roles and responsibilities in transportation electrification projects and a lack of expertise in this developing space.
- Infrastructure lead time is not synchronized with funding program lead time, leading fleets to return vouchers they spent resources securing, highlighting that available funding and the calculated TCO is only part of the adoption equation.
- Utilities and fleets sometimes cannot come to agreement on contractual terms, including load restrictions, managed charging, and guaranteed utilization time periods. It is unlikely these issues will be resolved without significant regulatory or legislative changes.

- State and municipal building codes and processes lack transparency and add significant time to depot electrification projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 54]

Utility Long Range Planning vs. Fleet Planning

Utilities today rely on long-range forecasts in the 5 - 10 year timeframe to plan investment and system upgrades. During CARB's ACF rulemaking process, a number of electric utilities submitted comments recommending that CARB facilitate the ongoing sharing of data with utilities about fleet customers' detailed near-term and long-term charging infrastructure needs, including fleet transition plans by year, whether the fleet would need to charge full-time or on peak, what percentage of time fleets would charge on peak and at what level, and if fleets anticipated seasonal peaks. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

As discussed above, fleets typically order their vehicles 6 - 12 months in advance, and it is unlikely fleets are able to make accurate predictions of what the future fleets' energy needs might be, as fleet operations are subject to change with changes in contracted routes, technology maturity, etc. Some fleets rent their depot facilities, and short term leases will prevent the tenant fleet from making long range plans. Where long term leases are in place, the fleet tenant often cannot make substantial changes to the property without the landlord's permission. Even with the landlord's permission, fleets are unlikely to make a long-term investment in sites that they do not own. Landlords could choose to install EVSE if they anticipated a positive business case, but are similarly unable to provide detailed long range forecasts. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

DTNA has made vehicle telematics data available for interested utilities to predict where future loads may occur, but this dataset only represents a subset of the Company's products, and not the market as a whole. Without substantive regulatory and/or legislative intervention to prompt utilities to plan for and buildout for transportation electrification, DTNA does not believe significant buildout of electrical infrastructure will occur on the timeline required to support EPA's proposed CO2 stringency levels. [EPA-HQ-OAR-2022-0985-1555-A1, p. 55]

Recommendations to Facilitate ZEV Infrastructure Buildout and CO2 Standard Feasibility

While EPA does not have regulatory authority over many of the factors that currently pose challenges to ZEV infrastructure development, the Agency could help to mitigate these challenges by supporting the policies, legislation, and regulatory initiatives that are detailed in Section I.B.4 of these comments, including:

- Align with EIA vehicle uptake estimates, to ensure accurate estimates of real power demand by MHD and HHD ZEVs and net CO2 emissions.
- Work with FERC to direct utilities to incorporate demand projects into both a system-wide transportation electrification electricity forecast and a utility distribution grid capacity requirement forecast, to serve these medium- and heavy-duty transportation electrification loads on a geographic basis.
- Assume financial liability as a demand guarantor for infrastructure buildout that is undertaken based upon EPA's ZEV penetration forecasts.
- Work with FERC to identify high traffic freight hubs that are likely to see rapid increase in BEVs, and direct utilities to proactively upgrade this infrastructure.

- Encourage state utility regulatory commissions to adopt PBRs to incentivize faster interconnection timelines for charging infrastructure projects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 57]
- Work with stakeholders to develop model building codes that can be adopted by state and local governments to streamline authorizations for EVSE installation projects and encourage state and local adoption of these model codes.
- Require reporting of medium- and heavy-duty ZEV infrastructure and make this information available to fleets.
- Work with FHWA to revise the NEVI formula program to more actively encourage states to provide HD-accessible public charging infrastructure. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

Finally, as described in more detail in Sections I.B.3 and II.C. of these comments, EPA should incorporate a scalar to be used in its calculations of appropriate CO2 standard stringency levels, designed (and regularly updated) to reflect actual installed capacity of HD-accessible charging equipment. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

Organization: Edison Electric Institute (EEI)

EPA notes that several stakeholders have raised concerns that ‘slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards.’ 88 Fed. Reg. 25,934. EEI member companies have addressed similar infrastructure build out issues in the past. Like those issues, these concerns can be addressed through deliberate effort and collaboration among electric companies, fleet operators, and stakeholders, including planning for increased demand, customer engagement, and fleet electrification. [EPA-HQ-OAR-2022-0985-1509-A2, p. 7]

Electric companies can accommodate increased energy demand.

As EPA notes, the electric power sector has a long history of accommodating growth in electricity demand from the adoption of new technologies, including electric home appliances, residential and commercial air conditioning, and data centers. See id. At 25,983. Electricity use from EVs today is modest. Argonne National Lab estimates the approximately 2.3 million EVs on the road as of the end of 2021 consumed 6.1 terawatt-hours of electricity in that year, or about 0.16 percent of the total electric sales to U.S. customers in that year.18 As EPA also notes, the increase in electricity use resulting from the Proposed Rule also will be modest, increasing electricity end-use by less than 3 percent in 2055. See id. On a macro-level, meeting the increased energy usage from electric truck adoption as contemplated in the Proposed Rule will not be a significant challenge for the electric power sector. Meeting the location-specific power needs of large electric vehicle (EV) charging facilities can be a more pressing challenge. However, this is a challenge that can be addressed with deliberate effort and collaboration among electric companies, fleet operators, and stakeholders. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 7-8]

18 See Gohlke, et al., Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010 – 2021, https://publications.anl.gov/anlpubs/2022/11/178584.pdf and U.S. Energy Information Administration, Electric Power Monthly

Electric companies can accommodate localized power needs at the pace of customer demand, provided appropriate customer engagement and enabling policies are in place. The power required by a customer is essential when considering the infrastructure needed at the facility level, because the capacity of the local distribution circuit is sized to meet the peak power requirements of customers on that circuit. Some large EV charging facilities have power requirements in the tens of megawatts (MW). Electric companies are well accustomed to serving facilities with those types of power needs, but large fleet customers differ from traditional electric customers (e.g., commercial or industrial buildings) in several important aspects. These aspects include, but are not limited to:

- Construction timelines: A new, large commercial building with a multi-MW power demand, for example, will typically have a multi-year construction timeline, giving the local electric company time to plan and make appropriate upgrades to the electric distribution system serving that customer. A fleet operator, in contrast, may be able to procure vehicles and complete construction on a multi-MW charging facility in a matter of months. This creates a potential misalignment between the fleet operators' timeline to procure vehicles and charging equipment and the electric company's timeline for making the necessary system upgrades to provide power to that facility. [EPA-HQ-OAR-2022-0985-1509-A2, p. 8]
- Customer familiarity with procuring electric power: Commercial and industrial electric customers are used to working with electric companies for the operation of their facilities as part of their normal course of business, including working with electric companies as part of the construction process for launching new facilities. In particular, national corporate customers often have long-standing relationships with the electric companies that serve them. Electric companies typically assign these customers an account manager, given their scale and complexity. A fleet operator, in contrast, is used to procuring diesel to operate its vehicles, and may consider procuring electricity in the same paradigm. Fleet operators may be small electricity users today and thus that division may not yet be considered a managed account for the electric company. However, EEI members have identified this issue and are expanding their working relationship with these customers. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 8-9]
- Uncertain and dynamic load profiles: The power usage throughout the day, known as the 'load profile,' of typical commercial and industrial buildings is well understood (e.g., large retail store, data center, or manufacturing facility). Typical load profiles for electric fleet customers are not yet well understood and often hypothetical given the early stage of electric truck commercialization. A fleet charging load profile is the product of many factors, including the routes of the vehicles, the state of charge of the EV when returning to the facility, the number of operating shifts, etc. Unlike a typical commercial building, the load profile of a fleet facility could also drastically change with a change in vehicle operations (e.g., changing from a one-shift to two-shift operation). This uncertainty adds complexity for electric companies when determining how best to serve the power requirements of a fleet customer. [EPA-HQ-OAR-2022-0985-1509-A2, p. 9]

These factors could result in misalignment between expectations and reality regarding the timing, cost, and complexity of procuring electric power for fleet charging. Electric companies are taking a multi-pronged approach to remedy this potential misalignment, as discussed in the following sections. [EPA-HQ-OAR-2022-0985-1509-A2, p. 9]

Earlier customer engagement through education and coordination will alleviate infrastructure delays.

Early engagement between the relevant fleet customer and electric company is important as it allows planning for the infrastructure to support EV charging to occur much earlier and accommodate longer lead-times. In 2020, EEI began a collaboration with a large, national corporate customer that was planning to electrify a significant portion of its fleet operation. EEI facilitated meetings for this customer to share its conceptual plans with EEI's members and establish points of contact at the customer and each electric company. Over the course of more than a year, the customer identified the locations within each member's territory where it planned to deploy EVs and developed a five-year forecast to inform the electric company how the power demand would increase at each location over time. This unprecedented level of collaboration has resulted in this customer deploying thousands of electric vehicles to date. This includes alternative locations that were identified by the electric company after consulting with the customer. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 9-10]

The extent of collaboration described in this example may not be feasible, or necessary, for every fleet customer. But it does provide a helpful template for how early engagement and planning can streamline fleet electrification. The Electric Power Research Institute (EPRI) is developing a data-sharing platform as part of its EVs2Scale2030 initiative that will formalize and expand this model by allowing fleet customers to upload their forward-looking fleet electrification plans to a common database.19 Electric companies will then be able to access this data to visualize where on its system upgrades will be needed to accommodate growing power needs from fleet customers. [EPA-HQ-OAR-2022-0985-1509-A2, p. 10]

19 See Electric Power Research Institute, EVs2Scale2030, https://www.epri.com/research/products/000000003002025622.

Many electric companies are developing tools and resources to assist fleet customers. These include, but are not limited to:

- Grid capacity evaluation tools: Several electric companies have launched capacity hosting maps that are available on public websites that illustrate local grid capacity in their service territory.20 These maps can be helpful early indicators for fleet customers when considering the level of upgrades that may be required at a particular facility. These maps have limitations, as they are a snapshot in time and do not substitute for a formal engineering study. Even if they have not published such a capacity map, many electric companies have the ability to assist fleet customers by providing an early screen for local grid capacity by location directly. In either case, the outcome is the same: for customers that have the ability to consider multiple locations for their EV deployment plans, pre-screening the local distribution system capacity at these locations allows the fleet to factor grid upgrade timelines into their deployment plans. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 10-11]

  20 Examples include: AVANGRID (United Illuminating, NYSEG, Rochester Gas & Electric), Ameren Illinois, Con Edison, Dominion Energy, Eversource, Exelon (Atlantic City Electric, Delmarva Power, Pepco, Comed, PECO), Jersey Central Power & Light, National Grid, Orange & Rockland, Public Service Electric & Gas, San Diego Gas & Electric, and Southern California Edison.

- Fleet assessments and advisory services: Many electric companies have launched programs to provide in-depth consulting services to fleets that are considering electrification, including elements like feasibility studies based on total cost of ownership.21 These programs also may include dedicated staff resources to guide customers through the fleet electrification journey, including choosing the appropriate charging strategy and charging infrastructure to meet their operational needs. These programs help to educate fleet customers about the nuances of procuring power for their fleet operations and allow electric companies to learn more about the expected operations of electric fleets. [EPA-HQ-OAR-2022-0985-1509-A2, p. 11]

  21 See Alliance for Transportation Electrification, Fleet Advisory Services (FAS) for Fleet Electrification: Meet Customer Needs and Provide Grid Benefits, https://evtransportationalliance.org/wp-content/uploads/2023/02/PRESS-ATE-EC-White-Paper.pdf, which includes case studies from DTE Energy, Exelon, Portland General Electric, Southern California Edison, and Xcel Energy.

These and other resources being developed and deployed today by electric companies are essential to ensuring that infrastructure plans and efforts are matched to forthcoming electrification efforts from fleets and other operators. [EPA-HQ-OAR-2022-0985-1509-A2, p. 11]

Electric companies are planning for fleet electrification.

Investor-owned electric companies are regulated by state commissions, which approve electric company capital plans to maintain and upgrade the electric grid. While policies vary by state commission, two generally applicable principles have important implications for fleet electrification. First, the 'used and useful' standard means that regulators will only approve the electric company to build infrastructure that will be utilized and provide value. The onus is on electric companies to provide evidence that their capital plans will meet this standard. Second is the principle that the customer that incurs the cost must pay for the cost. Typically, a customer seeking new or upgraded electric service must submit a formal service request to the electric company, which prompts the electric company to perform an engineering study to determine the cost of the upgrades needed to provide that service. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 11-12]

The implication for fleet electrification, a potentially fast-growing source of significant new demand on the electric system, is that electric companies are not authorized to upgrade the electric system in anticipation of new demand without robust evidence that those upgrades will be 'used and useful.' Only when a fleet customer submits a service request is the electric company permitted to make the upgrades necessary to serve that customer. Electric company forecasts for load growth, including that due to electrification, are typically at a system level, not the local distribution system level for individual fleet facilities. Given the nascent commercialization of fleet electrification, there is a lack of visibility into how, where, and when fleet electrification will appear on the system sufficient evidence to give electric companies (and their regulators) confidence to build for it. [EPA-HQ-OAR-2022-0985-1509-A2, p. 12]

Importantly, electric companies are recognizing the risks of this approach and are getting ahead of the need. Given the long lead times to make distribution upgrades, particularly if the upgrades are significant to extend further upstream to the substation and transmission level, it will increasingly be unacceptable to customers to wait for the customer service request-driven process. There is a risk that fleet customers, facing increased regulatory pressure to electrify their fleets, will be unable to plan their businesses around these infrastructure lead times and fail to meet their electrification goals. Electric companies must find mechanisms to plan and build for these increased loads now, so that the power is available when the customer needs them. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 12-13]

In California, the investor-owned electric companies use the California Energy Commission's Integrated Energy Policy Report (IEPR) as their base forecast. Southern California Edison (SCE) in its recent General Rate Case found a significant gap between the electric transportation load growth in the IEPR forecast and that expected due to the state's policies, specifically the California Air Resources Board's Advanced Clean Cars II, Advanced Clean Trucks, and Advanced Clean Fleets rules.22 SCE developed a Transportation Electrification Grid Readiness (TEGR) analysis to account for this gap in its General Rate Case that will set the electric company's grid investments for the next several years. SCE used a top-down methodology to apply this higher forecast to the circuit level for electric transportation loads, as well as a bottom-up methodology for certain high growth areas. [EPA-HQ-OAR-2022-0985-1509-A2, p. 13]

22 See Southern California Edison, 2025 General Rate Case, WP SCE-02, Vol. 07 Bk. A, TEGR Forecast Development Workpaper.

SCE has deployed a variety of new methods to account for HDV development and deployment, including the Power Service Availability (PSA) initiative to support transportation electrification. The PSA initiative, working in concert with the TEGR analysis, focuses on improving SCE's internal processes to streamline interconnection, engaging fleet operators to better understand their plans for electrification, improving their ability to forecast and assess the impacts of load growth from electrification, and leveraging new technologies as grid infrastructure solutions. Because some projects will require more time than others to build, SCE actively encourages fleet owners to engage with them early in the process so that SCE can better understand and plan for their needs. For grid upgrades that require a longer construction schedule, SCE is developing temporary solutions that can deploy quickly while those upgrades are being built. These solutions may include mobile battery storage or a mobile substation brought in on a semi tractor-trailer. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 13-14]

In New York, the Public Service Commission opened a proceeding in April to address barriers to medium-and heavy-duty electric vehicle infrastructure. In particular, the order recognizes that 'proactive planning for the grid infrastructure needed to serve future electrification load must anticipate the location and magnitude of future demand' and notes an analogy to previous policies in which the commission directed the electric companies in New York to 'develop proactive planning processes to anticipate the need for local transmission and distribution system upgrades to enable the renewable interconnections required to achieve the State's renewable energy goals.' 23 [EPA-HQ-OAR-2022-0985-1509-A2, p. 14]

23 State of New York Public Service Commission, Case 23-E-0070, Proceeding on Motion of the Commission to Address Barriers to Medium- and Heavy-Duty Electric Vehicle Charging Infrastructure.

EPA's assessment that 'there is sufficient time for the infrastructure, especially for depot charging, to gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply' is accurate. 88 Fed. Reg. 25,999. As seen above, EEI members actively are planning for and deploying infrastructure today. However, the increased deployment of this infrastructure over the next decade and beyond will not happen on its own. Proactive planning processes, whether initiated by the relevant electric company or state regulatory commission, will be critical to accommodate fleet electrification to meet customer expectations and planning requirements, while also providing affordable and reliable service. [EPA-HQ-OAR-2022-0985-1509-A2, pp. 14-15]

EPA specifically requests comment on ‘whether there are additional stakeholders EPA should work with during implementation of the Phase 3 standards.’ 88 Fed. Reg. 26,000. EPA, states, engine and truck manufacturers, and fleet operators should work with electric companies on a regional or state level to glean additional insight into their planning processes and help bolster proactive planning and infrastructure investments. As discussed above, electric companies and their regulators benefit from the confidence that fleet electrification load will materialize through additional forward planning and outreach, which also provides visibility into where and when that load will materialize on the system. Final adoption of the Proposed Rule will help provide confidence that fleet electrification will occur through the period of the rule, but at a national level. [EPA-HQ-OAR-2022-0985-1509-A2, p. 15]

Additionally, the States, Congress, EPA, and other federal partners should work with the electric power industry to ensure policies are aligned across the federal government to reduce the cost and timelines associated with building infrastructure to support increased electrification. This includes but is not limited to:

- Investing in domestic manufacturing of critical electrical infrastructure, including efforts to alleviate the labor pool shortage limiting domestic manufacturing of critical electrical infrastructure and provide loan or purchase guarantees to manufacturers. [EPA-HQ-OAR-2022-0985-1509-A2, p. 15]
- Not exacerbating the supply shortage of distribution transformers with unsupported efficiency rules. The U.S. Department of Energy should choose an efficiency standard for transformers that does not require switching to a new type of steel or make a determination that no new standard is needed.24 [EPA-HQ-OAR-2022-0985-1509-A2, pp. 15-16]

  24 EEI’s comments are attached as Appendix A.

- Reforming permitting, both at the bulk power level with respect to building electricity generation and transmission, and at the state and local levels with respect to building distribution infrastructure. [EPA-HQ-OAR-2022-0985-1509-A2, p. 16]

EEI and its members stand ready to work with our regulatory and legislative partners to ensure these challenges are appropriately addressed. [EPA-HQ-OAR-2022-0985-1509-A2, p. 16]

Organization: Energy Innovation

V. THE MODERN ELECTRIC GRID CAN SUPPORT WIDESPREAD TRANSPORTATION ELECTRIFICATION OF HDVS OVER TIME.

As part of its analysis, the EPA modeled changes to power generation due to the increased electricity demand from more EVs and projects that the “additional generation needed to meet the demand of the heavy-duty BEVs in the proposal [will be] relatively modest (as shown in DRIA Chapter 6.5). As the proposal is estimated to increase electric power end use by heavy-duty electric vehicles by 0.1 percent in 2027 and increasing to 2.8 percent in 2055. The U.S. electricity end use between the years 1992 and 2021, a similar number of years included in our proposal analysis, increased by around 25 percent, without any adverse effects on electric grid reliability or electricity generation capacity shortages. Grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with HD BEV charging."55 We concur with this finding. [EPA-HQ-OAR-2022-0985-1604-A1, p. 23]

55 U.S. EPA, "Proposed Rules," 25983

A similar analysis in the 2035 2.0 study found that the DRIVE Clean Scenario resulted in demand growth from increased electrification averages about 2 percent per year, a growth rate slower than that achieved between 1975 and 2005. See Figure 15. To meet this demand with a 90 percent clean grid (analyzed as part of the DRIVE Clean Scenario), the U.S. would need to install on average 105 GW of new wind and solar and 30 GW of new battery storage each year—nearly four times the current deployment rate.56 Even with additional electric loads in the DRIVE Clean Scenario, grid modeling found a 90 percent clean grid would be dependable without coal plants or new natural gas plants by 2035. The grid model also found that during normal periods of generation and demand, wind, solar, and batteries provide 72 percent of total annual generation, while hydropower and nuclear provide 16 percent. During periods of high demand and/or low renewable generation, existing natural gas plants (primarily combined-cycle plants) cost-effectively compensate for remaining mismatches between demand and renewables-plus-battery generation—accounting for about 10 percent of total annual electricity generation. The increased electrification and pervasive renewable energy and battery storage deployments require investments mainly in new transmission spurs connecting renewable generation to existing high-capacity transmission, rather than new investments in bulk transmission.57 Of note, the rates of HDV EV adoption envisioned in the DRIVE Clean Scenario are considerably higher than the adoption rates in the proposed rules, even if a more stringent alternative is finalized. [EPA-HQ-OAR-2022-0985-1604-A1, p. 23.] [See Figure 16, electricity Demand Growth, on page 23 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

56 Phadke et al., "2035 2.0: Plummeting Costs and Dramatic Improvements in Batteries Can Accelerate Our Clean Transportation Future" vi.

57 "Transitioning to All-Electric Cars and Trucks Won't Crash the Power Grid," 2035 2.0, n.d., https://www.2035report.com/transportation/evs-the-power-grid/.

The examples the EPA provides in its proposed rule offer useful reminders that increased electric demand from new technologies has, throughout recent history, been met with commensurate increases in investments, grid upgrades, and reinforcements to comply with grid reliability standards. Examples include the rapid adoption of air conditioners in the 1960s and 1970s and the rapid growth of power-intensive data centers and server farms over the past two decades.58 As noted in the proposed rule, the U.S. electric power utilities have already successfully designed and built the distribution system infrastructure required for 1.4 million BEVs and have successfully integrated 46.1 GW of new utility-scale electric generating capacity into the grid between 2020 and 2021.59 The challenges posed by the prospect of gradual growth in ZEVs in the HDV sector over the next decade can be addressed with the continued adoption of policies, regulations, planning, and prudent investments. Numerous reports articulate what's needed to support a highly electrified transportation future, including Accelerating Clean, Electrified Transportation by 2035: Policy Priorities: A 2035 2.0 Companion Report and the ACEEE State Transportation Electrification Scorecard.60 [EPA-HQ-OAR-2022-0985-1604-A1, p. 24]

58 U.S. EPA, “Proposed Rules,” 25983.

59 U.S. EPA, 25983.

60 Bryan Howard and Shruti Vaidyanathan, “State Transportation Electrification Scorecard” (American Council for an Energy-Efficient Economy, 2021), https://www.aceee.org/electric-vehicle-scorecard.

Finally, more nascent vehicle-to-grid (V2G) technologies, vehicle grid integration (VGI), and managed charging programs have the potential to be game changers for HDV electrification and the electric grid. Certain HDVs are especially well suited to deliver on the promise of V2G, given how they are used and where they are located. V2G can help HDV fleet owners recoup energy costs while also meeting power needs during grid constraints. For example, a fleet of electric-powered school buses in El Cajon can send electricity back to California’s grid, thanks to V2G technology developed by a San Diego company and a partnership with San Diego Gas & Electric.61 More utilities are working with original equipment manufacturers, fleets, and government officials to adopt V2G technologies and develop V2G programs, and the IRA and BIL both contain funding to support pilots and nex-tgeneration R&D.62 The EPA points to several other entities engaged in VGI research.63 [EPA-HQ-OAR-2022-0985-1604-A1, p. 24]

61 Rob Nikolewski, “How Eight School Buses Are Helping during Power Shortages: They’re Transporting Electrons,” Los Angeles Times, July 27, 2022, https://www.latimes.com/business/story/2022-07-27/electric-school-buses-in-el-cajon-will-send-power-to-the-grid and “SDG&E and Cajon Valley Union School District Flip the Switch on Region’s First Vehicle-to-Grid Project,” SDG&E News Center, July 26, 2022, https://www.sdgenews.com/article/sdge-and-cajon-valley-union-school-district-flip-switch-regions-first-vehicle-grid-project.

62 See for e.g., Paul Ciampoli, “Public Power Utilities, Others Pursue Vehicle-to-Grid Opportunities,” American Public Power Association, February 1, 2021, https://www.publicpower.org/periodical/article/public-power-utilities-others-pursue-vehicle-grid-opportunities and Dan Zukowski, “GM Partners with Utilities, Solar and Storage Providers on Vehicle-to-Grid, Home EV Charging,” Smart Cities Dive, October 11, 2022, https://www.smartcitiesdive.com/news/gm-energy-electric-vehicles-v2g-v2h-utilities-solar/633734/.

63 U.S. EPA, “Proposed Rules,” 25983.

Based on other analyses and continued advancements in technologies, we agree strongly with the EPA’s finding that the increase in electric power demand attributable to vehicle electrification is not expected to adversely affect grid reliability due to the modest increase in electricity demand associated with EV charging.64 [EPA-HQ-OAR-2022-0985-1604-A1, p. 24]

64 U.S. EPA, 25983.

Organization: Energy Strategy Coalition

Members of this coalition are already engaging in long-term planning to meet the increased demand for electricity attributable to vehicle electrification, and the HDV Proposal will provide a regulatory backstop supporting further investments in electrification and grid reliability. Demand for electricity will increase under both the HDV Proposal and recently-proposed multi-pollutant standards for light-duty and medium-duty vehicles (“LMDV Proposed Rule”),5 but the electricity grid is capable of planning for and accommodating such demand growth and has previously experienced periods of significant and sustained growth. Moreover, historic growth in demand and generation resources does not reflect the investments that will be made under the Infrastructure Investment and Jobs Act (“IIJA”) and the Inflation Reduction Act (“IRA”) to support the deployment of new renewable and zero-carbon generation resources, energy storage and charging infrastructure. Coalition members are already making investments in the resources and infrastructure needed to support transportation electrification and realize the benefits that integration of electric vehicles ("EVs")—including HDVs—can provide to the electricity grid. The Coalition encourages EPA to work closely with state and local partners and other federal agencies to ensure that deployment of this infrastructure occurs on the pace and scale needed to achieve the EV penetration-rates contemplated by these proposals, while ensuring grid reliability. [EPA-HQ-OAR-2022-0985-1626-A1, pp. 1 - 2]

5 Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184 (published May 5, 2023).

II. The proposed rule supports long-term planning and investment

Long-term planning and investment for vehicle electrification is a business imperative for the Coalition's members and a necessary element of their efforts to provide affordable, clean, and reliable power to their customers. By setting a clear trajectory for vehicle electrification that complements existing regulatory and market forces, EPA's HDV and LMDV proposals facilitate further investment in the generation and charging infrastructure needed to meet increased demand associated with electrification of the vehicle fleet. [EPA-HQ-OAR-2022-0985-1626-A1, p. 2]

In 2021, sales of electric buses increased 40% over the previous year (even as the global bus market remained consistent) and global sales of electric medium- and heavy-duty trucks more than doubled over 2020 volumes.6 In its 2023 Global EV Outlook, the International Energy Agency found that the number of models of zero-emission trucks continued to expand with nearly 840 current and announced medium- and heavy-duty vehicle models.7 And, as EPA notes, manufacturers are increasingly announcing targets to expand production and sales of zero-emission trucks.8 [EPA-HQ-OAR-2022-0985-1626-A1, p. 2]

6 INT'L ENERGY AGENCY, GLOBAL EV OUTLOOK 2022: SECURING SUPPLIES FOR AN ELECTRIC FUTURE 35, https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf.

7 INT'L ENERGY AGENCY, GLOBAL EV OUTLOOK 2023: CATCHING UP WITH CLIMATE AMBITIONS 40, https://iea.blob.core.windows.net/assets/dacf14d2-eabc-498a-8263-9f97fd5dc327/GEVO2023.pdf.

8 88 Fed. Reg. at 25,941. For example, Volvo Trucks and Scania announced a global target of 50% of trucks sold being electric by 2030, and Navistar has a goal of having 50% of its sales volume be ZEVs by 2030. Id.

These market trends complement government commitments and incentives to expand the heavy-duty vehicle fleet. Due to IRA incentives, between 39–48% of all truck sales are projected to be electric by 2030 and between 44–52% of sales will be electric by 2032.9 The IIJA similarly provides substantial incentives for the deployment of zero-emission heavy-duty vehicles: two IIJA programs alone provide over $10 billion in incentives to support zero-emission bus deployment.10 States like California, New York, and New Jersey also offer their own recurring rebates for electric buses and trucks.11 In addition to these generous subsidies, 17 states, the District of Columbia, and Québec, have formulated a road map to achieve 30% zero-emission truck sales by 2030.12 And under California's Advanced Clean Trucks regulation, zero-emission vehicle sales will need to comprise 75% of Class 4–8 straight truck sales and 40%

of tractor truck sales by 2035.13 Other states that have adopted California's truck regulation include Colorado, Massachusetts, Maryland, New Jersey, New York, Oregon, Vermont, and Washington.14 As an example of utility planning to achieve such high penetration-rates, National Grid co-authored a November 2022 study to "support utility long-term capital planning,"15 which assumed that the two states in its service territory (New York and Massachusetts) reached 100% sales of zero-emission passenger vehicles by 2035 and complied with California's Advanced Clean Trucks regulation.16 Although EPA's HDV Proposal is not projected to result in zero-emission vehicle penetration-rates as high as projected under California's Advanced Clean Trucks regulation, EPA's HDV rule will provide regulatory certainty for planning and investment decisions in all states, beyond California and the states that adopt its regulation. [EPA-HQ-OAR-2022-0985-1626-A1, pp. 2 - 3]

9 See INT'L COUNCIL ON CLEAN TRANSP. AND ENERGY INNOVATION POL'Y & TECH., ANALYZING THE IMPACT OF THE INFLATION REDUCTION ACT ON ELECTRIC VEHICLE UPTAKE IN THE UNITED STATES (Jan. 2023), https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23-2.pdf; see also 88 Fed. Reg. at 25,941 (citing the same study).

10 88 Fed. Reg. at 25,943 (noting EPA's Clean School Bus Program and the Federal Transit Administration's Low or No-Emission Grant Program). The IIJA contains other incentives to support vehicle electrification as well, such as a $7.5 billion program to build out electric charging and hydrogen fueling infrastructure through the Federal Highway Administration. Id. at 25,943-25,944.

11 Some of these programs include the California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project, the New York Truck Voucher Incentive Program, and the New Jersey Zero Emission Incentive Program. See Medium- and Heavy-Duty Vehicle Electrification, ATLAS EV HUB (last updated April 1, 2022), https://www.atlasevhub.com/materials/medium-and-heavy-duty-vehicle-electrification/.

12 See MULTI-STATE ZEV TASK FORCE, NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT, MULTI-STATE MEDIUM- AND HEAVY-DUTY TASK FORCE ZERO-EMISSION VEHICLE ACTION PLAN (July 2022), https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf.

13 Advanced Clean Trucks Fact Sheet, CAL. AIR RES. BD. (Aug. 20, 2021), https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet.

14 Advanced Clean Trucks Spreads, ATLAS EV HUB (May 15, 2023), https://www.atlasevhub.com/weekly-digest/advanced-clean-trucks-spreads/.

15 See GIDEON KATSH ET AL., NATIONAL GRID, ELECTRIC HIGHWAYS: ACCELERATING AND OPTIMIZING FAST-CHARGING DEPLOYMENT FOR CARBON-FREE TRANSPORTATION 1 (Nov. 2022), https://www.nationalgrid.com/document/148616/download.

16 Id. at 5.

Electric utilities, regional transmission organizations ("RTOs") and independent system operators ("ISOs") engage in long-term planning to ensure adequate generation resources will be available to meet anticipated demand for electricity. Expectations for electrification of the vehicle fleet and other end uses of energy are already being incorporated into long-term planning decisions, even the absence of the HDV and LMDV rules. The incremental demand attributable to these rules would increase electricity demand on a nationwide basis, while areas with higher concentrations of major transit corridors carrying a higher volume of medium and heavy-duty vehicles may experience even greater demand growth. But the electricity grid can, with adequate planning and investment, accommodate this growth and has previously experienced periods of significant and sustained growth,17 including relatively recently.18 Moreover, these historical periods do not reflect the pace and scale of generation growth anticipated as a result of implementation of the IRA and IIJA. By providing regulatory certainty needed for long-term resource planning and investment decisions, the HDV and LDMV rules will help ensure that the necessary resources are deployed to accommodate anticipated growth in demand due to electrification of the vehicle fleet. [EPA-HQ-OAR-2022-0985-1626-A1, pp. 3 - 4]

17 From 1960 to 1980, net generation in the electric power sector increased a remarkable 5.7% per year, with net generation more than tripling from just 756 GWh to 2,286 GWh. See ENERGY INFO. ADMIN., MONTHLY ENERGY REVIEW 134 tbl. 7.2b (May 2023), https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf.

18 Between 1995 and 2007, average nationwide generation demand grew approximately 1.9% per year. See id. (noting an increase from 3,194 GWh to 4,005 GWh over this 13-year period).

III. Coalition members are investing in EV charging infrastructure

Members of this Coalition have begun making significant investments in the charging infrastructure needed to support a growing number of electric heavy-duty trucks, vans, and passenger cars. For example, NextEra Energy is pursuing a $650 million joint venture called Greenlane with BlackRock Alternatives and Daimler Truck North America to design, develop, install, and operate a nationwide charging and hydrogen fueling network for medium- and heavy-duty vehicles.19 Coalition members are also making significant investments in the charging infrastructure for electric passenger cars and trucks:

- National Grid recently received approval for a $206 million initiative to enable up to 32,000 additional charging ports in Massachusetts.20
- The New York Power Authority will have up to 400 fast chargers installed or in construction through its EVolve NY program by the end of 2025.21
- The Pacific Gas and Electric Company ("PG&E") has successfully installed through March 2023 over 5,700 charging ports through its EV Charge Network, EV Fleet, EV Fast Charge and EV Schools programs.22
- Austin Energy provides rebates of up to $1,200 and $4,000 for customers installing Level 2 charging stations at their homes and workplaces respectively.23
- The Sacramento Municipal Utility District ("SMUD") offers up to $1,000 toward residential charging equipment and installation costs through its Charge@Home program.24
- Constellation Energy Corporation's venture arm (Constellation Technology Ventures, or "CTV") has invested in portfolio companies focused on EV and charging infrastructure.25 [EPA-HQ-OAR-2022-0985-1626-A1, pp. 4 - 5]

19 Introducing Greenlane: Daimler Truck North America, NextEra Energy Resources and BlackRock Forge Ahead with Public Charging Infrastructure Joint Venture, NEXTERA ENERGY (Apr. 28, 2023), https://newsroom.nexteraenergy.com/2023-04-28-Introducing-Greenlane-Daimler-Truck-North-America,-NextEra-Energy-Resources-and-BlackRock-Forge-Ahead-with-Public-Charging-Infrastructure-Joint-Venture.

20 NATIONAL GRID, ANNUAL REPORT AND ACCOUNTS 2022/23, at 30 (2023), https://www.nationalgrid.com/document/149701/download.

21 Leading the Way in EV Infrastructure, EVOLVE NY, https://evolveny.nypa.gov/ (last visited June 9, 2023).

22 More information on PG&E's EV charging programs can be found at: https://www.pge.com/en_US/small-medium-business/energy-alternatives/clean-vehicles/ev-charge-network/electric-vehicle-charging/electric-vehicle-programs-and-resources.page.

23 Commercial Charging, AUSTIN ENERGY (last reviewed or modified July 8, 2022), https://austinenergy.com/green-power/plug-in-austin/workplace-charging; Home Charging, AUSTIN ENERGY (last reviewed or modified July 8, 2022), https://austinenergy.com/green-power/plug-in-austin/home-charging.

24 Drive electric and save, SMUD, https://www.smud.org/en/Going-Green/Electric-Vehicles/Residential (last visited June 9, 2023).

25 For instance, CTV invested in Qnovo, which offers a solution suite that uses advanced computation to optimize the chemical reactions within lithium-ion batteries, resulting in faster charging, increased daily run times, and longer battery lifetimes. See Constellation Technology Ventures, https://www.constellationenergy.com/our-work/innovation-and-advancement/technology-ventures.html.

Coalition members are making these investments in part because of the benefits that EVs can provide to grid reliability. EVs' primary near-term grid benefits stem from their enablement of load shifting—whether from periods of higher load demand to periods of lower load demand, or from periods of more carbon-intensive power generation to periods where more renewable energy is available.26 Load shifting can involve both deferral (to avoid charging during periods of peak load) and more targeted scheduling (to take advantage of periods of excess energy supply).27 In addition to enhancing grid reliability, load shifting can also reduce customer electricity rates, increase the value of renewable energy investments (by maximizing usage of excess solar energy produced during the day), and mitigate the need for equipment upgrades (e.g., increased storage capacity to accommodate excess solar energy).28 [EPA-HQ-OAR-2022-0985-1626-A1, pp. 5 - 6]

26 See TIMOTHY LIPMAN ET AL., CAL. ENERGY COMM'N, TOTAL CHARGE MANAGEMENT OF ELECTRIC VEHICLES 5 (CEC-500-2021-055, Dec. 2021), https://www.energy.ca.gov/sites/default/files/2021-12/CEC-500-2021-055.pdf.

27 See id.

28 See Aligning Utilities and Electric Vehicles, for the Greater Grid, NAT'L RENEWABLE ENERGY LAB'Y (Jan. 10, 2022), https://www.nrel.gov/news/program/2022/aligning-utilities-electric-vehicles-for-greater-grid.html (citing Muhammad Bashar Anwar et al., Assessing the value of electric vehicle managed charging: a review of methodologies and results, 15 ENERGY ENV'T SCI. 466 (2022)).

For example, PG&E has partnered with the BMW Group to explore ways to incentivize EV drivers to shift their charging times to support grid reliability.29 This program—called ChargeForward—first kicked off in 2015 and moved into its third phase in 2021.30 Building on the success of the first two phases, phase three expanded the program's scope to 3,000 EV drivers (from prior pilots of 100 and 400 drivers in phases one and two).31 Phase two of ChargeForward demonstrated the ability to shift nearly 20% of charging from a particular hour to another time and to shift up to 30% of charging to a particular hour.32 SMUD is also engaged in a managed charging pilot program with BMW, Ford, and GM, and is planning to add Tesla vehicles to the pilot as well, targeting participation of around 2,000 vehicles through 2024.33 [EPA-HQ-OAR-2022-0985-1626-A1, p. 6]

29 PG&E Corporate Sustainability Report 2022, PG&E CORPORATION 105 (2022), https://www.pgecorp.com/corp_responsibility/reports/2022/assets/PGE_CSR_2022.pdf.

30 CLARION ENERGY CONTENT DIRECTORS, PG&E and BMW kick off 3rd phase of ChargeForward for clean, smart EV charging, POWERGRID INTERNATIONAL (Mar. 23, 2021), https://www.power-grid.com/der-grid-edge/pge-and-bmw-kick-off-3rd-phase-of-chargeforward-for-clean-smart-ev-charging/#gref.

31 PG&E Corporate Sustainability Report 2022, PG&E CORPORATION 105 (2022), https://www.pgecorp.com/corp_responsibility/reports/2022/assets/PGE_CSR_2022.pdf.

32 See Timothy Lipman et al., Total Charge Management of Electric Vehicles, CALIFORNIA ENERGY COMMISSION iii (CEC-500-2021-055, Dec. 2021), https://www.energy.ca.gov/sites/default/files/2021-12/CEC-500-2021-055.pdf.

33 2030 Zero Carbon Plan Progress Report, SMUD 21 (Apr. 2023), https://www.smud.org/-/media/Documents/Corporate/Environmental-Leadership/ZeroCarbon/2030-ZCP-Progress-Report---April-2023_FINAL.ashx.

Coalition members are also exploring Vehicle-to-Grid ("V2G") technology, through which EVs can send power back to load sources (e.g., homes) and the grid from their batteries. While still in the early stages of development, V2G technology can offer reliability benefits by serving as a grid resource during periods of peak demand.34 PG&E and BMW recently extended their ChargeForward partnership until March 2026 and, as part of that program, will conduct a field trial of V2G-enabled vehicles in order to explore their potential to increase grid reliability.35 In addition, PG&E has announced vehicle-grid integration ("VGI") pilot programs with Ford36 and General Motors to test the ability of EVs to provide backup power to homes.37 SMUD is also in the process of conducting an electric school bus V2G demonstration project with the Twin Rivers Unified School District.38 SMUD is planning to expand the program to additional school districts and is also pursuing other projects to explore V2G capabilities for light-duty EVs.39 [EPA-HQ-OAR-2022-0985-1626-A1, pp. 6 - 7]

34 See Value Assessment of DC Vehicle-to-Grid Capable Electric Vehicles: Analytical Framework and Results, EPRI (May 24, 2023), https://www.epri.com/research/programs/053122/results/3002026772.

35 More Power To You: PG&E and BMW of North America Start V2X Testing in California, PG&E CORPORATION (May 16, 2023), https://investor.pgecorp.com/news-events/press-releases/press-release-details/2023/More-Power-To-You-PGE-and-BMW-of-North-America-Start-V2X-Testing-in-California/default.aspx.

36 PG&E and Ford Collaborate on Bidirectional Electric Vehicle Charging Technology in Customers' Homes (Mar. 11, 2022), https://investor.pgecorp.com/news-events/press-releases/press-release-details/2022/PGE-and-Ford-Collaborate-on-Bidirectional-Electric-Vehicle-Charging-Technology-in-Customers-Homes/default.aspx.

37 A. Vanrenen, PG&E and General Motors Collaborate on Pilot to Reimagine Use of Electric Vechiles as Backup Power Sources For Customers (Mar. 8, 2022), https://www.pgecurrents.com/articles/3410-pg-e-general-motors-collaborate-pilot-reimagine-use-electric-vehicles-backup-power-sources-customers.

38 2030 Zero Carbon Plan Progress Report, SMUD 22 (Apr. 2023), https://www.smud.org/-/media/Documents/Corporate/Environmental-Leadership/ZeroCarbon/2030-ZCP-Progress-Report---April-2023_FINAL.ashx.

39 Id.

IV. EPA should work closely with state and local partners to ensure deployment of the resources and infrastructure needed to accelerate transportation electrification while maintaining grid reliability

EPA's HDV Proposal will help support deployment of the charging and generation resources needed to meet anticipated demand from vehicle electrification. Yet effective and efficient deployment of these resources will require coordination among electric utilities, state public utility commissions, and local governments to ensure loads from EVs are factored into long-range resource planning and to permit distribution and transmission system upgrades and siting of new generation and storage resources. To ensure these resources are deployed on the pace and scale needed to support vehicle electrification and grid reliability, EPA should play a leadership role in ensuring coordination occurs among relevant federal, state and local agenices to remove barriers, emphasizing the benefits to the electricity grid, public health, and climate that will be achieved as a result. [EPA-HQ-OAR-2022-0985-1626-A1, p. 7]

Organization: Environmental Defense Fund (EDF)

4. The benefits of bi-directional charging from buses should also be considered

EPA's rulemaking should consider the potential benefits of using school buses for bi-directional charging. Electric school buses can function as large batteries to support the power grid, providing energy to municipalities through the use of vehicle-to-grid (V2G) technologies. According to WRI, at least 15 utilities across 14 states have committed to pilot electric school bus V2G programs, which allow electricity to be stored in the bus batteries and later discharged onto the grid.128 The bus batteries' stored power "can help stabilize fluctuating energy conditions, alleviate the need to start up additional power generation sources by shaving peak energy needs and provide mobile emergency power to shelters and other essential facilities. Because school buses operate on set daily schedules and often sit idle in the summer and during portions of the school day when electricity demand is high, they are ideal for this purpose. The power they can provide to the grid or buildings could offer revenue to help pay for the buses, a win-win for schools and the utility or other entity using the electricity."129 [EPA-HQ-OAR-2022-0985-1644-A1, p. 52]

128 Norma Hutchinson and Greggory Kresge, "3 Design Considerations for Electric School Bus Vehicle-to-Grid Programs," World Resources Institute (February 14, 2022). https://www.wri.org/insights/electric-school-bus-vehicle-grid-programs

129 Id.

b) The electric grid can support widespread HD ZEV adoption

The U.S. electric grid has provided reliable, cheap, instantaneous power to millions of homes and businesses every second of every day for well over a century. For so many end uses, electrification represents the cheapest and most attainable decarbonization pathway. [EPA-HQ-OAR-2022-0985-1644-A1, p. 65]

Growing the electric grid to meet increased demand is nothing new. Since 1960, about a third of the year over year increases in state electricity sales have been higher than 5% with 7% of those years having increases higher than 10% annual growth.166 The compound annual growth rate for the entire grid since 1960 is 2.8%. The total increase in electricity consumption as a result of the proposed rule is expected to be 1.3%, less than half of the average annual increase that has occurred since 1960. Research shows that, with planning, utilities will meet the demand for additional electricity needed to charge our nation's fleet of heavy-duty vehicles, and those vehicles may improve the reliability of the grid. [EPA-HQ-OAR-2022-0985-1644-A1, p. 65] [See Figure 11 on p. 66 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

166 U.S. Energy Information Administration, EIA-861: Annual Electric Power Industry Report, 1960-2021, https://www.eia.gov/electricity/data/state/

EDF commissioned a report by Analysis Group to understand how the expected growth in HDV charging will impact the grid and what processes are in place or need to be added to enable the grid to meet the increased demand.167 Their main findings include:

5. The overall magnitude of growth in demand that would result from EPA's proposed rule is very small relative to historic periods of growth in the electric industry, and will not pose a challenge from the perspectives of power system generation or transmission infrastructure needs.
6. Charging station needs that may result from EPA's proposed rule range greatly in size and location; most counties and utilities in the U.S. analyzed in ICCT's report will likely not face new distribution system infrastructure needs due to charging load different from past experience.
7. Some utilities will need to plan for the development of new distribution system infrastructure to accommodate fairly large point sources of new charging station demand.
8. Adding significant new distribution system infrastructure is not a new experience for states, public utility commissions, or electric companies, and there are long-standing policies and practices in place to process development of infrastructure needed to ensure system reliability.
9. The need for a high level of certainty around the timely integration of charging stations and associated distribution system infrastructure at the scale and speed needed for HDV electrification warrants – and has already prompted – proactive action on behalf of some states and utilities to engage and expand planning and regulatory practices at the scale necessary to ensure timely readiness of the power system.
10. There are many emerging technologies, ratemaking practices, and distributed resource solutions that have the potential to significantly and efficiently reduce the expected impacts on distribution systems associated with vehicle electrification. [EPA-HQ-OAR-2022-0985-1644-A1, p. 66-67]

167 Paul Hibbard et al. Heavy Duty Vehicle Electrification: Planning for and Development of Needed Power System Infrastructure. 2023. Analysis Group, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files//Analysis-Group-HDV-Charging-Impacts-Report.pdf. Analysis Group, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files//Analysis-Group-HDV-Charging-Impacts-Report.pdf. (Attachment W).

Evolution of distribution systems to meet the potential increase in charging station demand associated with EPA's proposed Phase 3 rule for HDVs is eminently achievable. [EPA-HQ-OAR-2022-0985-1644-A1, p. 67]

Additionally, they found that 83% of utility service territories would not see more than 5 MW of increased load from HDV charging based on a study done by ICCT. The localized nature of the expected growth of HDV charging demand presents unique challenges but also allows for focused action. [EPA-HQ-OAR-2022-0985-1644-A1, p. 67]

ii. Robust solutions exist and are being implemented to ensure rapid interconnection and widespread vehicle electrification

The main concern that has been raised by OEMs and other parties related to the grid is the ability to build out infrastructure quickly enough to meet demand.177 In addition to the existing policies and practices around upgrading distribution systems that have served to build things like data centers which have high load requirements, additional practices have been developed and are being implemented in some areas to address specific challenges around HD ZEV charging. [EPA-HQ-OAR-2022-0985-1644-A1, p. 68]

177 https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={D05A8E88-0000-CE16-8EA2-97D9432AAEE9}

These include practices and policies that maximize the existing grid capacity, proactively building the grid, and updating planning procedures. [EPA-HQ-OAR-2022-0985-1644-A1, p. 69]

By maximizing the existing grid capacity, fleet owners can transition to ZEVs without requiring immediate grid upgrades allowing more time for utilities to build out infrastructures. Techniques such as leveraging non-wires alternatives (managed charging, onsite storage and generation, and energy efficiency programs) have had great success in minimizing the upgrades required, and allowing for continued load growth while waiting for a necessary upstream grid upgrade. One clear example of this is Con Edison' BQDM program which resulted in a 7-year grid upgrade deferral.178 A report by the Smart Electric Power Alliance (SEPA) found a wide range of non-wires alternatives succeeded at enabling rapid interconnection and HDV electrification.179 [EPA-HQ-OAR-2022-0985-1644-A1, p. 69]

178 Coley Girouard. BQDM program demonstrates benefits of non-traditional utility investments. 2019. Utility Dive, https://www.utilitydive.com/news/bqdm-program-demonstrates-benefits-of-non-traditional-utility-investments/550110/

179 Brenda Chew et al. Non-Wires Alternatives: Case studies from leading U.S. projects. 2018, Smart Electric Power Alliance, https://sepapower.org/resource/non-wires-alternatives-case-studies-from-leading-u-s-projects/

Where fleets install managed charging software and/or onsite storage and solar generation to minimize charging costs including demand charges, their net load can be significantly lower than the utility-assigned capacity requirements for the site. To connect to the grid, they may be required to undergo site and utility upgrades to provide significantly higher capacity than what is actually needed and in some cases these solutions result in some sites never exceeding the existing capacity on their site making the upgrades unnecessary. Flexible interconnection, where customers agree to limit their peak load to a specified level below that of the cumulative nameplate capacity of their equipment, is one solution to energize chargers while those grid upgrades are ongoing. This mitigates any site and upstream grid upgrades in the short term in exchange for early energization of their charging equipment, and can even lower long-term upgrade needs. EPRI has shown the benefits of flexible interconnections for broader grid decarbonization.180 [EPA-HQ-OAR-2022-0985-1644-A1, p. 69]

180 Chris Warren. Can allowing curtailment speedup DER growth? EPRI Journal, https://eprijournal.com/getting-flexible-about-interconnection/

States are working towards allowing utilities, with guardrails in place to protect ratepayers, to proactively build the grid to need ahead of interconnection requests for new load, such as EV charging. [EPA-HQ-OAR-2022-0985-1644-A1, p. 70]

There are legislative efforts that are paving the way for this solution. California's AB 2700, which in addition calls for the collection of fleet electric vehicle deployment plans, also allows for utilities to submit pro-active grid expansion proposals to the utility commission in areas with identified future congestion using fleet deployment data.181 SB 410 in California would take this a step further, setting requirements for utilities to have their grid ready for interconnection requests and calls for utilities to plan and evaluate potential grid impact of Advanced Clean Fleets (ACF) and Advanced Clean Trucks (ACT) rules as well as submit plans to address potential areas of congestion to meet energization timelines. This bill also requires utilities to report interconnection requests and delays to better track progress and hold utilities accountable.182 [EPA-HQ-OAR-2022-0985-1644-A1, p. 70]

181 Transportation electrification: electricial distribution grid upgrades. AB2700. 2021-2022 Regular Session, (California 2022) https://legiscan.com/CA/bill/AB2700/2021

182 Powering Up Californians Act, SB410, 2023-2024 Regular Session, (California, 2023) https://legiscan.com/CA/text/SB410/id/2813946

Other states have also taken steps to ensure utilities are able to proactively build infrastructure. New York senate bill S4830, which recently passed both houses of the New York legislature, directs the New York State Energy Research and Development Authority (NYSERDA) to identify the number and location of fleet charging zones and highway charging hubs where significant demand from EV charging, including electric HDVs, is expected in line with meeting state and federal transportation sector emissions regulations, and the associated grid impact of that charging.183 [EPA-HQ-OAR-2022-0985-1644-A1, p. 70]

183 Establishing a highway and depot charging action plan, Senate Bill S4830A, 2023-2024 Legislative Session. (New York, 2023) https://www.nysenate.gov/legislation/bills/2023/S4830

Efforts to update planning processes have also improved the ability for the grid to meet demand from HDV charging. If utilities have accurate forecasts well in advance of when grid needs arise, they can complete needed upgrades without as great of a need for mitigating solutions like grid deferment and flexible interconnection. In a recent article, Southern California Edison (SCE) emphasized the importance of planning for utilities: "On the forecasting and planning side, utilities and energy system planners must adapt planning efforts to reflect expected EV growth, including impacts from proposed and adopted policies and incentives. For example, to account for the new developing needs of the Advanced Clean Cars II and Advanced Clean Fleets policies in California, SCE and the other California investor-owned utilities were recently approved to use higher forecasts for transportation electrification than previously used."184 [EPA-HQ-OAR-2022-0985-1644-A1, p. 70-71]

184 Pamela MacDougall and Katie Sloan, As the electric truck transition shifts into high gear, utilities must lead the charge. 2022. Utility Dive, https://www.utilitydive.com/news/electric-truck-bus-ev-utilities-sce-edison-edf/634214/

The New York Joint Utilities' Coordinated Grid Planning Process and California PUC's Freight Infrastructure Planning Framework, both currently under development, also represent examples of improved planning processes to enable accelerated HDV electrification and grid interconnection.185 186 [EPA-HQ-OAR-2022-0985-1644-A1, p. 71]

185 https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=20-e-0197&CaseSearch=Search

186 Zero-Emissions Freight Infrastrucutre Planning. California Public Utilities Commission, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/freight-infrastructure-planning

iii. Upgrade costs for charging HD ZEVs can help more efficiently use the grid and drive down costs

Large-scale electrification of medium- and heavy-duty vehicles will require grid upgrades, largely at the distribution grid level, to support the added load from charging. But, research shows that EVs can help strengthen the grid, and the costs of the needed upgrades can be covered by the additional revenue from fleets charging without raising consumers' electricity rates.187 [EPA-HQ-OAR-2022-0985-1644-A1, p. 71]

187 Lucy Metz, Melissa Whited, Paul Rhodes and Ellen Carlson. Distribution System Investments to Enable Medium- and Heavy-Duty Vehicle Electrification: A Case Study of New York, Synapse Energy Economics, Inc., prepared for EDF. (April 2023). (Attachment X) https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ab0fd0780-9882-3a25-9ef2-f8c73bd80c92&viewer%21megaVerb=group-discover

According to electricity company executives, EVs can boost grid reliability.188 EVs are schedulable loads that typically charge off peak (at night). Utilities can encourage EV owners to charge when and where they want, leading to more efficient use of existing grid infrastructure.189 [EPA-HQ-OAR-2022-0985-1644-A1, p. 72]

188 Tomlinson, Chris. "Will electric vehicles crash the Texas grid? It's not complicated." Houston Chronicle (April 10, 2023). https://www.houstonchronicle.com/business/columnists/tomlinson/article/electric-vehicles-ercot-grid-reliabilty-17880578.php

189 Jennifer Chen. 2023. Leveraging Locational and Temporal Flexibility in Transportation Electrification to Benefit Power Systems. Energy Systems Integration Group. https://www.esig.energy/leveraging-locational-and-temporal-flexibility-in-transportation-electrification-to-benefit-power-systems/

EV charging can also finance and justify needed grid updates. Recent analysis conducted by Synapse Energy Economics for EDF finds that if U.S. utilities rate-base the cost of infrastructure upgrades needed for fleet charging, the utilities will see increased revenue without the need to raise consumers' electricity rates.190 The analysis used two New York State utilities as case studies and found that if utilities cover the "make-ready" cost for both private and municipal medium- and heavy-duty fleets at the pace necessary for 100 percent electrification by 2045, the investment will pay off for utilities and have a positive to neutral impact on ratepayers in both utility service areas. The analysis' findings are applicable beyond New York to states across the country due to the varying grid costs, geography and electricity demand profiles of the utilities studied. Con Edison primarily serves New York City, while National Grid provides electricity to portions of upstate New York. [EPA-HQ-OAR-2022-0985-1644-A1, p. 72]

190 Metz et al Distribution System Investments to Enable Medium- and Heavy-Duty Vehicle Electrification: (April 2023).

The study finds that if fleets are assumed to engage in modest managed charging (shifting charging times by only two hours at night), Con Edison's make-ready program could generate $690 million in net revenue between 2023-2045, while National Grid's program could generate $89 million in the same time period. Even without managed charging, investing in make-ready programs was shown to have a positive to neutral impact on ratepayers in both utility service areas. As more fleets are incentivized to plug in - and therefore spend more of their operating budget on electricity and less on diesel - utilities can invest a portion of that revenue on grid upgrades elsewhere that would have otherwise been paid for by all ratepayers. [EPA-HQ-OAR-2022-0985-1644-A1, p. 72-73]

iv. Managed charging represents an opportunity for fleet owners to reduce their costs and to increase grid benefits from HDV electrification

Medium- and heavy-duty fleets can experience short but high energy demand events that can significantly increase their grid impact and energy bills. When these fleets go beyond merely managing charging to leveraging onsite distributed energy resources (DERs) such as solar and battery storage, they can benefit from an even more powerful lever for reducing charging costs. A GNA study examined two types of clean DERs: on-site solar panels and batteries. When combined with managed charging, DERs produced additional annual electric savings of $625,000 (Schneider) and $835,000 (NFI) for fleets of 40-50 electric HDVs. Moreover, managed charging and DERs together reduced annual on-peak load by 611 kW for the Schneider fleet and 4 MW for the NFI fleet.191 Thus, such techniques would not only reduce costs for the truck companies, but the utility and ratepayers as a whole as well owing to the reduced need for grid buildout. If scaled to all trucks in a utility's territory, these load reductions could drastically decrease the amount of grid upgrades needed to accommodate electric fleets. [EPA-HQ-OAR-2022-0985-1644-A1, p. 73]

191 Gladstein, Neandross & Associates, California Heavy-Duty Fleet Electrification Summary Report, March 2021, http://blogs.edf.org/energyexchange/files/2021/03/EDF-GNA-Final-March-2021.pdf Gladstein, Neandross & Associates, California Heavy-Duty Fleet Electrification Summary Report, March 2021, http://blogs.edf.org/energyexchange/files/2021/03/EDF-GNA-Final-March-2021.pdf. (Attachment Y)

A recent New Jersey study evaluated the statewide grid impact of meeting ACT, as well as the grid savings when implementing managed charging and utilizing on-site solar and storage for all Class 3-7 vehicles in the state. Avoided peak load ranges from ~8,400 MW for managed charging, to ~10,000 MW for managed charging with solar + battery. Total avoided infrastructure costs are between $320 million and $1.80 billion for managed charging, and between $382 million and $2.15 billion for managed charging with solar + battery.192 [EPA-HQ-OAR-2022-0985-1644-A1, p. 73-74]

192 Jeffery Greenblatt. New Jersey Medium Duty Fleet Electrification Infrastructure Summary Report. 2022. Emerging Futures, https://blogs.edf.org/energyexchange/files/2022/05/New_Jersey_Medium_Duty_Fleet_Elecrtification_Infrastructure_Summary_Report.pdf Emerging Futures, https://blogs.edf.org/energyexchange/files/2022/05/New_Jersey_Medium_Duty_Fleet_Elecrtification_Infrastructure_Summary_Report.pdf (Attachment Z)

Furthermore, these largely avoided infrastructure costs are sure to be an underestimate for HDV electrification as a whole for the state since they do not account for the benefits of electrifying Class 8 vehicles with managed charging or managed charging with solar + battery. [EPA-HQ-OAR-2022-0985-1644-A1, p. 74]

The flexibility associated with vehicle charging is also extremely valuable to the grid operator. A study by the Midwest ISO shows the untapped potential of EV load flexibility as a DER resource in the wholesale markets. This study evaluated the impact of expected electrification of both MHDVs as well as LDVs in the MISO footprint. A key factor in this study was determining the potential flexibility of these vehicles when applying managed and bidirectional charging tactics to mitigate ramp and peak load. It showed that at any given hour this additional load can provide a minimum of 10 GW of combined ramp up capacity and just under 10 GW of ramp down or generation capacity using the flexibility of EV charging alone. To reiterate, this ramp capacity was based on vehicle charging alone and would be even greater if combined with other on-site DERs.193 [EPA-HQ-OAR-2022-0985-1644-A1, p. 74]

193 Greenblatt, Jeff and Margaret McCall, Exploring enhanced load flexibility from grid-connected electric vehicles on the Midcontinent Independent System Operator grid (Feb. 2021), available at https://cdn.misoenergy.org/Exploring%20enhanced%20load%20flexibility%20from%20grid%20connected%20EVs%20on%20MISO%20grid543291

Of critical importance, this load flexibility also comes at a fraction of the cost of traditional fixed battery storage. A study by Lawrence Berkeley National Lab shows that managed charging of EVs—modulating when and at what rate the EVs are charged— can provide reliable storage at approximately a tenth of the cost of equivalent storage provided by single-purpose, stationary batteries. When scaled to California’s projected 1.5 million light-duty EVs by 2025, the storage potential of managed charging alone is 1 GW, resulting in savings of approximately $1 billion compared to investments needed for equivalent stationary storage. This number also does not include the thousands of MHDVs such as buses and trucks expected to be electrified in the near future.194 By leveraging the flexibility of newly electrified resources, stakeholders can significantly reduce grid management costs ultimately, resulting in savings for end-customers and mitigating grid upgrade needs, further supporting accelerated HDV electrification. [EPA-HQ-OAR-2022-0985-1644-A1, p. 74-75]

194 Jonathan Coignard et al., Clean vehicles as an enabler for a clean electricity grid, 13 Environmental Research Letters 54031 (2018).

Organization: National Rural Electric Cooperative Association (NRECA)

EPA Should Account for Grid-side Investments in Proposed Rule’s Analysis

Bearing these realities in mind, we write to express our significant concern that EPA has failed to adequately account for the costs associated with serving the new load that will be created via heavy-duty highway vehicle (HDV) electrification as outlined in this proposed rule. While EPA accounts for the cost to purchasers for the hardware and installation of charging equipment, EPA fails to include the electric grid-side upgrades that will likely be needed, if not now, certainly in the future as electrification spreads and this could have serious negative consequences to American consumers. Specifically, within the proposed rule section on Charging Infrastructure Costs, EPA states:1 “there may be additional infrastructure needs and costs beyond those associated with charging equipment itself. While planning for additional electricity demand is a standard practice for utilities and not specific to BEV charging, the buildout of public and private charging stations (particularly those with multiple high-powered DC fast charging units) could in some cases require upgrades to local distribution systems." [EPA-HQ-OAR-2022-0985-1515-A1, p. 2]

1 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3, 88 Fed. Reg. 25,982 (April 27, 2023)

It is important for EPA to correct this failure in the proposed rule stage by updating its analysis with inclusion of a range of expected costs associated with serving the new load from the HDV fleet created by EPA's proposal. Failure to do so will likely result in unrealistic expectations on the part of fleet operators and possibly delay plans for electrification as they learn of the full costs that will be required to serve this new load from their electric cooperatives or other electric utilities. Neither these HDV fleet operators, nor the EPA, should expect that electric cooperatives can bear the burden of these new costs alone, particularly when these costs will ultimately need to be passed on to the end of the line consumer-members of the cooperative.[EPA-HQ-OAR-2022-0985-1515-A1, p. 2]

Overall, it is important for EPA to recognize that electrification of the transportation sector, and the increased flexibility of this newly electrified demand, will require substantial distribution infrastructure investment over time to meet increased average local electric demand and to meet increased demand in new locations (e.g., EV charging stations). Significant transmission infrastructure investment may also be required to meet increased average electric demand and changes in the spatial distribution of electric demand among load centers. According to the National Academy of Sciences, to transition the transportation sector through increased electrification, electric utilities will need to increase generation by up to 170% and see a three-fold expansion of the transmission grid by 2050. Over time, electrification of the transportation sector will require additional generation investment to ensure resource and energy adequacy to meet increased average electric demand and changing consumption profiles. Unfortunately, this investment challenge is becoming more complex due to several recent EPA actions that are jeopardizing flexible, dispatchable always available generation resources.2 These actions would require increased reliance on intermittent energy sources. Particular attention will be needed to ensure that generation investment is adequate in amount and in operational characteristics to meet the demands of electrification while ensuring grid stability, security, and reliability. [EPA-HQ-OAR-2022-0985-1515-A1, pp. 2-3]

2 These actions include: Supplemental Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 88 FR 18824 (March 29, 2023); National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 88 FR 24854 (April 24, 2023); Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Legacy CCR Surface Impoundments, 88 FR 31982 (May 18, 2023; New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, 88 FR 33240 (May 23, 2023); and Federal Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards, 88 FR 36654 (June 5, 2023).

Specific Costs for EPA to Consider Incorporating in the Proposed Rule's Analysis

Again, we urge EPA to update its analysis to account for the costs needed to make updates to the grid to support HDV electrification. Grid upgrade costs for EV charging will vary by region, neighborhood, cooperative, circuit, and feeder. However, to illustrate the types and ranges of costs that EPA should account for, we provide the following costs sourced from four different cooperative regions, broken down by charge level:

- Residential (Level 1 and Level 2): One out of three households will need an expanded electric panel to accommodate 240 V Breakers. If a household purchases two electric vehicles, then four slots on a breaker will be needed to accommodate this load. The average cost will be approximately $4,000 for a Level 2 residential charger with a panel upgrade.
    - Upgrading panel (20% of panels must be upgraded) ¡V can start around $600
    - Transformer upgrades - $2,600 and climbing
    - Service wire gauge upgrades to accommodate higher amperage - $3,000
- Public (Level 2 and DC Fast Charging (DCFC)): For commercial sites, transformer upgrade needs will vary. Most sites will already have three-phase power available; however, in very rural locations single-phase power will need to be upgraded to three-phase. If transformers do need to be upgraded on a three-phase line, then three transformers will need to be upgraded.
    - Level 2 charger including panel - approx. $4,000 on average
    - National EV Infrastructure Program (NEVI)-Compliant DCFC - approx. $25,000-$150,000
        - Transformer - $25,000 - $40,000 (reflects current prices for three transformers)
        - Service entrance - $3,000-$4,000
        - Metering package (including instrumentation, voltage transformers (PT) and current transformers (CT) - $2,000
        - Line extension, if required (site dependent) - $50,000 - $75,000 [EPA-HQ-OAR-2022-0985-1515-A1, pp. 3-4]

Circumstances vary across cooperatives, but some of these costs will be borne directly by the consumer-members and others will be paid for by the cooperative. Regardless, these costs help to illustrate more accurately the investment it will take to implement on EPA's proposed rule. [EPA-HQ-OAR-2022-0985-1515-A1, p. 4]

We note that these costs reflect a snapshot estimate in time and are likely to increase, particularly due to the significant challenges and delays utilities are facing in their supply chains, which are contributing to an unprecedented shortage of the most basic machinery and components essential to ensure the continued reliability of the electric grid. Electric cooperatives are waiting a year, on average, to receive distribution transformers. Additionally, lead times for large power transformers have grown to more than three years. And orders for electrical conduit have been delayed five-fold to 20 weeks with costs ballooning by 200 percent year-over-year. As a result, new projects are being deferred or canceled, and electric cooperatives are concerned about their ability to respond to major storms due to depleted stockpiles. We expect these supply chain challenges to persist with the increased demand for electrification projects being incentivized by the U.S. federal government. All these delays will likely impact the cost and timing of charging infrastructure buildout needed to support the HDV fleet electrification envisioned in this proposed rule. [EPA-HQ-OAR-2022-0985-1515-A1, p. 4]

Organization: Transfer Flow, Inc.

Even the Federal Energy Regulatory Commission (FERC) has warned that a rapid transition to electric vehicles would be devastating to the country's electric grid reliability.18'19 [EPA-HQ-OAR-2022-0985-1534-A1, p. 4]

18 https://robertbryce.substack.com/p/epa-v-the-grid?utm_source=substack&utm_medium=email

19 https://www.washingtonexaminer.com/policy/energy-environment/ev-push-threatens-to-strain-power-grids-and-threaten-reliability

Organization: Truck Renting and Leasing Association (TRALA)

Shifting all U.S. vehicles to battery electric would demand more than 40% of the country's current electricity production according to a recent study by the American Transportation Research Institute (ATRI). 5 Installing charging equipment at truck stop parking locations across the U.S. alone could cost upwards of $35 billion based on a per-unit cost of $112,000.6 Overall vehicle electricity demands will vary widely by state based upon vehicle populations, types, usage rates, and other factors. Figure 1 depicts the wide range in vehicle power demands anticipated if a 100% transition were to occur today. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 4-5] [Refer to Figure 1 on p. 5 of docket number EPA-HQ-OAR-2022-0985-1577-A1]

5 Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, American Transportation Research Institute (December 2022).

6 Id.

The U.S. Energy Information Administration projects electricity consumption byi the transportation sector will increase from 12 billion kWh in 2021 to more than 145 billion kWh in 2050.7 The electric power sector will have decades to meet that demand but in the near-term experts say possible constraints will need to be addressed. Even at a relatively slow transitional pace, there will be challenges on the grid such as can trucks and cars demanding electricity at the same time and located in the same geographic area be supported under existing power loads? [EPA-HQ-OAR-2022-0985-1577-A1, p. 5]

7 'Annual Energy Outlook 2023,' U.S. Energy Information Administration (March 16, 2023).

Organization: Valero Energy Corporation

2. EPA does not adequately consider potential grid reliability impacts.

As part of its evaluation of potential economic impacts to the welfare of Americans and businesses, EPA must assess grid reliability impacts stemming from the proposed rule's forced electrification of the HD transportation sector. Reliance on BEVs for freight transport may have unintended, negative consequences, especially in relation to the electricity generation sector. In addition, EPA needs to accurately predict the number of additional chargers that will be needed to support the anticipated HD BEV population, which will require DC fast chargers ("DCFC"). At present, charging and re-fueling infrastructure are inadequate to meet the country's freight transport needs. Moreover, most of America's existing DCFC and prospective installations are first and foremost intended to service light-duty passenger vehicles and do not include the commercial depot charging systems necessary to support electric HDV fleets. [EPA-HQ-OAR-2022-0985-1566-A2, p. 37.]

ZEV mandates like the proposed rule also present significant risks to grid reliability and the stability of the transportation sector. Transitioning truck stops into BEV charging hubs will require massive power, on a scale that has been likened to the power required by a small town178 or sports arena.179 Yet EPA's analysis of electrical grid impacts is weak. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 37 - 38.]

178 https://www.autoblog.com/2022/11/26/electric-vehicle-charging-stations-could-use-as-much-power-as-a-small-town-by-2035-and-the-grid-isn-t-ready/

179 https://www.bloomberg.com/news/articles/2022-11-14/tesla-s-electric-semis-are-coming-and-trucks-stops-aren-t-ready

EPA expects that the proposed standards will drive an increase in electricity demand and generation across the U.S.180 [EPA-HQ-OAR-2022-0985-1566-A2, p. 38.]

180 EPA's HD Phase 3 GHG Proposal at 25983.

EPA estimates an increase in electricity consumption in response to this proposal of 7.8 Terawatt-hours (TWh) in 2028 (a 0.2 percent increase), 18 TWh in 2030 (a 0.5 percent increase), 48 TWh in 2035 (a 1.2 percent increase), 72 TWh in 2040 (a 1.8 percent increase) and 98 TWh in 2050 (a 2.5 percent increase)."181 [EPA-HQ-OAR-2022-0985-1566-A2, p. 38.]

181 DRIA at 430.

EPA does not expect grid reliability to be adversely affected by this increase in electricity demand and generation, as long as charging behavior is carefully managed.182 This begs the question who would manage charging behavior, by what authority, and based on what standards or criteria. In the absence of any specific and credible information about how charging behavior will be managed, it is unreasonable for EPA to assume that it will be. [EPA-HQ-OAR-2022-0985-1566-A2, p. 38.]

182 DRIA at 70-71.

In its analysis of electric grid reliability, EPA refers to a 25% increase in electrical demand that occurred over 1992 to 2021 and concludes that since the increase in demand occurred ¡§without any adverse effects on electric grid reliability or electricity generation capacity shortages, "grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with HD BEV charging."183 However, this glib assessment overlooks the vast increase in inexpensive natural gas occurring during this period which made it possible to meet the increased demand without compromising reliability. It also overlooks the potential impacts to electrical grid costs and reliability from EPA's recently proposed New Source Performance Standards for GHG emissions from power plants.184 [EPA-HQ-OAR-2022-0985-1566-A2, p. 38.]

183 EPA's HD Phase 3 GHG Proposal at 25983.

184 88 Fed. Reg. 33240 (May 23, 2023).

Considering the regional and temporal nature of the PEV charging load, the recent trends of seasonal strain on grid reliability, and the increasing replacement of baseload generation with intermittent renewable sources, EPA's comparison to a national trend occurring over the past three decades is not particularly meaningful. [EPA-HQ-OAR-2022-0985-1566-A2, p. 38.]

EPA also acknowledges that "how the additional electricity demand from BEVs will impact the grid will depend on the time of day that charging occurs, the type or power level of charging, and the use of onsite storage and vehicle-to-grid (V2G) or other vehicle-grid integration technology, among other considerations."185 EPA explains that most of the electric power grid is owned and operated by the private industry, with Federal, state, local, Tribal and territorial governments playing significant role in enhancing the reliability of the electric power grid.186 While EPA is neither the expert in nor holds responsibility for the reliability of the electrical power grid, the agency offers suggestions for accommodating the increased electricity demand, such as:

- Grid operators incorporating automated load management or power control systems to dynamically limit total charging load;187 and
- EVSE station operators incorporating onsite battery storage or onsite renewable generation to reduce demand on the grid.188
- EPA does not account for the cost of either suggestion in its DRIA nor to any other safeguards to protect grid reliability. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 38 - 39.]

185 DRIA at 70.

186 EPA's HD Phase 3 GHG Proposal at 25983.

187 DRIA at 71.

188 DRIA at 71.

EPA asserts that it has statutory authority to adopt technology-forcing standards for reducing emissions from motor vehicle tailpipes. CAA Section 202(a) does not authorize the agency to force grid operators to manage electrical loads in completely new ways, or to dictate vehicle charging behavior to fleet owners and independent vehicle operators. Yet EPA must account for the costs and impacts on the grid in the RIA for the rule and consider such costs and impacts and the availability and reliability of the grid. [EPA-HQ-OAR-2022-0985-1566-A2, p. 39.]

4. EPA fails to recognize existing grid reliability concerns.

EPA's analysis of impacts to the electrical power grid overlooks existing grid reliability issues such as the following: [EPA-HQ-OAR-2022-0985-1566-A2, p. 40.]

The North American Electric Reliability Corporation's (NERC's) "2023 Summer Reliability Assessment" warns that two-thirds of North America is at risk of energy shortfalls this summer during periods of extreme demand. While there are no high-risk areas in this year's assessment, the number of areas identified as being at elevated risk has increased. The assessment finds that, while resources are adequate for normal summer peak demand, if summer temperatures spike, seven areas — the U.S. West, SPP and MISO, ERCOT, SERC Central, New England and Ontario — may face supply shortages during higher demand levels.192 [EPA-HQ-OAR-2022-0985-1566-A2, p. 40.]

192 NERC, "2023 Summer Reliability Assessment" (May 17, 2023), https://www.nerc.com/news/Headlines%20DL/Summer%20Reliability%20Assessment%20Announcement%20May%202023.pdf

NERC's "2022-2023 Winter Reliability Assessment" warned that a large portion of the North America BPS was at risk of insufficient electricity supplies during peak winter conditions, including Texas RE-ERCOT, MISO, SERC-East, WECC-Alberta, NPCC-Maritimes, NPCC-New England.193 [EPA-HQ-OAR-2022-0985-1566-A2, p. 40.]

193 NERC, "2022-2023 Winter Reliability Assessment" (November 2022), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2022.pdf

NERC's "2022 Long Term Reliability Assessment" identifies three high risk areas – MISO, NPCC-Ontario, and the California/Mexico part of WECC – that are projected to not have adequate electricity supply to meet demand forecasts associated with normal weather over the 10-year assessment period. Several other areas are identified as having elevated risk, i.e., meeting the resource adequacy criteria for normal forecasted conditions but at risk of shortfall in extreme conditions. These areas include the U.S. West—CA/MX, Western Power Pool (WPP), and the Southwest Reserve Sharing Group (SRSG), Texas RE-ERCOT, SPP and New England. Specific recommendations from NERC to manage the risks include considering "the impact that the electrification of transportation, space heating, and other sectors may have on future electricity demand and infrastructure."194 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 40 - 41.]

194 NERC, "2022 Long-Term Reliability Assessment" (December 2022), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf

As California has faced rolling blackouts and historic energy prices, Governor Newsom in his May 2022 state budget proposal, has pivoted to the use of traditional fuel infrastructure to ensure system reliability to protect against outages. Approximately one week after the California Air Resources Board approved its "Advanced Clean Cars II" rule prohibiting sales of new ICEV passenger cars in California by 2035, Governor Gavin Newsom issued a statewide request for electric vehicle owners to refrain from charging their vehicles in order to prevent blackouts.195 Significant investments in charging/fueling infrastructure will also be needed. The CEC has projected that an additional 157,000 chargers will be needed to support California's anticipated electric HD population in 2030—all of these will be DCFC, representing 9,100 additional job-years of dedicated workforce requirements, compounding timeline feasibility challenges. CEC further projects that the HDV charging network will see loads "in excess of 2,000 MW around 5 p.m. on a typical workday," further exacerbating the existing gap between net peak energy demand and existing generation. [EPA-HQ-OAR-2022-0985-1566-A2, p. 41.]

195 https://www.nytimes.com/2022/09/01/us/california-heat-wave-flex-alert-ac-ev-charging.html

Twelve states expressed concerns regarding electrical grid and utility impacts in their DOT-approved state EV Infrastructure Deployment Plans, as summarized below. While the plans primarily focus on infrastructure to be installed along designated alternative fuel corridors, the concerns relating to grid and utility impacts are similarly applicable to depot and truck parking stations. EPA has not accounted for these concerns in its analysis. [EPA-HQ-OAR-2022-0985-1566-A2, p. 41.] [See the table of State Concern on page 41 of docket number EPA-HQ-OAR-2022-0985-1566-A2.]

Additionally, within California there are significant challenges to be overcome in order to build the infrastructure necessary to support freight electrification under the CARB Advanced Clean Trucks and Advanced Clean Fleets rules. The California Public Utilities Commission (CPUC) recently identified the need for an accelerated electrical infrastructure deployment as a challenge for forecasting and planning, with approximately three years lead time needed for statewide planning efforts to be completed and infrastructure authorized.208 Indeed, in the six priority corridors alone, which doesn't account for more rural routes, California would need between 556 and 1,832 public BEV charging stations by 2040.209 For comparison, California currently has approximately 5,000 retail diesel stations statewide as of 2021.210 As a result, there are risks that could negatively impact MD and HD adoption including uncertainty regarding long-term electricity rate, delayed construction of distribution/transmission infrastructure, and differences in charging behavior from what was assumed in the planning stages (which would result in an infrastructure buildout that doesn't align with actual charging behavior).211 Clearly, there will be significant shortfall in resources in California alone to meet the needs of the freight electrification push, let alone the entire nation, as contemplated by the instant proposed rule. [EPA-HQ-OAR-2022-0985-1566-A2, p. 43.]

208 California Public Utilities Commission, Energy Division Webinar, "Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning" at 22 (May 22, 2023), https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/fip-draft-staff-proposal_5_22_23-webinar-final_ver2.pdf.

209 Id. at p. 60.

210 Id.

211 Id. at p. 28.

Organization: Volvo Group

An American Transportation Research Institute report from 2022 estimated that full national electrification of light-duty and medium/heavy-duty vehicles would require a 26% and 14% increase in power supply respectively.4 For a more regional perspective, a National Grid Report co-authored by Calstart, RMI and others looked at charging needs along major highways in Massachusetts and New York.5 Based on current truck traffic and the goal of having all light-duty and medium/heavy-duty vehicles be electric by 2035 and 2045 respectively, the report stated that "in 10 years more than a quarter of sites studied will require the same amount of power as an outdoor sports stadium to meet charging demand, with some requiring the same power as a small town within the next two decades." [EPA-HQ-OAR-2022-0985-1606-A1, p. 8]

4 Short, J., Shirk, A., & Pupillo, A. (2022, December). Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet. American Transportation Research Institute publication. Retrieved on 14 June 2022, from https://truckingresearch.org/2022/12/charging-infrastructure-challenges-for-the-u-s-electric-vehicle-fleet/

5 Electric Highways: Accelerating and Optimizing Fast-Charging Deployment for Carbon-Free Transportation. Accessed on 14 June 2023, from https://calstart.org/electric-highways-study/

Organization: Zero Emission Transportation Association (ZETA)

c. Electricity Generation and Grid Readiness

Transitioning to zero-emission transportation offers a unique challenge to the energy companies that will need to ensure they have ample electricity supply to match EV-driven demand. At minimum, this will require investments in the electricity distribution system to enable the deployment of electric vehicle charging equipment. In some instances, this may also require investing in new energy generation sources and associated distribution system infrastructure to accommodate major EV centers like heavy-duty vehicle depots or co-locate other necessary amenities. [EPA-HQ-OAR-2022-0985-2429-A1, p. 29]

However, this is not the first time electricity providers have navigated increases in electricity demand brought on by new technologies: similar spikes accompanied the mass adoption of now-standard appliances like refrigerators and in-home air conditioners. Still, it will be important to ensure that providers and government agencies can work within their regulatory frameworks to test solutions and upgrade the grid to prepare for future demand increases accompanying greater EV adoption. [EPA-HQ-OAR-2022-0985-2429-A1, p. 29]

This section will discuss the growing energy demands of widespread EV adoption and new potential hotspots for energy demand. It will also use case studies to highlight how electricity providers are preparing for this transition. These case studies showcase solutions that have the potential to revolutionize energy consumption and highlight how electricity providers support customer EV adoption through incentive programs, building infrastructure, and other initiatives. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 29 - 30]

The grid's ability to handle millions of additional EVs hinges on utilities' proactive planning capacity. Granting utilities the flexibility to make proactive upgrades to the electrical grid and facilitate transportation electrification will require careful planning and coordination between regulators and stakeholders. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

Regulatory certainty will allow utilities to make the investments necessary to facilitate a smooth EV transition. To invest proactively, rather than in response to firm load, energy providers will need clear insight into multi-year schedules for customer electrification, approval from regulators to recover costs, and/or flexibility to serve loads with non-wire alternatives. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

Robust EPA emission standards will provide the regulatory certainty needed to not only ensure vehicle manufacturers continue to invest in EV technologies, but that the entire supply chain supporting the transition to electrification will have a clearer picture of how to plan capital expenditures today to meet the increased demand over the coming years. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

i. Anticipated impacts to electricity providers from increased EV deployment

In 2021, the U.S. fleet of electric vehicles used 6.1 terawatt hours (TWhs) of electricity to travel 19.1 billion miles.125 That accounted for just 0.15% of the total national energy generation that year.126 In 2022, the United States produced 4,243 TWhs of electricity.127 To meet the demand of transportation electrification, more generation will be needed to service EVs and electrified vehicle technologies. One estimate suggests it would take roughly 800 to 1,900 TWh of electricity to power all vehicles if they were electric.128 It is important to remember, however, that this new demand will not occur all at once but rather more gradually as EVs continue to displace ICEVs. While achievable, meeting this increase in electricity demand will require significant strategy as electric providers transition to renewable, carbon free resources. [EPA-HQ-OAR-2022-0985-2429-A1, p. 30]

125 "Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010–2021," Argonne National Lab, November 2022 https://publications.anl.gov/anlpubs/2022/11/178584.pdf

126 “Monthly Energy Review May 2023,” EIA, https://www.eia.gov/totalenergy/data/monthly/pdf/sec7_3.pdf

127 Id.

128 “How much electricity would it take to power all cars if they were electric?,” USAFacts, (May 15, 2023) accessed June 13, 2023 https://usafacts.org/articles/how-much-electricity-would-it-take-to-power-all-cars-if-they-were-electric/

The key to meeting these energy requirements will be the expansion of renewable energy resources but also the addition of new, zero-emission and low-emission load-following resources like advanced nuclear, carbon capture, long-term energy storage, and green hydrogen. In 2022, electricity generated from renewable sources surpassed coal for the first time in U.S. history.129 At the same time, electricity providers are looking at ways to add low-cost energy storage to increase the availability of non-dispatchable renewable generation such as solar and wind. Currently, renewable energy generates about 20% of all electricity production in the U.S, and renewable sources like solar and wind are expected to account for the majority of new utility-scale electricity generation going forward.130,131 Already, available renewable energy resources in the U.S. are estimated to amount to more than 100 times the nation’s current electricity needs.132 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 30 - 31]

129 “U.S. renewable electricity surpassed coal in 2022,” Associated Press, (March 28, 2023), accessed June 4, 2023 https://apnews.com/article/renewable-energy-coal-nuclear-climate-change-dd4a0b168fe057f430e37398615155a0

130 “Renewable Energy,” Department of Energy, accessed June 4, 2023 https://www.energy.gov/eere/renewable-energy

131 ”Solar power will account for nearly half of new U.S. electric generating capacity in 2022,” EIA, (January 10, 2022) https://www.eia.gov/todayinenergy/detail.php?id=50818

132 “Renewable Energy Resource Assessment Information for the United States,” Department of Energy, accessed June 4, 2023 https://www.energy.gov/eere/analysis/renewable-energy-resource-assessment-information-united-states

133 “Yes, the grid can handle EV charging, even when demand spikes,” Yale Climate Connections, (March 23, 2023) accessed June 4, 2023 https://yaleclimateconnections.org/2023/03/yes-the-grid-can-handle-ev-charging-even-when-demand-spikes/

Power generation is only one of the considerations when preparing for 100% transportation electrification. In particular, the industry needs to develop its ability to precisely manage demand in real time, including by accurately predicting when and where increases in demand will occur. [EPA-HQ-OAR-2022-0985-2429-A1, p. 31]

It is important to note that energy demand is not constant. Instead, it consists of relatively predictable peaks and troughs throughout the day. High demand consistently occurs between 5:00 PM and 8:00 PM each day, as customers return home, turn up their climate control systems, begin cooking dinner, and turn on other devices.133 System demand peak is typically between 5:00-6:00 PM during the summer, and 7:00-8:00 AM in the winter. As such, EV charging poses minimal impacts to the winter peak hours but could increase summer peaks without managed charging. [EPA-HQ-OAR-2022-0985-2429-A1, p. 31]

ii. Utility-specific planning underway

The following collection of case studies demonstrates how electricity providers in ZETA's membership are preparing for the EV transition and highlights some of their groundbreaking initiatives to support EV adoption in the United States. It should be noted that each provider operates within a regulatory framework that is unique to the state in which it serves. The cases outlined below do not represent the entire portfolio of EV-related products and services offered by these providers. [EPA-HQ-OAR-2022-0985-2429-A1, p. 31]

These examples include programs that exist across the EV supply chain, with earlier examples covering infrastructure planning programs and later examples focusing on programs to engage with EV drivers on their charging needs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

1. Pacific Gas & Electric

As California's largest electric provider, PG&E continues to play an important role in advancing electric vehicle adoption in support of the state's broad climate goals. PG&E works in collaboration with the California Energy Commission and California Public Utilities Commission to plan and approve grid infrastructure upgrades to support this shift to zero-emission transportation. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

With nearly 500,000 EVs sold in its service area—one in every seven of all EVs on the road throughout the nation—expansion of PG&E's EV charging network in Northern and Central California is critical to support the State's transition to a clean transportation future. Over the last half-decade, the provider has deployed more than 5,000 EV charging ports across its service area. Additionally, it offers a variety of resources to help accelerate EV adoption among customers, and PG&E is working collaboratively with vehicle manufacturers to develop vehicle grid-integration technologies. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

Grid planning requires precise forecasts to ensure electric infrastructure is available to support future demand. Pre-existing electricity demand (load) forecasts did not provide the geographical granularity needed to best plan for grid investments. PG&E could allocate the load to residential charging locations; however, larger charging loads that are often not associated with existing service points—such as public charging systems—lacked a methodology to be accounted for in long-term forecasting efforts. Without the ability to identify future EV demand with geographic and temporal accuracy, PG&E was limited in its ability to plan future grid capacity. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

Lacking a long-term geospatial forecasting methodology, PG&E was primarily dependent on customer requests for service to inform where EV load would materialize. This reliance on customer requests led PG&E to reactively develop capacity solutions to serve load requests. Given the long lead times often associated with capacity projects and the relatively fast pace at which customers wish to build EV charging infrastructure, there would be instances where energization timelines exceeded the requested energization date from customers. This can occur with large load applications associated with public DCFC charging stations or large fleets, which have the potential to exceed the maximum capacity of existing electrical infrastructure in those areas. [EPA-HQ-OAR-2022-0985-2429-A1, p. 32]

Identifying a need for a more proactive approach, PG&E set out to improve its forecasting abilities to increase the clarity of where and when EV loading is most likely to materialize. This enables PG&E to build capacity in advance of service applications being received.

Although research indicates that customer preference for EVs is increasing, and there are many regulations and incentives which further support the transition to EVs, there are still uncertainties around the pace of adoption. This impacts how the EV load will manifest on the electric grid. For this reason, a solution capable of supporting a variety of forecast scenarios was necessary for success. PG&E commissioned a multi-faceted project focused on three common categories of EV charging load: 1) public DCFC & Level 2 charging stations, 2) residential EV charging, and 3) fleet charging. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 32 - 33]

Detailed analysis and machine learning modeling and testing were applied to each of these focus areas to predict where EV charging is most likely to occur. These analyses were performed at the premise level and resulted in over 5 million potential growth points across PG&E's service territory that were integrated into existing distribution planning software. This created a dynamic tool that can adapt to a variety of forecast inputs, such as system-level adoption forecasts, EV charging behaviors, and charging infrastructure assumptions. These scenarios can be integrated into PG&E's distribution planning processes. [EPA-HQ-OAR-2022-0985-2429-A1, p. 33]

Developing a solution that was easily integrated into existing distribution planning processes and software was critical for successful implementation. Involving PG&E forecasting and asset planning teams in the development of the EV forecasting tool, as well as reviewing and approval of the major inputs and assumptions used to develop forecast scenarios, ensured alignment in the scenarios generated. [EPA-HQ-OAR-2022-0985-2429-A1, p. 33]

In figure 7 above, the difference in magnitude of localized EV load in the year 2035 can be seen in a relatively low EV adoption scenario (2020 California Energy Commission (CEC) Integrated Energy Policy Report (IEPR Mid)) and a higher policy-based scenario based on the California Air Resources Board (CARB) Multiple Source Strategy (MSS) forecast. Grid planners can use this tool to investigate and solve for circuit level impacts of EV load growth. [EPA-HQ-OAR-2022-0985-2429-A1, p. 34.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 34, for Figure 7. This Figure was redacted]

Using varying EV forecast scenarios, PG&E was able to assess the localized grid impacts from high EV adoption scenarios that are better aligned with state transportation electrification goals and policies. PG&E assessed how various levels of EV adoption, as well as the impacts that changing charging behaviors (such as on vs. off-peak charging), can have on grid needs. Early analysis has indicated that off-peak charging can reduce near-term grid constraints. In the future, this may lead to new circuit peaks and capacity constraints that must be addressed. [EPA-HQ-OAR-2022-0985-2429-A1, p. 34]

Results from these analyses were helpful in advocating for approval of higher transportation electrification forecasts with regulators and the state energy commission, which are ultimately used for electric grid planning. PG&E has also used these forecasts to produce directional assessments of the resources needed to support capacity investments included in their long-term capital planning. PG&E continues to work to improve its forecasting and planning capabilities. Still, the solutions implemented to date have enabled a more robust approach that will allow PG&E to continue to support its customers' electrification transition. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 34 - 35]

2. Vistra

Electricity generators are making the transition to low- and no-carbon-emitting sources of energy as quickly as possible in response to investor, regulator, policymaker, and customer expectations. This transition is backed by a strong business case for doing so, as renewables and battery storage systems are able to compete effectively with fossil fuel generation and provide benefits to the power grid. The International Energy Agency expects renewable energy resources to provide 18% of the world's power by 2030, up from 11.2% in 2019.134 However, certain renewable energy sources—such as solar and offshore/onshore wind—are dependent on weather conditions and the time of day. This means deploying these resources at scale will require accompanying battery technology to ensure electric grid reliability. [EPA-HQ-OAR-2022-0985-2429-A1, p. 35]

134 "Modern renewables," IEA, accessed June 4, 2023 https://www.iea.org/reports/sdg7-data-and-projections/modern-renewables

Energy storage allows for the integration of more intermittent resources by storing electricity until it is needed. It also augments existing energy generation by allowing excess energy to be produced when low demand is stored until demand peaks. Energy storage can provide benefits beyond emissions reduction, including cost-savings for consumers, reliability, and backup and startup power during extreme events. [EPA-HQ-OAR-2022-0985-2429-A1, p. 35]

Vistra operates the Moss Landing Energy Storage Facility in California, the largest of its kind in the world, and is pursuing an expansion that will bring 750 MW online in the second quarter of 2023.135 This facility is particularly valuable in California, where the swift transition to renewable energy, paired with a constantly growing demand for electricity, illustrates the need for reliability in the electric grid and the role energy storage can play. As of 2021, non-hydroelectric renewables provide approximately 35% of California's electricity, and electricity demand has increased due to a variety of factors, including severe weather events, widespread electrification, and electric vehicle deployment.136 This combination was put to the test in September 2022, when the state faced its most extreme September heat event in recorded history. This weather event put unprecedented strain on the electric grid and set records for electricity demand. To the surprise of many, the lights stayed on. During that event, batteries, including Vistra's Moss Landing facility, provided about 4% of supply—over 3,360 MW, more than the Diablo Canyon nuclear power plant (the state's largest electricity generator)—during the peak demand, averting rolling blackouts. A report from the California Independent System Operation (CAISO) following the September 2022 event specifically highlighted the increase in energy storage resources as a key factor that supported the grid's reliability.137 As a comparison, the August 2020 heat wave, which occurred when California's energy storage resources were few and far between, resulted in rolling blackouts over multiple days. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 35 - 36]

135 "Vistra Announces Expansion of World's Largest Battery Energy Storage Facility," Vistra, accessed June 4, 2023 https://investor.vistracorp.com/2022-01-24-Vistra-Announces-Expansion-of-Worlds-Largest-Battery-Energy-Storage-Facility

136 "2021 Total System Electric Generation," California Energy Commission, accessed June 5, 2023 https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation

137 "California ISO posts analysis of September heat wave," California ISO, accessed June 5, 2023 http://www.caiso.com/Documents/california-iso-posts-analysis-of-september-heat-wave.pdf

Recognizing that the replacement of fossil fuel-powered assets with zero-carbon resources is not a one-to-one exchange, Vistra is working to maintain reliability by using energy storage and installing zero-carbon investments on the sites of retired or soon-to-be-retired fossil fuel plants. This also ensures that communities do not lose key energy supplies or ongoing tax revenue. Vistra is also focused on ensuring that existing zero-carbon generation remains online, such as the Comanche Peak Nuclear Power Plant in Texas, which is currently going through the Nuclear Regulatory Commission's relicensing process to continue operations through 2053. This high-performing plant is able to produce power—rain, snow, or shine—increasing grid reliability for Texans and making it a keystone generator for the Electric Reliability Council of Texas (ERCOT) grid. Alongside the transition to cleaner generation resources, Vistra has been able to maintain reliability for its consumers and ensure that individuals and businesses are able to keep their lights on, even during extreme weather events. During Winter Storm Uri in Texas in 2021, Vistra's plants produced between 25-30% of the power on the grid during the storm, far beyond its ~18% market share. [EPA-HQ-OAR-2022-0985-2429-A1, p. 36]

As the energy supply mix shifts toward low- and zero-carbon resources, energy storage will fill the reliability gap and allow that mix to evolve more reliably and flexibly. The Inflation Reduction Act provides new tax incentives for investment in energy storage technologies and resources to support the R&D of advanced and long-duration energy storage technologies. These investments will enable the deployment of utility-scale energy storage and add reliability to the grid, no matter what the future energy generation mix looks like. It is crucial that the United States continues to make the transition to a carbon-neutral economy and electric grid in a way that ensures the continued reliability of the grid at a reasonable cost to consumers. [EPA-HQ-OAR-2022-0985-2429-A1, p. 36]

3. Southern California Edison: Preparing the Grid for EV Adoption

About 40% of the nation's electric vehicles, more than 1.3 million, have been sold in the state of California. More than 430,000 of those are in SCE's service area alone. Many have expressed doubts that the grid is ready for the energy demand created by the need to charge so many EVs, but electric power companies, including SCE, are keeping up with increasing levels of adoption. [EPA-HQ-OAR-2022-0985-2429-A1, p. 36] In anticipation of growing EV demand in Southern California, SCE is continuously taking the steps to upgrade the grid and promote customers' transition to electric transportation and proactively solve near-term issues, while also undertaking long-term investments to ensure the grid is ready for all levels of anticipated electrification adoption. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

Solving near-term challenges

One way SCE is addressing the near-term issues is its Power Service Availability (PSA) initiative for Transportation Electric service

- SCE is focusing on (1) improving its internal processes to streamline interconnection, (2) engaging fleet operators to better understand their plans for electrification, (3) improving its ability to forecast and assess the impacts of transportation electrification (TE) growth, and (4) leveraging new technologies as grid infrastructure solutions
- Because some projects require more time than others to build, SCE is encouraging fleet owners to engage with the utility early in the process so that SCE can better understand and plan for the fleets' needs [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

SCE is also improving how we partner with customers to meet their needs.

- This includes streamlining buildout, developing deeper customer engagements that include rate planning and load management education, and right-sizing grid solutions to meet the expected charging demand growth in both the near and long term. These efforts will provide more innovative and customer-focused solutions. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

In addition to customer project deployment, SCE has also pushed to accelerate EV adoption through customer-side infrastructure programs such as Charge Ready for light-duty vehicles.

- Through its Charge Ready program, SCE installs, maintains, and covers installation costs for charging infrastructure while participants own, operate, and maintain the charging stations. For those ready to invest in EV charging for medium- and heavy-duty vehicles, SCE's Charge Ready Transport program similarly offers low- to no-cost site upgrades to support the installation. The program provides funding to help electrify semi-trucks, buses, and delivery vehicles, among others. Through its Charge Ready programs, SCE has installed more than 3,000 charging ports throughout its service area and is targeting 30,000 charging ports by 2026. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

SCE's Transportation Electrification Advisory Services program is also available for commercial customers considering electric transportation options.

- On top of offering educational webinars and workshops, the program also offers to develop site-specific EV-readiness studies to help determine the feasibility of proposed projects and grant writing assistance to help customers secure zero-emission vehicle grants. [EPA-HQ-OAR-2022-0985-2429-A1, p. 37]

Long-term Planning and investing in the grid for TE

SCE is improving the value of EV adoption forecasts used for grid planning by assessing where, when, and how much EVs are likely to charge.

- SCE led the West Coast Clean Transit Corridor Initiative, composed of nine other electric utilities and two agencies representing more than two dozen municipal utilities, to conduct a multi-phase and multi-year research study to forecast EV truck populations and determine the proper number and size of highway charging sites. Subsequent phases of this initiative are supporting internal planning operations across the participating utilities.
- SCE developed a new forecasting approach for Medium-Duty / Heavy Duty (MDHD) vehicles for the recent General Rate Case (GRC) Application.
    - Because MDHD electrification is still nascent, current forecasting methodologies that are based (in part) on historical adoption are insufficient
    - For the GRC, SCE's new forecasting methodology leverages MDHD fleet industry data to more accurately predict MDHD electrification adoption and corresponding grid needs
    - SCE (and the IOUs) are collaborating with CPUC on a new "Freight Infrastructure Planning" (FIP) Framework to further address planning for MDHD
- SCE is working to expand the current distribution planning forecast window from 10 years to 20 years. Developing and implementing an interagency-sponsored forecast that spans 20 years for distribution will bring benefits, such as:

- Identifying long lead time projects that are needed beyond the 10-year horizon
    - Identifying important land acquisition needs
    - Informing how the development of infrastructure may need to be levelized to practically achieve the scale of development required by achieving state ZEV policies and GHG targets
- SCE has proposed robust investments in its GRC application to support TE adoption and load growth.
    - The investments proposed are designed to ensure long-lead infrastructure projects (such as new or expanded substations) will be completed when load growth arrives. The plan especially focuses on high TE locations: freight corridors, fleet hubs, Port of Long Beach, etc.
    - Specific TE-focused projects include: [EPA-HQ-OAR-2022-0985-2429-A1, p. 38.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, pages 38-39, for Figure of TE-focused projects]

4. Con Edison

Con Edison is helping to accelerate New York State's transition to clean transportation and EV adoption through grid and customer investments that support buildout of a widespread charging network. The Company's PowerReady Program provides incentives to connect thousands of new public and private charging stations to the electric grid. Authorized by the New York State Public Service Commission's July 2020 Order Establishing Electric Vehicle Infrastructure Make-Ready Program and Other Programs, the program offsets the electric infrastructure costs associated with installing chargers for light-duty EVs, including cars and small vans. To date, nearly 4,000 Level 2 and 175 DCFC chargers have been installed under the program, with the goal of installing 18,539 Level 2 and 457 DCFC chargers by 2025, with the potential for significant expansion of the program budget and goals as recently recommended by the New York State Department of Public Service Staff. The Company provides a similar pilot program for medium- and heavy-duty (MHD) vehicles, and a full-scale program is being considered in the recently launched New York State proceeding to address barriers to MHD charging infrastructure (MHD Proceeding). [EPA-HQ-OAR-2022-0985-2429-A1, p. 39]

Along with these infrastructure incentive programs, Con Edison also offers the SmartCharge New York managed charging program that provides incentives for personal drivers to charge outside of grid peak periods and the Company is launching a commercial managed charging program later this year including eligibility for all fleets, public stations, and multi-unit dwellings. SmartCharge New York is discussed below as an example of how managed charging can help mitigate the impact of EV charging on the grid. [EPA-HQ-OAR-2022-0985-2429-A1, p. 39]

An essential step in EV charger buildout is interconnection with the grid. Con Edison has developed dedicated teams that support the growing number of EV charging interconnections, including those that provide load evaluation, engineering review, project queue management, and incentive deployments. The Company is implementing multiple efforts to improve the customer experience and speed interconnection timelines and will continue to identify and implement efficiencies and improvements. For example, the Company provides pre-application advisory services for fleets and other customers to evaluate site feasibility and understand electric fueling costs, automates internal processes such as service rulings for smaller stations, and is coordinating with permitting agencies to identify and resolve challenges. Con Edison provides load-serving capacity maps to help those seeking to install EV charging infrastructure identify suitable sites with adequate grid capacity. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 39 - 40]

While Con Edison is supporting installation of increasing numbers of EV chargers under its programs today, the Company is also working to evolve its robust planning processes to prepare for the ramp in clean transportation loads. These loads are expected to drive significant grid impacts in New York State and ambitious emissions regulations will further accelerate an already rapidly growing EV market, with the exact timing in the inflection point unknown. The timeline to install EV chargers is relatively short compared to that of other new customer infrastructure, such as a new building, while the buildout of utility-side grid infrastructure to meet the significant increase in demand from EV chargers requires longer timelines, sometimes of 5 to 7 years. A proactive grid planning process to meet near-term needs and build out the grid in advance to support long-term growth in the deployment of EVs is being considered in the New York State MHD Proceeding. Con Edison, along with other NY State Utilities, filed comments proposing a proactive utility infrastructure planning framework to prepare the grid in advance of future transportation electrification needs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 40]

SmartCharge New York Managed Charging Case Study

In 2017, Con Edison launched SmartCharge New York program with the goal of instilling gridbeneficial charging behavior in parallel with the upswing in electric vehicle adoption. The goal was to influence driver behavior at the inflection point of transitioning from combustion-engine fueling to electric battery charging and have drivers default to grid-optimizing charging activity. Program participants received a free cellular-enabled device that plugs into the vehicle's diagnostic port that allowed Con Edison to track time, energy, and power consumed when charging in the utility's service territory. Incentives encourage drivers to 1) avoid charging during the system peak (2 PM to 6 PM) during summer weekdays from June to September, and 2) charge overnight from 12 AM to 8 AM. Incentives were initially paid off-bill through gift cards to the customer's business of choice, such as Amazon, Starbucks, or Home Depot. [EPA-HQ-OAR-2022-0985-2429-A1, p. 40]

As electric vehicle adoption continues to rise, managing charging behavior will grow increasingly important in maintaining a healthy and reliable grid. Since its inception, the SmartCharge New York program has evolved to meet customer needs and program objectives. Starting in 2023 for example, the program was overhauled to allow participation through a mobile application and payments are now issued through Venmo or Paypal, in line with participant feedback. This shift also changed the way the program collects data, favoring more cost-effective vehicle onboard telematics or networked electric vehicle supply equipment such as a Wi-Fi-enabled charger or charging cable. This enables the program to scale efficiently with the market and give a greater number of drivers insight into their behavior and how that activity translates to incentive earnings. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 40 - 41]

In light of the EPA announcement of its heavy-duty and light/medium-duty proposed emissions standards, Con Edison released the following statement:

"Con Edison applauds the Environmental Protection Agency's efforts to rev up the market for electric vehicles, which will improve the air in the communities we serve and help in the fight against climate change. A rapid shift to mass EV adoption looks more achievable all the time, with vehicle options expanding and new charging stations being built across New York City and Westchester County, including locations that serve the needs of disadvantaged communities. Con Edison will continue to support the EV market's development through investment in the grid and by offering a range of programs, from incenting new chargers to managing the grid impact by rewarding drivers for charging overnight."138 [EPA-HQ-OAR-2022-0985-2429-A1, p. 41]

138 "Con Edison Supports Effort to Encourage Electric Vehicle Adoption," Con Edison Media Relations, (April 12, 2023) accessed June 5, 2023 https://www.coned.com/en/about-us/media-center/news/2023/04-12/con-edison-supports-effort-to-encourage-electric-vehicle-adoption

5. SRP

When EVs were still in the early stages of adoption, SRP recognized the importance of exploring ways to identify EV households and analyze their charging behavior in order to help prepare for greater EV uptake in the future. It was also important to begin engaging customers who were EV drivers in order to understand their interests and their charging patterns and assess ways to influence charging behaviors. [EPA-HQ-OAR-2022-0985-2429-A1, p. 41]

In 2014, SRP launched "EV Community" (EVC)—a program that offers customers a $50 bill credit for each EV they register (up to two vehicles per household)—as a means to incentivize EV drivers to identify themselves and engage with SRP. Participants provide basic information about the electric vehicle and the type of charger they use. This provides a way for SRP to learn more about EV customers and their charging behavior and needs while offering them an incentive to help support EV growth in the region. There are currently more than 7,500 customers enrolled in the program. [EPA-HQ-OAR-2022-0985-2429-A1, p. 41]

While EVC members only account for a small number of total EV households, they are a fair overall representation of the EV customer base since all price plans are included, as well as households with one vs. two EVs. The program offers SRP a good platform for analysis, including the type of cars they drive (PHEV, BEV, brand, etc.) and the charge levels they use. In addition, SRP found that EVC members are willing to share information and are eager to participate in future pilot programs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

The EVC program also provides SRP with a method and channel to promote their Electric Vehicle Price Plan, a special time-of-use pricing plan which offers EV drivers the most opportunity to save on EV charging costs by charging during super off-peak times (between 11 PM and 5 AM). Load research has shown that this program has been highly effective at shifting EV charging loads away from peak periods. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

The EVC program has helped SRP plan and prepare the grid for widespread EV adoption by enabling them to:

- Anticipate load growth. A pilot study with EVC members that monitors their EV driving and charging behavior through data telematics devices enables SRP to estimate typical consumption and charging load profiles per EV.
- Understand the impacts of EV charging on the grid. EVC data is used to model the impacts of EV charging on the electric grid, identify when transformers and wires may need to be upgraded, and understand when and how customers need to charge.

- Recruit for Managed Charging pilot programs. The EVC program and channel have enabled SRP to recruit participants for additional Managed Charging pilot programs to test other active control technologies to control EV charging load on the grid.
- Survey participants for insights. EVC members are surveyed regularly to get more data on their charging behaviors, including their use of home, workplace, and public charging and their satisfaction with EVs overall.
- Engagement. EVC participants receive regular newsletters and other communications with EV-related information. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

6. Duke Energy

Electric fleet commitments are increasing as companies with ambitious sustainability goals work to decarbonize operations. Fleet owners are also seeking ways to take advantage of the cost savings available by transitioning to EVs. However, programs for fleet electrification and managed charging options are still limited to date. [EPA-HQ-OAR-2022-0985-2429-A1, p. 42]

When transitioning to an electric fleet, it is important that fleet managers understand the full scope of charging multiple vehicles while maintaining fleet operations and that larger MHDVs bring with them additional factors to consider. Fleet owners who have electrified fleets without consulting experts or an electric provider have likely been experiencing avoidable operational and technological issues. Long-term energy cost and performance risk are also potential issues for fleets and can hinder mainstream fleet electrification technology development if not managed correctly. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 42 - 43]

Duke Energy's significant experience and large customer base make it well-positioned to design and implement fleet electrification and charging programs. Duke Energy is building a first-of-its-kind performance center that will model and accelerate the development, testing, and deployment of zero-emission light-, medium-, and heavy-duty commercial electric vehicle EV fleets. The site will be located in North Carolina at Duke Energy's Mount Holly Technology and Innovation Center and incorporate microgrid integration. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

The fleet electrification center will provide a commercial-grade charging experience for fleet customers evaluating or launching electrification strategies—reinforcing reliability, clean power, and optimization by integrating solar, storage, and microgrid controls software applications. The center will be connected to both the Duke Energy grid—charging from the bulk electric system—and to 100% carbon-free resources through the microgrid located at Mount Holly. This project is the first electric fleet depot to offer a microgrid charging option. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

In addition to fleet charging, the site will also function as an innovation hub, allowing Duke Energy to collect data around charger use, performance, management, and energy integration with various generation resources. It will also allow for the development of managed charging algorithms for fleets connected to the bulk power system or integrated with renewables and storage—which can be utilized to minimize the upgrades needed to the distribution system, easing the transition to electrifying fleets. Identifying EV charging technologies and how they may be used to power any type of fleet with vehicles (ranging from class 1) will help develop a model to show the industry a clear, integrated, and cost-effective path to fleet electrification. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

Duke Energy is teaming up with Daimler Truck North America and Electrada on this important work. Electrada, an electric fuel solutions company, is providing funding for research and demonstration efforts. For fleets seeking to electrify, Electrada invests all required capital “behind the meter” and delivers reliable charging to the fleet’s electric vehicles through a performance contract, eliminating the complexity and risk that fleets face in transitioning to this new source of fuel. Electrada’s investment in the depot allows Duke Energy to focus on programs that simplify adoption for electric fleet customers and distribution system performance to support the predictable addition of electric load over time. [EPA-HQ-OAR-2022-0985-2429-A1, p. 43]

By the end of 2023, fleet operators will be able to experience a best-in-class, commercial-grade fleet depot integrated with energy storage, solar, and optimization software. Moving to zero-emission vehicles in this sector allows North Carolina to seize the large economic potential of the transition and generate billions in net benefits for the state. Projects like Duke Energy’s fleet performance center will be key for fleet owners across the state to take advantage of the cost savings of transitioning to electric vehicles. That said, fleet owners exploring electrification should engage their electricity provider early and often to identify and address site-specific considerations. As fleet electrification accelerates, it will be important for electricity providers and policymakers to identify best practices to proactively plan for fleet electrification, including readying the distribution grid. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 43 - 44]

7. Xcel Energy

Xcel Energy is committed to electrifying all of its light-duty fleet and 30% of its medium and heavy-duty fleet by 2030, equating to over 2,500 EVs. It’s part of their vision to be a net-zero energy provider by 2050 and enable one out of five vehicles to be electric in the areas they serve by 2030. This will save customers $1 billion annually on fuel by 2030 and deliver cleaner air for everyone. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

With a fleet that includes iconic bucket trucks, all-terrain service vehicles, and a host of pickup trucks and pool cars across eight states, achieving these goals will be no small feat, but an important one. There are notable hurdles, yet evolving technology presents solutions. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

Electrifying the Marquee Fleet Vehicle

Xcel Energy is the first electric provider in the nation to add an all-electric bucket truck to its fleet. The truck features two electric sources: one for the drivetrain and one for the lift mechanism. It has a 135-mile driving range and can operate the bucket for an entire workday on a single charge. Crews are collecting data from real working conditions in Minnesota and Colorado that will be used to inform further improvement to the vehicle’s technology and operation. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

Optimizing Charging to Minimize Grid Impacts

To support a growing electric fleet, over 1,200 EV chargers must be brought into service by 2030, which will result in an electric load increase of 71 megawatts. Charge management techniques enable low-cost charging for this growing electric fleet. It’s a sophisticated approach to optimize charging times by using time-of-day and grid demand efficiencies and builds on the expertise Xcel Energy has developed through offering managed charging programs to customers in multiple states. [EPA-HQ-OAR-2022-0985-2429-A1, p. 44]

For fleets, overnight charging schedules make the most sense. Demand and rates are lower, and renewable wind sources are ample at that time. Yet, fast charging outside of these time periods may be required to help larger vehicles make it through a workday. This is when charging schedules need to be customized and highly specific. [EPA-HQ-OAR-2022-0985-2429-A1, p. 45]

Enabling Cleaner Service Calls Through Bucket Truck Technology

Xcel is also taking immediate action on other high-impact emission reduction opportunities, using technologies such as electric power take-off, idle mitigation, and solar systems to power jobsite tools.

- Electric power take-off (ePTO) - An ePTO system is a device that uses battery power. It's similar to an EV, but instead of moving the vehicle down the road, it powers equipment and tools to avoid engine idling at the job site. These devices are recharged by plugging into the same chargers that EVs use.
- Idle mitigation - An idling truck can consume 1.5 gallons of gas each hour. Idle mitigation on Xcel Energy's utility bucket trucks works by automatically shutting down the gas-powered engine when the vehicle is not in use or when the engine is idling for too long. This helps to reduce emissions and conserve fuel. [EPA-HQ-OAR-2022-0985-2429-A1, p. 45]

Fleet Electrification Solutions for Customers

Xcel Energy's experience and expertise with fleet electrification doesn't stop with their own fleet. They have developed a mix of customer programs across service areas to support fleet electrification for businesses and communities. These customer-centric solutions enable sophisticated planning, lower upfront costs with various rebates and incentives, and minimize impacts to the grid. [EPA-HQ-OAR-2022-0985-2429-A1, p. 45]

Xcel's approach for commercial EV fleet development includes:

- Advisory services: Xcel offers a "white-glove service" to meet customers where they are on their electrification journey by guiding them through customized planning for their infrastructure needs. For fleet operators, this includes a free assessment to help them determine the best path to electrify their fleet and advise them on future electric fleet considerations such as charging best practices.
- Infrastructure installation: Xcel designs and builds EV supply infrastructure to support charging station installations at minimal to no cost to customers.
- Equipment recommendations and rental options: Xcel also provides recommendations for charging equipment and offers customers the option to purchase their own qualifying vehicle chargers or rent them at a monthly fee that includes installation and maintenance.
- Grid continuity: Xcel designs long-term clean energy resource and distribution plans to consider the future impact of new EV load to ensure ongoing grid stability, reliability and affordability.
- Equitable opportunities: Xcel supports EV adoption in higher emissions communities and income-qualified neighborhoods through rebates and incentives. This includes facilitating

the electrification of carshare, refuse trucks, school buses, paratransit vehicles, and other fleets operating in these disproportionately impacted communities. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 45 - 46]

Fleet electrification is a key component of Xcel Energy's larger vision, which includes enabling zero-carbon transportation by 2050 across our eight-state service footprint. This long-term strategy balances affordability with sustainability across the entire grid. It's why Xcel is dedicated to assisting fleet managers across the ecosystem in providing fleet electrification solutions that empower and inspire a clean energy future while also leading by example. [EPA-HQ-OAR-2022-0985-2429-A1, p. 46]

iii. Transmission

A critical part of ensuring a smooth transition to an electrified heavy-duty sector will be a robust build out of high-voltage transmission lines. Doing so will also enable increased penetration of renewables into the grid mix, helping to further improve the environmental and climate benefits of electric vehicles. While progress in this space has historically been slow and bogged down by procedural delays, there are some signs of progress. In April 2023, the U.S. Bureau of Land Management approved a 732-mile transmission line, which will carry wind energy from Wyoming through to Nevada.139 Also in April 2023, a Maine court granted approval to restart work on the 145-mile New England Clean Energy Connect project, which will carry hydropower from Canada to New England.140 The line is expected to carry up to 1,200 megawatts of power. [EPA-HQ-OAR-2022-0985-2429-A1, p. 46]

139 "US approves $3bn Wyoming-Nevada power line," (April 12, 2023) accessed May 15, 2023 https://www.power-technology.com/news/us-approves-3bn-wyoming-nevada-power-line/#:~:text=The%20US%20BLM%20has%20given,blustery%20Wyoming%20through%20to%20Nevada.&text=US%20officials%20on%20Tuesday%20gave,running%20from%20Wyoming%20to%20Nevada

140 "Maine court greenlights embattled $1B transmission line," (April 17, 2023) accessed May 17, 2023 https://subscriber.politicopro.com/article/eenews/2023/04/21/maine-court-greenlights-embattled-1b-transmission-line-00093087

Electricity transmission is also a key focus of the Biden-Harris Administration. In May 2023, the administration published its plan to decrease permitting timelines for new transmission projects, among other key items.141 Also in May 2023, the U.S. Department of Energy proposed a rule on designating National Interest Electric Transmission Corridors.142 There will also be a role for Congress to play in improving transmission permitting times and this is a policy area where some bipartisan support exists. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 46 - 47]

141 "FACT SHEET: Biden-.Harris Administration Outlines Priorities for Building America's Energy Infrastructure Faster, Safer, and Cleaner," (May 2023) https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/10/fact-sheet-biden-harris-administration-outlines-priorities-for-building-americas-energy-infrastructure-faster-safer-and-cleaner/

142 88 FR 30956

EPA Summary and Response:

Summary:

EPA received many comments about the nation's power supply and its ability to support the demand from increased adoption of HD BEV (AFPM, EC, EDF). CFDC focused concern on the power demand of HD plus LD BEV while power plant policy is proposed that could reduce electricity supply and increase cost. AFPM, Arizona State Legislature, Clean Fuels Development Coal., National Ass'n of Rural Electric Cooperatives stated that EPA had failed to account for the combined impact of various EPA rules when assessing the issue of grid reliability (adequacy). These rules (many of which are proposed) include not only the parallel rule concerning GHG emission standards from LDV, but also the proposed rule for CO2 emissions from electricity generating units, the cross-state air pollution rule, the proposed rule for discharge to navigable waters for steam electric units (Clean Water Act), and the proposed rule to control leakage and other releases from of historic surface impoundments used to manage waste from coal combustion (Resource Conservation and Recovery Act). Some commenters stated that our power supply has insufficient margin now and that increased demand from this policy and other energy related policy actions drive additional risk. ASL shares FERC concern that dispatchable energy could be removed from the grid too quickly. NTEA focused on the long lead times for adding power generation and questioned if the policy adoption rates can be supported. Concerns were raised regarding the power supply quantity, quality, stability, and transmission losses.

Many responses referenced reports by NERC (North American Electric Reliability Corporation) and specific comments on summer 2023 reserve margins (AFPM, ASL, CFDC, TRALA, Valero). Valero also shares NERC's concern with winter 2022/2023 reliability and NERC's 2022 long term reliability assessment. AFPM also points out that regional issues exist as the southwest US appears most at risk when generation capacity is compared to BEV load added. Commenters maintained that the power increase to support HD BEVs is not 2.8% as estimated by EPA but was higher, some values going as high as 14% (Arizona State legislature, ATA per ATRI) and 40% power increase for LD plus HD. Note: ATRI 14% and 40% is driven by full fleet electrification (100% adoption) which is significantly higher than the EPA adoption scenario. NRECA asserted that generation needs to increase 170% along with a three-fold increase in the transmission grid by 2050 (although this is total anticipated need, not need attributable to the proposed vehicle GHG standards). Valero states that past success with increasing power generation, including the increase of 25% in the near past in a period comparable to the roll out of the Phase 3 rule cited by EPA, are not analogous since those improvements were enabled by inexpensive natural gas which is no longer an option due to emissions restrictions. AFPM raises concern with adding generation capacity quickly enough due to time for permitting and approvals, supply chain issues, and availability of skilled workers. Other commenters agreed that the power needed for an HD Phase 3 rule is a relatively small share of the national electricity demand, that the annual demand growth is same or less than the last few decades, and that power generating capacity will not be a constraint. These comments came from the electric utility sector (EEI), from regulated entities themselves (DTNA, EMA), from NGOs (EDF, MFN, CATF), and from affected States (CARB). CATF analysis shows the HD BEV proposal (NPRM) to drive 0.5% average annual load growth while the 31 years up to 2021 has seen 1,1 percent growth with 10 of those years over 2% growth. Thus, EMA stated "[t]he overall impact of MDHV charging demand on the grid is minimal and is well under forecasted margins published in the NREC Long-Term Reliability Assessment from December 2022. "EMA Comments at Exh. 1 p. 29. EEI states that "Electricity companies can accommodate increased demand" attributable to the modest EV growth projected in the rule. Daimler states that it "generally agrees with EPA's assessment that scale-up of electric power generation is not likely to significantly limit the development of BEV electric vehicle charging infrastructure." (Daimler did, however, estimate increased demand on the national grid attributable to the proposed rule slightly larger than EPA's estimate—3.9% above 2021 levels rather than the 2.8% EPA estimated.) To the same effect, see Comments of Advance Energy United, Electrification Coalition, ZETA. These commenters posited modest increase in demand on the national grid attributable to the proposed rule (1% over 2021 grid demand) (ICCT) to 3.9% (DTNA). They indicated that these increases were modest in comparison with historic increases in grid capacity. While CARB agrees that HD BEV demand can be met, they recognize that private utilities, government, and public utilities commissions will need to work together and be cognizant of all new demand to ensure that adequate power is available. MFN was not concerned with power delivery but rather the carbon intensity of the power being supplied. MFN highlights the need for sustainable power across the US to ensure that HD BEV use is delivering net benefits. ZETA supported the deployment of renewable energy resources as well as nuclear, carbon capture, and green hydrogen. Comments by MFN regarding projected emissions from electricity generation are covered in RTC 13, health benefits in RTC 15, and LCA in RTC 17. Energy Innovation shared analysis (Drive Clean Scenario) that specifies what a 90 percent clean grid looks like that would be capable of handling 2% annual demand growth. They found, "the U.S. would need to install on average 105 GW of new wind and solar and 30 GW of new battery storage each year—nearly four times the current deployment rate. Even with additional electric loads in the DRIVE Clean Scenario, grid modeling found a 90 percent clean grid would be dependable without coal plants or new natural gas plants by 2035. The grid model also found that during normal periods of generation and demand, wind, solar, and batteries provide 72 percent of total annual generation, while hydropower and nuclear provide 16 percent… The increased electrification and pervasive renewable energy and battery storage deployments require investments mainly in new transmission spurs connecting renewable generation to existing high-capacity transmission, rather than new investments in bulk transmission".

AEU, ESC, ZETA pointed to potential measures to assist generation by reducing peak demand, such as time of use rates, managed charging, demand response technologies, stationary batteries, and vehicle-to-grid technologies. Advanced Energy Solutions, CARB, Energy Innovation, Energy Strategy Coalition mentioned utilities are investing in part because of benefits EVs "can provide to grid reliability". Other comments (EC, ESC, EDF) likewise promote HD BEV as a way to support the grid during times of shortfall or shutdown by using V2G. These comments promote HD BEV as assisting with peak power, backup power, or simply freeing up power with charging flexibility.

A smaller number of commenters like AFPM maintain that there could also be shortages of electricity transmission capacity. NAM asserts that, per a draft DOE report, the electrical transmission infrastructure would need to grow 57% for LD, MD, and HD BEV. Commenters AFPK and National Rural Electrical Cooperative Ass'n raised concerns such as a threefold increase in transmission by 2050. AFPM raises concern that required infrastructure may not be available by 2027. They shared data from DOE that the time for a typical interconnection project, from initial request to commercial operation, is 5 years. EDF's report from Analysis Group showed that the small growth needed would not be an issue for the transmission infrastructure. Commenter ZETA, pointed to recent regulatory actions approving several large-scale regional transmission expansions, plus Administration actions to expedite such expansions. MFN reports that MISO is working on total energy needs and timing of annual peaks that could change due to HD BEV adoption.

Response:

A. Response to Comments Relating to Overall Demand and Reliability

EPA performed emissions and power modeling with MOVES as described in RIA Chapter 4.2. HD BEV adoption rates (aligned with the modeled potential compliance pathway) are applied to determine future power demand. This power demand is distributed geographically based on current registrations and future expectations due to external forces like ACT. MOVES supports granularity down to the county level. Power demand as determined by MOVES is then input to IPM to determine how the power will be generated and transmitted. IPM takes into consideration EGU additions and retirements. Concerns with specific geographic areas (like that expressed by AFPM) are addressed as IPM showed all areas to have adequate generation and transmission. IPM also understands that reserve margins must be maintained to protect grid adequacy. The power demand increase from HD BEVs will be at levels that have been handled by the electricity power sector for decades.

EPA acknowledges the quantified estimates from the utility industry, regulated entities, NGOs, and other expert commenters, all of which corroborate EPA's conclusion that demand from the Phase 3 rule is minimal and does not pose issues of grid reliability. Moreover, all of these entities provided quantified estimates of demand which are quite similar to EPA's. Note further that these estimates are for 2055, when there has been full fleet turnover and hence maximum demand impact on the grid. The increased demand as the Phase 3 program commences is roughly an order of magnitude less. See RTC Section 7 (Distribution) above; that same section documents that there also will be only minor incremental increases in daily demand attributable to standards somewhat more stringent from the standpoint of energy demand than the Phase 3 rule. EPA agrees with this assessment from the Energy Strategy Coalition (speaking for some of the nation's largest utilities, public power authorities and generators of electricity from renewable, nuclear, and gas-fired sources): "[d]emand for electricity will increase under both the HDV Proposal and recently-proposed multi-pollutant standards for light-duty and medium-duty vehicles ("LMDV Proposed Rule"), but the electricity grid is capable of planning for and accommodating such demand growth and has previously experienced periods of significant and sustained growth." The Edison Electric Institute, the trade association for the nation's investor-owned utilities, agrees: "As EPA also notes, the increase in electricity use resulting from the Proposed Rule also will be modest, increasing electricity end-use by less than 3 percent in 2055. On a macro-level, meeting the increased energy usage from electric truck adoption as contemplated in the Proposed Rule will not be a significant challenge for the electric power sector." [577] Moreover, this comment, as well as the others summarized above, evaluated the impact of EPA's proposed rule, which in its initial model years was somewhat more stringent than the final rule; demand on the grid is correspondingly slightly lower with the final rule. EPA further believes that these comments from the electric utility industry representatives serve as a response to commenter Valero, which comment posited that historic growth rates were predicated on availability of inexpensive natural gas, and that similar historic growth should not be assumed.

EPA also notes that many of the comments appear to discuss general information about the grid as opposed to impacts of the Phase 3 Rule, and therefore are of limited, if any relevance. For example, NRECA's claim of a 170% increase by 2050 appears to reflect their estimate of total

[577] Comments of Edison Electric Institute at 7.

demand increases across the entire economy, not demand associated with this rule. ATA and ATRI's estimate of 14% increase due to heavy-duty BEVs and 40% due to light- and heavy-duty BEVs reflects estimate in total demand associated with all 267 million light- and heavy-duty vehicles in the light- and heavy-duty fleets being electrified, as opposed to the orders of magnitude less electrification in the EPA modeled compliance pathways.[578] NERC reviews of our national and regional power supply, which do not directly address issues associated with vehicle electrification and any associated grid impacts, continue to appropriately identify issues and identify government and industry actions that can mitigate national power supply risk. Similarly, the testimony by a FERC Commissioner referenced in several comments (Transfer Flow, ASL) did not address potential grid impacts from electrification in the transportation sector and so is not directly relevant to the issues discussed here of demand posed by EPA transportation sector and other rules affecting the grid, or to EPA's analysis thereof.

As EPA noted at proposal, and as many commenters emphasize, many opportunities exist for optimization due to placement of both distributed and dispatchable power sources, as well as stationary batteries as the nation adds power supply. EPA notes the comment of the Energy Strategy Coalition that these measures create a distinct incentive for utility investment. EPA notes further that its estimate of grid demand is conservative because EPA included only the most basic of mitigative measures.

B. Response to Comments Relating to Impact of EPA Vehicle Rules and other Potential EPA Rules Affecting the Power Sector

EPA has also carefully evaluated the potential impact on grid resource adequacy or reliability posed by various recent and projected EPA rules implementing the Clean Air Act: the LDMD multi-pollutant rule establishing GHG and criteria pollutant emission standards for light and medium duty vehicles, proposed emission limits and guidelines for CO2 emissions from new and existing fossil-fueled fired electricity generating units (CAA section 111 (d))(proposed), the cross-state air pollution rule (CAA section 110 (a)(2)(D)) (88 FR 36654) (June 5, 2023)(final)), and the Mercury and Air Toxics Risk and Technology Review proposed rule (section 112 (d)(6)).[579] In response, we used power sector modeling to estimate emissions from electric power plants for loads associated with vehicle electrification as well as to assess generation resource adequacy and grid reliability of the rapidly-transitioning electric grid. For resource adequacy, we considered the combined projected resource adequacy impacts of this Phase 3 rule

[578] ATRI, Charging infrastructure Challenges for the U.S. Electric Vehicle Fleet (Dec. 2022) at 16-17.

[579] Commenters also referred to the proposed rule for management of coal combustion residuals under subtitle D of the Resource Conservation and Recovery Act. This proposed rule would only apply to residuals managed in inactive surface impoundments at inactive electric utilities; to closed surface impoundments, closed landfills and inactive landfills at operating utilities; and closed landfills and to inactive landfills at sites with a legacy surface impoundment at utilities not generating power. 88 FR 31982, 31984 (May 18, 2023), No closures are projected for the proposed rule for those operating facilities that would be affected. 88 FR at 32028-29..At this preliminary stage, EPA does not see that this rule (assuming it is finalized as proposed) would have any adverse impact on grid reliability or resource adequacy.

Commenters also referred to the proposed rule implementing sections 301 and 304 of the Clean Water Act, which proposed rule would further limit discharge of toxic metals and other pollutants from coal-fired power. 88 FR 181824 (March 29, 2023). EPA projected a single plant closure attributable to this proposed rule (assuming it is finalized as proposed). 88 FR at 18834. At this preliminary stage, EPA does not see that this rule would have adverse impacts on grid resource adequacy or reliability. Our IPM modeling, described in the text, also reflects this proposed rule and EPA's Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles (LMDV))) (collectively "Vehicle Rules") to demonstrate that the impacts of both the Vehicle Rules alone and combined with other anticipated EPA actions related to the EGU sector "Power Sector Rules" result in anticipated power grid changes that adversely affect resource adequacy or grid reliability. .

Specifically, we considered whether the Vehicles Rules alone and combined with the Power Sector Rules would result in anticipated power grid changes such that they 1) respect and remain within the confines of key National Electric Reliability Corporation (NERC) assumptions, [580] 2) are consistent with historical trends and empirical data, and 3) are consistent with goals, planning efforts and Integrated Resource Plans (IRPs) of industry itself.[581] We demonstrate that the effects of EPA's vehicle and power sector rules do not preclude the industry from meeting NERC resource adequacy criteria or otherwise adversely affect resource adequacy. This demonstration includes explicit modeling of the impacts of the Vehicle Rules, an additional quantitative analysis of the cumulative impacts of the Vehicles Rules and the Power Sector Rules, as well as a review of the existing institutions that maintain grid reliability and resource adequacy in the United States. We conclude that the Vehicles Rules, whether alone or combined with the Power Sector Rules, satisfy these criteria and are unlikely to adversely affect the power sector's ability to maintain resource adequacy or grid reliability.

Beginning with EPA's modeling of the Vehicle Rules, we used EPA's Integrated Planning Model (IPM), a model with built-in NERC resource adequacy constraints, to explicitly model the expected electric power sector impacts associated with the two vehicle rules. IPM is a state-of-the-art, peer-reviewed, multi-regional, dynamic, deterministic linear programming model of the contiguous U.S. electric power sector. It provides forecasts of least cost capacity expansion, electricity dispatch, and emissions control strategies while meeting energy demand and environmental, transmission, dispatch, and resource adequacy constraints. IPM modeling we conducted for the Vehicle Rules includes in the baseline all final rules that may directly impact the power sector, including the final Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards (NAAQS), 88 FR 36654 (August 4, 2023).

EPA has used IPM for over two decades, including for prior successfully implemented rulemakings, to better understand power sector behavior under future business-as-usual conditions and to evaluate the economic and emissions impacts of prospective environmental policies. The model is designed to reflect electricity markets as accurately as possible. EPA uses the best available information from utilities, industry experts, gas and coal market experts, financial institutions, and government statistics as the basis for the detailed power sector

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[580] NERC was designated by FERC as the Electric Reliability Organization (ERO) in 2005 and, therefore, is responsible for establishing and enforcing mandatory reliability standards for the North American bulk power system. Resource Adequacy Primer for State Regulators, 2021, National Association of Regulatory Utility Commissioners (https://pubs.naruc.org/pub/752088A2-1866-DAAC-99FB-6EB5FEA73042).

[581] Our analysis of the proposed Power Sector Rules is based on the modeling conducted for proposals. We believe this analysis is a reasonable way of accounting for the cumulative impacts of our rules affecting the EGU sector, including the proposed Power Sector Rules, at this time. Our cumulative analysis of the Vehicles and Power Sector Rules supports this final rule, and it does not reopen any of the Power Sector Rules, which are the subject of separate agency proceedings. Consistent with past practice, as subsequent rules are finalized, EPA will perform additional power sector modeling that accounts for the cumulative impacts of the rule being finalized together with existing final rules at that time.

modeling in IPM. The model documentation provides additional information on the assumptions discussed here as well as all other model assumptions and inputs. EPA relied on the same model platform at final as it did at proposal, but made substantial updates to reflect public comments. Of particular relevance, the model framework relies on resource adequacy-related constraints that come directly from NERC. This includes NERC target reserve margins for each region, NERC Electricity Supply & Demand load factors, and the availability of each generator to serve load across a given year as reported by the NERC Generating Availability Data System. Therefore, the model projections for the Vehicle Rules are showing compliance pathways respecting these NERC resource adequacy criteria. These NERC resource adequacy criteria are standards by which FERC, NERC and the power sector industry judge that the grid is capable of meeting demand. Thus, we find that modeling results demonstrating that the grid will continue to operate within those resource adequacy criteria supports the conclusion that the rules will not have an adverse impact on resource adequacy, which is an essential element of grid reliability.

EPA also considered the cumulative impacts of the Vehicle Rules together with the Power Sector Rules, which as noted above are several recent proposed rules which would regulate the EGU sector. In a given rulemaking, EPA does not generally analyze the impacts of other proposed rulemakings, because those rules are, by definition, not final and do not bind any regulated entities, and because the agency does not want to prejudge separate and ongoing rulemaking processes. However, some commenters on this rule expressed concern regarding the cumulative impacts of these rules when finalized, claiming that the agency's failure to analyze the cumulative impacts of the Vehicle Rules and its EGU-sector related rules rendered this rule arbitrary and capricious. In particular, commenters argued that renewable energy could not come online quickly enough to make up for generation lost due to fossil sources that may retire, and that this together the increasing demand associated with the Vehicle Rules would adversely affect resource adequacy and grid reliability. EPA conducted additional analysis of these cumulative impacts in response to these comments. Our analysis finds that the cumulative impacts of the Vehicle Rules and Power Sector Rules is associated with changes to the electric grid that are well within the range of fleet conditions that respect resource adequacy, as projected by multiple, highly respected peer-reviewed models. In other words, taking into consideration a wide range of potential impacts on the power sector as a result of the IRA and Power Sector Rules (including the potential for much higher variable renewable generation), as well the potential for increased demand for electricity from both this rule and the Phase 3 Heavy-Duty GHG rule, EPA found that the Vehicle Rules and proposed Power Sector Rules are not expected to adversely affect resource adequacy and that EPA's rules will not inhibit the industry from its responsibility to maintain a grid capable of meeting demand without disruption. [582]

Finally, we note the numerous are existing and well-established institutional guardrails at the federal- and state-level, as well as non-governmental organizations, which we expect to continue to maintain resource adequacy and grid reliability. These well-established institutions – including the Federal Energy Regulatory Commission (FERC), state Public Service Commissions (PSC), Public Utility Commissions (PUC), and state energy offices, as well as NERC and Regional Transmission Organization (RTO) and Independent System Operator (ISO) – have been in place for decades, during which time they have ensured the resource adequacy and reliability of the

[582] See "Resource Adequacy Analysis Technical Memorandum for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles - Phase 3 ," available in the docket for this rulemaking.

electric power sector. As such, we expect these institutions to continue ensuring that the electric power sector is safe and reliable by ensuring that owners of electric power generators will not retire electric power plants in a haphazard or disruptive manner. We also note that EPA's proposed Power Sector rules include built-in flexibilities that accommodate a variety of compliance pathways and timing pathways, all of which helps to ensure the resource adequacy and grid reliability of the electric power system.[583] In sum, the power sector analysis conducted in support of this rule indicates that the Vehicle Rules, whether alone or combined with the Power Sector Rules, are unlikely to affect the power sector's ability to maintain resource adequacy and grid reliability.[584]

C. Response to Comments Relating to Impacts on Transmission

With respect to new transmission, the need for new transmission lines associated with the LMDV and HDP3 rules between now and 2050 is projected to be very small, approximately one percent or less of transmission. Nearly all of the projected new transmission builds appear to overlap with pre-existing transmission line right of ways (ROW), which makes the permitting process simpler. Approximately 41-percent of the potential new transmission line builds projected by IPM have already been independently publicly proposed by developers. The approximate regional distribution of the potential new transmission line builds are:

- 24% in the West (excluding Southern California), which are largely Federal lands, that are more-easily permittable for new transmission builds;
- 21% in the desert Southwest, which are largely Federal lands, that are more-easily permittable for new transmission builds;
- 14% in the Midwest;
- 9% for each of the Northeast, Mid-Atlantic, and Southeast and Mid-Atlantic regions; and
- 5% for each for Southern California and New York State/City regions.[585]

We note further that with respect to impacts on transmission, the federal government has limited authority to direct transmission system planning, although there are a myriad of programs and efforts underway that will help support improvements to the grid and provide reliability benefits. While there is congestion and delays in transmission buildout, utilities and other actors have other ways to improve reliability, by deploying Grid Enhancing Technologies (GET) and Storage As Transmission Asset (SATA).

For example, two 230-kV transmission lines used by PPL Electric Utilities, in Pennsylvania, were found to be approaching their maximum transmission capacity in 2020. As a result, the utility paid more than $60 million in congestion fees in the winters of 2021-2022 and 2022-2023. Rather than rebuilding or reconductoring the two transmission lines, which would have cost tens of millions of dollars, the utility spent under $300 thousand installing dynamic line rating (DLR) sensors, which helped the utility to rebalance each of the two transmission lines and allowed them to reliably carry an additional 18 percent of power [586]

[583] As noted above, EPA is not prejudging the outcome of any of the Power Sector Rules.
[584] "Resource Adequacy Analysis Technical Memorandum for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles - Phase 3" available in the docket for this rulemaking.
[585] See Multi-Pollutant Emission Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Regulatory Impact Analysis at 5-22 (2024).
[586] PPL's Dynamic Line Ratings Implementation: https://www.energypa.org/wp-content/uploads/2023/04/Dynamic-Line-Ratings-H-Lehmann-E-Rosenberger.pdf

DOE recently announced several programs and projects to reduce transmission congestion include the interconnection queue backlog.[587] Examples of such programs and projects include DOE's Interconnection Innovation e-Xchange (i2X), which aims to increase data access and transparency, improve process and timing, promote economic efficiency, and maintaining grid reliability; FERC Order 2023, discussed in an earlier comment response, which provides generator interconnection procedures and agreements to address interconnection queue backlogs, improve certainty, and prevent undue discrimination for new technologies; and DOE's Grid Resilience and Innovation Partnerships (GRIP) program,[588] with $10.5 billion in Bipartisan Infrastructure Law funding to develop and deploy Grid Enhancing Technologies (GET), such as Dynamic Line Ratings (DLR) and Advanced Power Flow Controllers (APFC). To facilitate upgrading and rebuilding transmission lines, DOE issued a Notice of Proposed Rulemaking to update its National Environmental Policy Act ("NEPA") implementing regulations. DOE also conducted the National Transmission Planning Study to designate areas experiencing electricity transmission constraints or congestion as National Interest Electric Transmission Corridors (NIETCs). In February 2024, DOE announced a Request for Proposals (RFP) for the second round of the Transmission Facilitation Program, a revolving fund supported by the Bipartisan Infrastructure Law to help overcome financial hurdles facing large-scale new and upgraded transmission lines.

The capacity of existing electric power transmission lines can also be increased by a process known as reconductoring, in which existing transmission lines, typically with steel cores, are replaced with higher capacity composite conductors. Since the process makes use of existing transmission towers, it typically does not require additional rights of way. As such, new generation capacity can be rapidly added, which serves to improve resource adequacy. For example, American Electric Power, a Texas-based transmission utility, replaced the aging conventional conductors of a 240 miles transmission line with advanced composite core conductors from 2012-2015[589] The reconductoring resulted in an approximate doubling of the previous transmission line capacity and was accomplished while the 345-kilovolt transmission lines remained energized.[590]

Energy storage projects can also be used to help to reduce transmission line congestion and are seen as alternatives to transmission line construction in some cases.[591] These projects, known

[587] DOE Interconnection Innovation e-Xchange (i2X), https://www.energy.gov/eere/i2x/interconnection-innovation-e-xchange and Abboud, A. W., Gentle, J. P., Bukowski, E. E., Culler, M. J., Meng, J. P., & Morash, S. (2022). A Guide to Case Studies of Grid Enhancing Technologies (No. INL/MIS-22-69711-Rev000). Idaho National Laboratory (INL), Idaho Falls, ID (United States). https://inl.gov/content/uploads/2023/03/A-Guide-to-Case-Studies-for-Grid-Enhancing-Technologies.pdf

[588] DOE, Grid Deployment Office, Grid Resilience and Innovation Partnerships (GRIP) Program, https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program

[589] AEP Raises Transmission Capacity https://www.tdworld.com/overhead-transmission/article/20963095/aep-raises-transmission-capacity

[590] American Electric Power – Energized Reconductoring Project in the Lower Rio Grande Valley https://www.quantaenergized.com/project/574

[591]Federal Energy Regulatory Commission, Managing Transmission Line Ratings, Docket No. RM20-16-000; Order No. 881 (December 16, 2021), https://www.ferc.gov/media/e-1-rm20-16-000. , and Federal Energy Regulatory Commission, Staff Presentation Final Order Regarding Managing Transmission Line Ratings FERC Order 881 (December 16, 2021), https://www.ferc.gov/news-events/news/staff-presentation-final-order-regarding-managing-transmission-line-ratings.

as Storage As Transmission Asset (SATA),[592] can help to reduce transmission line congestion, have smaller footprints, have shorter development, permitting, and construction times, and can be added incrementally, as required. Examples of SATA projects include the ERCOT Presidio Project,[593] a 4 MW battery system that improves power quality and reducing momentary outages due to voltage fluctuations, the APS Punkin Center,[594] a 2 MW, 8 MWh battery system deployed in place of upgrading 20 miles of transmission and distribution lines, the National Grid Nantucket Project,[595] a 6 MW, 48 MWh battery system installed on Nantucket Island, MA, as a contingency to undersea electric supply cables, and the Oakland Clean Energy Initiative Projects, a 43.25 MW, 173 MWh energy storage project to replace fossil generation in the Bay area. [596],

FERC has issued various orders to address interconnection queue backlogs, improve certainty, and prevent undue discrimination for new technologies.[597,598] FERC Order 2023, for example, requires grid operators to adopt certain interconnection practices with the goal of reducing interconnection delays. These practices include a first-ready, first-served interconnection process that requires new generators to demonstrate commercial readiness to proceed, and a cluster study interconnection process that studies many new generators together.[599]

Through such efforts, the interconnection queues can be reduced in length, transmission capacity on existing transmission lines can be increased, additional generation assets can be brought online, and electricity generated by existing assets will be curtailed less often. These factors help to improve overall grid reliability.

EPA Summary and Response: DER

Summary:

Commenters (AFPM, Clean Fuels Development, NRECA) shared concern that removing dispatchable energy too quickly from our power generation arsenal, while adding distributed energy resources (DER), will lead to shortfalls and reliability concerns when DER like solar and wind are not able to generate sufficient power. These commenters maintained that the agency's proposed rule under CAA section 111 addressing CO2 emissions from Electricity Generating

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[592]Nguyen, T. A., & Byrne, R. H. (2020). Evaluation of Energy Storage As A Transmission Asset (No. SAND2020-9928C). Sandia National Lab.(SNL-NM), Albuquerque, NM (United States). https://www.osti.gov/servlets/purl/1821846

[593] Presidio NAS® Battery Project Facts at a Glance http://www.ettexas.com/Content/documents/NaSBatteryOverview.pdf.

[594] APS Integrated Resource Plan IRP 2023 https://www.aps.com/-/media/APS/APSCOM-PDFs/About/Our-Company/Doing-business-with-us/Resource-Planning-and-Management/APS_IRP_2023_PUBLIC.ashx?la=en&hash=B0B8ED59F4698FE246386F3CD118DEC8.

[595] Balducci, P. J., Alam, M. J. E., McDermott, T. E., Fotedar, V., Ma, X., Wu, D., ... & Ganguli, S. (2019). Nantucket island energy storage system assessment (No. PNNL-28941). Pacific Northwest National Lab. (PNNL), Richland, WA (United States), https://energystorage.pnnl.gov/pdf/PNNL-28941.pdf.

[596] PG&E Proposes Two Energy Storage Projects for Oakland Clean Energy Initiative to CPUC https://www.pgecurrents.com/articles/2799-pg-e-proposes-two-energy-storage-projects-oakland-clean-energy-initiative-cpuc

[597] Federal Energy Regulatory Commission, Improvements to Generator Interconnection Procedures and Agreements, Docket No. RM22-14-000; Order No. 2023 (July 28, 2023), https://www.ferc.gov/media/e-1-order-2023-rm22-14-000.

[598] Staff Presentation | Improvements to Generator Interconnection Procedures and Agreements https://www.ferc.gov/news-events/news/staff-presentation-improvements-generator-interconnection-procedures-and.

[599] See generally FERC Order 2023, 184 FERC 61,054 (July 28, 2023) (Docket No. RM22-14-000).

Units would reduce supply due to intermittent power provided by renewables, while the vehicle electrification rules would at the same time increase grid demand. (e.g., Arizona State Legislature, AFPM.) Other commenters welcomed distributed energy resources, shared ways that they add grid reliability, and added ways to leverage their strengths and mitigate their weaknesses. As noted above, for example, MFN explained how demand from vehicle electrification could smooth out a "negative valley" potentially posed by storage issues associated with increased use of renewable sources. Energy Innovation noted that a grid powered by increased use of renewables can readily accommodate demand posed by vehicle electrification.

Response:

We respond to comments about the cumulative impacts of the 111 proposed rule and this rule in our prior response. Here, we focus on DER. DER utilization has the potential to provide clean sustainable power. They can be positioned throughout the grid, helping to reduce power transmission across the grid. The decreased power transmission drives reduced power loss as well as minimizes cost of the transmission hardware. EPA understands that DER cannot always generate power at the same time that it is required. Mitigating actions like stationary batteries and temporal electricity rates will help to leverage DER and increase grid resilience. In addition, dispatchable power may be reduced but we do not expect it to be eliminated. As demand vs power available is managed, the life of some existing dispatchable energy could be extended while other appropriate dispatchable power may be added. DER, when combined with stationary batteries, can help optimize existing grid infrastructure. The stationary battery is able to absorb power when supplied by the DER and then deliver the energy when required by the HD BEV, greatly reducing demand placed on the grid. The stationary battery is critical to optimize capture of the DER output (as the HD BEV is not always charging) and providing power to the BEV as the DER is not always providing output. EPA's analysis of potential impacts on grid (both generation and distribution) is conservative in that it does not consider future DER. That is, we find that the additional generation and distribution associated with this rule can be met even if no additional DER are deployed. The potential for DER deployment is an additional strategy for supporting the charging infrastructure associated with this rule. Future sources of electricity generation, including DER from renewables, are reflected in the EGU emission factors calculated from IPM runs but those DER are not modeled in the TEIS to reduce distribution build out. See RIA section 4.2.4.2.

7.2 Resilience

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

Grid reliability

In the Proposal, EPA states that BEV trucks will have a negligible impact on the nation's electrical grid.20 Unfortunately, it cannot be assumed that the U.S. grid will always be reliable. There is growing evidence that fleet owners may be less likely to purchase BEVs without improved grid reliability.21

- The average annual number of weather-related power outages increased by roughly 78% during 2011-2021, compared to 2000-2010.
- From 2000-2021, there were 1,542 weather-related power outages, an average of four per day.
- The states with the most reported weather-related power outages were the heavy trucking corridors of Texas, Michigan, California, North Carolina, and Pennsylvania.22 [EPA-HQ-OAR-2022-0985-1571-A1, p. 8]

  20 Federal Register / Vol. 88, No. 81 / Thursday, April 27, 2023 / at 25983

  21 Rocky Mountain Institute: Preventing Electric Truck Gridlock - Meeting the Urgent Need for a Stronger Grid https://rmi.org/insight/preventing-electric-truck-gridlock/

  22 https://www.climatecentral.org/climate-matters/surging-weather-related-power-outages

[EPA-HQ-OAR-2022-0985-1571-A1, p. 8]

Organization: Missouri Farm Bureau (MOFB)

Further, MOFB is greatly concerned that the proposed rule contains zero language regarding what impact it will have on the severely aged and inadequate electric grid. In 2020, the U.S. experienced 180 major electrical disruptions, up from fewer than two dozen in 2000.9 In this proposed rule, EPA fails to illustrate how electricity will actually be delivered to thousands of new charging stations that will be built in the near future, and what impact this action will have upon every other aspect of our lives, much of which relies on the constant delivery of electricity. [EPA-HQ-OAR-2022-0985-1584-A1, p. 2]

9 America’s Power Grid Is Increasingly Unreliable - WSJ, accessed June 14, 2023.

In addition, but not separable from this conversation, MOFB is especially concerned with the future buildout of electric transmission lines that will be needed to carry the proposed rule’s mandates into fruition. Unfortunately, and all too often, farmers and ranchers hear others say that their land is needed for the ‘public’s benefit.’ Government agencies and renewable energy advocates often forget that farmers and ranchers are part of the ‘public’ as well, and need to be fairly compensated for the continued buildout of transmission lines through their private property which will take away the critical farm and ranch land necessary to run their businesses for generations to come. [EPA-HQ-OAR-2022-0985-1584-A1, p. 3]

Organization: Transfer Flow, Inc.

Even the Federal Energy Regulatory Commission (FERC) has warned that a rapid transition to electric vehicles would be devastating to the country’s electric grid reliability.18’19 [EPA-HQ-OAR-2022-0985-1534-A1, p. 4]

18 https://robertbryce.substack.com/p/epa-v-the-grid?utm_source=substack&utm_medium=email

19 https://www.washingtonexaminer.com/policy/energy-environment/ev-push-threatens-to-strain-power-grids-and-threaten-reliability

Organization: Truck Renting and Leasing Association (TRALA)

The Federal Energy Regulatory Commission (FERC) expressed great concern for the state of the nation's energy infrastructure, and vulnerabilities to cybersecurity attacks, physical threats, and extreme weather. In May 2023, during a congressional hearing, FERC Chairman Philips informed the Senate Committee on Energy and Natural Resources, 'We face unprecedented challenges to the reliability of our nation's electric system,' and that, 'Our country urgently needs more energy infrastructure of all kinds.'4 Exacerbating pressure to our energy grid, power production from previously reliable electric generation sources has diminished. [EPA-HQ-OAR-2022-0985-1577-A1, p. 4]

4 Full Committee Hearing to Conduct Oversight of FERC: Hearing before the Senate Committee on Energy and Natural Resources, 118th Cong. (2023) (testimony of Willie L. Phillips).

Power Outages Have Potential to Significantly Impact Goods Movement

States, particularly in the western U.S., are repeatedly learning what happens during brownout or blackout periods. The truck renting and leasing industry relies on critical components to provide services, vehicles, and energy sources – one missing element results in lost revenue, disruptions to the supply chain, and essential products not being delivered throughout the economy. [EPA-HQ-OAR-2022-0985-1577-A1, p. 7]

Monitoring electric power generation and transmission are critical and difficult in the short and long-term, let alone over a decade out and beyond under Phase 3. The North American Electric Reliability Corporation (NERC) closely monitors and forecasts the nation's power needs. NERC is predicting two-thirds of North America could face elevated risks of blackouts during extreme weather this summer alone. 11 (See Figure 2). [EPA-HQ-OAR-2022-0985-1577-A1, p. 7] [Refer to Figure 2 on p. 7 of docket number EPA-HQ-OAR-2022-0985-1577-A1]

11 2023 Summer Reliability Assessment, North American Electric Reliability Corporation (May 2023).

NERCs attributes geographical grid strain to a variety of factors including increased peak demands; planned nuclear refurbishment outages; wildfire risks to transmission networks; shortages of distribution transformers; new environmental rules restricting power plant emissions for coal-fired generators in 23 states; hurricanes and extreme storms; supply chain issues presenting maintenance and summer preparedness challenges and delays in some new resource additions; and unseasonable temperatures coinciding with generator unavailability to just name a few.12 [EPA-HQ-OAR-2022-0985-1577-A1, p. 8]

12 Id.

Power outages can create obvious concerns for anyone who owns, rents, or leases a ZEV. Generators can supply back-up power but for a fleet accustomed to Direct Current (DC) fast-charging, generators will need to be substantially sized and will come at a steep price. Back-up energy storage has its limitations as well given its temporary energy banking capabilities. Unfortunately, electricity availability challenges create on-going questions and hesitation for an industry being mandated to rely almost exclusively on a new energy source to move the nation's freight consistently and reliably. Meanwhile, grid reliability risk is exacerbated by a rule that also forces ZEV technology on vocational vehicle applications that are required to build and maintain critical infrastructure. Converting all vehicle applications at once to BEVs compounds risk factors that could make overall implementation more problematic. [EPA-HQ-OAR-2022-0985-1577-A1, p. 8]

EPA Summary and Response

Summary:

The electricity grid must be reliable in that it performs consistently well due to adequacy of generation and transmission as covered in 7.1. The grid must also be reliable in that the existing infrastructure (generation, transmission, distribution) keeps working during extreme weather events (snow/ice storms, hurricanes, other high wind speed events, wildfires). The grid reliability received a range of comments. Many of these comments deal with extreme weather, it's impact on the grid, and its possible impact on HDBEV users. Some comments turn the tables and speak to the possible benefits of using BEV to back up the grid in times of challenge. Power outage frequency, level, and the impact to critical areas has been increasing per comments by AVE and MFB. ASL points out the peak number of power outages in 2020. AFPM and TRALA comment that fleets must keep operating to generate income but that power outages could keep fleets from operating for days at a time and cause those fleets significant cost. AFPM suggests that fleets will require expensive back up power systems consisting of generators and/or stationary batteries. CFDC comments cover NERC statements from their Long-Term Risk Assessment and from a NERC paper, Electric Vehicle Dynamic Charging Performance explaining how grid disturbances, combined with BEV charging could have catastrophic consequences. Similarly, the Arizona State legislature cited a Summer 2023 Reliability Study of the North American Electric Reliability Corp. which described grid reliability issues already being experienced in various regions of the country largely due to extreme weather. Transfer Flow and ASL comment that FERC warns of a rapid transition being devasting to the grid and that the US is heading for a reliability crisis and resource adequacy crisis. AmFree shared concerns that HD BEV power needs could shorten the life of transformers. Other comments (AEU, EC, ESC, EDF, MFN) promote HD BEV as a way to support the grid during times of shortfall or shutdown via load management or by using V2G. Energy Strategy Coalition (ESC) gave examples of investments in charging infrastructure driven by the grid reliability benefits. They also shared trials being conducted regarding both load management and V2G technologies. EDF and MFN promote the value in using school buses for grid reliability fromV2G and provides information on pilot programs in process. These comments promote HD BEV as assisting with peak power, back up power, or simply freeing up power with charging flexibility.

Response:

Available data suggests risk to grid reliability due to extreme weather events is increasing (the greater frequency and severity of extreme weather events being a predicted consequence of climate change, see 74 FR at 66497, 66498, 66524-25 (endangerment finding for section 202(a), the endangerment to which GHG emissions from HDVs contribute and which the Phase 3 rule addresses). As TRALA and others state, there will be times when grid infrastructure is damaged, and HD BEV cannot get the power they need to recharge. While this is a small part of any given calendar year, fleets should be aware of this risk when making vehicle choices. Power outages in the U.S. are infrequent, occurring about 1.4 times per customer annually and typically lasting between 2-5 hours (EIA, Average duration of total annual electric power interruptions, United States (2013-2020) 2023). The effect of power outages on electric vehicle owners is expected to be similar to that of non-electric vehicle drivers. Neither driver will be able to "fuel" during power outages, as gasoline pumps are electric powered. However, electric vehicles can provide their owners with residential power for a limited time. Moreover, electric vehicle chargers that are attached to distributed energy resources, such as homes or businesses with solar and/or stationary battery storage, would be unaffected by power outages and, thereby, can continue to provide charge for electric vehicles via its independent capacity. In fact, electric vehicles could be used to power gasoline pumps during electric power outages. Given that the physical extent of typical power outages tends to be relatively small, electric vehicle drivers, as well as conventional vehicle drivers, can be expected to drive out of the outage area and to unaffected charging or refueling stations, should it become necessary. EPA does not add the cost of backup power systems (batteries or generators) as suggested by AFPM. Backup power is a reliability opportunity for fleet owners but is not required. Stationary batteries also provide the opportunity to optimize charging costs by slowly drawing power from the grid during the best rates and then charging trucks quickly. The cost / benefit analysis for backup power is best left to individual fleets. Fleets should also consider that many severe weather events also block roads that would affect the operation of vehicles generally, and they also shut down gas and diesel stations or disrupt other petroleum or renewable fuel distribution infrastructure that would particularly affect vehicles with ICE. Note that EPA also does not model these costs either, including the additional costs to fleets with ICE (but not BEVs) associated with disruptions in liquid fuel distribution infrastructure. Fleet owners may even benefit by having emergency electrical power available from their HD BEV when the grid has been damaged. EPA is not mandating HD BEV, and its modeled compliance pathway posits a majority of ICE vehicles in the fleet even in 2032, so fleets that see electricity reliability as insufficient will be free to stay with other propulsion systems or purchase back up power systems.

AmFree shares concern that integration of HD BEV could drive shortened life of transformers. The article they cite makes use of a previous article ("Impacts of plug-in hybrid electric vehicles on a residential transformer using stochastic and empirical analysis" (Razeghi, 2014)[600]) for this statement. Although the source article is for residential PEV, their highlights apply to any properly designed electricity distribution system and support our case for HD BEV adoption: Catastrophic failure of distribution transformers due to ZEV charging is unlikely, Off-peak charging results in prolonged transformer life, ZEV demand is manageable for transformers even if multiple vehicles exist.

There is also a general comment going to issues of overall grid reliability and not to the relevant question of whether demand posed by the Phase 3 rule could pose an issue to grid reliability and resilience. As we explained in RTC section 7.1 and earlier section, we can reasonably show that no such adverse impacts will occur. With respect to the general issues raised in the comment, CFDC brings up the challenge that is imposed by severe heat or cold ambient temperatures hitting a portion of the country. The NERC report it cites speaks to long term reliability of the generation and transmission systems with respect to handling unusually high loads occasioned by extreme weather events by supplying all of the energy demanded. Concerns raised by the report show that NERC is raising awareness such that timely actions can

[600] Razeghi, Ghazal. "Impacts of plug-in hybrid electric vehicles on a residential transformer using stochastic and empirical analysis". Highlights in April 15, 2014; https://www.sciencedirect.com/science/article/pii/S0378775313019320

be aligned. EPA applauds NERCS executive summary[601] that states, "Reliably integrating inverter-based resources (IBR), which include most solar and wind generation, onto the grid is paramount. Over 70% of the new generation in development for connecting to the BPS over the next 10 years is solar, wind, and hybrid (a generating source combined with a battery)." That executive summary further states, "As new resources are introduced and older traditional generators retire, careful attention must be paid to power system and resource mix reliability attributes. Within the 10-year horizon, over 88 GW of generating capacity is confirmed for retirement through regional transmission planning and integrated processes. Effective regional transmission and integrated resource planning processes are the key to managing the retirement of older nuclear, coal-fired, and natural gas generators in a manner that prevents energy risks or the loss of necessary sources of system inertia and frequency stabilization that are essential for a reliable grid." NERC's strategy is properly aligned with EPA's IPM modeling that, as described in section 7.1, recognizes these EGU changes. With these changes the electricity generation will continue to not only align with needs but have the proper resource adequacy for events such as extreme temperatures.

CFDC also comments on NERC's paper on dynamic charging performance[602]. They are correct that the paper explains how, if left unchecked, infrequent bulk power system disturbances could interact with charging EVs (with future expected significant increase in EV charging loads) and cause blackouts or power interruptions. The paper shows that NERC and the Western Electricity Coordinating Council (WECC) supports and has a MOU with the California Mobility Center (CMC) and their EV Grid Reliability Working Group. CFDC comments also fail to share that DOE and the national labs provided help with dynamic load modeling back in 2010 when this issue, fault-induced delayed voltage recovery (FIDVR), was dealt with successfully in relation to loads from residential air conditioners. The paper provides multiple actions to prevent this EV charging scenario from occuring. It shows that EVSE that behave in a grid friendly manner exist today suggesting that modest changes will allow all EVSE to respond as needed.

Commenter Transfer Flow states that "[e]ven the Federal Energy Regulatory Commission (FERC) has warned that a rapid transition to electric vehicles would be devastating to the country's electric grid reliability." They cite as support a blog by Robert Bruce, and a newspaper article from the Washington Examiner which proved to be inaccessible. In fact, it is clear from the cited blog that the testimony of several FERC Commissioners before the Senate Environment and Public Works Committee did not mention electrification of the transportation sector (or mention any EPA rule), but rather dealt with challenges facing the grid generally. As explained in RTC section 7.1 above, the Phase 3 rule is not associated with demands on the grid that would cause significant adverse impacts to grid reliability, in the view (and analysis) not only of EPA but of trade associations representing major segments of the electric utility industry. EPA consequently views this comment as a mischaracterization.

Commenter Missouri Farm Bureau notes that farmers and other landowners should be compensated should additional transmission lines be needed which require installation on private property. EPA is projecting minimal (about 1%) need for additional transmission capacity that

[601] NERC. 2022 Long Term Reliability Assessment. December 2022.
https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf
[602] NERC. Electric Vehicle Dynamic Charging Performance Characteristics during Bulk Power System Disturbances. https://www.nerc.com/comm/RSTC/Documents/Grid_Friendly_EV_Charging_Recommendations.pdf

will use existing right of ways as a result of the Phase 3 rule as explained earlier. Review of energy pricing modeling (IPM conducted by ICF) with the increased loads shows no cost increase due to transmission congestion. The stable prices are a clear indicator that transmission is adequate. In addition, as the grid develops and DER are added, many DER will be logically situated closer to demand and decrease transmission stress. Additional DER with location optimization can help minimize buildout of electricity transmission and distribution but this scenario was not applied in the TEIS.

8 Hydrogen Infrastructure

8.1 Hydrogen Infrastructure Readiness and Lead Time

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

Hydrogen infrastructure

According to the Department of Energy (DOE), only 59 hydrogen fueling stations operate across the U.S. and there are approximately 50 stations under construction. DOE is bringing together federal agencies, automakers, hydrogen providers, fuel cell developers, and additional stakeholders to support the growth of hydrogen as a transportation option. [EPA-HQ-OAR-2022-0985-1571-A1, p. 8]

Bringing significant numbers of hydrogen trucks into production will incentivize the building of more hydrogen stations. By removing any CO2 penalty on hydrogen engine trucks, EPA can help lead the way to developing the necessary infrastructure. [EPA-HQ-OAR-2022-0985-1571-A1, p. 8]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Hydrogen Refueling Stations. Although much of the available data focuses on charging infrastructure for battery-electric vehicles, the state of hydrogen refueling is even worse. According to EPA, every step of this supply chain is underdeveloped. Clean hydrogen production is at "nearly zero today," Draft RIA at 82, and even accounting for tax incentives and federal funding, the Department of Energy predicts that clean hydrogen will only be "emerging" for heavy-duty vehicles during the timeframe of the proposed rule, id. at 83. There are also no large-scale pipelines for distribution, which means that hydrogen will have to be delivered from central production facilities by truck until at least 2031. Id. at 84. And the number of public refueling stations will have to increase many times over to make the use of fuel-cell vehicles possible—let alone preferred— for the fleet owners expected to adopt this technology. See id. at 85 ("[W]e considered FCEVs in the technology packages for select applications that travel longer distances and/or carry heavier loads[,] . . . includ[ing] coach buses, heavy-haul tractors, sleeper cab tractors, and some day cab tractors."). Currently, there are only 58 public hydrogen refueling stations in the entire country, 57 of them are in California, and most are designed for light-duty vehicles. See Alternative Fueling Station Counts – Public; 88 Fed. Reg. at 25,999 (noting that the existing public stations are "primarily for light-duty vehicles").6 [EPA-HQ-OAR-2022-0985-1660-A1, p. 47]

6 There are also 16 private en-route stations. See Dep't of Energy, Alternative Fuels Data Ctr., Alternative Fueling Station Counts by State (Private), https://tinyurl.com/4xc8jfcs (last accessed June 14, 2023). These are not generally accessible to the public.

And this ignores many of the upstream problems with hydrogen. While the feedstock for hydrogen is abundant, it takes a huge amount of energy to produce. Using electricity to generate hydrogen loses about a third of the power input as compared to transmitting it into the grid. There are further losses when hydrogen is consumed by the fuel cells. Even if hydrogen is readily available, there are still problems to solve because of hydrogen's propensity for embrittling metal. Because of embrittlement, existing infrastructure is incapable of handling hydrogen and that problem with continue to plague new infrastructure, exacerbating the safety issues discussed below. American Institute of Physics, Hydrogen Embrittlement Creates Complications for Clean Energy Storage, Transportation, ScienceDaily (Oct. 6, 2020), www.sciencedaily.com/releases/2020/10/201006114309.htm. And even if the hydrogen is safely onboard, hydrogen suffers from some of the same energy density problems that plague electric batteries. Hydrogen itself is very light, but compressing or liquifying hydrogen requires very high-pressure tanks, which weigh far more than the hydrogen they contain. Jody Muelaner, Comparing EV Battery and Fuel Cell Energy Density, Battery Power Tips (Nov. 18, 2021), https://www.batterypowertips.com/comparing-ev-battery-and-fuel-cell-energy-density-faq/. After accounting the tank, the gravimetric energy density of hydrogen is much lower than diesel, making liquid fuels a better fit for heavy-duty vehicles. Id. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 47 - 48]

Despite the extraordinary challenges that lie ahead for hydrogen refueling, EPA provides little by way of solutions. The agency notes that there are tax incentives and federal funding designed to increase the production and distribution of clean hydrogen, but it identifies only one tax credit—the "Alternative Fuel Refueling Property Credit"—aimed at increasing the number hydrogen refueling stations. Draft RIA at 19–20, 85. As discussed above, that tax credit is limited to infrastructure in low-income or non-urban area census tracts and is capped at $100,000—a small fraction of the amount needed to construct a public station, which is estimated to cost between $9 and $45.5 million. Id. at 19–20, 86. Moreover, EPA does not identify any current private investment plans in the refueling industry other than noting that the West Coast Collaborative's Alternative Fuel Infrastructure Corridor Coalition is "actively considering buildout of a network for medium- and heavy-duty vehicles throughout the western states" and has received 153 project proposals for hydrogen stations. Id. at 86. Under these circumstances, emissions standards premised on the adoption of fuel-cell vehicles as soon as 2030 are not feasible. [EPA-HQ-OAR-2022-0985-1660-A1, p. 48]

Organization: American Trucking Associations (ATA)

Hydrogen refueling

EPA assumes that hydrogen fuel technology will become the predominant technology of choice for line-haul fleets by 2030 when long-haul tractor percentage sales requirements begin. EPA's cost analysis relies on the availability of hydrogen fuel stations and low-cost green hydrogen. Today, there are 57 hydrogen refueling stations in the United States, almost all of them in California. To support hydrogen-fuel adoption in line-haul tractors, stations must be built on interstate freight corridors. [EPA-HQ-OAR-2022-0985-1535-A1, p. 19]

Organization: BorgWarner Inc.

BorgWarner appreciates the Administration's support for EV charging and hydrogen infrastructure.

BorgWarner applauds the Administration's support for EV charging and hydrogen infrastructure. More infrastructure support is needed, however, for the HD, MD, and other commercial vehicles to help these segment's shift to an electrified and hydrogen-powered future. We urge federal agencies to align resources and goals to leverage the shared endeavors to decarbonize the transportation sector. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4.]

A key factor for expanding infrastructure is private sector charging support. Fleet owners will need to not only bear higher costs for new ZEV vehicles, but also the charging and refueling equipment as well. More support for these commercial facilities is crucial. Many products are available to help fleet owners navigate this transition and we hope more federal and state incentives will be forthcoming. BorgWarner is currently working with customers to install needed charging stations. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4.]

Organization: California Air Resources Board (CARB)

The NPRM requests comments on lead time considerations related to the development of HD hydrogen fueling infrastructure. Based on the CEC's experience, LD hydrogen refueling stations on average take around two years to build. Post-pandemic, construction times have slowed, and costs have increased, although this may be temporary. For MD/HD refueling stations, refueling station construction times seem similar. For example, the CEC's Center for Transportation and the Environment drayage project constructed a hydrogen station near the Port of Oakland, capable of fueling 30 class 8 trucks. The project was approved in July 2021 and is expected to be commissioned in September 2023. This timeline includes time lost to some permitting challenges. A number of entities are developing and offering rapid deployment mobile or transportable hydrogen dispensing solutions that can lessen the site preparation and permitting challenges in some cases or provide a bridge during the construction of permanent hydrogen stations.177,178,179,180 Even with those challenges, U.S. EPA's proposal provides adequate lead time, including for its more stringent alternative standards. [EPA-HQ-OAR-2022-0985-1591-A1, pp.48-49]

177 Nikola highlights its integrated hydrogen solution and introduces new hydrogen energy brand "HYLA," January 25, 2023. https://www.prnewswire.com/news-releases/nikola-highlights-its-integrated-hydrogen-solution-andintroduces-new-hydrogen-energy-brand-hyla-301731030.html

178 Hydrogen Fuel News: FirstElement Fuel's H2 refueling stations support Hyundai Motor's fuel cell truck pilot program, March 16, 2023. https://www.hydrogenfuelnews.com/h2-refueling-firstelement--hyundai/8557730/

179 Portable Hydrogen Fueler, last accessed June 13, 2023. https://www.airproducts.com/services/portable-hydrogen-fueler

180 Nikola Motor: Chart Industries and Nikola Execute Strategic Partnership for Hydrogen-Related Equipment, March 30, 2023. https://www.nikolamotor.com/press_releases/chart-industries-and-nikola-execute-strategic-partnershipfor-hydrogen-related-equipment/Organization: CALSTART

Phased approach: Building the next level of implementation detail into this strategy, the infrastructure needs assessment illustrates that infrastructure, while a near-term challenge, will not be the limiting factor on meeting steeper penetration rates. This is due to the unique phased and geographically targeted way infrastructure is most likely to deploy. Indeed, CALSTART's findings show the network benefits of this clustered and phased rollout, which matches ZE-MHDV penetration volumes with first-launch regions, will create charging network efficiencies in deployment volume and utilization that can support more ZE-MHDVs than EPA's approach assumes.37 [EPA-HQ-OAR-2022-0985-1656-A1, p. 18.]

37 Phasing In U.S. Charging Infrastructure, CALSTART, June 2023

The analysis considers that deployment will first occur where it makes sense, not everywhere.38 That is, priority areas will be a focus of most private investment in the near term, and prioritization will inform the coordination of several of the factors critical in reducing lead times for the installation of infrastructure, developing the grid, and making costs more predictable. [EPA-HQ-OAR-2022-0985-1656-A1, p. 18.]

38 https://nacfe.org/research/electric-trucks/#electric-trucks-where-they-make-sensehigh-poten..al-regions-for-electric-truck-deployments Organization: Clean Air Task Force et al.

c. EPA should more fully incorporate the extent to which BIL incentives will hasten the buildout of FCEV refueling infrastructure.

EPA should also consider the hydrogen hubs program currently being run by the Department of Energy and how it may accelerate the building of necessary hydrogen infrastructure, which could in turn expedite FCEV market growth. Hydrogen hubs are a key tool for demonstrating the full value chain of clean hydrogen, including production, connective infrastructure, and end-use in new off-taker markets, including HDVs. The BIL appropriates $8 billion for at least 4 regional clean hydrogen hubs, $1 billion for the Clean Hydrogen Electrolysis Program, and $500 million for the Clean Hydrogen Manufacturing Initiative. Furthermore, the National Alternative Fuel Corridors Program has $2.5 billion for charging alternative fuel infrastructure along major highways in the U.S., and the Port Infrastructure Development Program set aside $2.3 billion for port infrastructure, including hydrogen refueling infrastructure for drayage trucks and trains that service the port. Additionally, the Biden Administration recently published its final U.S. National Clean Hydrogen Strategy and Roadmap,295 which details plans to substantially increase U.S. hydrogen production. It outlines “pathways for clean hydrogen to decarbonize applications [that] are informed by demand scenarios for 2030, 2040, and 2050 with strategic opportunities for 10 million metric tons (MMT) of clean hydrogen annually by 2030, 20 MMT annually by 2040, and 50 MMT annually by 2050.”296 The DOE and other agencies are working with national laboratories and industry through a program called the 21st Century Truck Partnership to use hydrogen and medium and heavy-duty trucks and buses to reduce harmful emissions.297 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 67 - 68]

295 U.S. DOE, U.S. National Clean Hydrogen Strategy and Roadmap (2023), https://subscriber.politicopro.com/f/?id=00000188-8c84-db64-afd9-9fbd2ad70000&source=email.

296 Id. at 1.

297 Id. at 32.

In total, this $14.3 billion has led to an explosion of hydrogen activity, much of it centered around massive hubs that will be scattered across the country.298 Heavy-duty trucking will likely move between hubs, stopping in regions across the U.S. to refuel with clean hydrogen.299 Hubs will help to kick start the market, increasing the chance of realizing the cost reductions discussed previously, which in turn will help more quickly boost FCEV stocks in U.S. truck fleets. The synergy we expect to see between the hubs and the developing FCEV market is an additional reason EPA should consider FCEV technology as feasible before 2030, giving cause to further strengthen the proposed rule. [EPA-HQ-OAR-2022-0985-1640-A1, p. 68]

298 CATF, Hydrogen Hubs Map, https://www.catf.us/us-hydrogen-hubs-map/, (last visited June 6, 2023).

299 Anna Menke & Emily Kent, CATF, The outlook for U.S. hydrogen hubs: Who's applying and what they could achieve (Mar. 29, 2023), https://www.catf.us/2023/03/outlook-us-hydrogen-hubs/.

Organization: Daimler Truck North America LLC (DTNA)

EPA's assumptions about the timing for hydrogen-fueled vehicles to become cost-competitive are unreasonable.

Like EPA, DTNA believes that hydrogen-fueled vehicles, whether FCEV or hydrogen combustion technologies, will be the primary pathway for decarbonizing segments that are more challenging to electrify, including long-haul HHD applications where weight sensitivities or dwell times prohibit BEV adoption, and applications where electrical infrastructure is cost-prohibitive. However, EPA's assumption that FCEVs will be available in significant volumes starting in 2030128 is overly optimistic based on the current state of the technology and infrastructure. DTNA believes that FCEVs will not see significant market penetration until at least 2032. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58]

128 See Proposed Rule, 88 Fed. Reg. at 25,973 ('Though fuel cell technology is still emerging in HD vehicle applications, FCEVs are a viable ZEV technology for heavy-duty transportation and will be available in the 2030 timeframe.').

Relying on its assumptions regarding calculated payback periods and adoption rates, the Agency input into its HD TRUCS tool values that reflect significant FCEV uptake in 2032, with more than half of new Class 8 coach buses and regional day cab tractors indicated as FCEVs, as shown in Table 18 below. Even if EPA's assumptions of TCO and adoption rates turn out to be true (which is doubtful, as discussed in Sections II.B.3.a and II.B.3.b of these comments), EPA should incorporate an infrastructure scalar into the equation used to calculate the Phase 3 CO2 standards to reflect the current state of hydrogen infrastructure buildout, and it must regularly review the state of this infrastructure and adjust the scalar accordingly to ensure standard feasibility, as discussed in Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 58] [Refer to Table 18 on p. 59 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

DTNA is optimistic about the future of hydrogen refueling infrastructure. Hydrogen infrastructure can leverage some synergies from the nation's existing petroleum infrastructure and is not hindered by the process and policy hurdles that pose challenges for electric infrastructure development (as discussed in Sections I.B.4 and II.B.3.f of these comments). Because hydrogen producers are not subject to utility-style regulation, the scale and pace of capital investments for hydrogen infrastructure serving the transportation sector will be largely driven by the free market and business cases, making for potentially more flexible and faster development as compared to the electricity utility sector. [EPA-HQ-OAR-2022-0985-1555-A1, p. 59]

In addition, as EPA notes in the Proposed Rule, DOE is supporting the development of at least four clean hydrogen hubs through 2026 and there are numerous corridor-pending AFCs, where public hydrogen stations will be separated by no more than 100 miles.130 According to DOE's Alternative Fuels Locator, however, as of May 2023 there are only two areas of the country with 'ready corridor' designations for hydrogen, extending from the San Francisco Bay Area along I-80 toward Reno, Nevada, and in Southern California from Santa Barbara to San Diego, reflected in Figure 8 below.131 These corridor designations note only distances between stations, and do not indicate whether or not these stations would be accessible to all types of

HDVs. It is also likely that as FCEV technology develops, current gaseous hydrogen stations may need to undergo a conversion to liquid hydrogen to serve medium- and heavy-duty applications. [EPA-HQ-OAR-2022-0985-1555-A1, p. 59] [Refer to Figure 8 on p. 60 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

130 See Proposed Rule, 88 Fed. Reg. at 25,944; 25,999.

131 See DOE, Alternative Fuels Data Center,'Alternative Fueling Station Locator,' https://afdc.energy.gov/stations/#/corridors?fuel=HY&state=CA.

Hydrogen infrastructure in the United States is currently insufficient to enable the FCEV volumes that EPA projects in the 2030 - 2032 timeframe. 55% of new day cab tractors, 25% of new sleeper cab tractors, and 15% of new heavy haul day cabs clearly cannot be constrained to operating around the California corridors and four hydrogen hub locations pictured above. Such a constraint would have significant consequences for fleet operations and goods movement. Further, the pace of infrastructure development outside of these corridors and hubs cannot be accurately predicted. [EPA-HQ-OAR-2022-0985-1555-A1, p. 60]

EPA Request for Comment, Request #19: We request comment on our approach that focuses primarily on BEVs, which currently are more prevalent in the HD vehicle market, and whether there are additional vehicle types that should be evaluated as FCEVs along with BEVs.

- DTNA Response: DTNA agrees in principle with EPA's primary focus on BEVs at this time, as these vehicles are more prevalent in the market. EPA should not consider FCEVs until at least MY 2032, due to the current state of the technology and refueling infrastructure. EPA also should not project ZEV uptake for any vehicle types outside of the BEV and FCEV categories included in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #60: We request comment on lead time considerations related to the development of HD hydrogen fueling infrastructure.

- DTNA Response: According to the DOE's Alternative Fuels Data Center, there are currently very few 'Ready Corridor' designations for hydrogen fueling stations (meaning that there are enough stations on the corridor to support travel with a minimum distance of 150 miles between hydrogen stations). The designated 'Ready Corridors' that do exist are located in California, and it is unclear whether stations at these locations are accessible to all types of HDVs. There is currently no data to accurately predict the pace of hydrogen infrastructure expansion, but it is unlikely that significant infrastructure to enable regional and long haul applications will be built out by 2030, when EPA projects that the fuel is first expected to be cost-competitive, as discussed in Section II.B.3 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 170]

EPA Request for Comment, Request #61: EPA requests comment on what, if any, additional information and data EPA should consider collecting and monitoring during the implementation of the Phase 3 standards; we also request comment on whether there are additional stakeholders EPA should work with during implementation of the Phase 3 standards and what measures EPA should include to help ensure success of the Phase 3 program, including with respect to the important issues of refueling and charging infrastructure for ZEVs.

- DTNA Response: See DTNA Response to Request # 60, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 170]

Organization: Energy Innovation

IV. THE COMBINED IMPACT OF FEDERAL, STATE, AND PRIVATE INVESTMENTS ON INFRASTRUCTURE DEPLOYMENT WILL HELP MEET THE NEEDS OF AN INCREASINGLY ELECTRIFIED HDV FLEET OVER THE NEXT DECADE.

The EPA notes that "[u]ncertainty about ZEV technology, charging infrastructure technology and availability for BEVs, or hydrogen refueling infrastructure for FCEVs, may affect ZEV adoption rates. As ZEVs become increasingly more affordable and ubiquitous, we expect uncertainty related to these technologies will diminish over time."42 We concur with this assessment and recognize that vehicle adoption must occur apace with infrastructure deployment. [EPA-HQ-OAR-2022-0985-1604-A1, p. 19]

Organization: MEMA

Infrastructure Success is Critical

While MEMA urges EPA to consider other propulsion systems, we believe it is imperative to address infrastructure challenges that will limit the success of a zero-emission vehicle fleet. [EPA-HQ-OAR-2022-0985-1570-A1, p. 8.]

We note the timelines forecasted by the U.S. DOE for deployment of nationwide hydrogen production, distribution and delivery are several years, almost a decade, behind the EPA estimates for production of vehicles fueled by hydrogen (H2ICE or FCEV). The recently released DOE paper titled "U.S. National Clean Hydrogen Strategy and Roadmap"6 shows, in its generation and distribution studies, significant gaps in regional production and availability of hydrogen through 2050. While it may be possible for national production of clean hydrogen to reach the 50 million metric ton (MMT) capability noted in the paper, we call attention to figures 7, 8(a), 8(b) and 23, which show an infrastructure yet to emerge, and one that as forecasted is not likely able to support HD trucking effectively. Furthermore, the timelines for growth of hydrogen generation and distribution, pages 70-75, do NOT ALIGN with EPA forecast of vehicle production. We note this gap so that it may be addressed, and hydrogen-powered trucks manufactured using MEMA member technology will have the fuel they will need to deliver the service they are built for. Left unattended, the national hydrogen infrastructure could lag vehicle production by almost a decade. In practical terms, such mismatch will result in loss of consumer confidence and low- to no-sales of hydrogen fueled trucks, leading to few financially and technologically feasible options for fleets obliged to upgrade or replace existing diesel trucks. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 8 - 9]

6 https://www.hydrogen.energy.gov/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf

Organization: National Association of Manufacturers

In addition to building out the transmission system to accommodate a substantial increase in electric vehicle usage, accompanying hydrogen fueling stations will need to be matched with hydrogen fuel cell vehicle rollout, which will be accelerated under this proposed rule. We cannot unlock the full market potential of zero emissions vehicles without the appropriate infrastructure. [EPA-HQ-OAR-2022-0985-1649-A2, p. 2]

Organization: PACCAR, Inc.

PACCAR is working diligently to develop ZEVs for the future, but the necessary supporting infrastructure must be in place before widespread ZEV market penetration and adoption. Planning, developing, and implementing the charging infrastructure required to support battery electric trucks is a major initiative. The hydrogen refueling infrastructure is also not well developed. EPA's proposed standards are premised on the infrastructure being established and functional. EPA should facilitate the feasibility of the regulation by including a mechanism to adjust the applicable standards to correlate with the progress of the necessary infrastructure development and readiness. [EPA-HQ-OAR-2022-0985-1607-A1, p. 2]

Organization: Schneider National Inc.

Hydrogen is assumed to become the sleeper technology solution.

- Schneider is currently testing hydrogen technology. However, the lack of existing hydrogen infrastructure and equipment will make implementing this technology challenging within the timeframe proposed by the EPA. As of today, there are approximately six (6) existing hydrogen fueling locations in the country (all in southern California). [EPA-HQ-OAR-2022-0985-1525-A1, p. 3]

Organization: South Coast Air Quality Management District (South Coast AQMD)

Finally, while most sites installing infrastructure are focused on their local needs (e.g., site installation, local utility distribution infrastructure, etc.), when implemented at scale, additional generation/production and transmission/transportation of electricity and hydrogen will be needed, in many cases across state lines. The federal government can continue to facilitate these interstate connections to ensure a streamlined market that will encourage the rapid growth of zero emissions vehicles. Key factors in the adoption of zero emissions vehicles is the actual price that end consumers will pay for electricity and hydrogen as well as a reliable supply of both, especially in comparison to conventional fossil fuels. The federal government can play a role in driving down the cost to consumers as well as ensuring stable and reliable fuel supplies to the extent that they cross state lines. [EPA-HQ-OAR-2022-0985-1575-A1, p. 4]

Organization: Truck and Engine Manufacturers Association (EMA)

- The envisioned level of deployment of ZEV trucks also will require the construction of approximately 700 hydrogen refueling stations across the country by 2032, at an aggregate cost of approximately $5.25 billion, not including any of the costs for the hydrogen manufacturing or distribution systems. As a point of reference, there are currently just six (6) operational MHD hydrogen refueling stations in California. [EPA-HQ-OAR-2022-2668-A1, p. 13]

5. The Critical Importance of Infrastructure Readiness

Even if the more reasonable outputs from EMA's HD TRUCS are used to frame the final Phase 3 standards, there is no doubt that the infrastructures to power the ZEVs must be in place for any Phase 3 rule to be implementable. For trucking fleets to operate BEVs or FCEVs, whether a few or many, adequate battery-recharging or hydrogen-refueling infrastructures will be needed to power the ZEVs. Without sufficient infrastructures in place in time to meet the needs of the ZEVs implicitly required by EPA's GHG Phase 3 regulation, the rule will be destined to fail. [EPA-HQ-OAR-2022-0985-2668-A1, p. 43]

The NPRM and HD TRUCS incorrectly assume that all commercial BEVs will be depot-charged at night, and that any commercial ZEVs that need to operate further from home will be FCEVs. The NPRM also assumes that trucking fleets will be able to devote up to 30% of each vehicle's cargo carrying capacity for batteries large enough to provide enough power for the vehicle's entire daily work. If a commercial vehicle cannot carry enough batteries to complete its daily work, or if it must travel too far from its home terminal, the NPRM assumes that a FCEV will be used instead of a BEV. Of course, those FCEVs will require an entirely separate infrastructure of hydrogen-refueling stations, which still needs to be designed and developed. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 45 - 46]

The hydrogen needed to fuel FCEVs (and hydrogen-fueled internal combustion engines, or H2-ICEs) may need to be a compressed gas (3,500 – 10,000 psi) or a cryogenic liquid (-423° F). As this time, it is not clear which type of hydrogen will be most cost-effective to produce, distribute and deliver to MHD ZEVs. Manufacturers are able to produce vehicles with either type of on-board storage tanks; the technology choice will be determined by fleet customers and the readiness of the infrastructures. Therefore, the necessary whole-of-government initiative also should: (i) determine what type of hydrogen infrastructure is needed, (ii) identify where the hydrogen-refueling stations will be needed, and (iii) ensure that the investments for the necessary hydrogen-refueling infrastructure will be in place in time (i.e., by 2030) to power the MHD FCEVs required by the GHG Phase 3 rule. [EPA-HQ-OAR-2022-0985-2668-A1, p. 46]

EPA has established as a foundational premise of the NPRM that the necessary battery-recharging and hydrogen-refueling infrastructures will be developed in time to meet the needs of the MHD ZEVs that the GHG Phase 3 rule will require manufactures to sell. However, there is a significant chance that EPA's key premise – what really amounts to little more than a stated aspiration – may prove fundamentally wrong, a prospect that would completely undermine this rulemaking. Accordingly, a massive and focused whole-of-government initiative must come together very quickly to ensure the development of the necessary ZEV-truck infrastructures in time. [EPA-HQ-OAR-2022-0985-2668-A1, p. 46]

The current lack of the much-needed whole-of-government initiative already may be chilling investments in the development of necessary battery-recharging and hydrogen-refueling infrastructures. Without clarity about whether long-distance commercial vehicles will be BEVs or FCEVs, investors may be hesitant to commit capital to develop the infrastructure for one of the technologies. For example, clarity is needed regarding whether the required public stations will deliver electricity or hydrogen. Without a long-term technology path identified, investors may be sitting on the sidelines. Similarly, if hydrogen will be part of the solution, clarity is needed to identify whether it will be a compressed gas or cryogenic liquid. Until that hydrogen infrastructure direction is clear, more investors may stay on the sidelines. [EPA-HQ-OAR-2022-0985-2668-A1, p. 46]

Truck manufacturers are doing their part by developing all of the potential ZEV technologies: BEVs, compressed hydrogen-fueled FCEVs, cryogenic hydrogen-fueled FCEVs, compressed hydrogen-fueled H2-ICEs, and cryogenic hydrogen-fueled H2-ICEs. However, without adequate assurances that the appropriate infrastructures will be in place in time, fleets simply will not purchase any of those types of ZEVs. Thus, developing the necessary infrastructures represents the most complicated, most expensive, and longest lead-time challenge to transition the U.S. trucking industry to ZEVs. Without an effective whole-of-government initiative focused on understanding, developing and ensuring those infrastructures, there may be little chance that the GHG Phase 3 rule will be successful. Consequently, clear links between the phase-in of the Phase 3 rule and the phase-in of the requisite infrastructure must be established, monitored, and acted on if misalignment among the respective phase-ins is detected. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 46 - 47]

In that regard, EMA recommends that EPA work with other agencies, departments and stakeholders to establish clear annual benchmarks for assessing progress in the deployment of the necessary ZEV-truck infrastructures. For example, using the data developed by ICCT, Ricardo, NREL and others, EPA could determine the top 100 counties across the country where the greatest numbers of ZEV-trucks will be deployed under the Phase 3 and ACT regulations by 2032. For each of those counties, benchmarking assessments could be made of the number of BEV-recharging and FCEV-refueling stations that will need to be installed on an annual basis to support the annually increasing deployment of the anticipated numbers of ZEV-trucks in each of those counties. Each year, evaluations could be made on a county-by-county basis to determine whether and how the actual pace of installation of ZEV-truck recharging/refueling stations is keeping up with the benchmark numbers of necessary recharging/refueling stations. If it is determined that the aggregate actual progress in infrastructure development is falling behind the benchmark rates of progress by, for example, 20% or more, the phase-in schedule of the Phase 3 standards could be deferred by one or more years as deemed appropriate by EPA, perhaps in consultation with other agencies and departments. [EPA-HQ-OAR-2022-0985-2668-A1, p. 47]

The foregoing is just an example of the type of direct linkage that needs to be made between the implementation of the Phase 3 rule and the implementation of the fundamentally necessary ZEV-truck infrastructure. Without that type of linkage, there is no real prospect for the proposed rule to stand. To the contrary, much like a one-legged stool, it will be preordained to collapse. [EPA-HQ-OAR-2022-0985-2668-A1, p. 47]

Organization: Truck Renting and Leasing Association (TRALA)

TRALA requests EPA conduct annual reviews to ascertain whether charging infrastructure, power demands, and hydrogen fuel (when/if available), will satisfy the needs for all ZEVs in every state to meet trucking’s charging and hydrogen needs. If the status of charging or hydrogen fueling infrastructure identifies significant gaps that would impede truck mobility in any state, EPA should not implement subsequent milestone year requirements until identified fueling gaps are operational in keeping pace with vehicle needs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 8]

Organization: Valero Energy Corporation

Major hydrogen production and distribution infrastructure would need to be put in place before FCEVs would even be serviceable. “[A]nalysis [also] suggests that the infrastructure for the hydrogen pathway is generally costlier than battery electric," with hydrogen transport facing "the largest cost-penalty in the near-term."113 It is estimated that the capital cost for a single hydrogen filling station is $1.5 to $2.0 million.114 Moreover, there are currently no hydrogen fuel cell tractor-trucks commercially available in North America or Europe to confirm their true cost or economic viability.115 [EPA-HQ-OAR-2022-0985-1566-A2, p. 25]

113 Hall, Dale and Lutsey, Nic, ICCT White Paper, "Estimating the Infrastructure Needs and Costs for the Launch of Zero-Emission Trucks" at 18 (August 2019). https://theicct.org/sites/default/files/publications/ICCT_EV_HDVs_Infrastructure_20190809.pdf

114 For stations built between 2015 and 2017 for 400-500 kg/day. California Hydrogen Business Council, "Hydrogen FAQs," https://californiahydrogen.org/resources/hydrogen-faq/#:~:text=Capital%20costs%20in%20California%2C%20where,early%20(2013)%20market%20fueling, accessed June 23, 2022.

115 Sharpe, Ben & Basama, Hussein, ICCT Working Paper 2022-09, "A meta-study of purchase costs for zero-emission trucks" at 12 (February 2022), https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22-1.pdf.

The transition of a large and complex transportation system to a BEV or FCEV technology is a massive undertaking, requiring the establishment of new manufacturing, assembly and supply chains; build-out of new charging/fueling infrastructure; interface with public utilities; re-conception of fuel distribution logistics; and ultimate design of end-of-life resource recovery strategies. Renewable diesel, on the other hand, can utilize existing infrastructure (i.e., pipelines, terminals, and retail distribution supply chains), requiring far less investment when compared against BEV charging and FCEV hydrogen fueling build-out. [EPA-HQ-OAR-2022-0985-1566-A2, p. 25.]

Organization: Volvo Group

Of course, the availability of hydrogen (H2) fueling infrastructure is even further behind that for battery electric vehicles and thus Volvo Group does not believe the requisite charging and hydrogen fueling infrastructure will develop sufficiently on a year-over-year basis to support penetrations of the magnitude EPA has determined in its stringency setting. We urge the agency to include a provision in the Phase 3 regulation tying manufacturer compliance to minimum infrastructure availability and density thresholds. Without some such mechanism it is beyond OEMs' capacity to control their own compliance with the regulation. [EPA-HQ-OAR-2022-0985-1606-A1, p. 9]

EPA Summary and Response:

Summary:

We received several comments on the topic of hydrogen infrastructure. Some commenters were optimistic and provided support for their view. AVE noted that producing hydrogen trucks, including H2 ICEVs, will incentivize the building of new stations. They suggested removing a CO2 penalty on H2 ICEVs could help make this happen. AVE and CATF expressed awareness of DOE efforts to bring stakeholders together to support the growth of hydrogen as a transportation option. CATF pointed out that a $14.3 billion federal investment via the BIL and IRA in clean hydrogen production, alternative fuel corridors, ports, and the 21st Century Truck Partnership is expected to heavily influence the market. They suggested that much of the investment is centered around regional hydrogen hubs; there is opportunity for trucks to travel between hubs, and expected synergies between hydrogen hubs and FCEVs can launch the markets more than EPA anticipates, making FCEVs feasible before 2030. CARB agreed there is enough infrastructure lead time based on experience with building LD hydrogen refueling stations in the California. They shared an example of a hydrogen station for HD vehicles near the Port of Oakland expected to move from approval to commissioning in just over two years, despite permitting challenges. They cited numerous entities developing mobile refueling solutions that could provide a fueling option “bridge” during the construction of permanent stations.

Energy Innovation suggested that uncertainty could diminish over time as the technology becomes more ubiquitous. CALSTART noted that infrastructure may be a near-term challenge, but it will not be a limiting factor since it is likely to deploy in a phased or geographically targeted way. They cited a paper specific to charging infrastructure.

Other commenters were more cautious about the readiness and availability of hydrogen infrastructure. Several indicated there are few existing hydrogen refueling stations for HD FCEVs—mostly in California—and stated that it is overly optimistic to expect buildout of a national network by 2030. AmFree noted that hydrogen refueling infrastructure is nascent compared to BEV charging infrastructure. They said that in the NPRM, EPA did not offer solutions to the myriad of upstream problems with hydrogen refueling. They pointed out that hydrogen production is energy-intensive and raised concerns about issues such as metal embrittlement, safety related to the delivery of hydrogen, and the low gravimetric density of hydrogen. They stated that the impact of the Alternative Fuel Refueling Property Credit, which EPA referenced in the NPRM, is limited given that a public station can cost between $9 and $45.5 million. AmFree also said that EPA did not sufficiently identify current private investment plans, thus indicating that FCEVs by 2030 are not feasible. Valero said that a transition to BEV or FCEV technology is a massive undertaking, particularly given that there is little now, and transitioning to a fuel like renewable diesel would require far less investment. Schneider noted that a lack of infrastructure will make it hard to implement HD FCEV technology. EMA estimated that 700 hydrogen refueling stations will be needed by 2032, compared to six for HD FCEVs in place in California now.

Several commenters identified refueling infrastructure challenges that need to be addressed. ATA said that stations must be built along interstate freight corridors to support line-haul tractors. MEMA observed a lag between EPA’s forecast of vehicle production and timelines for hydrogen production in the U.S. National Clean Hydrogen Strategy and Roadmap, which they say could result in a loss of consumer confidence if left unchecked. Energy Innovation and the National Association of Manufacturers called for a coordinated rollout of FCEVs and hydrogen refueling stations. Borg-Warner and EMA suggested that more support for commercial facilities is necessary, and they urged Federal agencies to align resources and goals to ensure that buildout happens in a coordinated fashion and at a necessary pace. South Coast AQMD highlighted a federal role to facilitate infrastructure development across state lines.

Industry commenters anticipated lead time issues beyond their control. Daimler stated that there are good reasons to be optimistic about the future of hydrogen. They pointed out that hydrogen infrastructure can leverage synergies from existing petroleum infrastructure and is not hindered by the process and policy hurdles that pose challenges for BEV infrastructure development, such as utility rate proceedings, but they also stated that there are still too many unknowns to ensure adequate coverage in the 2030 to 2032 timeframe. Daimler, PACCAR, and Volvo suggested adjusting the standards based on the pace of infrastructure deployment. TRALA and EMA joined their calls to regularly evaluate infrastructure. EMA also highlighted numerous uncertainties about the future of hydrogen in transportation—with regards to the form of the fuel (gaseous vs liquid), location of stations, and investments—and called for a clear long-term technology path with annual benchmarks for assessing progress towards deploying infrastructure.

Response:

For more on how we accounted for hydrogen infrastructure uncertainties in assessing corresponding technologies and developing the technology packages for the modeled potential compliance pathway for the final rule and for responses about suggested post-rule actions, including the concept of including an infrastructure scalar, please refer to RTC Chapters 2 and 3. For a discussion of H2 ICEVs and related comments, please see RTC Section 9. For discussion about upstream emissions impacts of hydrogen, please see RTC Section 13.

We agree with commenters who suggested that federal investment can encourage the buildout of hydrogen refueling stations for HD FCEVs. EPA has seen progress since the NPRM on the implementation of BIL and IRA funding and other provisions to incentivize the establishment of a clean hydrogen market in the United States that could offer $140 billion in revenues and 700,000 jobs by 2030,[603] as described in more detail in RIA Chapters 1.3 and 1.8. For example, in June 2023, the U.S. National Clean Hydrogen Strategy and Roadmap was finalized[604] Also in June 2023, DOE updated Clean Hydrogen Production Standard (CHPS) guidance that establishes a target for lifecycle (defined as “well-to-gate”) GHG emissions associated with hydrogen production.[605] In October 2023, DOE announced the selection of seven Regional Clean Hydrogen Hubs (H2Hubs) in different regions of the country that will receive a total of $7 billion to kickstart a national network of hydrogen producers, consumers, and connective infrastructure while supporting the production, storage, delivery, and end-use of hydrogen, expected to catalyze nearly $50 billion in additional hydrogen investment.[606] In December 2023, the Treasury Department and Internal Revenue Service proposed regulations to offer income tax credit of up to $3 per kg for the production of qualified clean hydrogen at a qualified clean hydrogen facility

[603] U.S. Department of Energy. “Hydrogen Shot: An Introduction”. August 2021. Available online: https://www.energy.gov/eere/fuelcells/articles/hydrogen-shot-introduction.

[604] U.S. Department of Energy. “U.S. National Clean Hydrogen Strategy and Roadmap”. June 2023. Available online: https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf, https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.

[605] U.S. Department of Energy, Hydrogen Program. “Clean Hydrogen Production Standard Guidance”. June 2023. Available online: https://www.hydrogen.energy.gov/library/policies-acts/clean-hydrogen-production-standard, https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/clean-hydrogen-production-standard-guidance.pdf.

[606] U.S. Department of Energy. “Biden-Harris Administration Announces $7 Billion For America’s First Clean Hydrogen Hubs, Driving Clean Manufacturing and Delivering New Economic Opportunities Nationwide”. October 13, 2023. Available online: https://www.energy.gov/articles/biden-harris-administration-announces-7-billion-americas-first-clean-hydrogen-hubs-driving.

(Section 45V), as established in the IRA.[607,608] In January 2024, DOE selected a consortium to design and implement a $1 billion initiative to offer "demand pull" for H2Hubs.[609] Also in January 2024, DOE announced $98 million in grants to start build and enhance up to ten hydrogen fueling stations for HD freight trucks in Texas, California, and Colorado.[610] Furthermore in March 2024, DOE announced $750 million for 52 projects to dramatically reduce the cost of clean hydrogen and help advance electrolysis technologies and improve manufacturing and recycling capabilities for clean hydrogen systems and components.[611]

Meanwhile, several processes are getting started at the federal level that demonstrate that federal agencies are taking steps to align resources and facilitate infrastructure development in a coordinated manner. For example, consistent with EMA's recommendation for a whole-government initiative relating to hydrogen production and deployment, a Hydrogen Interagency Taskforce (HIT) has been established across 11 federal agencies to implement the U.S. National Clean Hydrogen Strategy and Roadmap.[612] There is a HIT workgroup goal to support the establishment of 10 million metric tons per year (MMT/yr) of new, clean supply and end use by 2030, 20 MMT per year by 2040, 50 MMT per year by 2050. And in March 2024, the U.S. released a National Zero-Emission Freight Corridor Strategy[613] that, "sets an actionable vision and comprehensive approach to accelerating the deployment of a world-class, zero-emission freight network across the United States by 2040. The strategy focuses on advancing the deployment of zero-emission medium- and heavy-duty vehicle (ZE-MHDV) fueling infrastructure by targeting public investment to amplify private sector momentum, focus utility and regulatory energy planning, align industry activity, and mobilize communities for clean transportation."[614] The strategy has four phases. The first phase, from 2024-2027, focuses on establishing freight hubs defined "as a 100-mile to a 150-mile radius zone or geographic area

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607 88 FR 89220. Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election To Treat Clean Hydrogen Production Facilities as Energy Property. Available online: https://www.federalregister.gov/documents/2023/12/26/2023-28359/section-45v-credit-for-production-of-clean-hydrogen-section-48a15-election-to-treat-clean-hydrogen.

608 The White House. "Treasury Sets Out Proposed Rules for Transformative Clean Hydrogen Incentives". December 22, 2023. Available online: https://www.whitehouse.gov/cleanenergy/clean-energy-updates/2023/12/22/treasury-sets-out-proposed-rules-for-transformative-clean-hydrogen-incentives/#:~:text=The%20%C2%A7%2045V%20tax%20credit,catalyze%20nearly%20%2450%20billion%20in.

609 U.S. Department of Energy. "Biden-Harris Administration to Jumpstart Clean Hydrogen Economy with New Initiative to Provide Market Certainty and Unlock Private Investment". July 5, 2023. Available online: https://www.energy.gov/articles/biden-harris-administration-jumpstart-clean-hydrogen-economy-new-initiative-provide-market.

610 U.S. Department of Energy, Hydrogen and Fuel Cell Technologies Office. "Biden-Harris Administration Announces $623 Million in Grants for EV Charging and Alternative Fueling—Including More Than $90 Million for Hydrogen Infrastructure". January 30, 2024. Available online: https://www.energy.gov/eere/fuelcells/articles/biden-harris-administration-announces-623-million-grants-ev-charging-and.

611 U.S. DOE. "Biden-Harris Administration Announces $750 Million to Support America's Growing Hydrogen Industry as Part of Investing in America Agenda." March 13, 2024. Available online: https://content.govdelivery.com/accounts/USEERE/bulletins/3905889.

612 U.S. Department of Energy. "Hydrogen Interagency Task Force". Available online: https://www.hydrogen.energy.gov/interagency.

613 Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf.

614 Joint Office of Energy and Transportation. "Biden-Harris Administration, Joint Office of Energy and Transportation Release Strategy to Accelerate Zero-Emission Freight Infrastructure Deployment." March 12, 2024. Available online: https://driveelectric.gov/news/decarbonize-freight.

centered around a point with a significant concentration of freight volume (e.g., ports, intermodal facilities, and truck parking), that supports a broader ecosystem of freight activity throughout that zone."[615] The second phase, from 2027-2030, will connect key ZEV hubs, building out infrastructure along several major highways. The third phase, from 2030-2045, will expand the corridors, "including access to charging and fueling to all coastal ports and their surrounding freight ecosystems for short-haul and regional operations."[616] The fourth phase, from 2035-2040, will complete the freight corridor network. This corridor strategy provides support for the development of HD ZEV infrastructure that corresponds to the modeled potential compliance pathway for meeting the final standards. This kind of certainty can allow industry and other stakeholders to develop emissions reduction solutions that work best for them related to details such as the form of the fuel (e.g., gaseous or liquid) or the location of stations.

We also agree with commenters that the availability of HD FCEVs for select vehicle applications in early market volumes by MY 2030, as discussed in RTC Section 5.1, can further incentivize the deployment of hydrogen refueling stations.[617,618] In consideration of comments, we assessed infrastructure needs and lead time (see RIA Chapter 1.8.3), including California's experience with building stations for FCEVs and the suggestion that mobile fueling can help fill gaps as fleets start to adopt HD FCEVs (see RIA Chapter 1.8.3.2). And we re-evaluated our assumptions about the retail price of hydrogen (see RTC Section 8.2 and RIA Chapter 2.5.3.1), in consultation with DOE, along with FCEV technology-related costs (see RIA Chapter 2.5.2). Based on all of these factors, our assessment is that early market buildout of a hydrogen refueling station network to support the updated FCEV adoption levels in the modeled potential compliance pathway is feasible in the 2030 to 2032 timeframe.

We are not suggesting that a full national hydrogen infrastructure network needs to be in place by 2030 or even by 2032, as implied by a few commenters, and specifically note that a full national hydrogen infrastructure network is not needed to accommodate the demand that we posit for FCEVs in our modeled potential compliance pathway. First, we project that manufacturers would choose to adopt FCEVs for a limited number of longer-range HD vehicles (HD TRUCS coach bus 18 and tractors 41, 45, and 79), that such inclusion in the HD TRUCS analysis does not begin until MY 2030, and that even then we project FCEVs for these limited number of vehicle types only at modest adoption rates. For example, in MY 2032, we project that there would need to be roughly 10,000 FCEVs sold, an adoption rate of 25 percent of long-haul tractors would be ZEVs (Preamble Table II-4), and that just over 2 percent of new HD vehicle sales would be FCEVs with most of them being long-haul tractors.

Second, as explained in RIA Chapter 1.8.3.5, through BIL and IRA incentives and private investment spurred by H2Hubs, we conclude there is opportunity to concentrate HD FCEV hydrogen demand from the modeled potential compliance pathway in priority areas. Secure and

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615 Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 3.

616 Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 8.

617 Since at least 2014, a coordinated rollout has been a stated objective of California's program to install hydrogen fueling stations, for instance—to establish fueling capacity of their station network ahead of hydrogen fuel demand.

618 CARB. "Annual Evaluation of Fuel Cell Electric Vehicle deployment and Hydrogen Fuel Station Network Development". June 2014. Available online: https://ww2.arb.ca.gov/sites/default/files/2020-10/ab8_report_final_june2014_ac.pdf.

sufficient demand from local or regional anchor fleets would offer certainty that could help lower infrastructure costs in targeted regions and enable expansion over time. This strategy is supported in the literature, which includes regional analyses that demonstrate that infrastructure buildout can start in targeted regions. Similar to BEVs, as explained in RTC 7.1 above, the infrastructure needed to meet this initial demand will likely be centered in a discrete sub-set of states and counties where freight activity is concentrated. Thus, the select vehicle applications for which we project FCEV adoption could start traveling within or between regional hubs in this timeframe where hydrogen development is prioritized initially. For example, the projects that recently received more than $90 million to deploy public hydrogen fueling stations along corridors in Texas, California, and Colorado could be candidates for initial deployment.[619,620] We agree with commenters who pointed out that uncertainty can diminish over time as these technologies are adopted and near-term challenges are resolved.

We note further, as commenter DTNA points out, that hydrogen infrastructure development might have certain advantages over BEV infrastructure that favor its rapid deployment such as existing petroleum infrastructure that can be leveraged in some instances and fewer potential policy and process challenges (e.g., associated with utility commission regulations).

We agree with commenters that federal investment alone is insufficient (nor is it intended to be all-encompassing). For example, as noted by AmFree, the impact of the Alternative Fuel Refueling Property Credit of up to $100,000 may be limited given the cost of a public station. NREL estimates that a station can cost nearly ~$4 million to up to ~$40 million, depending on its size and use.[621] Thus, we have also assessed private investment and coordination spurred by the federal investment for hydrogen infrastructure buildout. See RIA Chapters 1.8.3.2. According to Cipher's Clean Technology Tracker, as of September 2023, there is $45.752 billion in total clean hydrogen production investment in the United States,[622] with 1 percent in projects that are in operation (close to $500,000), 7 percent ($3.2 million) under construction, and a majority still classified as announced.[623] DOE has started tracking announcements of domestic electrolyzers and fuel cell manufacturing facilities. So far, over $1.8 billion has been announced in over 10 new and expanded facilities with the capacity to manufacture over 10 GW of electrolyzers per year.[624] We anticipate that private investment strategies will become clearer over time after the rule is finalized as policy and process details start to settle. We expect this rule will provide

[619] U.S. Department of Energy, Hydrogen and Fuel Cell Technologies Office. "Biden-Harris Administration Announces $623 Million in Grants for EV Charging and Alternative Fueling—Including More Than $90 Million for Hydrogen Infrastructure". January 30, 2024. Available online: https://www.energy.gov/eere/fuelcells/articles/biden-harris-administration-announces-623-million-grants-ev-charging-and.

[620] U.S. Department of Transportation, Federal Highway Administration. "Charging and Fueling Infrastructure Program Grant Recipients: FY 2022 and 2023 Grant Award Recipients". Available online: https://www.fhwa.dot.gov/environment/cfi/grant_recipients/.

[621] Bracci, Justin, Mariya Koleva, and Mark Chung. "Levelized Cost of Dispensed Hydrogen for Heavy-Duty Vehicles". National Renewable Energy Laboratory. NREL/TP-5400-88818. March 2024. Available online: https://www.nrel.gov/docs/fy24osti/88818.pdf.

[622] According to the Clean Technology Tracker, clean hydrogen production refers to the production of hydrogen fuel with proton exchange membrane (PEM) electrolyzers and solid oxide electrolyzer cells (SOEC) or through other methods such as methane pyrolysis and natural gas with carbon capture.

[623] Cipher. "Tracking a new era of climate solutions: Cleantech growth across the U.S.". Available online: https://ciphernews.com/cleantech-tracker/#definitions.

[624] U.S. Department of Energy. "Building America's Clean Energy Future". Available online: https://www.energy.gov/invest.

greater certainty to the market to support timely development of hydrogen refueling stations, which could consequently allow industry to capture more of the 45V tax credit potential to produce clean hydrogen.

We acknowledge the perceived differences noted by MEMA between FCEV projections in the NPRM and the U.S. National Clean Hydrogen Strategy and Roadmap (Roadmap).[625] EPA's analysis for the NPRM was based on similar information and assumptions as the Roadmap report, as our agencies have coordinated on this issue.

- The Roadmap report notes that at $4 per kg, the scenario analysis has shown that 10 to 14 percent of all MHD trucks would demand about 5 MMT per year of hydrogen by 2040 and up to 8 MMT per year by 2050.[626] The NPRM referred to the same Ledna report but focused more on the technology-based potential of specific use cases for HD FCEVs at $4 per kg that resulted in less than 1 MMT hydrogen demand by 2032. The timeframes are not inconsistent since hydrogen production is expected to ramp up quickly through 2035 and beyond. In the final rule, we revised our hydrogen price so that it is further in line with DOE's Ledna analysis and Liftoff reports (see RIA Chapter 2.5.3.1).
- MEMA pointed to Figures 7, 8(a), 8(b), and 23 in the Roadmap, suggesting that they show an infrastructure yet to emerge. However, none of these Figures deal with infrastructure availability during the rule's timeframe: Figure 7 concerns present conditions, Figure 8 deals with clean hydrogen production, and Figure 23 displays current hydrogen and natural gas national pipeline networks. They are not projections of the future given that there is $9.5 billion of federal investment available to kickstart the clean hydrogen market, along with an all-of-government Roadmap in place to guide the private and intergovernmental process. We do agree that hydrogen infrastructure for trucking is at an earlier stage.
- MEMA also suggested that the timelines for growth of hydrogen generation and distribution on pages 70 to 75 of the Roadmap do not align with EPA forecasts. As outlined in RIA Chapter 1.8.3.6, our assessment is that a scenario for early market buildout of hydrogen refueling stations is in line with the Roadmap timeline:
    - Page 70 of the Roadmap report includes an action to, "deploy scalable hydrogen fueling stations to support early fleet markets, such as heavy-duty trucks and buses" in 2026 to 2029, which is before the introduction of FCEVs in the modeled potential compliance pathway of the final rule.
    - Page 71 of the Roadmap report includes an action to, "deploy at least two Regional Clean Hydrogen Hubs, demonstrating hydrogen use in hard-to-decarbonize sectors (e.g., industry and heavy-duty transport)" in 2026 to 2029," likewise consistent with timeline for FCEV introduction that we project in our modeled potential compliance pathway.
    - As mentioned on pages 73-74 of the Roadmap, long-haul heavy-duty trucks (for example) are part of the "first wave" of hydrogen end uses. As noted above, our

[625] U.S. Department of Energy, Hydrogen Program. "DOE National Clean Hydrogen Strategy and Roadmap". June 2023. Available online: https://www.hydrogen.energy.gov/library/roadmaps-vision/clean-hydrogen-strategy-roadmap, https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.
[626] See page 19 and Figure 12 of the Roadmap report.

modeled compliance pathway likewise projects HD FCEV use for only a limited percentage of longer-range vehicle types.

We recognize that these plans will represent increases in hydrogen infrastructure, and our assessment, in consultation with relevant federal agencies, is that our projections are supported and correspond to our measured approach in our modeled compliance pathway for FCEVs. EPA is also committed to ensuring the Phase 3 program is successfully implemented and, as described in preamble Section II.B.2.iii, in consideration of concerns raised regarding inherent uncertainties about the future, we are including a commitment to monitor progress on infrastructure development in the final rule.

AmFree pointed out that hydrogen refueling infrastructure is nascent compared to BEV charging infrastructure. In December 2023, DOE announced plans to spend $59 million to advance research, development, demonstration, and deployment of technologies for HD FCEV stations.[627] There is global momentum to continue to develop technologies to deliver hydrogen to FCEVs as well. For example, in May 2023, European Union states reached an agreement to build hydrogen refueling stations in all major cities at 200 km intervals along core highway networks, including for HD FCEVs, starting in 2030.[628]

AmFree also raised certain issues regarding uncertainties relating to transport and management of hydrogen. Specifically, they indicated that there are issues of metal embrittlement, safety related to the delivery of hydrogen, and the low gravimetric density of hydrogen, which they said EPA failed to address. We understand that hydrogen can permeate cracked steel pipes and cause metal embrittlement. If left unattended, leakage or explosions are possible. DOE's Liftoff report refers to embrittlement in relation to pipelines. They indicate that, "like all pipelines (natural gas, ammonia, etc.), hydrogen pipelines are designed around codes and standards to ensure safety and account for unique properties of the molecule)" and indicate that proper monitoring and maintenance can reduce risk.629,630 We are not aware of major concerns about metal embrittlement related to HD FCEVs but address a range of FCEV and hydrogen safety issues in RTC Section 5.2 and RIA Chapter 1.7.4. In short, the entire hydrogen

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[627] U.S. Department of Transportation, Hydrogen and Fuel Cell Technologies Office. "DOE Announces $59 Million to Advance National Clean Hydrogen Strategy". December 15, 2023. Available online: https://www.energy.gov/eere/fuelcells/articles/doe-announces-59-million-advance-national-clean-hydrogen-strategy#:~:text=DOE%20Announces%20%2459%20Million%20to%20Advance%20the%20National%20Clean%20Hydrogen%20Strategy,-December%2015%2C%202023&text=The%20Department%20of%20Energy%20(DOE,of%20affordable%20clean%2Dhydrogen%20technologies.

[628] Martin, Polly. "Europe to install hundreds of hydrogen filling stations by 2030 after EU ministers give final approval to AFIR". HydrogenInsight. July 25, 2023. Available online: https://www.hydrogeninsight.com/policy/europe-to-install-hundreds-of-hydrogen-filling-stations-by-2030-after-eu-ministers-give-final-approval-to-afir/2-1-1491167.

[629] U.S. Department of Energy. "Pathways to Commercial Liftoff: Clean Hydrogen". March 2023. Available online: https://liftoff.energy.gov/wp-content/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf.

[630] Campari, Alessandro, et. al. "A review of hydrogen embrittlement and risk-based inspection of hydrogen technologies". International Journal of Hydrogen Energy, Volume 48, Issue 90. November 9, 2023. Available online: https://www.sciencedirect.com/science/article/pii/S0360319923027106.

value chain—from production to distribution and end use—is regulated to address safety concerns.631,632

Regarding the density of hydrogen, please note that in RIA Chapter 1.8.1, we say that hydrogen has low energy density (i.e., volumetric density), so it must be compressed or liquified for use, but high specific energy (i.e., gravimetric density), with about 2.5 to 3 times the energy content per unit of mass than gasoline or diesel.[633] We recognize that hydrogen tanks can add weight (see RTC Section 5) and volume (see RTC Section 5.3), but our assessment at this time is that neither pose constraints on the feasibility of HD FCEVs as they are evaluated in HD TRUCS.

8.2 Hydrogen Fuel Costs

Comments by Organizations:

Organization: American Trucking Associations (ATA)

ICCT's analysis of hydrogen pricing and refueling indicates a lack of cost competitiveness before 2035, while EPA's preferred proposal would require 10 percent of the line-haul market to be ZEV in 2030 with hydrogen-fuel cell winning out.26 [EPA-HQ-OAR-2022-0985-1535-A1, p. 19]

> 26 The International Council on Clean Transportation, Near-Term Infrastructure Deployment to Support Zero-Emission Medium-and Heavy-Duty Vehicles in the United States, pgs. 16-17 May 2023.

"Our renewable hydrogen price projections of $8/kg-$10/kg in 2040 means there will be very few cases of lower cost of ownership for hydrogen long-haul trucks over their battery-electric counterparts. Hydrogen trucks could become cost-competitive in the late 2030s, if hydrogen became significantly lower than our central estimate. However even with median hydrogen prices as low as $3, we find no significant business case for hydrogen trucks before 2035 due to lower technology maturity." [EPA-HQ-OAR-2022-0985-1535-A1, p.19]

Organization: Clean Air Task Force et al.

b. EPA is correct that hydrogen prices will continue to fall.

As the hydrogen market grows, economies of scale will likely help bring the levelized cost of hydrogen in line with EPA projections of $4/kg by 2030. Two key areas where costs are expected to drop are electricity and electrolyzers, which have the potential over time, according to a report from the International Renewable Energy Agency, "to cut hydrogen costs by 80%."290 If this occurs, it will be due to reductions in electrolyzer cost, increasing electrolyzer capacity factors as more renewables come online, increasing electrolyzer durability that results in

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[631] Baird, et. al. "Federal Oversight of Hydrogen Systems". Sandia National Laboratories. March 2021. Available online: https://energy.sandia.gov/wp-content/uploads/2021/03/H2-Regulatory-Map-Report_SAND2021-2955.pdf.
[632] Pacific Northwest National Laboratory. "Hydrogen Tools". Available online: https://h2tools.org/.
[633] Chukwudi Tashie-Lewis, Bernard and Somtochukwu Godfrey Nnabuife. "Hydrogen Production, Distribution, Storage and Power Conversion in a Hydrogen Economy—A Technology Review". Chemical Engineering Journal Advances, Volume 8. November 15, 2021. Available online: https://www.sciencedirect.com/science/article/pii/S2666821121000880#bib0012.

lifetimes closer to 20 years rather than 10, increasing electrolyzer efficiency (greater than 70 percent by lower heating value), and electricity costs falling into the $20/MWh range. If all of those things come to pass, hydrogen production costs, not including transport, storage, and dispensing, could fall under $2/kg in 2030. [EPA-HQ-OAR-2022-0985-1640-A1, p. 66]

290 Int'l Renewable Energy Agency, Making the breakthrough: Green hydrogen policies and technology costs 10-11, figs. 1-2 (2021), https://www.irena.org/publications/2020/Dec/Green-hydrogen-cost-reduction.

291 Energy Transitions Comm'n, Making the Hydrogen Economy Possible: Accelerating Clean Hydrogen in an Electrified Economy 45 (2021), https://energy-transitions.org/wp-content/uploads/2021/04/ETC-Global-Hydrogen-Report.pdf.

The UC Davis report292 used to model market penetration also included a model-based projection for the cost of hydrogen that is broken down into production costs as well as transport, storage, and dispensing costs. This analysis uses SERA to analyze the hydrogen supply chain for a range of scenarios and sensitivity cases. Those scenarios look at both natural gas with carbon capture and electrolyzer-based production methods for the 2025 to 2035 timeframe and find a cost of $5–$6/kg at the pump in 2030. This analysis assumes that delivery trucks would be used for local distribution (distances less than 32 miles) and pipelines would be used for longer distances (up to 625 miles). The hydrogen production costs in 2030 are projected to be $2–$4/kg and the transport, storage, and dispensing costs $2–$3/kg, where the larger volumes handled in the pipeline scenarios resulted in cheaper production costs but more expensive distribution. [EPA-HQ-OAR-2022-0985-1640-A1, p. 67]

292 Fulton et al., § 6.1.

It is important to note that all three of these analyses do not include the effect of the hydrogen production tax credit in the IRA.293 Taking that into account, all three would see the cost of hydrogen at or below the $4/kg level projected by EPA. As such, $4/kg by 2030 is achievable assuming the hydrogen and FCEV markets ramp up as expected and industry participants along the supply chain make full use of available incentives. States are aiding this process by adopting laws that further incentivize the use of hydrogen for heavy-duty vehicles.294 [EPA-HQ-OAR-2022-0985-1640-A1, p. 67]

293 See 26 U.S.C. § 45V (providing a tax credit of up to $3 per kilogram of clean hydrogen produced)

294 For example, Colorado recently passed a law that provides tax credits for the use of hydrogen, including in heavy-duty vehicles. See H.R. 1281, 2023 Leg., Reg. Sess. (Colo. 2023), https://leg.colorado.gov/sites/default/files/2023a_1281_signed.pdf.

Organization: Daimler Truck North America LLC (DTNA)

DTNA agrees with EPA's projection that hydrogen may potentially be cost-competitive as a fuel by 2030, but this projection must be regularly evaluated as the market develops. In addition, there is not sufficient data to accurately project the rate of hydrogen station proliferation now, seven years before the fuel is expected to be cost-competitive. The existing petroleum network required several decades to build, and it is likely hydrogen will need additional time before becoming available nationwide to enable hydrogen-fueled regional and long-haul applications. For this reason, the availability of hydrogen fueling infrastructure must be factored in to the infrastructure scalar that DTNA proposes be included in EPA's CO2 stringency calculations, as discussed below in Section II.C of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 60]

Hydrogen pricing cannot be accurately forecasted, thus the hydrogen price inputs used in HD TRUCS must be reviewed as the market develops. Today, hydrogen dispensed at California hydrogen stations costs as much as $17.00 per kilogram. EPA projects that the cost of hydrogen will fall to $4.00 per kilogram in 2030 and beyond, whereas ICCT projected the 2030 green hydrogen price to be $9.86 per kilogram. Using ICCT's analysis, hydrogen-fueled vehicles will not achieve cost parity with comparable ICE vehicles until after 2040. While DTNA is optimistic that the price of hydrogen will fall, the Company does not believe that the future costs of hydrogen can be accurately projected to inform adoption rate and CO_2 stringency at this time.

Organization: Dana Incorporated

EPA should also conduct studies to analyze the impact of new federal incentives on the cost of producing hydrogen, which could play an important role for long-haul trucks. [EPA-HQ-OAR-2022-0985-1610-A1, p. 2.]

Organization: International Council on Clean Transportation (ICCT)

ASSUMPTIONS REGARDING THE RETAIL PRICE OF HYDROGEN EPA references Argonne National Laboratory's BEAN model for a $4/kg hydrogen retail price in 2030 and references the DOE's Liftoff report for a $4-$5/kg hydrogen price in 2030, and stating both values incorporate IRA incentives from the Inflation Reduction Act in their prices (Islam et al., 2022; Murdoch et al., 2023). However, both citations source the hydrogen price from a cost parity analysis done by NREL published prior to the passage of the Inflation Reduction Act (Ledna et al., 2022). This NREL study analyzed the required retail hydrogen price for fuel-cell electric vehicles, including buses and long-distance trucks, to reach total cost of ownership parity with diesel comparators. The hydrogen price at which the vehicles reach cost parity, determined to be $4-$5/kg, was referenced as the 'willingness to pay' fuel price in the DOE's Liftoff report. Therefore, the $4/kg hydrogen price used by EPA cannot reflect the real market. It is more appropriate to take a bottom-up approach to understand what fleet owners would pay at the hydrogen refueling station. [EPA-HQ-OAR-2022-0985-1553-A1, p. 15]

Islam, E. S., Vijayagopal, R., & Rousseau, A. (2022). A Comprehensive Simulation Study to Evaluate Future Vehicle Energy and Cost Reduction Potential (ANL/ESD-22/6). Transportation and Power Systems Division, Argonne National Laboratory. https://anl.app.box.com/s/qc3nov3w25qmxs20b2m2wmru0gadp83z

Murdoch, H., Munster, J., Satyapal, S., Rustagi, N., Elgowainy, A., & Penev, M. (2023). Pathways to Commercial Liftoff: Clean Hydrogen. U.S. Department of Energy. https://liftoff.energy.gov/wpcontent/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf

Ledna, C., Muratori, M., Yip, A., Jadun, P., & Hoehne, C. (2022). Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis. National Renewable Energy Laboratory. https://doi.org/10.2172/1854583

A bottom-up analysis would estimate all the potential costs along the hydrogen supply chain that would contribute to the final retail price. The main cost components are hydrogen production, hydrogen distribution, and hydrogen dispensing. EPA references three studies for the production cost of green hydrogen, including a past study from ICCT. Among the three studies cited, only the Rhodium Group's cost ($0.39/kg -$1.92/kg) considered the hydrogen production tax credit (PTC) under the Inflation Reduction Act. However, that report simply subtracted $3/kg (the maximum value of the hydrogen PTC) from its estimated green hydrogen production cost without PTC ($3.39-$4.92 /kg). This is not how the PTC works in the real world. To reflect the impact of the PTC accurately, it is necessary to apply a discounted cash flow (DCF) model that evaluates the annual incomes and expenses at a hydrogen production plant. This cash flow analysis would determine the amount of annual tax liability by the hydrogen producer with and without the PTC. Similarly, the DOE’s Liftoff report provided a range for green hydrogen production cost of $1.5/kg - $3.4/kg without the PTC and a less than or equal to $0.4/kg cost with PTC, explaining that, ‘$0.40/kg is when the PTC is applied in a given year / point-in-time and clean hydrogen costs can go negative. However, if investors apply a discounted cash flow DCF) to calculate the value of the credit (10-years) over 25+ year asset life, the value of the credit will fall from $3/kg (point-in-time) to ~$1.4/kg (applying DCF on the value of the PTC)’. [EPA-HQ-OAR-2022-0985-1553-A1, p. 15]

A more recent ICCT study estimated the retail green hydrogen price considering the PTC and using a DCF model (Slowik et al., 2023). This analysis follows the detailed provisions in the Inflation Reduction Act to best reflect the impact of the PTC. Specifically, the 10-year tax credit starts in 2023 and ends in 2030, meaning that only producers that started operating early in 2023 would receive the full 10-year credits while plants start in 2030 would only receive 2 years of PTC out of the plant’s lifetime of 30 years. Besides the $3/kg clean hydrogen PTC, the $0.026/kWh PTC for renewable electricity is also included, since the two are allowed to be combined under the Act. In addition, the PTCs for clean hydrogen are refundable for the first five years of operation per ‘direct pay’ provision under section 6417 of the Act. Further, tax ‘transferability’ under section 6418 was also included, where both renewable electricity and clean hydrogen producers are eligible to sell their unused tax credits to a buyer who has the tax value of the credit will fall from $3/kg (point-in-time) to ~$1.4/kg (applying DCF on the value of the PTC)’. [EPA-HQ-OAR-2022-0985-1553-A1, p. 15]

value of the credit will fall from $3/kg (point-in-time) to ~$1.4/kg (applying DCF on the value of the PTC)’. [EPA-HQ-OAR-2022-0985-1553-A1, p. 15]

value of the credit will fall from $3/kg (point-in-time) to ~$1.4/kg (applying DCF on the value of the PTC)’. [EPA-HQ-OAR-2022-0985-1553-A1, p. 15]

burden. The ICCT result shows that the PTCs would reduce the levelized production cost of green hydrogen by $2/kg for a plant start in 2023, decreasing to $0.3/kg for a plant start in 2030. [EPA-HQ-OAR-2022-0985-1553-A1, p. 15]

Slowik, P., Searle, S., Basma, H., Miller, J., Zhou, Y., Rodríguez, F., Buysse, C., Minjares, R., Kelly, S., & Pierce, L. (2023). Analyzing the impact of the Inflation Reduction Act on electric vehicle uptake in the United States. International Council on Clean Transportation. https://theicct.org/publication/ira-impactevs- us-jan23/

For hydrogen distribution and dispensing costs estimates of $1/kg-$2/kg EPA references two reports (Rustagi et al., 2018; Satyapal, 2022). However, the numbers cited are based on very optimistic scenarios with aggressive fuel-cell electric vehicle market uptake, high-volume hydrogen supply and refueling, and advanced research and development accomplishment. In contrast, the same DOE 2018 document that is referenced by EPA (Rustagi et al., 2018) projected distribution and dispensing cost of $4.2/kg-$4.9/kg in 2025, which is more realistic.

The ICCT analysis of the Inflation Reduction Act assumed a $4.6/kg cost in 2030, decreasing to $2/kg in 2050, based on an Argonne National Laboratory study of prices in the United States and an impact assessment of the Alternative Fuel Infrastructure Regulation in the EU (European Commission, 2021; Reddi et al., 2017). [EPA-HQ-OAR-2022-0985-1553-A1, pp. 15-16]

> Rustagi, N., Elgowainy, A., & Vickers, J. (2018). Current Status of Hydrogen Delivery and Dispensing Costs and Pathways to Future Cost Reductions (No. 18003). U.S. Department of Energy. https://www.hydrogen.energy.gov/pdfs/18003_current_status_hydrogen_delivery_dispensing_costs.pdf

> Satyapal, S. (2022, June 6). 2022 AMR Plenary Session. 2022 Annual Merit Review Plenary Session. https://www.energy.gov/sites/default/files/2022-06/hfto-amr-plenary-satyapal-2022-1.pdf

European Commission. (2021). Impact Assessment Accompanying the Proposal for a Regulation of the European Parliament and of the Council on the Deployment of Alternative Fuels Infrastructure, and Repealing Directive 2014/94/EU of the European Parliament and of the Council. https://data.consilium.europa.eu/doc/document/ST-10877-2021-ADD-3/en/pdf

> Reddi, K., Elgowainy, A., Rustagi, N., & Gupta, E. (2017). Impact of hydrogen refueling configurations and market parameters on the refueling cost of hydrogen. International Journal of Hydrogen Energy, 42(34), 21855–21865. https://doi.org/10.1016/j.ijhydene.2017.05.122

Taking all of this into consideration, ICCT estimates about $9.5/kg retail fueling price in 2030, assuming green hydrogen and meeting the 700-bar pressure requirement and high hydrogen purity requirement by the FCEV. This estimate taken from Slowik et al., 2023 is significantly greater than the price used in the EPA rule. [EPA-HQ-OAR-2022-0985-1553-A1, p. 16]

> Slowik, P., Searle, S., Basma, H., Miller, J., Zhou, Y., Rodríguez, F., Buysse, C., Minjares, R., Kelly, S., & Pierce, L. (2023). Analyzing the impact of the Inflation Reduction Act on electric vehicle uptake in the United States. International Council on Clean Transportation. https://theicct.org/publication/ira-impactevs-us-jan23/

Organization: MEMA

g) Hydrogen needs support to reach Total Cost of Ownership (TCO) parity with conventional technology. Hydrogen is not expected to have good TCO unless it gets to $5/gal and then it will need deployment at stations.

EPA Summary and Response:

Summary:

We received a range of comments on hydrogen fuel costs. CATF highlighted several reports that indicate large potential for the hydrogen price to rapidly drop with economies of scale, particularly on the production side. For example, they cited a UC Davis study for California, which estimated a potential retail price for green hydrogen of $5 to 6 per kg in 2030, where production costs are projected to be $2 to $4 per kg and distribution and dispensing costs could fall to $2 to $3 per kg. They noted that, after taking hydrogen production tax credit incentives into account, the estimates from all three studies would fall within the range of EPA's proposal. They pointed to reductions in electricity price and the cost of electrolyzers as two main factors that could impact hydrogen production prices. CATF also noted that states such as Colorado are adopting laws that further incentivize the use of hydrogen in HD vehicles.

Several commenters expressed concern about the hydrogen price assumption in the NPRM or said that prices cannot be predicted at this time. ATA and OEMs pointed to ICCT's analysis, which indicated that FCEVs would not be cost-competitive before 2035 due to low technology maturity. ICCT said that it is better to conduct a bottom-up analysis that considers hydrogen fuel production, distribution, and dispensing that uses a model to properly account for potential tax credit benefits to understand what fleet owners would pay at hydrogen refueling stations. They showed how they did this to estimate a final retail price for green hydrogen (at 700 bar and to meet high purity needs of FCEVs) in 2030 of $9.50/kg, which is over twice the price that EPA projected in the NPRM. They said that the DOE reports we referenced in the proposed rule include a "willingness to pay" that reflects the total price at which FCEVs could reach cost parity with diesel vehicles, which cannot reflect the real market.

DTNA agreed that hydrogen may be cost-competitive by 2030 but asserted that progress needs to be regularly evaluated as the market develops. They stated there is not sufficient data to project station buildout nationwide to enable regional and long-haul applications. They noted that the petroleum fueling network took several decades to build. DTNA shared the high price of hydrogen in California now and pointed to ICCT's report that found that HD FCEVs will not reach cost parity with comparable ICE vehicles until after 2040. They suggested including an infrastructure scalar to adjust the stringency of the standards based on the pace of buildout.

MEMA suggested that hydrogen would need to get to a price of $5 per kg to reach TCO parity with conventional technology, and then the fuel will need to be deployed at stations.

Dana suggested that EPA should conduct studies to analyze the impact of federal incentives on the cost of producing hydrogen.

Response:

EPA discusses the issue of hydrogen cost in detail in RIA Chapter 2.5.3.1, which includes a review of literature that addresses the ICCT paper mentioned by several commenters. We note here in summary that, after further consideration, including of public comment and in consultation with DOE, our initial estimate of a retail hydrogen price of $4 per kg in 2030 in the proposal was adjusted higher in this final rule to $6 per kg in 2030 and dropping to $4 per kg in 2035. This is intended to reflect a price that fleet owners would pay at hydrogen refueling stations.

To evaluate our estimates further, and in response to comments, the National Renewable Energy Laboratory (NREL) conducted a bottom-up analysis that explores the potential range of levelized costs of dispensed hydrogen (LCOH) from hydrogen refueling stations for HD FCEVs in 2030. The authors conclude that the overall system LCOH for stations in 2030 is estimated to range from ~$3.80/kg-H2 to ~$13/kg-H2.[634] This cost range is not the same as a retail price, but we assume that any retail markup at the station is minimal, given that gas and diesel fuel retailers

[634] Bracci, Justin, Mariya Koleva, and Mark Chung. "Levelized Cost of Dispensed Hydrogen for Heavy-Duty Vehicles". National Renewable Energy Laboratory. NREL/TP-5400-88818. March 2024. Available online: https://www.nrel.gov/docs/fy24osti/88818.pdf.

generally make very little selling fuel.[635,636] Importantly, it does not consider any tax incentives or other state or federal incentive policies that may further reduce the retail price that consumers see at a fueling station in 2030. Therefore, we conclude that our retail price of hydrogen is within a reasonable range of anticipated values. MEMA suggested that hydrogen would need to be $5 per kg to get to a total cost of ownership (TCO) parity with conventional technology. ICCT noted that the National Clean Hydrogen Strategy and Roadmap[637] and Liftoff Report[638] identify a willingness to pay (or threshold price) for clean hydrogen of $4 to $5 per kg for commercial trucks and buses. We acknowledge that our revised hydrogen price projection for the final rule of $6 per kg in 2030 is above $5 per kg and that our projection of $5.20 per kg in 2032 is still slightly above the threshold price (see RIA Chapter 2.5.3.1). Importantly, however, our projections indicate that the price would fall below $5 per kg by 2033 and thus the use of hydrogen would become more at parity with diesel fuel within one to two years of HD FCEV vehicle ownership. RIA Chapter 2.9.2 includes our payback calculations to determine the number of years that it will take for the annual operational savings of a ZEV to offset the incremental upfront purchase price of a BEV or FCEV. This analysis shows that when purchased in 2030, two of the four HD FCEVs in the modeled potential compliance pathway pay back in less than 10 years[639] and, when purchased in 2032, all four HD FCEVs pay back in four to seven years due to operational savings. See RIA Chapter 2.12 for a related TCO analysis.

CATF asserted that hydrogen prices will continue to fall, and possibly lower than we projected in the proposed rule by 2030. We agree that many factors are at play that will ultimately impact the price and recognize that the potential hydrogen market is larger than the transportation sector, as outlined in RIA Chapter 1.8.3.5. According to the U.S. National Strategy, long-haul heavy-duty trucks are within the “first wave” of hydrogen market development in the U.S.[640] There are BIL and IRA incentives in place to develop seven H2Hubs that could start to produce clean hydrogen and deliver it to end uses during the timeframe of the rule, possibly in addition to the 10 million metric tons that is produced annually today.[641] This includes up to $4 billion in tax credits for the manufacturing of hydrogen production equipment

[635] West Virginia Oil Marketers and Grocers Association. “How Much Money Do Businesses Make on Fuel Purchases?” Available online: https://www.omegawv.com/faq/140-how-much-money-do-businesses-make-on-fuel-purchases.html#:~:text=Retailers%20Make%20Very%20Little%20Selling,cents%20per%20gallon%20in%20profit..
[636] Kinnier, Alex. “I’ve analyzed the profit margins of 30,000 gas stations. Here’s the proof fuel retailers are not to blame for high gas prices”. Fortune. August 9, 2022. Available online: https://fortune.com/2022/08/09/energy-profit-margins-gas-stations-proof-fuel-retailers-high-gas-prices-alex-kinnier/.
[637] U.S. Department of Energy. “U.S. National Clean Hydrogen Strategy and Roadmap”. June 2023. Available online: https://www.hydrogen.energy.gov/library/roadmaps-vision/clean-hydrogen-strategy-roadmap , https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.
[638] U.S. Department of Energy. “Pathways to Commercial Liftoff: Clean Hydrogen”. March 2023. Available online: https://liftoff.energy.gov/wp-content/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf.
[639] As mentioned in RIA Chapter 2.9, vehicles with a payback of greater than 10 years (including the two HD FCEVs that do not pay back in 2030) were not considered when developing the standards based on the modeled potential compliance pathway.
[640] This is based on estimated willingness to pay and the relative attractiveness of hydrogen as a decarbonization solution as well as stakeholder input.
[641] Satyapal, Sunita. “U.S. DOE Hydrogen Program Annual Merit Review (AMR) Plenary Remarks”. U.S. Department of Energy. June 5, 2023. Available online: https://www.energy.gov/sites/default/files/2023-06/h2amr-plenary-satyapal-2023_0.pdf.

and fuel cells, among other technologies.[642,643] As suggested in DOE's Liftoff report, "as fleets begin to transition to clean hydrogen, a reinforcing feedback loop could occur in which hydrogen infrastructure catalyzes more FCEV production, and thus—more FCEV production leads to lower cost vehicles, more customer demand, and more widely scaled, lower-cost hydrogen infrastructure" as challenges such as those identified by commenters can be overcome.[644] This final rule provides greater certainty to early market HD FCEV participants who can initiate market development so that lower hydrogen fuel costs are realized by MY 2030.

DTNA said that there is insufficient data to project hydrogen station buildout and related pricing, noting that California's price for hydrogen is currently high. We understand that the hydrogen price in California spiked recently, from an average of $14.95 per kg in the second quarter of 2022 to $36 per kg in August 2023. According to the State, causes include supply chain constraints, hydrogen supply disruptions, and equipment failures, and the State is taking actions to address these issues, some of which are still related to COVID-19 pandemic-related slowdowns.[645] S&P Global found that key challenges affecting hydrogen supply and prices in California reflect an immature FCEV fueling infrastructure market. According to data collected by S&P Global, fuel availability and price volatility have not been issues for transit bus FCEVs because transit agencies structure long-term fixed hydrogen price supply contracts to meet their needs. Transit agencies require more fuel and more station operations and maintenance (O&M) so are less risk-prone than smaller stations for light-duty vehicles.[646] We expect that as hydrogen production develops to meet higher levels of demand required by HD FCEVs, there will be fewer issues with supply. Another challenge identified in California is the equipment failures at stations. California issued a solicitation to support O&M, along with a manufacturing grant to produce hydrogen refueling equipment, and they entered into a contract to conduct surveys to investigate issues further.[647] DOE is also funding efforts to advance research, development, demonstration, and deployment of technologies for HD FCEV stations and to address station

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642 Satyapal, Sunita. "U.S. DOE Hydrogen Program Annual Merit Review (AMR) Plenary Remarks". U.S. Department of Energy. June 5, 2023. Available online: https://www.energy.gov/sites/default/files/2023-06/h2amr-plenary-satyapal-2023_0.pdf.

643 Internal Revenue Service. "IRS provides additional guidance for advanced energy projects". May 31, 2023. Available online: https://www.irs.gov/newsroom/irs-provides-additional-guidance-for-advanced-energy-projects.

644 U.S. Department of Energy. "Pathways to Commercial Liftoff: Clean Hydrogen". March 2023. Available online: https://liftoff.energy.gov/wp-content/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf.

645 Crowell, et. al. "Joint Agency Staff Report on Assembly Bill 8: 2023 Annual Assessment of the Hydrogen Refueling Network in California". CEC/CARB. CEC-600-2023-069. December 2023. Available online: https://www.energy.ca.gov/sites/default/files/2023-12/CEC-600-2023-069.pdf.

646 Canel Soria, Santiago and Daniel Weeks. "Feature: Logistical woes and high pump prices stall California H2 market development". S&P Global: Commodity Insights. January 25, 2024. Available online: https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/012324-logistical-woes-and-high-pump-prices-stall-california-h2-market-development.

647 Crowell, et. al. "Joint Agency Staff Report on Assembly Bill 8: 2023 Annual Assessment of the Hydrogen Refueling Network in California". CEC/CARB. CEC-600-2023-069. December 2023. Available online: https://www.energy.ca.gov/sites/default/files/2023-12/CEC-600-2023-069.pdf.

reliability issues.[648,649] We expect equipment failures will decrease over time as both manufacturers and operators of equipment gain experience with it while bringing it to scale. The modeled potential compliance pathway in the final rule includes an early market level of FCEV adoption, which allows for growth in technology maturity before and during the 2030 to 2032 timeframe and prior to more widespread adoption in later years. We anticipate that infrastructure concerns can be addressed to meet the needs of an early market HD FCEV fleet by 2030.

DTNA also noted that the petroleum network took decades to build. MEMA suggested that prices need to be cost-effective prior to station deployment. As discussed in RTC Section 8.1, we are not suggesting that a full national hydrogen infrastructure network needs to be in place by 2030 or even by 2032, and specifically note that a full national hydrogen infrastructure network is not needed to accommodate the demand that we posit for FCEVs in our modeled potential compliance pathway. EPA does believe, however, that a full infrastructure network for hydrogen can be achieved over the coming decades. To help accomplish this goal, the U.S. released a National Zero-Emission Freight Corridor Strategy[650] in March 2024 that, "sets an actionable vision and comprehensive approach to accelerating the deployment of a world-class, zero-emission freight network across the United States by 2040. The strategy focuses on advancing the deployment of zero-emission medium- and heavy-duty vehicle (ZE-MHDV) fueling infrastructure by targeting public investment to amplify private sector momentum, focus utility and regulatory energy planning, align industry activity, and mobilize communities for clean transportation."[651] The strategy has four phases. The first phase, from 2024-2027, focuses on establishing freight hubs defined "as a 100-mile to a 150-mile radius zone or geographic area centered around a point with a significant concentration of freight volume (e.g., ports, intermodal facilities, and truck parking), that supports a broader ecosystem of freight activity throughout that zone."[652] The second phase, from 2027-2030, will connect key ZEV hubs, building out infrastructure along several major highways. The third phase, from 2030-2045, will expand the corridors, "including access to charging and fueling to all coastal ports and their surrounding freight ecosystems for short-haul and regional operations."[653] The fourth phase, from 2035-2040, will complete the freight corridor network. This corridor strategy provides support for the development of HD ZEV infrastructure that corresponds to the modeled potential compliance

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[648] U.S. Department of Energy, Hydrogen and Fuel Cell Technologies Office. "DOE Announces $59 Million to Advance National Clean Hydrogen Strategy". December 15, 2023. Available online: https://www.energy.gov/eere/fuelcells/articles/doe-announces-59-million-advance-national-clean-hydrogen-strategy#:~:text=DOE%20Announces%20%2459%20Million%20to%20Advance%20the%20National%20Clean%20Hydrogen%20Strategy,-December%2015%2C%202023&text=The%20Department%20of%20Energy%20(DOE,of%20affordable%20clean%2Dhydrogen%20technologies.

[649] National Renewable Energy Lab. "News Release: Predictive Model Could Improve Hydrogen Station Availability". September 18, 2023. Available online: https://www.nrel.gov/news/press/2023/news-release-predictive-model-could-improve-hydrogen-station-availability.html.

[650] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf.

[651] Joint Office of Energy and Transportation. "Biden-Harris Administration, Joint Office of Energy and Transportation Release Strategy to Accelerate Zero-Emission Freight Infrastructure Deployment." March 12, 2024. Available online: https://driveelectric.gov/news/decarbonize-freight.

[652] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 3.

[653] Joint Office of Energy and Transportation. "National Zero-Emission Freight Corridor Strategy" DOE/EE-2816 2024. March 2024. Available at https://driveelectric.gov/files/zef-corridor-strategy.pdf. See page 8.

pathway for meeting the final standards. EPA is committed to ensuring the Phase 3 program is successfully implemented, and as described in preamble Section II, in consideration of concerns raised regarding inherent uncertainties about the future, we are including a commitment to monitor progress on infrastructure development in the final rule. Please see RTC Section 2.9 for a response to comments about the need for an infrastructure scalar.

9 ICE Vehicle Technologies

9.1 Fuels

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

E. EPA Failed To Consider Alternatives

EPA also unreasonably ignored alternative solutions to the proposed heavy-duty emissions standards. Agencies are required, as part of any reasoned decision-making process, to consider all “significant and viable and obvious alternatives” to their proposed action. Dist. Hosp. Partners, 786 F.3d at 59 (citation omitted); see Spirit Airlines, Inc. v. DOT, 997 F.3d 1247, 1255 (D.C. Cir. 2021) (“[T]he failure of an agency to consider obvious alternatives has led uniformly to reversal.” (quoting Yakima Valley Cablevision, Inc. v. FCC, 794 F.2d 737, 746 n.36 (D.C. Cir. 1986))). [EPA-HQ-OAR-2022-0985-1660-A1, p. 67]

Here, EPA failed to consider any alternatives that did not fall within the narrow category of tailpipe-emissions standards. The agency instead considered only whether emissions standards of varying level of stringency or with differing phase-in periods may be appropriate alternatives. See 88 Fed. Reg. at 26,082–83. But tailpipe-emissions standards are not the only means available to achieve EPA’s stated goal of “reduc[ing] GHG air pollution from” heavy-duty vehicles. Id. at 25,928. [EPA-HQ-OAR-2022-0985-1660-A1, p. 67]

For instance, in its parallel proposed rule on emissions standards for light and medium-duty vehicles, EPA asserted that it has authority to impose fuel controls—though it requested comment only on whether fuel controls should be used in the future as a “complement” to emissions standards, rather than as an alternative to them. 88 Fed. Reg. at 29,397–98. But the heavy-duty rule at issue here does not address fuel controls as an alternative at all. That omission violates the requirement of reasoned decisionmaking.12 Cf. Am. Radio Relay League, Inc. v. FCC, 524 F.3d 227, 242 (D.C. Cir. 2008) (remanding where agency did not “consider responsible alternatives to its chosen policy and . . . give a reasoned explanation for its rejection of such alternatives” (citation omitted)). EPA’s failure to consider any non-emissions-standard-based alternatives to the proposed rule renders the proposed rule arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1660-A1, p. 67]

12 We do not at this time express any view on any particular fuel-control measure, and any regulation incorporating such measures would first have to be proposed for public comment. See 42 U.S.C. § 7607(d). We simply note the proposed rule’s failure to address this alternative.

Organization: American Highway Users Alliance

In addition, EPA seems to have given little or no consideration to incentives for lower emission liquid fuels as part of the solution to reducing lifecycle emissions from heavy-duty vehicles. Such fuels are already in the marketplace; increasing their use would appear to be achievable. Policy approaches to help encourage the production of lower emission liquid fuels could offer near-term emissions reductions from existing vehicles, potentially at a lower cost to society. Yet, EPA's proposal in this docket focuses on electrification as the sole means of reducing emissions from heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1550-A1, p. 3]

Greater use of lower-emission liquid fuels should be part of the overall approach to reducing emissions from heavy-duty vehicles.

As noted earlier, the discussion in the NPRM seems to have given little or no consideration to the potential gains in emissions reductions that medium- and heavy-duty fleets could achieve through greater use of lower emission fuels. Fuels produced with lower emission renewable feedstocks and traditional fuels produced with lower carbon intensities, such as in association with carbon capture and sequestration, exist today and are scalable with the right policy support. Greater use of these fuels could help progress emission reductions from existing fleets while refueling infrastructure, recharging infrastructure and critical mineral supply chains develop. [EPA-HQ-OAR-2022-0985-1550-A1, p. 8]

Even with the accelerated fleet turnover the EPA's proposed standards seek, millions of medium and heavy-duty vehicles with internal combustion engines will remain on the roads in the coming decades. Instead of pursuing policies that focus on a sole technology pathway for achieving transportation-related emissions reductions, EPA should allow for multiple technology pathways – including pathways that recognize how to improve the overall lifecycle carbon intensity for existing vehicles and fuels. This might include linked, carbon-intensity based vehicle and fuel standards that enable consumers to retain the preference for engine type, while still participating in societal aims to achieve emissions reductions. [EPA-HQ-OAR-2022-0985-1550-A1, p. 8]

Organization: American Petroleum Institute (API)

As noted by the American Trucking Associations (ATA), in testimony before the U.S. Senate Committee on Environment and Public Works8:

When battery electric vehicles are not the answer, federal support should refrain from playing favorites, and instead assist in the buildout of alternative fuel facilities. Proposals for hydrogen infrastructure for trucks need to ensure that the infrastructure is in place where that technology best fits in supply chains. Where lifecycle emissions can be reduced by deploying renewable diesel and renewable natural gas, those fuel stocks need to be available for trucking. [EPA-HQ-OAR-2022-0985-1617-A1, p. 8.]

8 U.S. Senate Committee on Environment and Public Works, hearing on "The Future of Low Carbon Transportation Fuels and Considerations for a National Clean Fuels Program", February 15, 2023 (https://www.epw.senate.gov/public/index.cfm/2023/2/the-future-of-low-carbon-transportation-fuels-and-considerations-for-a-national-clean-fuels-program).

Bio and renewable fuels, such as renewable diesel, renewable natural gas, and biodiesel can and should be considered as part of an "all-of-the-above" approach to decarbonization of the transportation sector, including biocircularity. Especially for HD vehicles (and other hard-to-abate sectors) which may not be EV-ready or have infrastructure available, renewable fuels can serve as a lower emission and cost option that is readily available. As previously noted, API members are currently investing heavily in renewable fuel production – continued investment and development will increase the available volumes of such fuels in the marketplace and allow them to serve both as a viable lower carbon solutions leading up to the start of the Phase 3 program, throughout implementation, and beyond. Further, key findings of a study prepared for the Diesel Technology Forum showed results (for the scenarios considered in the study) of cumulative GHG reductions that were up to three times greater than BEVs for ICEVs fueled with 100 percent renewable diesel, and reductions from vehicles fueled with biodiesel blends were on par with BEV reductions.9 [EPA-HQ-OAR-2022-0985-1617-A1, p. 8]

9 "Environmental Benefits of Medium- and Heavy-Duty Zero Emission Vehicles Compared with Clean Bio- & Renewable-Fueled Vehicles 2022-2032," prepared for Diesel Technology Forum by Stillwater Associates LLC, July 19, 2022.

Further, EPA's LCA modeling for the proposal is based on biocircularity with atmospheric CO2 consumed by biomass, resulting in zero tailpipe carbon emissions if the combusted biofuels were made from renewable biomass. The agency is thus not taking the source of carbon into account, and is classifying all carbon tailpipe emissions as the same related to their atmospheric GHG impact. For example, the agency should have considered in its analysis that a Class 7/8 ICEV run on 100% Renewable Diesel made from used cooking oil would have a greater than 70 percent tailpipe carbon reduction. EPA's approach is not consistent with other existing EPA policies (e.g., the Renewable Fuel Standard). [EPA-HQ-OAR-2022-0985-1617-A1, pp. 8 - 9]

Organization: American Soybean Association (ASA)

Through this rulemaking process, ASA urges EPA to recognize and maintain robust opportunities for biomass-based diesel to make immediate carbon reductions in the heavy-duty market now and in the future; and to consider the potential economic and environmental impacts that the proposed Phase 3 rule may have on farmers through continued use of readily available technologies and slower pace for implementation of new regulations. [EPA-HQ-OAR-2022-0985-1549-A1, p. 1]

Biomass-Based Diesel Impacts As the federal government seeks to address climate change both today and in the long-term, biomass-based diesel will remain an important tool in the toolbox in both existing diesel engines and new ultra-low carbon liquid fuel engine technologies. Carbon emissions continue to accumulate, and increased utilization of biomass-based diesel and other biofuels can help mitigate increasing emissions occurring at present. The Intergovernmental Panel on Climate Change notes in its sixth assessment report that using existing low carbon technologies is a crucial component to avoiding catastrophic temperature increases, stating that 'biodiesel and renewable diesel fuels…could offer important near-term reductions' for several technologies, including buses, rail, and long-haul trucking.3 [EPA-HQ-OAR-2022-0985-1549-A1, p. 3]

3 Jaramillo, P., Ribeiro, S.K., et al. (2022). Transport. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. (https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter10.pdf)

Of note, government and corporate entities around the country are already utilizing biomass-based diesel as an opportunity to achieve lower emissions. For example, New York City requires all 11,000 city fleet vehicles to use biomass-based diesel—from the police department and fire department to the department of sanitation and off-road equipment vehicles. Other cities, like Washington, D.C., are also transitioning their fleets to biomass-based diesel. In 2018, D.C. used 120,000 gallons of biomass-based diesel in its vehicle fleet, which resulted in 1,000 fewer tons of greenhouse gas emissions. In 2020, the D.C. Department of Public Works announced it would begin running 17 garbage trucks on B100, or 100% biomass-based diesel—an 86% greenhouse gas emissions reduction from a traditional petroleum-fueled garbage truck. The results are so clear that the city plans to double the size of its B100 vehicles in the next year. Through funds granted by EPA's Diesel Emissions Reduction Act program, D.C. Water Authority is expanding its use of B100 to 31 vehicles where it also benefits worker health. [EPA-HQ-OAR-2022-0985-1549-A1, p. 3]

Soy farmers are proud of the success of biomass-based diesel—not only for the new market opportunities the fuel created for farmers, but also for being able to grow a clean energy solution right in soybean fields. In fact, many soybean growers are using biomass-based diesel in their own farming equipment. Soybean oil represents about half the feedstock used to produce biomass-based diesel and, according to analysis by Clean Fuels Alliance America, biomass-based diesel has led to a savings of 143.8 million metric tons of carbon since 2010. [EPA-HQ-OAR-2022-0985-1549-A1, p. 3]

Given the current boom in the biomass-based diesel sector, the continued development of more efficient heavy-duty vehicles employing ICE technology that can utilize renewable fuels will encourage purchase of newer model year technology and retirement of older trucks with higher emissions in the agricultural hauling sector. New ZEV technologies are not yet widely accepted in rural America, based on cost and infrastructure considerations mentioned earlier. However, powertrain ICEs that can run on biomass-based diesel can provide real GHG emissions reductions today. ASA believes that ensuring continued pathways for these technologies will lead to increased utilization in the agricultural sector. [EPA-HQ-OAR-2022-0985-1549-A1, p. 3]

Organization: American Trucking Associations (ATA)

Fleets are evaluating and implementing cost-effective options to reduce emissions. Biodiesel is a traditional plug-in fuel that yields lower carbon emissions. More recently, renewable diesel has emerged as a desirable carbon reduction option, producing near-zero tailpipe emissions when combined with the newest engine technologies. Fleets are also operating renewable natural gas and propane-powered vehicles in locations where fueling infrastructure is established. These fuel-based options present more cost-effective solutions and should be encouraged under the proposed regulation. A crediting system that prorates the annual expansion of lower carbon fuel use across new conventional vehicle sales is needed to capture existing carbon reduction efforts. This system would help account for fleet efforts to purchase conventional or alternative fueled vehicles rather than only ZEVs. [EPA-HQ-OAR-2022-0985-1535-A1, p. 13]

Organization: Anonymous Public Comment

There should be provisions in the rule for the handling of biofuels and/or synthetic fuels ("efuels") in GHG emission calculations. Phasing out fossil fuels for ICEVs while phasing in renewable fuels/efuels could be just as effective in achieving climate goals as a shift to so-called "zero-emission" vehicles, possibly even more so. In fact, even if 100% of new vehicle sales are BEV by 2035, or any other date for that matter, it could potentially be counterproductive from an environmental perspective. ICEVs will be on the road for decades even if new ICEVs are effectively banned by regulation, and those vehicles would be contributing to significantly reduced GHG emissions with bio/efuels, while still in use. The European Union just adopted a provision to allow new ICEVs to be sold after 2035 if efuels are used exclusively to fuel the vehicles, in spite of efforts to "ban" ICEVs after 2035. Some consideration of biofuels/efuels should be adopted. [EPA-HQ-OAR-2022-0985-1773]

According to Argonne National Laboratory (ANL), efuels produced by the Fischer-Tropsch (FT) process can be carbon NEGATIVE from a well-to-wheels perspective if the system is properly configure (https://pubs.acs.org/doi/10.1021/acs.est.0c05893). Some FT biofuels can also be carbon negative with CCS (e.g., https://velocys.com/2019/10/10/negative-emission-fuel-agreement/), or by sequestering carbon produced as a byproduct from the process (https://www.greencarcongress.com/2023/04/20230415-terrastar.html). There are no pathways in ANL's GREET model for BEVs to be carbon negative, not even with 100% renewable electricity. If GHG emission reduction is really the goal, these fuels should be given top priority from a regulatory perspective. It should also be pointed out that FT ediesel fuel has very low upstream (well-to-tank) criteria pollutant air emissions according to ANL's GREET model. The Renewable Fuel Standard (RFS) could be used as a mechanism for phasing out fossil-based fuels in favor of biofuels/efuels. Alternatively, the U.S. could follow the European model and allow only ICEVs that use efuels/biofuels exclusively to be produced post 2035. [EPA-HQ-OAR-2022-0985-1773]

Organization: Barry Supranowicz

I am pleased that the EPA is taking important steps to address global warming pollution from trucks, but the heavy-duty vehicle standard needs to do much more to put us on a path to eliminate all tailpipe emissions from new vehicles by 2035. [EPA-HQ-OAR-2022-0985-2252]

Black, Asian America, and Latin American communities and other marginalized communities living in high traffic areas have suffered the health impacts of diesel trucks for too long. Now is the time to set us on a path to eliminate toxic tailpipe emissions from trucks. [EPA-HQ-OAR-2022-0985-2252]

Technology currently exists in the US (see PLUG) to supply green-energy produced hydrogen and oxygen as fuels for the trucking industry (as opposed to gray- or fossil fuel-based hydrogen-oxygen of which would continue to foster pollution of our air). We need to move forward in mandating green-energy produced hydrogen-oxygen fuel cell powered big rigs. Fact is, not only do green hydrogen-oxygen fuel cell powered trucks offer zero pollution power plants to move things around - they offer to said trucking industry vastly reduced costs for fuel purchases and thereby reduced costs for goods and services - making those manufacturing-trucking industries more competitive in their offerings of goods and services. Green hydrogen-oxygen use for hydrogen-oxygen fuel cell powered power plants for trucks and businesses offers much lower costs for energy-power production (compared to fossil fueled power plants) from a infinite (for human purposes) supply of said power through accessing that hydrogen-oxygen from our oceans. Fossil fueled power plants arise from limited and dwindling oil in our earth surface, a resource increasingly more difficult and expensive to acquire, not to even consider the pollutive effects of fossil fuel acquisition-extraction-refinement-transport-and usage - costs that arise in future time from fossil fuel extraction-use and making fossil fuels even more expensive. [EPA-HQ-OAR-2022-0985-2252]

The EPA has the power to accelerate the deployment of zero-emission vehicles. Please finalize the strongest possible rule to deliver clean air. The clock is ticking, and zero-emission trucks will save lives. [EPA-HQ-OAR-2022-0985-2252]

I strongly urge the EPA to adopt requirements that would address the disproportionate health impacts for marginalized communities living near freight corridors and accelerate the rollout of zero-emission trucks. Thank you for your consideration. [EPA-HQ-OAR-2022-0985-2252]

Organization: Chevron

4. The role of biofuels

Recent data from the EPA Moderated Transaction System shows 2022 annual production of approximately 2.0 billion gallons of biodiesel, an additional 2.0 billion gallons of renewable diesel, and 700 million gallons equivalents of renewable natural gas. These renewable fuels represent over 8% of the total diesel demand in the U.S. In California, biodiesel and renewable diesel together supplied 34% of total diesel demand in the state. Renewable fuels are contributing significantly to GHG reduction in today's market using existing infrastructure. The heavy-duty GHG standards should recognize the potential for additional GHG reduction from the existing vehicle fleet using these renewable fuels. [EPA-HQ-OAR-2022-0985-1552-A1, pp.5-6]

We believe there is ample feedstock, oilseed crush capacity, and fuel production capacity to achieve an additional 500 million gallons per year of advanced biofuels through the end of 2025, as outlined in Chevron's comments7 earlier this year for EPA's proposed regulations for the Renewable Fuel Standard. The majority of these advanced biofuels will be made up of renewable diesel and biodiesel. [EPA-HQ-OAR-2022-0985-1552-A1, p.6]

7 Docket ID No. EPA-HQ-OAR-2021-0427, Chevron Comment Letter in response to Renewable Fuel Standard Program Proposed Rule: Standards for 2023-2025 and Other Changes. Available here: EPA-HQ-OAR-2021-0427-0553

Several of our trade association partners highlight investments to expand lower carbon intensity biofuels that are playing a key role today to reduce emissions from the hard to electrify transportation sector. We reference the comments filed by Clean Fuels Alliance America and the Natural Gas Vehicles for America noting advances in expanding biodiesel, renewable diesel, and renewable natural gas supply. [EPA-HQ-OAR-2022-0985-1552-A1, p.6]

Additionally, Chevron is investing in capabilities to increase the supply of biofuels. In 2022, Chevron acquired Renewable Energy Group (now Chevron REG) a leading biodiesel and renewable diesel fuel producer. Chevron REG is scheduled to complete the expansion of the renewable diesel facility in Geismar, LA in 2024 that will triple capacity to 340 million gallons of lower carbon intensity renewable diesel. [EPA-HQ-OAR-2022-0985-1552-A1, p.6]

Chevron announced a collaboration with Corteva to introduce winter canola that will produce lower carbon intensity feedstocks. Chevron has invested in CoverCress to develop and introduce small winter oilseeds that will also produce lower carbon intensity feedstocks. A Chevron joint venture with Bunge, a leading oilseed processor, will expand crush capacity to yield greater access to lower carbon intensity feedstocks. [EPA-HQ-OAR-2022-0985-1552-A1, p.6]

Chevron is also partnering with CalBio Energy, Brightmark and dairy farmers to market and produce renewable natural gas, which is used as compressed natural gas (CNG) for vehicle fueling. In January of 2023, Chevron acquired full ownership of Beyond6 with its network of 55 CNG stations across the United States. [EPA-HQ-OAR-2022-0985-1552-A1, p.6]

Finally, Chevron is forming creative alliances with partners such as Walmart, Cummins, and Raven SR to develop alternative heavy-duty fuel and technology options. All of the above technology pathways and commercial ventures are important contributors to reduce lifecycle and tailpipe emissions from new vehicles and from the existing truck fleet and should be incorporated into a strategy to reduce GHG emissions from heavy-duty trucks. [EPA-HQ-OAR-2022-0985-1552-A1, p.6]

Organization: Clean Fuels Alliance America (Public Hearing Testimony)

[*From Hearing Testimony, May 2, 2023*] On behalf of Clean Fuels members, thank you for the opportunity to testify on the immediate benefits of biodiesel and renewable diesel have and will continue to bring as we de-carbonize the heavy-duty sector. Biodiesel and renewable diesel are among the cleanest and lowest carbon fuels available today to help reduce greenhouse gas emissions and are available now to meet President Biden's near- and long-term climate goals, particularly in the hard-to-decarbonize heavy-duty sector. We appreciate EPA's acknowledgement that the internal combustion engine will continue to play an important role in the markets that Clean Fuels member serve. Low-carbon liquid fuels are the lowest cost option towards decarbonization that can be used in every diesel-fueled application and every engine technology. The heavy-duty sector will continue to rely on liquid fuels for decades to come. Clean Fuels has a long history of working with users, fleets, and the OEM community to conduct technically-credible research that validates the performance and positive impacts of biodiesel when used in existing and future diesel engines. To date, the utilization of increasing volumes of ultra-low carbon liquid fuels, like biodiesel and renewable diesel, reduces greenhouse gas emissions by more than 70 percent on average, directly and immediately reducing GHG emissions from the vehicles that use our fuels. Our fuels reduce more than just greenhouse gas emissions. Biodiesel and renewable diesel also reduce criteria pollutants from existing diesel engines, reduce health and environmental impacts in major trucking corridors, warehouse distribution centers, and other diesel hotspots close to major population sectors. This means that using these fuels today can lower healthcare costs and costs for all populations living in and near these areas including, minority, low-income, and indigenous populations. Through our continued partnership with Trinity Consultants, Clean Fuels quantified the health benefits and corresponding economic savings from converting petroleum-based diesel to 100-percent biodiesel at 23 sites across the country. This research finds that switching to 100-percent biodiesel can provide immediate community health improvements, including more than 436,000 fewer reduced asthma cases per year, more than 137,000 few sick days per year, nearly 9,400 less cancer cases, the prevention of more than 885 premature deaths, over $7.4 four billion in avoided healthcare costs annually, and a 45-percent reduction in cancer risk. And legacy heavy-duty trucks, such as older semis, use B100. The immediate benefits of B100 usage can bring -- cannot be underscored enough, especially for disadvantaged communities when you consider the longer, full, useful life requirements of existing diesel engines and the decades-old take to pursue across-the-board electrification and other decarbonization strategies. Clean Fuels looks forward to working with EPA to continue to optimize the immediate benefits of biodiesel and renewable diesel to decarbonize the heavy-duty sector today and in the years to come. Thank you. [EPA-HQ-OAR-2022-0985-2666, Public Hearing Testimony, Day 1]

Organization: Clean Fuels Alliance America

Low carbon liquid fuels are the lowest cost option toward decarbonization that can be used in every diesel fueled application and every engine technology. It cannot be overlooked that the heavy-duty sector will continue to rely on the internal combustion engines when you consider the longer full useful life requirements of existing diesel engines and the decades it will take to pursue across the board electrification and other decarbonization strategies. As a result, EPA cannot discount the immediate benefits biodiesel and renewable diesel have and will continue to bring as we decarbonize the heavy-duty sector. [EPA-HQ-OAR-2022-0985-1614-A1, pp. 1 - 2]

Our fuels reduce more than just greenhouse gas emissions. Biodiesel and renewable diesel also reduce criteria pollutants from existing diesel engines, reducing health and environmental impacts in major trucking corridors, warehouse distribution centers and other diesel hot spots close to major population sectors. This means that using these fuels today will also lower health care impacts and costs for all populations living in and near these areas including minority, low-income, and indigenous populations. [EPA-HQ-OAR-2022-0985-1614-A1, p. 2]

We ask that EPA adjust the performance-based standards to reflect a more appropriate and feasible mix of technologies available in the time-frame proposed to meet the revised standards recognizing that EPA will still achieve both carbon reductions and environmental justice benefits using biodiesel and renewable diesel in the heavy-duty sector. [EPA-HQ-OAR-2022-0985-1614-A1, p. 2]

II. Proposed CO2 Emission Standards

We appreciate EPA's acknowledgement of the role the internal combustion engine will continue to play in the heavy-duty market. The heavy-duty trucking sector alone will be reliant on liquids fuels until at least 2050 with the assumed average lifetime of 15 years. [EPA-HQ-OAR-2022-0985-1614-A1, p. 2]

The Ultra-Low Emissions Diesel Engines (ULEDEs) produced under the "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards" are substantially cleaner than New Technology Diesel Engines (NTDE) in the market today and will approach near-zero regulated emissions of PM, NOx, unburned hydrocarbons, and carbon monoxide.3 Low-carbon liquid fuels will address the emissions of PM, NOx, unburned hydrocarbons, and carbon monoxide in existing engines. Using renewable fuels in existing internal combustion engines will remain an important option for decarbonizing the transportation sector. In addition, these fuels continue to make improvements in emissions, are readily available nationwide, have known predictable performance, and other known operating characteristics such as higher cetane rating and improved lubricity, which help prolong engine life. Biodiesel burns cleaner, reduces harmful emissions, and helps eliminate injector and fuel system deposits, which can extend maintenance intervals. [EPA-HQ-OAR-2022-0985-1614-A1, p. 2]

3 U.S. Environmental Protection Agency. Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, EPA-HQ-OAR-2019-0055, 88 FR 4296 (January 24, 2022), available at https://www.federalregister.gov/d/2022-27957

Meeting clean air demands does not require switching to a zero-emissions vehicle. Biodiesel and renewable diesel are drop-in alternatives, achieving valuable carbon reductions today at a relatively low cost.4 These fuels offer owners, users, and fleet operators of heavy-duty vehicles affordable, low-carbon solutions to immediately improve the sustainability of their operations. These cleaner fuels are available now and can be used in every diesel fueled application and every engine technology. Nearly all medium- and heavy-duty original equipment manufacturers (OEMs) support using biodiesel blends of 20% or more in the vehicles they produce, and the vast majority of OEMs support the use of biodiesel blends up to 20%. For those that do not, warranties cannot be voided or impacted in any way using biodiesel, due to existing federal law.5 [EPA-HQ-OAR-2022-0985-1614-A1, pp. 2 - 3]

4 Source: Frank, J. et al. Quantifying and comparing the cumulative greenhouse gas emissions and financial viability of heavy-duty transportation pathways for the Northeastern, United States. Fuel, 323, 124243, Sep. 2022. https://doi.org/10.1016/j.fuel.2022.124243. See Table 4.

5 Magnuson-Moss Warrant Act, P.L. 93-637

When compared to other decarbonization strategies such as zero emissions and specifically electrification approaches, which require both new vehicles and infrastructure to realize the benefits, biodiesel and renewable diesel remain the lowest cost option. [EPA-HQ-OAR-2022-0985-1614-A1, p. 3]

Organization: ClearFlame Engine Technologies

ClearFlame supports a strong Final Rule that accelerates the decarbonization of the all vehicles in the heavy-duty truck sector in a manner that will meet the ambitious goals of the Biden Administration's Transportation Decarbonization Blueprint (the 'Blueprint').Integrating our recommendations and proposed solutions into the Final Rule will align the Phase 3 GHG standards 3 More specifically, the Blueprint stated that we will need to deploy a range of solutions to meet our climate goals, including biofuels and e-fuels (collectively referred to as 'Sustainable Liquid Fuels' or 'SLFs'), electric vehicles, and hydrogen-powered vehicles. and the Final Rule with the Blueprint. [EPA-HQ-OAR-2022-0985-1654-A2, p. 2]

3 The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation (the 'Blueprint').

We are pleased to see EPA acknowledge that there will be no 'one-size-fits-all' approach to future heavy-duty vehicles and engines, and that it expects to see a mix of engine technologies as part of the solution set.5 Our goal in submitting these comments is to support EPA by proposing changes to the Final Rule that better aligns with the Administration's Blueprint, especially with respect to ethanol, the most common SLF. [EPA-HQ-OAR-2022-0985-1654-A2, p. 2]

5 Proposal at 25932.

A Final Rule that is silent on ethanol and other SLFs – that does not even create a certification pathway for engines that dedicated to ethanol usage – will stifle innovation in this sector, send a signal to America's farms and rural communities that they will not participate in the exciting economic opportunities presented by a decarbonized transportation future, and result in a longer, slower, less cost-effective transition from petroleum-fueled, internal combustion engine ('ICE') vehicles in the long-haul truck sector. [EPA-HQ-OAR-2022-0985-1654-A2, p. 2]

Currently, of the three strategies highlighted in the Blueprint to decarbonize our future trucks, the Proposal only incentivizes electric vehicles and hydrogen vehicles. However, the Blueprint concluded that, in the long-haul truck sector, biofuels and other SLFs will be a 'large, long-term' opportunity that is even greater than the market opportunity for battery-electric vehicles (‘BEVs’).6 We believe that the Blueprint’s recognition of the large, long-term opportunity of biofuels and other SLFs in the long-haul truck sector should be embodied In the Final Rule. [EPA-HQ-OAR-2022-0985-1654-A2, p. 3]

6 The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation, see page 5, Figure B

The Clean Air Act authorizes EPA to integrate the type of fuel into the Phase 3 GHG emission standards. [EPA-HQ-OAR-2022-0985-1654-A2, p. 4]

This Proposal is based on authority granted to EPA under Clean Air Act Section 202(a).8 Section 202(a)(1) gives EPA authority to establish emissions standards for ‘any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines.’ On numerous occasions, EPA has found that carbon dioxide (CO2) and other GHG emissions have significant impacts that endanger public health and welfare.9 Thus, we agree that EPA is authorized to proceed with this Proposal to establish Phase 3 GHG standards for heavy-duty engines pursuant to Section 202(a)(1) of the Clean Air Act. [EPA-HQ-OAR-2022-0985-1654-A2, p. 4]

8 42 U.S.C. 7521(a)(1).

9 See Proposal, p. 25928, footnote 4.

As EPA knows, GHG pollution is a global problem. Unlike pollutants that trigger asthma emergencies, heart attacks, or other local health impacts, it does not matter whether GHG emissions reductions occur at the tailpipe of a vehicle or from the shift from high-carbon petroleum to low-carbon SLFs like ethanol. From the perspective of carbon pollution, the location of these reductions is irrelevant. Thus, it makes sense to create a Final Rule that reduces the total GHG emissions impact of America’s future heavy-duty vehicles as much as possible, as quickly as possible, wherever possible, and as cost-effectively as possible. Doing so makes it more likely that the Final Rule will be a success. [EPA-HQ-OAR-2022-0985-1654-A2, p. 4]

Section 202(a)(3)(A)(ii) authorizes EPA to look beyond the basic engine to set its engine or vehicle emission standards. Specifically, it states that, ‘in establishing classes or categories of vehicles or engines for purposes of regulations under this paragraph, the Administrator may base such classes or categories on gross vehicle weight, horsepower, type of fuel used, or other appropriate factors.’10 (emphasis added). [EPA-HQ-OAR-2022-0985-1654-A2, p. 4]

10 42 U.S.C. 7521(a)(3)(A)(ii)

In the case of a dedicated alternative fuel engine, the type of fuel used is an inherent part of the engine system. In such an engine, the engine cannot be separated from fuel that powers it. The fuel must be considered in determining whether the engine meets the relevant emission standard. Indeed, EPA’s GEM has a fuel input for natural gas, because the agency recognizes that it is impossible to consider the emissions performance of a natural gas engine (and thus, whether such an engine should receive its certificate of conformity) separate and apart from the natural gas fuel that powers it. Similarly, it is appropriate – even imperative – that EPA establishes a certification pathway for a class or category of dedicated alternative fuel engines. It would be counter-productive if EPA simultaneously acknowledges that a low-carbon SLF like ethanol should be an important component of the Administration’s Blueprint, yet fails to provide a certification pathway that acknowledges and integrates the GHG benefits of such a dedicated alternative fuel engine that uses ethanol or other low-carbon SLF. [EPA-HQ-OAR-2022-0985-1654-A2, pp. 4-5]

EPA Should Update its Certification Pathways and GEM Inputs in the Final Rule to Specifically Integrate ethanol and other SLFs [EPA-HQ-OAR-2022-0985-1654-A2, p. 5]

In response to EPA's request for comment on the need to 'include additional GHG-reducing technologies and/or higher levels of adoption rates of existing technologies for ICE vehicles' in the Final Rule,11 and EPA's proposal to update 40 CFR 1036.505 to clarify that 'when certifying vehicles with GEM, for any fuel type not identified in Table 1 of 40 CFR 1036.550, the manufacturer would identify the fuel type as diesel fuel for engines subject to compression-ignition standards,'12 we strongly urge EPA to include an engine certification pathway for all fuels that it reasonably expects to see used in dedicated alternative fuel engine.13 Today, new engines have to be certified using the GEM. GEM assumes that the only fuels to be used by heavy-duty engines are gasoline, diesel, and natural gas. EPA recognizes that the absence of a fuel-specific approach for hydrogen will chill investment or technology development and recognizes that the emissions performance of a hydrogen-fueled engine cannot be separated from the hydrogen fuel that powers it. Thus, it is seeking comment to determine how to create a certification pathway for internal combustion engines that are fueled by hydrogen.14 [EPA-HQ-OAR-2022-0985-1654-A2, p. 5]

11 Proposal at 25961.

12 Proposal at 26022.

13 To avoid confusion and to be consistent with EPA's traditional terminology (see., e.g., EPA's Part 1065 requirements for Alternative Fuel Engine Conversions), we are using the phrase 'alternative fuel' throughout these comments, rather than the Blueprint's use of the phrase 'SLF.' However, for the purposes of our comments and recommendations, these terms are interchangeable.

14 Proposal at 26024.

EPA's Final Rule must similarly provide a mechanism for certifying dedicated ethanol and other dedicated alternative fuel engines. Failure to do so would be arbitrary and capricious as a legal matter, chilling as an investment matter, scientifically unsound from a GHG perspective, and extremely short-sighted from the perspective of creating a program to reduce GHGs at scale, as quickly and as cost-effectively as possible. [EPA-HQ-OAR-2022-0985-1654-A2, pp. 5-6]

Creating a certification pathway for dedicated alternative fuel engines that run on ethanol is not just critical to the success of ClearFlame, it is the scientifically and technically correct way to treat our engines, as well as other dedicated ethanol engines that may follow once EPA has sent this market signal to the OEMs that their dedicated ethanol engines will provide emissions certification benefits that are in sync with their real-world climate benefits. [EPA-HQ-OAR-2022-0985-1654-A2, p. 6]

The current system treats the ethanol-fueled engine as though it were actually dirtier than diesel from a carbon perspective, because GEM treats a dedicated ethanol engine as though it is running on high-carbon diesel fuel (in contrast to a CNG engine, which is not treated by GEM as though it is running on diesel). By treating a dedicated ethanol engine as though it was running on diesel, the resulting GEM calculations yield an unintended negative outcome that has no bearing in reality - modeled emissions that are actually ‘even dirtier than diesel,’ despite their obviously different contributions to climate change. [EPA-HQ-OAR-2022-0985-1654-A2, p. 6]

This ‘ethanol penalty’ happens (1) because GEM does not take the biogenic nature of ethanol emissions into account, (2) it does not take the lower carbon Intensity of ethanol into account, and (3) it does not take other combustion differences (like heating value and H/C ratio) between ethanol and diesel into account. Taken together, this means that the GEM output masks the climate benefit of the ethanol fuel choice, compared to diesel. Leading climate research indicates that these errors result in overestimating the climate impact of ethanol by 3x.15 [EPA-HQ-OAR-2022-0985-1654-A2, p. 6]

15 GEM currently estimates emissions from ethanol vehicles to be approximately 1.5 times worse than diesel. However, GREET, based on national average, calculates ethanol to have 50% of the emissions impact of diesel. Based on this information, GEM overestimates the climate impact of an ethanol-fueled engine by 3x (1.5/.5).

GEM currently estimates emissions from ethanol vehicles to be approximately 1.5 times worse than diesel. However, GREET, based on national average, calculates ethanol to have 50% of the emissions impact of diesel. Based on this information, GEM overestimates the climate impact of an ethanol-fueled engine by 3x (1.5/.5). EPA should create a fuel input for ethanol within GEM, which would account for its heating value, H/C ratio, and biogenic carbon ratio. This would enable GEM to accurately account for the different combustion properties and decarbonization benefits of a compression-ignition engine that has been designed to run exclusively on ethanol. [EPA-HQ-OAR-2022-0985-1654-A2, p. 6]

While it would be possible to achieve the same goal by adding a conversion or correction factor to the calculation of GEM emissions, a fuel-specific fuel Input (such as is being considered for hydrogen) is highly preferred to ensure GEM consistency across the various fuels that will power future heavy-duty vehicles.16 [EPA-HQ-OAR-2022-0985-1654-A2, pp. 6-7]

16 Adding such an after-the-fact conversion or correction factor to GEM could enable EPA to correctly estimate that actual, real world GHG benefits of switching from diesel to ethanol. However, this approach would not send the same market signal that a fuel-specific input does—a market signal enjoyed by engine makers that use natural gas and, presumably soon, hydrogen. That said, using the Argonne National Laboratory GREET model, we estimate a truck operating solely on E98 ethanol (i.e., 98% ethanol) would receive a 32% conversion factor, which would account for the two GHG advantages of ethanol, i.e., its lower heating value and significantly lower carbon intensity. See Argonne National Laboratory, The Greenhouse gases, Regulated Emissions, and Energy use in Technologies Model (‘GREET’), accessible at https://greet.es.anl.gov/.

We note that EPA has requested comment on whether the agency ‘should add specifications for alternative test fuels, like methanol, and fuels other than carbon-containing fuels like hydrogen and ammonia, to 40 CFR part 1065, subpart H (‘Subpart H’).’17 Currently, 40 CFR 1065.701(c) allows the use of test fuels that are not specified in Subpart H, but only with EPA’s prior written approval.18 [EPA-HQ-OAR-2022-0985-1654-A2, p. 7]

17 Proposal at 26025.

18 40 CFR 1065.701(c). See also Id. at Table 1.

The current approach enables a company like ClearFlame to request approval to use as an alternative test fuel any of the following if we meet EPA’s criteria: (1) E98 that meets ASTM D4806 (i.e., uses gasoline as its denaturant), (2) another form of E98 that does not use gasoline as its denaturant, or (3) ethanol that includes 5% water (as would result from the output of an unaugmented distillation process). However, this approach does not guarantee that EPA will approve any of these fuels as an alternative test fuel. [EPA-HQ-OAR-2022-0985-1654-A2, p. 7]

This approach adds an unnecessary layer of uncertainty into our product development, our test plans, and even the expectations of our potential investors and customers. Since EPA's intent in Subpart H seems to be to encourage innovators to develop new, low-emission technologies using a wide range of alternative fuels, it should add specifications for all SLFs that are likely to be used in future engine technologies that are developed to meet the standards and requirements of the Final Rule, including the three examples cited above. [EPA-HQ-OAR-2022-0985-1654-A2, p. 7]

Currently, the relevant section of 40 CFR part 1065, subpart H limits the use of high-blend ethanol as a test fuel to E51-83 fuel that meets the specifications of ASTM D5798.19 We request that EPA adds specifications for high-blend ethanol for each of the examples that we have outlined above: (1) E98 that meets ASTM D4806 (i.e., uses gasoline as its denaturant), (2) another form of E98 that does not use gasoline as its denaturant, and (3) ethanol that includes 5% water (as would result from the output of an unaugmented distillation process). [EPA-HQ-OAR-2022-0985-1654-A2, pp. 7-8]

19 See 40 CFR Part 1065.725.

EPA Should Treat Ethanol as Carbon-Neutral at the Tailpipe in the Final Rule, just as it treats BEVs and FCVs [EPA-HQ-OAR-2022-0985-1654-A2, p. 8]

In its Proposal, EPA proposes to treat future battery-electric vehicles and hydrogen-fueled vehicles as carbon-neutral at the tailpipe.20 This disregards any upstream or life cycle emissions that are associated with the power generation necessary to charge BEVs or the source or amount of energy that is used to generate the hydrogen that is used in any hydrogen-fueled ICE or fuel cell vehicles. [EPA-HQ-OAR-2022-0985-1654-A2, p. 8]

20 Proposal at 26022.

In its Final Rule, EPA should also treat a heavy-duty engine that is designed to operate solely on ethanol as carbon-neutral at the tailpipe. Why? Because the carbon emissions from an ethanol-fuel engine are 100% biogenic, i.e., they derive from photosynthesis pulling carbon from the atmosphere in the natural carbon cycle. Stated another way, biogenic carbon does not contribute to the process of moving carbon from the lithosphere to the atmosphere (e.g. extracting fossil-based carbon from deep underground). Since these emissions do not derive from fossil fuels, they do not contribute to climate change at the point of combustion in the engine. And thus, just like battery-electric and hydrogen-fueled vehicles, dedicated ethanol engines and vehicles should be treated as carbon-neutral at the tailpipe because they are not contributing to global climate change at the tailpipe. [EPA-HQ-OAR-2022-0985-1654-A2, p. 8]

To be as scientifically sound as possible, the Phase 3 GHG standards should focus on reducing the human-generated (or anthropogenic) climate impacts from America's future trucks and buses by reducing anthropogenic GHG emissions from their engines. To achieve this goal, EPA should recognize that biogenic and anthropogenic carbon are different in how –and even whether—they contribute to climate change. Renewable SLFs like ethanol reduce overall GHGs from heavy-duty transportation by keeping the carbon from petroleum diesel out of the atmosphere—in the ground, where it should stay. [EPA-HQ-OAR-2022-0985-1654-A2, p. 8]

Failure to recognize the difference between biogenic and anthropogenic emissions would yield an outcome that is not scientifically sound and that seems arbitrary and capricious. It would yield an outcome where a hydrogen-fueled engine that is derived from coal combustion could be certified at a lower emissions level than a dedicated ethanol engine that is derived from a low-carbon (or even carbon-negative) feedstock. [EPA-HQ-OAR-2022-0985-1654-A2, p. 8]

It is worth noting that EPA already has a policy of treating certain biogenic carbon as carbon-neutral in stationary sources. In 2018, EPA adopted a policy of treating carbon emissions resulting from the combustion of biomass from managed forests at stationary sources as carbon-neutral.21 [EPA-HQ-OAR-2022-0985-1654-A2, p. 9]

21 See U.S. Environmental Protection Agency, policy statement, accessed on April 30, 2023 at https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf.

Given that EPA has requested comment on whether to include additional GHG-reducing technologies for ICE vehicles in its technology assessment for the Final Rule, we do not believe that EPA would need to publish an additional Notice of Proposed Rule Making or other procedural step to integrate our recommendations.31 [EPA-HQ-OAR-2022-0985-1654-A2, p. 12]

31 Proposal at 25961.

Organization: Diesel Technology Forum (DTF)

One can reasonably conclude that both the acquisition of new ICEV and continued use of ICEV in the existing fleet in the commercial trucking sector will continue at significant levels for several decades at least. [EPA-HQ-OAR-2022-0985-1618-A1, p. 4]

As such, we believe EPA has failed to fully consider the GHG mitigation potential and factors related to the expanded use of renewable biobased diesel fuels in the extensive population of existing and expected future ICEVs that will be in service for decades to come. The resulting GHG mitigation impacts from the potential for use of the renewable biofuels on the levels of stringency in GHG standards proposed and the timing for their implementation as well as other factors has not been considered, as discussed further below. [EPA-HQ-OAR-2022-0985-1618-A1, p. 4]

III. The Proposal Fails to Consider the Current and Future Utilization of Biobased Diesel Fuels as A Decarbonization Strategy for The Sector, And Its Resulting Implications for All Aspects of The Proposed Rule.

While the proposed rule focuses on establishing emissions standards that govern future new vehicles, the justification of all the aspects of the rule is based on the hazards of greenhouse gases and the EPA’s duty to reduce them. EPA notes in its arguments that

“Despite the significant emissions reductions achieved by previous rulemakings, GHG emissions from HD vehicles continue to impact public health, welfare, and the environment. The transportation sector is the largest U.S. source of GHG emissions, representing 27 percent of total GHG emissions. Within the transportation sector, heavy-duty vehicles are the second largest contributor to GHG emissions and are responsible for 25 percent of GHG emissions in the sector.4 [EPA-HQ-OAR-2022-0985-1618-A1, p. 4]

4 Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2020 (EPA–430–R–22–003, published April 2022).

Use of low-carbon renewable fuels is recognized as a proven means to reduce GHG emissions of the transportation sector. In EPA's February 2023 proposed Renewable Fuel Standard (87 Fed Reg 80585) EPA notes that

"This proposed rule is projected to reduce GHG emissions, which would benefit communities with environmental justice concerns who are disproportionately impacted by climate change…" [EPA-HQ-OAR-2022-0985-1618-A1, p. 5]

In the current proposal however, EPA provides only a single passing mention of biobased diesel fuels (biodiesel and renewable diesel) (88 Fed Reg 25951)

"Manufacturers have responded to standards over the past decade by continuing to develop and deploy a wide range of technologies, including more efficient engine designs, transmissions, aerodynamics, and tires, air conditioning systems that contribute to lower GHG emissions, as well as vehicles based on methods of propulsion beyond diesel- and gasoline fueled ICE vehicles from mild hybrids and alternative fuels (such as natural gas, biodiesel, renewable diesel, methanol, and other fuels), as well as various levels of electrified vehicle technologies from mild hybrids, to strong hybrids, and up through batery electric vehicles and fuel cell electric vehicles." [EPA-HQ-OAR-2022-0985-1618-A1, p. 5]

EPA has failed to factor in the use of biobased diesel fuels and their overall impact on reducing GHG from this sector during the timeframe of the proposed rule. According to the Energy Information Administration, in 2022, U.S. refiners produced 71,879,000 barrels of biodiesel and renewable diesel combined, in addition to over 10,000,000 barrels imported. [EPA-HQ-OAR-2022-0985-1618-A1, p. 5]

By definition as an Advanced Biofuel, biodiesel and renewable diesel reduce C02 emissions by at least 50 percent compared to petroleum diesel fuel. Depending on feedstocks, the use of these fuels reduces greenhouse gas emissions by as much as 85%. [EPA-HQ-OAR-2022-0985-1618-A1, p. 5]

Given the significant role of renewable biobased diesel fuels today and projections for future growth, the Agency's failure to consider the GHG mitigation potential of the use of these fuels in the trucking sector ICEV undermines the analysis and justification for proposed future standards and other aspects of this proposed rule. These biobased diesel fuels currently meet about 4% of the nation's on-road diesel demand, and 38% in California. Biobased diesel fuels have generated more cumulative Low-Carbon Fuel Credits (42% of total since 2013) than other transportation fuels. [EPA-HQ-OAR-2022-0985-1618-A1, p. 5]

Many aspects of the proposed Phase 3 GHG rule should be reevaluated by factoring in current and future potential for GHG mitigation through the use of low carbon fuels, including the overall role of ICEV using renewable fuels in helping the US achieve climate goals, the need for the rule, the timing of the implementation of the rule, the stringency of GHG standards adopted and other factors. [EPA-HQ-OAR-2022-0985-1618-A1, p. 5]

Research completed by Stillwater Associates for the Diesel Technology Forum in July 2022 evaluated options for reducing greenhouse gas emissions from commercial vehicles in 10 northeastern states over the ten-year period 2022-2032:

- Medium and heavy-duty trucks operating in 10 Northeastern states (Connecticut, Delaware, Massachusetts, Maryland, Maine, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont) that have adopted California's low emission (LEV) and zero emission vehicle (ZEV) regulations were studied by Stillwater Associates for the Diesel Technology Forum.
- An analysis was undertaken to analyze the environmental benefits attainable from three strategies in the 2022-2032 period; electrification, accelerated fleet turnover and use of biodiesel and renewable diesel fuel.
- The considerable benefits of using low-carbon renewable biobased diesel fuels were evident from this analysis. As these fuels can be used in all diesel vehicles today, fueling the diesel vehicles in the study with 100% renewable diesel resulted in three times larger cumulative GHG reductions by 2032 than the EV scenarios. Using B20 – a 20% blend of biodiesel with 80% petroleum diesel – provided about the same cumulative GHG reduction. [EPA-HQ-OAR-2022-0985-1618-A1, pp. 5 - 6.] [See the Figure, HD Scenarios 2022-2023 GHG Reductions, on page 6 of docket number EPA-HQ-OAR-2022-0985-1618-A1, pp.5-6]

Beyond GHG emissions, the research also highlighted impacts of an advanced diesel vs. electrification strategy on regional air quality as well, finding that the business-as-usual case replacing pre-2007 model year diesel vehicles which lacked diesel particulate filters with advanced technology diesel vehicles provided the largest particulate matter (PM) reduction. This is due to new technology diesel engines' 98% PM reductions compared to EVs' 95% PM reduction assuming power from the U.S. Grid Mix. [EPA-HQ-OAR-2022-0985-1618-A1, p. 6]

As for nitrogen oxides (NOx) emissions, EVs have 98.5% lower NOX than pre-2007 diesel vehicles on a per mile basis, and 2010 and later MY vehicles have 79% less NOx emissions than a 2007 diesel model. However, when replacing a diesel medium and heavy-duty vehicle with an EV and evaluated on an annual miles driven basis, the NOx benefit is diminished. EVs are generally deployed on shorter routes and have a shorter range of operation than that of a comparable diesel vehicle, with about 87% of the mileage on a daily basis. Given this mileage difference, NOx emission reductions for a fleet transitioning to EV will be less than the business-as-usual turnover from older generation diesel to advanced technology with selective catalytic reduction (SCR) systems that reduce NOx by 98%. [EPA-HQ-OAR-2022-0985-1618-A1, p. 6]

On a cumulative fleet conversion cost basis, turning over a medium and heavy-duty fleet of 10,000 vehicles in the 10-state region over to EV carries a price tag more than three times higher than the equivalent cost for new technology diesel vehicles. The incremental EV cost for Class 7/8 vehicles is $250,000 for the vehicle and $45,000 for charging infrastructure. [EPA-HQ-OAR-2022-0985-1618-A1, pp. 6-7]

The full study and supporting infographic are appended to these comments. They are also available for View and downloading as follows:

- View the full study at https://dieselforum.egnyte.com/dl/MWHPcRW4e6

- View and download the infographic at https://dieselforum.egnyte.com/dl/fZ9UzT4y6h [EPA-HQ-OAR-2022-0985-1618-A1, p. 7.] [See the Appendix on pages 8-42 of docket number EPA-HQ-OAR-2022-0985-1618-A1.]

Organization: Energy Vision

Energy Vision, a leading NGO in the clean energy sector, is submitting these comments in strong support of EPA's goal of decarbonizing the US economy as quickly as possible. However, our research shows that the country could achieve greater climate benefits on a much faster timeline through an amendment to the proposed Greenhouse Gas Phase 3 regulations: one that would indefinitely allow heavy-duty vehicles fueled by renewable natural gas (RNG), often a net carbon-negative fuel. [EPA-HQ-OAR-2022-0985-1576-A1, p. 1]

Reasons for Allowing RNG-Fueled Heavy-Duty Vehicles in EPA Phase 3 Regulations

- Measuring greenhouse gas emissions on a lifecycle basis – meaning from all aspects of production, transportation, and end-use – is the gold standard. This methodology was developed by Argonne National Laboratory and is utilized by a number of states with progressive climate laws. By contrast, a tailpipe 'zero emissions' requirement measures just a slice of the whole picture. Having zero tailpipe emissions is misguided as a criterion when the consideration that matters most to the global climate is getting total lifecycle emissions down to zero – or negative, as with renewable natural gas (RNG). [EPA-HQ-OAR-2022-0985-1576-A1, p. 1]
- RNG is the lowest carbon fuel available today. Energy Vision has found that the greatest environmental benefits accrue from converting the methane biogases emitted by decomposing organic wastes into RNG, also known as biomethane. When greenhouse gas emissions from RNG as transportation fuel are compared to diesel on a lifecycle basis, RNG from food waste, manure, and wastewater is deeply carbon-negative. This means that more carbon is captured in producing the gas (in the form of potent methane) than is ever released by combusting it (as far less potent CO2). RNG also has 90% fewer NOx emissions and 60% fewer particulate emissions than diesel; both are very damaging to health and disproportionately affect environmental justice communities. [EPA-HQ-OAR-2022-0985-1576-A1, pp. 1-2]
- It is essential to decarbonize the economy as quickly as practicable. EPA's objectives are critical in doing so, but RNG-fueled heavy-duty vehicles are a vital part of the solution. These vehicles are not technically zero-emission, but as noted above, on a lifecycle basis, they are actually net carbon negative, which is even better from a climate perspective. Put another way, even if all vehicles were to become battery electric tomorrow, there would still be a continuous flow of organic wastes – food waste, manure, wastewater, etc. – all over that must be disposed of and would be emitting methane as they decompose. By capturing that methane to produce RNG and displace the dirtiest vehicle fuel – diesel – our country would maximize climate benefits right away. [EPA-HQ-OAR-2022-0985-1576-A1, p. 2]
- Incentivizing the capture and use of methane that is otherwise escaping into the atmosphere or being flared is essential for the US to meet its climate goals. Organic waste generates a large portion of US methane emissions. Landfills accounted for approximately 16.9% in 2021 (the third largest source); when wastewater treatment, composting, anaerobic digestion, and manure management are added, that proportion

rises to over 28% – almost as much as the 29% from the oil and gas industry. The US has committed to reducing its methane emissions 30% from 2020 levels by 2030, so putting that methane to use for RNG production is a win-win. [EPA-HQ-OAR-2022-0985-1576-A1, p. 2]

- RNG technology is already well-established, high-performing, and available today, with over 50,000 trucks running on it. RNG broke a new record in 2022, making up 69% of all on-road fuel used in natural gas vehicles. There is sufficient feedstock for RNG to power a quarter of the nation's heavy-duty trucks. It's slightly more expensive for trucks to use a modern, efficient natural gas engine than a diesel engine but vastly less than a battery electric truck, which currently often retails for over twice as much as a diesel truck. While total cost of ownership for battery electric trucks is expected to come down in the years ahead, relying solely on a technology that is largely unproven in the heavy-duty on-road sector is unwise and misguided. [EPA-HQ-OAR-2022-0985-1576-A1, p. 2]
- The two leading market-based programs for transportation decarbonization in the U.S. – EPA's very own Renewable Fuel Standard and California's Low Carbon Fuel Standard – both treat RNG favorably. The vast majority of the 250+ domestic RNG projects operating today send at least a portion of their fuel to the heavy-duty on-road vehicle market. Yes, potential demand for RNG will always outpace supply, particularly for stationery (non-road) applications. But much of the success we have tracked over the past decade in seeing this country's waste-derived methane put to beneficial use has been tied to investors' and developers' ability to see the direct link between supply and demand. Eliminating RNG's eligibility for use in trucks and buses within the next decade may seriously undermine efforts to drastically reduce unchecked methane emissions. [EPA-HQ-OAR-2022-0985-1576-A1, p. 2]
- Europe provides a noteworthy example of including – even mandating – RNG (aka 'biomethane') in its transport sector. The European Union (EU) measures greenhouse gases on a lifecycle basis, and biomethane is among its accepted renewable energy sources. This includes the EU-wide carbon Emissions Trading System, where biomethane production generates valuable credits that higher-carbon producers must purchase to offset their emissions. Furthermore, the EU has set a legally binding mandate for aggregate annual production and usage of biomethane by member-states: 35 billion cubic meters (bcm) by 2030. This builds upon its previous target for renewables to cover at least 14% of the transport sector by 2030, with sub-targets for advanced biofuels and biogas to reach 1% by 2025 and 3.5% by 2030. By 2024, EU countries must separately collect organic waste, which should help scale up biomethane production. A whole host of EU financing mechanisms are available to help meet this 35 bcm target by 2030 as well. [EPA-HQ-OAR-2022-0985-1576-A1, pp. 2-3]
- RNG can also be used as a sustainable feedstock – 'bio-intermediate' – for producing other low- and no-carbon gaseous and liquid fuels that will be essential for economy-wide decarbonization. This includes production of sustainable aviation fuel, methanol and hydrogen without the use of any fossil fuels, since organic waste will continue to be generated. [EPA-HQ-OAR-2022-0985-1576-A1, p. 3]
- Battery electric trucks may have zero tailpipe emissions, but on a lifecycle basis, they actually do have significant emissions (and human rights concerns) from mining lithium and cobalt abroad – such as in the Democratic Republic of Congo and China – as well as from transportation and manufacturing; they also have troublesome battery disposal

issues. Additionally, the batteries necessary to power a Class 8 truck are heavy, in turn increasing wear on the tires, brakes, and the roads, all of which cause fine particulate emissions. Some studies have even found particulate emissions from these non-tailpipe sources on battery electric heavy-duty vehicles to be higher than what diesel trucks emit (tailpipe and non-tailpipe). [EPA-HQ-OAR-2022-0985-1576-A1, p. 3]

- EPA projects that the proportion of battery electric trucks in the heavy-duty sleeper cab category will rise from 0% in 2029 to 10% in 2030, 20% in 2031, and 25% in 2032. Those figures seem unrealistic, but even at face value they leave the vast majority of these sleeper cabs still presumably using diesel for at least the next decade, and likely much longer. However, allowing RNG-fueled heavy-duty vehicles to count indefinitely under Phase 3 regulations would lead to much faster adoption and massive greenhouse gas reductions starting now, rather than waiting many years to make a difference. [EPA-HQ-OAR-2022-0985-1576-A1, p. 3]

On a final note, we want to underscore that we are totally supportive of the development of battery electric technology and infrastructure for heavy-duty vehicles. It will take many years for the US to scale up electric vehicle charging infrastructure for heavy-duty trucks; to improve electric vehicle technology for heavy-duty models and thus their performance; and to eventually reduce costs through economies of scale. In the meantime, trucking fleets can make a big difference in emissions by switching to RNG-fueled trucks now, at reasonable cost and reliable availability. Knowing that RNG-fueled trucks would be allowed indefinitely in the Phase 3 rules would give fleet owners the certainty they seek, likely leading to a major increase in RNG usage, at least until battery electric becomes a realistic option for many of these fleets performing an essential service that is the lifeblood of our economy. In any case, RNG will never be able to cover all diesel usage – even at full theoretical production from all feedstocks, it could displace perhaps 20% of total diesel usage in the US. But to exclude it entirely from eligibility under the EPA Phase 3 regulations would be a grave mistake. [EPA-HQ-OAR-2022-0985-1576-A1, p. 3]

Organization: Hexagon Agility Inc.

Vehicles with internal combustion engines running on renewable fuels should be given credit under the Proposed Rule. [EPA-HQ-OAR-2022-0985-1507-A1, p. 1]

We request that as part of EPA's GHG emission standards analysis, EPA further investigate the emissions reduction efficacy of renewable natural gas as it compares to other fuel types – including electricity. As indicated in the graph below, and as further described in the following link (Clean Energy Fuels - How sustainability goals become reality), RNG is the only fuel with a negative carbon intensity. Indeed, RNG captures harmful methane that would otherwise be released into the atmosphere, and repurposes it as a clean fuel that quickly and effectively decarbonizes the heavy duty sector. [EPA-HQ-OAR-2022-0985-1507-A1, pp. 2-3] [See the graph on p. 2 of docket number EPA-HQ-OAR-2022-0985-1507-A1]

We believe that a wider and more agnostic approach to clean fuel technologies will allow the market to determine whatever technology is best for a particular interest, while ensuring GHG reductions are achieved over time. Remember, internal combustion architecture in the heavy-duty sector has a 100+ year track record, whereas their electric counterparts have only a roughly 3-to-5-year history. [EPA-HQ-OAR-2022-0985-1507-A1, p. 2]

Heavy duty vehicles with renewable natural gas-powered internal combustion engines (‘ICE’) and hydrogen ICE engines effectively allow for massive reductions in greenhouse gases, particularly in the in the 10L to 15L heavy duty segment. Currently, battery electric and fuel cell heavy duty vehicles do not replace their ICE and HICE counterparts on a 1:1 basis due to energy storage capacity. Future iteratives may be able to replace these, however today they cannot. Thus, achieving GHG emission reductions in this sector can only be accomplished through utilization of ICE vehicles running on clean and renewable fuels. [EPA-HQ-OAR-2022-0985-1507-A1, p. 2]

Hexagon Agility has the unique perspective of offering products within all fields of the clean energy marketplace and therefore is keenly aware of the state of that marketplace. Renewably fueled low emission heavy-duty vehicles are available, cost-effective, safe and reliable. Indeed, Hexagon Agility has over two decades of experience with natural gas fuel systems and storage. Medium- and heavy-duty trucks using renewable fuel remain one of the most cost-effective remedies to address greenhouse gas and NOx emissions, especially in the near-term. Low NOx technologies (i.e., trucks with 0.02 gram per brake horsepower (g/bhp-hr) engines) are certified by CARB as 90 percent cleaner than diesel and are available today to help achieve emissions goals on time. Moreover, medium- and heavy-duty trucks running on RNG are only continuing to improve, with CARB recently certifying the lowest NOx engine ever. Simply put, these trucks, specifically in classes 4 through 8, are commercially available and technologically feasible and therefore should be evaluated and included in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1507-A1, p. 2]

Practicality and cost-effectiveness support inclusion of ICE vehicles running on clean fuels in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1507-A1, p. 2]

Hexagon Agility’s products have proven real-world reliability, having been used on over 60,000 commercial vehicles for more than 20 years, logging billions of miles. Common examples of vehicles utilizing our RNG fueling systems are refuse trucks, transit buses and line haul trucks. These customers have predictable routes, demand high vehicle up-time & reliability while logging high miles and long days. These companies are highly sensitive to vehicle lifecycles and total cost of ownership (TCO). [EPA-HQ-OAR-2022-0985-1507-A1, p. 3]

Currently, by taking a tailpipe only approach, EPA is really demanding a fuel cell and electrification-only solution. This position will cause substantial up-front financial investment for customers while being the highest risk option in terms of up-time and TCO, considering vehicles are not replaced on a 1:1 basis. This will also drive all consumer goods up during a time of inflation and threatened recession. There are faster and lower cost pathways to protecting public health and driving carbon emissions down. As EPA is aware, low NOx technologies are available today and have a proven track-record as a critical and cost-effective emissions reduction strategy. It is imperative to fully consider faster and lower cost pathways to attaining cleaner air for the public health. [EPA-HQ-OAR-2022-0985-1507-A1, p. 3]

Organization: Lubrizol Corporation (Lubrizol)

Lubrizol believes that vehicle owners and fleets in the heavy-duty vehicle sector will use a range of fuels and technologies to meet their future operational and environmental needs. Thus, we are pleased to see EPA acknowledge that it expects to see Original Engine Manufacturers

(“OEMs”) use an array of technologies to meet the requirements of the Final Rule. Lubrizol strongly encourages EPA to promulgate a Final Rule that will advance all three strategies highlighted in the Biden administration’s Transportation Decarbonization Blueprint (the “Blueprint”), i.e., Sustainable Liquid Fuels (“SLFs”), Battery-Electric Vehicles (“BEVs”), and Hydrogen.2 While there is exciting progress being made to develop heavy-duty engines and vehicles that will operate on electricity and hydrogen, the majority of new heavy-duty vehicles will continue to use internal combustion engines (“ICE”) for many years to come. This will be especially true in the heavier vehicle classes in the heavy-duty vehicle market.3 [EPA-HQ-OAR-2022-0985-1651-A2, p. 2.]

2 The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation (the “Blueprint”). Accessed on June 11, 2023 at The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation | Department of Energy. See, e.g., page 5, Figure B and similar references elsewhere in the Blueprint.

3 Lubrizol notes that, even in California and the other states that adopt California’s Advanced Clean Transportation (“ACT”) rule (collectively, the “ACT States”), most new trucks sold in 2035 will still be ICE vehicles fueled by petroleum diesel fuel, absent any further changes in state or federal fuel policy. More specifically, manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines will be required to sell zero-emission trucks as an increasing percentage of their annual sales in the ACT States from 2024 to 2035. By 2035, zero-emission truck/chassis sales will need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales in the ACT States.

In the segments of the market that will continue to rely on ICE technologies, we note that the Blueprint described SLFs as a “large, long-term opportunity” for long-haul heavy trucks. In fact, the Blueprint found that SLFs represent an even greater opportunity in this market segment than BEVs. We agree with this assessment, and we encourage EPA to integrate the potential market growth of biofuels, e-fuels, and other SLFs into its Technology Assessment, certification pathways, and other relevant aspects of the Final Rule. We believe that doing so will maximize and accelerate the emissions reduction potential of ICE vehicles. [EPA-HQ-OAR-2022-0985-1651-A2, p. 2]

2) The Final Rule Should Include Certification Pathways for all emerging ICE Technologies

The Proposal acknowledges that further ICE technology development is likely to be needed to meet the requirements of the Final Rule. For example, it notes the likely use of hybrid and hydrogen-fueled ICE vehicles. Lubrizol anticipates that there will be additional ICE technology development, including dedicated SLF engines, as well as new technologies for engines and vehicles that will continue to operate on traditional petroleum diesel fuel. The Final Rule should include certification pathways for each of these technologies and fuels, as well as flexibility to enable the certification of new technologies that have not been developed yet. [EPA-HQ-OAR-2022-0985-1651-A2, p. 5]

We strongly urge EPA to update its Greenhouse Gas Emissions Model (“GEM”) inputs to account for the full range of fuels that are likely to power these emerging engine technologies. In particular, limiting the GEM fuel inputs to gasoline, diesel, and natural gas masks the potential emissions benefits of engines that are developed as dedicated SLF engines. Creating GEM inputs for each SLF that may be used will create additional incentives for innovation and investment in dedicated SLF-fueled ICE vehicles, which will help ensure that the Final Rule meets its goals as fully, as expeditiously, and as cost-effectively as possible. In addition, it will help the lubricant industry develop appropriate lubricants and oils for these engines by ensuring that we have appropriate information when setting our performance specifications. [EPA-HQ-OAR-2022-0985-1651-A2, p. 5]

4) Lubrizol supports consideration for the creation of a diesel deposit control standard similar to 40 CFR 1090.260

As warranty and useful life requirements are extended, it is imperative that in-use practices for vehicles maintain emission and GHG performance as ‘like-new” as possible. Deposits and wear within the fuel system can lead to a significant deterioration of emissions and efficiency through mechanisms such as:

- External injector tip deposits
- Internal injector deposits
- Fuel injection system wear [EPA-HQ-OAR-2022-0985-1651-A2, p. 6]

Modern engines operate at much higher injection pressures, their fuel injectors have tighter passages and tolerances, and injection strategies may include several injections per single piston stroke. Extremely small deposits on the tip of the injector can dramatically alter fuel flow affecting emissions. This is particularly critical in engines where the injector tip is subjected to combustion related soot combined with high in-cylinder temperatures and pressures. Internal deposits can affect the response of the injector needle, also leading to higher emissions. Increased particulates can accelerate the rate of particulate filter soot accumulation (plugging), which leads to more regenerative cycles and decreased fuel economy. [EPA-HQ-OAR-2022-0985-1651-A2, p. 6]

In the US diesel market, different from many other countries, the average detergent additive level is very low. In fact, most of the diesel fuel sold contains no diesel detergent, even though it is known and demonstrated that the usage of diesel detergent is an effective way to keep the engines clean or even clean them up (depending on the treat rate). Clean engines generate less emissions than a dirty one and the use of detergent additives can extend that performance throughout their serviceable lives. Thus, we request the EPA consider the creation of a diesel deposit control standard similar to 40 CFR 1090.260. [EPA-HQ-OAR-2022-0985-1651-A2, p. 7]

Organization: Lynden Incorporated

Limiting Renewable Fuel Options

Lynden understands that the proposed rule is considered technology neutral, however mandating ‘Zero-Emission Vehicles’ becomes a de-facto ban on the internal combustion engine, limits viable options, and fails to consider renewable fuels and other currently available technologies that are able to significantly reduce emissions. [EPA-HQ-OAR-2022-0985-1470-A1, p. 1]

For example,

- Engines manufactured after 2010 are 25% more fuel efficient and cut NOx (nitrous oxide) and PM (particulate matter) by over 90% compared to older engines. Replacing these older engines that remain in operation, estimated at 47%, would be the most cost effective and reliable solution for reducing CO2, PM, and NOX emissions.

- Renewable diesel, manufactured from biological feedstocks, emits 56% less CO2 than traditional diesel and 38% less CO2 than a battery electric truck when considering the full lifecycle emissions of vehicle production, use, and disposal.1
- Renewable Natural Gas provides negative carbon emissions by capturing methane from agricultural biogas and landfills. However, these ‘carbon negative’ trucks are not considered ‘zero-emissions’ under the rule.
- Some of the high-horsepower engines that we rely on to haul very heavy loads in Alaska are being phased out of production because of the inability to meet emission standards. Using lower horsepower engines will require more trips and result in more overall emissions. [EPA-HQ-OAR-2022-0985-1470-A1, pp. 1-2]

1 American Transportation Research Institute (May 2022). Understanding the CO2 Impacts of Zero-Emission Trucks. Understanding the CO2 Impacts of Zero-Emission Trucks – TruckingResearch.org

The proposed standards will not only increase the cost, weight, and complexity of compliant diesel engines, they will force engine manufacturers to subsidize ‘Zero Emission Vehicles’ by further increasing the cost of diesel and natural gas engines. By reducing our options and making diesel engines more expensive, the most cost effective and reliable solutions for reducing emissions: replacing pre-2010 engines with modern engines combined with the option to use renewable diesel and renewable natural gas becomes artificially less economical and even further out of reach. [EPA-HQ-OAR-2022-0985-1470-A1, p. 2]

Recommendations:

- Assist small fleets and owner-operators to replace pre-2010 diesel engines with modern diesel engines.
- Take into account the lifecycle emissions of fuels such as renewable diesel, renewable natural gas, and electrical generation as well as vehicle operation, production, and disposal. [EPA-HQ-OAR-2022-0985-1470-A1, p. 5]

Organization: MEMA

Renewable fuels, such as hydrogen, ethanol, renewable natural gas (RNG) and carbon-neutral renewable diesel are viable, proven pathways to lower emissions in the trucking sector almost immediately. We are concerned the EPA has dismissed alternate fuel options, and as a result is missing opportunities for greater emissions reductions. We refer the EPA to the U.S. DOE alternate fuels data center for detailed examples of how alternate fuels can reduce vehicle emissions.’ Several studies and programs run by Argonne National Laboratory also point to reduced emissions through alternate fuels.2 EPA should include more analysis of these alternatives and do more to encourage investment and deployment of these technologies. We note CARB recognizes renewable diesel fuel3 and allows it to be used for compliance with certain regulations. EPA should consider similar provisions. [EPA-HQ-OAR-2022-0985-1570-A1, p. 5]

1 https://afdc.energy.gov/fuels/

2 https://www.anl.gov/taps/fuels

3 See § 2449.1(f) of the CARB In-Use Off-Road Diesel-Fueled Fleets Regulation https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/off-roaddiesel/ord15dayatta-1.pdf

Trucks that use alternative, lower-carbon fuels can help advance EPA climate goals while also contributing to national security by lowering our dependence on foreign oil. Additionally, encouragement and investment in carbon-neutral fuels will also positively impact existing vehicles already on the road. [EPA-HQ-OAR-2022-0985-1570-A1, p. 5]

Organization: Missouri Farm Bureau (MOFB)

MOFB urges EPA to thoroughly consider an all-of-the-above approach, and not overlook the important role home-grown biofuels can and should play in this policy discussion. According to a 2021 study conducted by the U.S. Department of Energy and published by Argonne National Laboratory, ethanol has 52 percent less greenhouse gas (GHG) emissions than gasoline.2 In addition, biodiesel and renewable diesel reduce GHG emissions 50-80 percent when compared to petroleum diesel, depending on the feedstock used.3 Meanwhile, the proposed rule will upend the transportation sector to 'achieve significant reductions in GHG emissions' to achieve a mere 17-18 percent decrease in GHG emissions.4 EPA should look to Missouri and the heartland of America as a key part of the solution, instead of the approach taken by its proposed rule, which will surely prop up the economies of foreign countries – namely China's - instead of our own. EPA should acknowledge that higher utilization of biofuels can occur today with the majority of vehicles on our nation's roadways, rather than attempting to replace all of the internal combustion engines being driven by Americans on a daily basis. [EPA-HQ-OAR-2022-0985-1584-A1, pp. 1-2]

2 Ethanol vs. Petroleum-Based Fuel Carbon Emissions | Department of Energy, accessed June 14, 2023.

3 https://cleanfuels.org/docs/default-source/one-pagers/2019-greenhouse-gas-benefit.pdf?sfvrsn=d4909bbc_10, accessed June 14, 2023.

4 EPA Greenhouse Gas Standards for Heavy-Duty Vehicles – Phase 3, Vol. 88, Fed. Reg. 25926, p. 25935 (Apr. 27, 2023) (to be codified at 40 C.F.R. pts. 1036, 1037, 1054, 1065 & 1074).

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

The Proposed Rule Blunts Innovation and Competition.

EPA's effort to mandate a shift to EV technologies directly disincentivizes new technology that could maximize diverse investments and achieve near-term and long-term emission reduction goals. Indeed, EPA's proposal risks zeroing out new innovations in emissions reductions for ICE vehicles. Because there is no way for manufacturers to comply based on ICE vehicles alone, they would not achieve a return on new investments for and in developing that technology. Finalizing regulations that push people to that conclusion will cause truck manufacturers to miss an opportunity for innovative emissions reductions. Climate research has consistently emphasized the importance of near-term emissions reductions relative to future reductions.23 More efficient diesel engines coupled with low-carbon, biomass-based diesel can reduce emissions immediately. [EPA-HQ-OAR-2022-0985-1603-A1, p. 9]

23 See G. Cornelis van Kooten, Patrick Withey, and Craig M.T. Johnston, BIOMASS AND BIOENERGY 151 'Climate Urgency and the Timing of Carbon Fluxes,' (August 2021) available at https://doi.org/10.1016/j.biombioe.2021.106162. ('The current climate emergency dictates that immediate action is required to mitigate climate change, which implies that carbon fluxes occurring 20 or more years from now are too late to have any mitigative effect.')

As just one example, there have been increasingly innovative technologies surrounding expanded natural gas vehicle ('NGV') production in recent years. But the Proposed Rule fails to provide the automotive sector with any meaningful incentive to continue developing such technology or similar vehicles that can effectively rely on renewable natural gas ('RNG'). The latest data available from the California Low Carbon Fuel Standard Program indicates that the average carbon intensity of bio-CNG (compressed natural gas) sold in 2020 was -5.85gC)2e/MJ.24 In the coming years, the carbon intensity of RNG is expected to be even lower as greater amounts of low-carbon dairy gas is produced and used in NGVs. This is especially important in light of market considerations for HD vehicles in particular. [EPA-HQ-OAR-2022-0985-1603-A1, p. 9]

24 California Air Resources Board, Low Carbon Fuel Standard Program, LCFS Pathway Certified Carbon Intensities (2023) available at https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities.

Further, existing alternative fuel incentives—such as the Renewable Fuel Standard ('RFS') and biofuel blending and alternative fuel infrastructure tax credits—have allowed truckstops and other fuel retailers to offer less expensive, lower carbon fuels to our customers, while also supporting investments in renewable fuel production.25 The incentives Congress established over the past few decades have caused the displacement of significant volumes of petroleum-based fuel with renewable fuels. [EPA-HQ-OAR-2022-0985-1603-A1, p. 9]

25 Importantly, renewable fuels significantly reduce carbon dioxide emissions through the lifecycle of heavy-duty vehicles without requiring truck drivers to cover the upfront costs of a battery-electric truck, which costs roughly twice as much as a comparable diesel-powered truck. See Todd Dills, OVERDRIVE, 'Cutting through Heavy-Duty E-Trucks Hype: 7 in 10 Owner-Ops Show 'Zero' Interest in Electric Powertrain Techs,' (Dec. 15, 2021) available at https://www.overdriveonline.com/equipment/article/15286428/cutting-through-the-heavyduty-etrucks-hype.

Recent estimates indicate that renewable diesel reduces carbon intensity by 65% compared to petroleum-based diesel.26 Increased utilization of renewable fuels could lead to significant emissions reductions by improving the emissions profiles not only of new vehicles but existing vehicles as well. The Proposed Rule surrenders the market's ability to deliver near-term emissions savings by imposing a top-down, hurried transition to one technology. [EPA-HQ-OAR-2022-0985-1603-A1, p. 10]

26 U.S. Dep't of Energy, 'Renewable Diesel' (2023) available at https://afdc.energy.gov/fuels/renewable_diesel.html.

Organization: National Corn Growers Association (NCGA)

As producers of the primary feedstock for low-carbon ethanol and users of heavy-duty vehicles, we support a final rule that will allow all solutions to accelerate decarbonization of the heavy-duty vehicle sector. The final rule should follow the direction of the Biden Administration's Transportation Decarbonization Blueprint (Blueprint), which directly stated that we need to deploy a range of solutions to meet our climate goals, including ethanol and other sustainable biofuels and e-fuels, clean electricity, and clean hydrogen. More specifically, in the long-haul truck sector, the Blueprint concluded that these Sustainable Liquid Fuels (SLFs) will be a 'large, long-term' opportunity that is even greater than the market opportunity for battery-electric vehicles in the long-haul truck sector.1 [EPA-HQ-OAR-2022-0985-1622-A1, p. 1]

1 The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation, see page 5, Figure B

The final rule should send a clear signal to innovators who seek to use ethanol to reduce the GHG emissions of future trucks that will still rely on traditional internal combustion engines. Unfortunately, as currently proposed, the Phase 3 GHG standards will hamper – if not wholly preclude—the use of affordable and readily available low-carbon ethanol to decarbonize the hard-to-electrify long-haul truck market. Further, it risks creating a chilling precedent for ethanol's potential to decarbonize even harder-to-electrify nonroad engines used in agriculture, construction, mining, locomotives, and marine engines. [EPA-HQ-OAR-2022-0985-1622-A1, p. 1]

EPA's Final Rule must provide a mechanism for certifying dedicated ethanol and other dedicated alternative fuel engines. Currently, a dedicated ethanol engine must certify its emissions as though it were a diesel-fueled engine. This penalizes ethanol in two ways: First, it overlooks the real-world difference between biogenic and anthropogenic carbon, and thereby treats ethanol as dirty as fossil diesel fuel from a climate perspective. Second, it ignores other attributes of ethanol that should be incorporated into EPA's Greenhouse Gas Emissions Model that are different than diesel fuel. Together, these two penalties mask the climate benefit of a dedicated ethanol engine, compared to diesel, and overestimates the climate impact of ethanol by threefold.2 [EPA-HQ-OAR-2022-0985-1622-A1, p. 1]

2 GEM currently estimates emissions from ethanol vehicles to be approximately 1.5 times worse than diesel. However, using national averages, GREET calculates ethanol to have 50% of the lifecycle emissions impact of diesel. Based on this information, GEM overestimates the climate impact of an ethanol-fueled engine by 3x (1.5/.5).

EPA has proposed to treat future battery-electric vehicles and hydrogen-fueled fuel cell vehicles as carbon-neutral at the tailpipe. EPA should also treat a dedicated ethanol engine as carbon-neutral because the carbon emissions from such an engine will be 100 percent biogenic, i.e., they derive from photosynthesis pulling carbon from the atmosphere in the natural carbon cycle. These emissions will not be derived from fossil fuels, and they will not contribute to climate change at the point of combustion in the engine. For these reasons, dedicated ethanol vehicles should be treated as carbon-neutral at the tailpipe. [EPA-HQ-OAR-2022-0985-1622-A1, p. 2]

Fixing the 'ethanol penalty' in EPA's current certification structure will enable SLFs to do their job decarbonizing America's hard-to-electrify long-haul trucks as envisioned by the Administration's Blueprint. The GEM calculations for a dedicated ethanol engine yield a perverse outcome that has no bearing in reality - modeled emissions that are actually 'even dirtier than diesel,' despite their obviously different contributions to climate change. Without fixing the ethanol penalty in the final Phase 3 rule, it will be impossible for ethanol, and likely other SLFs, to provide the 'large, long-term decarbonization opportunity' that the Administration's Blueprint hopes for. [EPA-HQ-OAR-2022-0985-1622-A1, p. 2]

Correcting this penalty in the final rule will:

- Make the overall program more scientifically robust.

- Avoid the unintended climate backsliding that would result from a rule that disincentivizes—if not precludes—investment in SLF-based engines that will help accelerate decarbonization of hard-to-electrify vehicles.
- Provide a certification pathway that is aligned with Blueprint's prioritization of SLFs for long-haul trucking and consistent with EPA's authority under Title II of the Clean Air Act, as well as the Agency's proposed treatment of battery-electric and hydrogen-fueled fuel cell vehicles.
- Reward American innovation and create new economic opportunities for the many farm and rural communities that produce the fuels that will be used in future compression-ignition engines that are designed to operate exclusively on SLFs like low-carbon ethanol; and
- Result in faster, greater, more cost-effective decarbonization, air quality, and related health benefits overall. [EPA-HQ-OAR-2022-0985-1622-A1, p. 2]

The bottom line is that to meet its decarbonization goals, EPA must finalize a rule that sends the right market and regulatory signals to encourage and reward performance-based innovation that delivers near-term, cost-effective emission reductions at scale. This includes sending the signal that dedicated ethanol-fueled engines will be rewarded for their decarbonization potential, rather than treating them as dirty as diesel from the perspective of tailpipe climate impacts. [EPA-HQ-OAR-2022-0985-1622-A1, p. 2]

Organization: Natural Gas Vehicles for America (NGVAmerica)

EPA must act now to adopt regulations that reward, credit, or account for the emission reductions provided by biofuels. Without this requested action, eventually there could be no new natural gas vehicles or other biofuel vehicles, and consequently no use of biofuels in transportation unless they are used to produce electricity for electric vehicles. To continue to certify and sell new natural gas vehicles, the current and proposed approach means that natural gas vehicle manufacturers will eventually be forced to subsidize electric vehicle truck sales to offset their tailpipe greenhouse gas emissions. This factor combined with regulations adopted by California and approved by EPA that mandate the sale of zero-tailpipe vehicles eventually will force manufacturers to stop offering natural gas trucks despite delivering substantial criteria pollutant and greenhouse gas emission reductions, and supplying a significant portion of the on- and off-road vehicles that will not be able to be electrified. This will have a negative impact on emission reductions and will be extremely financially detrimental to businesses that have invested in and employ workers in supporting the use of natural gas in transportation. [EPA-HQ-OAR-2022-0985-1522-A1, p. 2]

Numerous studies and analyses support the conclusion that there are significant environmental benefits associated with powering natural gas vehicles with RNG to displace petroleum motor fuels. Many of these studies support the conclusion that RNG fueled vehicles offer superior benefits to electric vehicles. To be fair, that should not be a requirement for equitable treatment. It should not be the job of RNG advocates to prove that RNG is superior to electricity or hydrogen, or that it is more cost-effective, or more readily deployable, or doesn't rely on rare earth minerals, etc. [EPA-HQ-OAR-2022-0985-1522-A1, p. 3]

EPA must stop favoring one technology over others by relying on outdated methods of certifying vehicles and engines. There is not a single environmental journal that would publish a paper or study that evaluates greenhouse gas emissions by only looking at tailpipe emissions or tank to wheel emissions. They would not do it because it is not defensible and would be an absurd comparison. The same is true for retaining greenhouse gas vehicle regulations that only look at tailpipe emissions. It is no longer rational, defensible, or equitable. [EPA-HQ-OAR-2022-0985-1522-A1, p. 3]

As noted in the introduction, data from California's Low Carbon Fuel Standard (LCFS) program demonstrates how clean and low carbon these RNG fueled heavy-duty vehicles truly are. The most recent data confirms that the average carbon intensity (CI) value of California's bio-CNG is negative 99 gCO2e/MJ and has been negative for three consecutive years. In California, 97 percent of the natural gas consumed or credited to on-road transportation fuel in 2022 was renewable natural gas. Nationally the percentage was 69 percent in 2022 including fuel used in California. California continues to be a critical market for natural gas vehicles, but it is noteworthy that nearly 50 percent of the RNG reported in 2022 was for use in areas outside of California. [EPA-HQ-OAR-2022-0985-1522-A1, p. 3]

RNG Supply Can Support Additional NGV Uptake Here and Abroad

The International Energy Agency's (IEA) World Energy Outlook 2022 projects that, under its different scenarios to 2050, renewable biogases (hydrogen and others) reach more than 400 billion cubic meters (bcm) by 2050; around 65 percent of that (260 bcm) is biomethane.5 The World Biogas Association's far more aggressive outlook estimates that biomethane could substitute 993 to 1380 bcm of natural gas, equivalent to 26-37 percent of the current natural gas consumed globally.6 European authorities recently set a target of achieving 35 bcm of biomethane by 2030.7 That target is roughly the energy equivalent of 8.9 billion diesel gallons. The European target is notable in that if achieved it would represent a ten-fold increase in production levels in less than ten years.8 [EPA-HQ-OAR-2022-0985-1522-A1, p. 5]

5 International Energy Agency, World Energy Outlook, Chapter 8, Outlook for Gaseous Fuels pp. 370, 377, and 380.

6 https://www.worldbiogasassociation.org/wp-content/uploads/2019/09/WBA-execsummary-4ppa4_digital-Sept-2019.pdf

7 European Parliament supports 35 bcm biomethane target in EU Gas Package (gasworld.com)

8 EBA: 30% increase in European biomethane plants since 2021 | Bioenergy Insight Magazine (bioenergy-news.com)

Part of the reason NGV advocates are confident there are ample supplies is that the RNG industry and technology associated with it is very mature and existing domestic resources have not been fully exploited. Another reason is that NGVs are expected to make up a portion of the on-road market but not totally displace all gasoline or diesel vehicles. For example, NGVAmerica projects that successful future commercialization of NGVs in the heavy-duty market segment, specifically Class 8 trucks, in the U.S. could begin to displace between 10 – 15 percent of annual sales in the next several years. [EPA-HQ-OAR-2022-0985-1522-A1, pp. 5 - 6]

If NGVs sales attain and maintain a level of 10 – 15 percent of new Class 8 sales, over the next decade that could result in several hundred thousand Class 8 NGV trucks consuming the equivalent of roughly 3 – 3.5 billion diesel gallon equivalents of fuel. Based on projections developed by the America Gas Foundation and other organizations, this level of fuel consumption -- even if the vehicles were operated 100 percent on biomethane -- would represent only a small portion of the available RNG supplies projected to be available in the U.S. As noted above, natural gas vehicles operating on blends considerably less than 100 percent still offer significant greenhouse gas benefits. [EPA-HQ-OAR-2022-0985-1522-A1, p. 6]

Various reports include projections of U.S. renewable natural gas supply. The most recent is a 2019 report prepared by ICF for the American Gas Foundation.9 Based on the projections in that report and shown below, there is more than sufficient potential supply of RNG to meet the demand posed by on-road NGVs. NGVs today consume approximately 75 trillion Btu per year (tBtu/y) and based on NGVAmerica's projections could grow to about 485 tBtu/y by 2035. This amount is far below what the AGF report projects is possible in the future. [EPA-HQ-OAR-2022-0985-1522-A1, p. 6.] [See Docket Number EPA-HQ-OAR-2022-0985-1522-A1, pages 6-7, for referenced figures.]

9 AGF 2019 RNG Study Full Report - FINAL 12-18-2019 (1).docx (gasfoundation.org)

EPA Must Amend its Proposal to Account for Benefits of Biofuels

NGVAmerica is not alone in making the case that EPA must amend its proposal. Other organizations including the refinery industry, independent fuel retailers, and the ethanol industry have argued that EPA must make a course correction and following through on its prior commitment to do so. [EPA-HQ-OAR-2022-0985-1522-A1, p. 7]

In 2012, EPA10 committed to sunset the use of the 0 g/mi allowance for electric vehicles as explained below:

EPA is finalizing the full net upstream GHG emissions approach for the compliance treatment for EV/PHEV/ FCVs beyond the per-company vehicle production threshold caps in MYs 2022–2025. EPA is not adopting any type of ‘‘phase-in’’, i.e., the compliance value will change from 0 g/mi to the full net upstream GHG emissions value once a manufacturer exceeds the cap. EPA believes that the levels of the per company vehicle production caps in MYs 2017–2025 are high enough to provide a sufficient incentive such that any production beyond those caps should use the full net upstream GHG emissions accounting. [EPA-HQ-OAR-2022-0985-1522-A1, p. 7]

10 2012-21972.pdf (govinfo.gov)

The preamble to that rule included the following discussion aptly summarizing the opposition to the use of the 0 g/mi standard.

Two automakers opposed the use of 0 g/mi. Honda ‘‘believes that EPA should separate incentives and credits from the measurement of emissions. Honda believes that without accounting for the upstream emissions of all fuels, inaccurate comparisons between technologies will take place * * *. EPA's regulations need to be comprehensive and transparent. By zeroing out the upstream emissions, EPA is conflating incentives and credits with proper emissions accounting.’’ EcoMotors International ‘‘encourages EPA to drop the 0 g/mile tailpipe compliance value.’’ Environmental advocacy groups also opposed the 0 g/ mi compliance treatment. The Natural Resources Defense Council claimed that 0 g/mi ‘‘undermines’’ the pollution and technology benefits of the program. Along with other environmental groups, the American Council for an Energy Efficient Economy also opposed 0 g/mi, but added that ‘‘[m]ost important, however, is that a zero-upstream treatment of plug-in vehicles not be continued indefinitely, and that full upstream accounting be applied to these vehicles by a date certain.

EPA's proposed treatment of EVs largely accomplishes this, so we strongly support that aspect of the proposal.'' The American Petroleum Institute argued that ''[i]gnoring the significant contribution of (and extensive compilation of published literature on) upstream CO2 emissions from electricity generation, defies principles of transparency and sound science and distorts the market for developing transportation fuel alternatives. It incentivizes the electrification of the vehicle fleet with a pre-defined specific and costly set of technologies whose future potential is not measured with the same well-to-wheels methodology against that of advanced biofuels or other carbon mitigation strategies.'' Organizations advocating fuels other than electricity also opposed the use of 0 g/mi. [EPA-HQ-OAR-2022-0985-1522-A1, p. 8]

Despite the expressed views, EPA nevertheless retained the 0 g/mi standard. In defense of continuing to retain the 0 g/mi treatment and providing multiplier credits, EPA stated that:

EPA believes that it is both reasonable and appropriate to accept some short-term loss of emissions benefits in the short run to increase the potential for far-greater game-changing benefits in the longer run. The agency believes that these multipliers may help bring some technologies to market more quickly than in the absence of incentives. [EPA-HQ-OAR-2022-0985-1522-A1, p. 8]

The European Biogas Association eloquently explained why the EU Commissions rules should account for well-to-wheel emissions and their explanation is worth including here:

The current "tank-to-wheel" approach does not compare the different technologies appropriately because it ignores emissions associated with the production of the fuel. It does not recognise the positive contribution of renewable fuels such as biomethane to climate protection, and thus biases one technology over others without a climate protection rationale. [EPA-HQ-OAR-2022-0985-1522-A1, p. 8]

The revised CO2 regulation should propose technology-neutral solutions to reduce emissions in an accelerated and cost-effective way. It should avoid one-size-fits-all options that could prove insufficient in the long-term and may lead to a slow, unfair and costly emissions reduction process. [EPA-HQ-OAR-2022-0985-1522-A1, p. 8]

The CO2 regulation should be amended to ensure an integrated transition that picks no single green technology over others and leaves no-one behind. All alternative fuels are necessary if transport decarbonisation is to be delivered at pace.11 [EPA-HQ-OAR-2022-0985-1522-A1, pp. 8 - 9]

11 SMART CO2 STANDARDS FOR LEAN MOBILITY (europeanbiogas.eu)

The Frontier Economics report similarly offers an excellent case for ensuring proper treatment and inclusion of biomethane.

Our analysis shows that gas mobility can help to contribute to reducing GHG emissions in road transport at comparably low system cost. As gas mobility – in contrast to other drivetrain technologies which are less mature – is readily available on vehicle, infrastructure and fuel supply levels and thus quickly scalable now, it can contribute to ambitious early GHG emission reduction by 2030 at low cost.

- Technological diversification. The immense challenge and high urgency for the mobility sector to achieve emissions reductions does not allow for cherry picking of individual technologies. Rather, we have to go "all-in" by enabling as many options to contribute as possible.

- Freedom of choice and competition of technologies. The heterogeneity of mobility applications with many individual factors determining the most efficient technology in each case rules out any central planning approach – there is no "one size fits all" solution.
- Keeping options open. There is a high degree of uncertainty around the optimal technology options in the future. Regulation therefore should avoid prematurely ruling out any pathway (e.g. by banning combustion engines which may in the future be fuelled by renewable or low-carbon fuels or gases). [EPA-HQ-OAR-2022-0985-1522-A1, p. 9]

We fervently believe that the Administration's decarbonization and clean air goals will only be achieved by focusing on a multi-technology approach that includes cost-effective carbon-negative solutions like RNG trucks that can begin accruing and compounding significant clean air and carbon reductions right away. We, therefore, respectfully request that EPA provide credits for natural gas vehicles based on the well-to-wheel benefits of the consuming natural gas which increasingly includes larger amounts of RNG. We also believe that any additional incentives finalized in this rulemaking to offer aid in the commercialization of electric vehicles or fuel-cell vehicles should be extended to NGVs based on the extraordinary emission reduction potential of these vehicles. [EPA-HQ-OAR-2022-0985-1522-A1, pp. 9 - 10]

Developing a Credit Mechanism for Biofuels

For greenhouse gas emissions, NGVAmerica previously requested that EPA use the 0.15 factor for greenhouse gas emissions to give credit to manufacturers for RNG use and to create an efficient method of calculating the benefit of renewable natural gas until EPA moves to adopt a well-to-wheels regulatory approach for all fuels, or until EPA can develop a detailed assessment and emission factor specific to RNG use. A benefit of the 0.15 factor is that it is consistent with the fuel efficiency credits and has been used in the past in EPA's regulations. [EPA-HQ-OAR-2022-0985-1522-A1, p. 11]

Given the recent state of developments and based on the increasing amount of carbon negative RNG that is being used in transportation, a factor of 0.15 may not adequately represent the credit that is warranted for RNG use. A factor of 0.15 would represent an 85 percent reduction and therefore is not carbon neutral or carbon negative. Developing a precise factor based on WTW comparisons of different fuels is complicated for various reasons: moving baseline targets; year-over-year changes in fuel mix; truck lifetimes, etc. That is probably part of the reason that EPA decided to abandon developing factors for electric vehicles and retained the 0 g/mi factor. [EPA-HQ-OAR-2022-0985-1522-A1, p. 11]

One solution might be to adopt a similar approach for NGVs as has been adopted for electric vehicles. Such a concept has been developed and is explained in the attached European Biogas and NGVA Europe documents. NGVA Europe has proposed using a carbon correction factor (CCF) that treats biomethane as having a carbon content of zero, and then providing an emission offset related to the percentage of biomethane distributed in a country. In the example provided in the NGV Europe document, 10 percent displacement with biomethane equates to a CCF discount of 10 percent that is applied to a vehicle's tailpipe emissions of CO2. In the case of the U.S., the CCF for 2022 would be 69 percent if the national average were used or 97 percent if the California average were used and credits were assigned based on state registration of motor vehicles. [EPA-HQ-OAR-2022-0985-1522-A1, pp. 11 - 12]

One limitation of this approach is the fact that if RNG levels go up in the future manufacturers selling trucks today would not receive the full benefit of future increases, and thus the credit or CCF used would underrepresent the benefit of their trucks. This could be addressed by periodically revising the levels of RNG use projected to occur during a vehicle's lifetime and using that level of displacement to offset emissions. EPA previously proposed a similar concept for electric vehicles that would have based emissions on future EIA forecasts of renewable electricity. [EPA-HQ-OAR-2022-0985-1522-A1, p. 12]

(6) Federal agencies should work with state authorities to ensure that transportation policies include performance metrics and consider a variety of different technologies as opposed to only promoting specific technologies regardless of their cost; [EPA-HQ-OAR-2022-0985-1522-A1, p. 13]

Organization: POET

Renewable fuels, such as bioethanol, already significantly reduce lifecycle carbon emissions relative to fossil fuels. POET and other companies are exploring ways to further reduce those lifecycle emissions. Bioethanol may soon achieve net-zero, or even net-negative, lifecycle emissions by utilizing carbon capture, renewable power for process energy and biomass for process heat at bioethanol plants, as well as requiring the use of climate-smart farming practices by our producers. Renewable fuels will be particularly critical in decarbonizing heavy-duty internal combustion engine ('ICE') vehicles that will remain on the road for the next several decades. EPA's proposed GHG standards should credit vehicles that use renewable fuels to reduce their net GHG emissions. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 1-2]

Renewable fuels are a well-proven technology. Many federal and state programs, such as the federal Renewable Fuel Standard ('RFS') and California's Low Carbon Fuel Standard ('LCFS'), among others, support the production of significant quantities of low-carbon renewable fuels. Renewable fuels are also key to the Administration's renewable energy policies. They receive funding and tax credits under the recently enacted Bipartisan Infrastructure Law ('BIL') and Inflation Reduction Act ('IRA'). The U.S. National Blueprint for Transportation Decarbonization, which EPA co-authored, also calls for more renewable fuels as one of its many decarbonization strategies.1 EPA's Proposed Rule should align with those policies by incorporating renewable fuels. [EPA-HQ-OAR-2022-0985-1528-A1, p. 2]

1 The U.S. National Blueprint for Transportation Decarbonization (Jan. 2023), available at https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf.

EPA Should Revise the Proposed Rule to Credit Lifecycle Emissions Reductions from Renewable Fuels.

The Proposed Rule should credit renewable fuels and their lifecycle GHG emissions reductions as an additional technology pathway for meeting EPA's emissions reduction standards. EPA's focus on ZEVs ignores that renewable fuels are available now to significantly reduce emissions from ICE vehicles. This is critical because, even under the most optimistic ZEV projections, ICE vehicles, especially heavy-duty ICE vehicles, are expected to remain on the road for decades. Renewable fuels offer one of the best solutions to decarbonizing those legacy ICE vehicles. [EPA-HQ-OAR-2022-0985-1528-A1, p. 4]

Incorporating renewable fuels will have myriad benefits.

i. Renewable fuels significantly reduce carbon emissions on a lifecycle basis and may soon achieve net-zero or net-negative emissions. [EPA-HQ-OAR-2022-0985-1528-A1, p. 4]

The carbon-reducing benefits of renewable fuels are immense. Bioethanol, for instance, reduces lifecycle GHG emissions by at least 46 percent relative to fossil transportation fuels.8 This figure represents the latest scientific research on land-use impacts, energy consumption, and other processes that affect carbon emissions from bioethanol production.9 Other renewable transportation fuels achieve similarly significant and, in some cases, even greater lifecycle emissions reductions relative to fossil fuels.10 [EPA-HQ-OAR-2022-0985-1528-A1, p. 4]

8 See Scully MJ, Norris GA, Alarcon Falconi TM, MacIntosh DL. 2021a. Carbon intensity of corn ethanol in the United States: state of the science. Environmental Research Letters, 16(4), pp. 043001. The 46 percent reduction figure relates to typical corn starch ethanol on an energy-adjusted basis. Cellulosic ethanol that is currently being produced is associated with even greater reductions, and corn starch ethanol may also have greater benefits when its octane value is accounted for.

9 See generally id.

10 See, e.g., U.S. EPA, Proposed Rule, Renewable Fuel Standard (RFS) Program: Standards for 2023-2025 and Other Changes, 87 Fed. Reg. 80582, 80611 (Dec. 30, 2022).

POET and others are pursuing ways to reduce lifecycle emissions of renewable fuels even further. By deploying carbon capture and storage technologies, switching to renewables such as wind and solar for process energy at production facilities, utilization of renewable biomass rather than natural gas for process heat, and encouraging farmers to implement climate-smart farming practices, renewable fuel producers would reduce the carbon footprint of their processes even further and may even achieve net-negative lifecycle emissions—removing carbon from the total atmospheric carbon load. [EPA-HQ-OAR-2022-0985-1528-A1, p. 5]

POET is taking bioethanol production in this direction. For example, it is taking concrete steps towards reducing bioethanol's carbon footprint by working to capture and store the concentrated biogenic carbon dioxide emitted during bioethanol production. EPA has recognized the immense benefits of this approach. In its most recent proposed RFS rulemaking, EPA observed:

- Corn ethanol facilities produce a highly concentrated stream of CO_2 that lends itself to carbon capture and sequestration (CCS). CCS is being deployed at ethanol plants and has the potential to result in negative emissions at the ethanol production facility, especially if mills with CCS use renewable sources of electricity and other advanced technologies to lower their needs for thermal energy.11 [EPA-HQ-OAR-2022-0985-1528-A1, p. 5]

11 U.S. EPA, Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes, at 175.

By POET's calculations, bioethanol production could achieve significant emissions reductions from such measures, and could even achieve net-negative emissions. The latest scientific assessments assign bioethanol a carbon intensity of 51.4 gCO_2/MJ.12 POET estimates that sequestering the biogenic carbon dioxide byproduct of bioethanol production would reduce bioethanol's carbon intensity by 30 gCO_2/MJ. Switching to renewable electricity for process energy at bioethanol plants would reduce bioethanol's carbon intensity by another 5 gCO_2/MJ. And climate-smart farming practices could lower bioethanol's carbon intensity by at least an additional 30 gCO2/MJ. The Proposed Rule should encourage these developments by crediting renewable fuels for vehicles. [EPA-HQ-OAR-2022-0985-1528-A1, p. 5]

12 Scully et al., supra note 8.

Renewable fuels are a proven technology in a growing industry.

Renewable fuels are proven technology with a sophisticated regulatory incentive system and a well-developed industry. That industry is also growing. This is due in part to existing federal and state programs, including the RFS, California's LCFS, and Oregon's Clean Fuel Standard. It is also due in part to the industry's genuine desire, and proven track record, to use biofuels to reduce our dependence on fossil fuels and combat climate change. EPA can rely on the existing incentive programs in the same way it relies on the BIL and IRA—which also promote biofuels—when assessing technology pathways in the Proposed Rule. The existing programs have given EPA years of real-world evidence showing how renewable fuels have succeeded in reducing and replacing fossil transportation fuels at scale. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 5-6]

Beyond innovation in renewable fuels themselves, other companies are making significant carbon-reducing advancements for heavy-duty vehicles. ClearFlame Engine Technologies, for example, is deploying fleets of bioethanol-powered heavy-duty vehicles.13 And Remora, another heavy-duty vehicle company, designs carbon capture and sequestration systems that are fitted to semi-trucks and capture carbon emitted directly from those vehicles as they travel.14 Those technologies greatly reduce carbon emission from heavy-duty vehicles. They, too, deserve a boost from the Proposed Rule. Ignoring them, in fact, would run counter the very purpose of utilizing 202 to address greenhouse gas emissions. Instead of encouraging these incredibly promising greenhouse gas reduction technologies, the EPA approach would move towards eliminating them from the marketplace by treating those technologies the same as engines that utilize traditional fossil fuel. [EPA-HQ-OAR-2022-0985-1528-A1, p. 6]

13 ClearFlame Engine Technologies, https://clearflame.com/about/ (last visited June 16, 2023).

14 Remora, https://remoracarbon.com/vision/ (last visited June 16, 2023).

Renewable fuels crediting would give vehicle manufacturers more options to comply and make for a more durable emissions reduction program. [EPA-HQ-OAR-2022-0985-1528-A1, p. 6]

Adding a renewable fuel crediting mechanism would also make it more feasible for automakers to meet EPA's stringent standards. Renewable fuels would further diversify the pathways for manufacturers to comply with the proposed standards. This would be especially important in places, particularly rural areas with lower population densities, where battery-electric and hydrogen infrastructure will be difficult to develop and may not be cost-effective. Renewable fuels would serve as a viable alternative to attain significant heavy-duty vehicle emissions reductions in such areas. [EPA-HQ-OAR-2022-0985-1528-A1, p. 6]

EPA and the National Highway Traffic Safety Administration ('NHTSA') have experience with exactly this type of crediting. In prior iterations of EPA's 202 standard, and in the existing NHTSA fuel economy standards, 'flexible fuel vehicles' ('FFVs') receive compliance benefits because they can run on alternative fuels such as E85.15 This ability to utilize lower greenhouse gas fuels is adjusted by an 'F Factor' that represents how much renewable fuel is actually used in the real world.16 EPA should re-introduce crediting for vehicles that can utilize higher blends of renewable fuels, and should expand the program to include technologies other than just FFVs. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 6-7]

15 49 CFR 523.2 (definition of dual-fuel vehicle includes flexible fuel vehicles); 49 CFR 536.10 (indicating that dual-fuel vehicles can earn credits under the standards); 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62624 (Oct. 5, 2012) (providing that FFVs could generate credits under the standards).

16 40 CFR 600.510-12(k).

Crediting vehicle engines that run on biofuels would also create a more durable program. Enabling a broader suite of technologies could avoid supply chain and other problems that are plaguing industry generally and threatening to undermine the Proposed Rule as currently structured. EPA should take a broader, more diversified approach to guard against other unforeseen events that may affect the flow of critical materials in the international economy. [EPA-HQ-OAR-2022-0985-1528-A1, p. 7]

Finally, a broader set of technologies may protect the rule from being withdrawn by future administrations. Biofuels enjoy broad bipartisan support, as evidenced by the recent debt ceiling negotiations between members of Congress.17 Both Republicans and Democrats in the House of Representatives successfully pressed for the removal of provisions in an early version of the debt ceiling bill that would have cut biofuels subsidies, and Congress remained steadfast in including important biofuels incentives that should not be undermined by the Proposed Rule.18 A rule that moves the needle too far toward one or two technologies risks political pushback if those technologies lose public support. [EPA-HQ-OAR-2022-0985-1528-A1, p. 7]

17 K. Brugger, Clean Energy, Ethanol Concerns Dog Debt Ceiling Bill, E&E Daily (Apr. 25, 2023), https://subscriber.politicopro.com/article/eenews/2023/04/25/clean-energy-ethanol-concerns-dog-debt-ceiling-bill-00093594; J. Dillon et al., GOP Scrambles to Address Energy Concerns with Debt Bill, E&E Daily (Apr. 26, 2023), https://www.eenews.net/articles/gop-scrambles-to-address-energy-concerns-with-debt-bill/.

18 Id.

EPA Should Credit Renewable Fuels for Their Lifecycle Emissions Reductions or By Treating the Biogenic Emissions from Renewable Fuels as Zero-Emissions Sources.

Because carbon dioxide differs from other air pollutants, a different regulatory approach is warranted. EPA's crediting programs, like the Proposed Rule, should include renewable fuels because they replace fossil fuels, reducing their use and the need to extract and burn them. Although renewable fuels emit carbon when burned, those emissions are biogenic: the carbon dioxide naturally recirculates when the plants and other biomass sources absorb the carbon dioxide as they grow. The result is no net increase in atmospheric carbon. The more we can rely on fuels utilizing biogenic carbon, the less we will need to use fossil fuels that increase the atmosphere's total carbon load. [EPA-HQ-OAR-2022-0985-1528-A1, p. 10]

This phenomenon is widely recognized by lifecycle greenhouse gas models such as the GREET model developed and maintained by Argonne National Laboratory. EPA regularly utilizes lifecycle greenhouse gas modeling in its implementation of the RFS. EPA could utilize the Argonne GREET model and its own experience with lifecycle assessments to establish nationwide average carbon intensity scores for renewable fuels. Vehicles that utilize those fuels could be credited based on the degree of GHG reductions compared to fossil fuels and a factor that represents real-world use of renewable fuels in the vehicle (an ‘F Factor’). [EPA-HQ-OAR-2022-0985-1528-A1, p. 10]

To the extent EPA does not wish to examine lifecycle emissions in detail, an alternative approach could be to assign zero tailpipe emissions to renewable fuels because their biogenic emissions are canceled out by the carbon intake of biofuels feedstocks. Such an approach would be consistent with EPA’s lack of consideration of lifecycle emissions associated with ZEVs. EPA already largely assumes zero tailpipe emissions for renewable fuels when determining whether to approve new RFS production pathways for biofuels.30 EPA also considers ‘biogenic CO2 emissions resulting from the combustion of biomass from managed forests at stationary sources for energy production as carbon neutral,’ per the agency’s 2018 statement of policy.31 Additionally, the California Air Resources Board (‘CARB’) treats biogenic emissions as carbon neutral under its cap-and-trade regulations. Under CARB’s regulations, CO2 emissions from certain biomass-derived fuels (biogenic solid waste; waste pallets, crates, dunnage, manufacturing and construction wood wastes, tree trimmings, mill residues, and range land maintenance residues; all agricultural crops and waste; and certain wood and wood wastes) do not count towards an entity’s compliance obligations.32 The same assumptions could apply here.[EPA-HQ-OAR-2022-0985-1528-A1, pp. 10-11]

30 See, e.g., ENVIA Energy, LLC, Landfill Biogas to Diesel, Naphtha for D-Code 3 or D-Code 7 RINs (May 8, 2015), available at https://www.epa.gov/sites/default/files/2015-08/documents/envia-energy-merged-deter-ltr.pdf; Oberon Fuels, Inc., Waste-derived Biogas to Demethyl ether (‘DME’) (Aug. 12, 2014), available at https://www.epa.gov/sites/default/files/2015-08/documents/oberon-fuels-determination.pdf.

31 EPA’s Treatment of Biogenic Carbon Dioxide (CO2) Emissions from Stationary Sources that Use Forest Biomass for Energy Production at 6 (Apr. 23, 2018), available at https://www.epa.gov/air-and-radiation/epas-treatment-biogenic-carbon-dioxide-emissions-stationary-sources-use-forest.

32 Cal. Code Regs. tit. 17, 95852.2.

U.S. EPA Fails to Account for the Potential of Ethanol and Other Renewable Fuels to Achieve GHG Reductions from HD Vehicles as Alternatives to Electric and Hydrogen Vehicles [EPA-HQ-OAR-2022-0985-1528-A1, p. 31]

Although HD BEVs, FCEVs, and H2-ICE vehicles have zero tailpipe emissions of CO2, they are still sources of CO2 emissions because of the emissions associated with fossil fuels used to produce the electricity or hydrogen used to power them. It then follows that the magnitude of the effective CO2 emissions from these vehicles will not be zero and will in fact vary depending on the source of that electricity or hydrogen. In contrast, while HD vehicles fueled by ethanol or other renewable biofuels fuels will have tailpipe CO2 emissions, they may have lower overall effective CO2 emissions than electric or hydrogen vehicles. This is because there may be less fossil fuel used in their production and the fact that the CO2 emitted at the tailpipe will ultimately be removed from the atmosphere by the growing of the next generation of feedstock plants. [EPA-HQ-OAR-2022-0985-1528-A1, p. 31]

Given that the purpose of the Proposed Rule is to reduce GHG emissions is to ‘further reduce GHG air pollution from highway heavy-duty engines and vehicles across the United States’ and not to mandate the use of HD ZEVs, U.S. should consider the addition of provisions in the Proposed rule that would lead to greater substitution of ethanol and other fuels for gasoline and diesel used in conventional vehicles These would include creating appropriate tailpipe GHG credit provisions for new HD vehicles designed to operate on ethanol blends above E10 and up to E99 that recognize the renewable nature of ethanol and similar provisions for HD vehicles capable of operating on other renewable fuels. An obvious advantage of this approach is that it would provide vehicle and engine manufacturers with compliance options other than overreliance on HD ZEV technology that may or may not be accepted in the marketplace and help to ensure that substantial reductions in HD GHG emissions are actually realized by the Proposed Rule. [EPA-HQ-OAR-2022-0985-1528-A1, p. 31]

Organization: South Dakota Department of Agriculture and Natural Resources (DANR)

Biofuels

The proposed emissions standards and the effort to use regulations to essentially mandate EV use ignores the benefits of continued use of renewable biofuels to power our vehicles. South Dakota's primary industry is agriculture, and we are the nation's fifth-largest ethanol producer. Ethanol is clean burning, renewable fuel used in our existing vehicle fleet allowing our citizens to travel across our state safely and reliably. Instead of working to mandate EV use, DANR recommends EPA look for ways to support the continued production and use of renewable biofuels. [EPA-HQ-OAR-2022-0985-1639-A2, p. 3]

South Dakota is a rural state with a small population, wide open spaces, and clean air. South Dakota is in full compliance or attainment with all federal criteria pollutants and the proposed emissions standards will not significantly improve our air quality. However, by essentially mandating EV use, they will limit the ability of our citizens to live and work in rural South Dakota. [EPA-HQ-OAR-2022-0985-1639-A2, p. 3]

Organization: Truck Renting and Leasing Association (TRALA)

Continued EPA Support is Needed for the Use of Low-Carbon Fuels

TRALA requests EPA support and incentivize the continued use of lower carbon intensity fuels throughout the coming decades instead of limiting itself to zero-emission technology pathways that reduce CO2 at tailpipe under the proposed rule. By way of example, data from California's Low Carbon Fuel Standard (LCFS) program demonstrates how clean and low-carbon emitting Renewable Natural Gas (RNG) fueled HD vehicles truly are. Recent data confirms that the average carbon intensity value of California's bio-compressed natural gas has been characterized as being a negative carbon fuel for three consecutive years. [EPA-HQ-OAR-2022-0985-1577-A1, p. 22]

Renewable diesel fuel is another low carbon alternative. Drop-in renewable diesel fuels, produced from forest residues or wood waste feedstock via thermochemical conversion technologies, could also potentially reduce GHG emissions more than 75% despite the varying energy efficiency of the conversion routes and feedstocks used.28 [EPA-HQ-OAR-2022-0985-1577-A1, p. 22]

28 Journal of Sustainable Energy & Fuels, Decarbonization potential of on-road fuels and powertrains in the European Union and the United States: a well-to-wheels assessment, (Published Sept. 1, 2022) (Decarbonization potential of on-road fuels and powertrains in the European Union and the United States: a well-to-wheels assessment - Sustainable Energy & Fuels (RSC Publishing).

Transitioning to a zero-emissions future is not about flipping a switch. Such unprecedented efforts will not occur overnight and must consider the fact that internal combustion engines will remain necessary for the trucking industry nationwide for decades to come. EPA has the opportunity to support the continued growth and use of low-carbon alternative fuels within the scope of this rulemaking. TRALA therefore recommends that EPA adopt a regulation that rewards, credits, and accounts for the emission reductions provided by biofuels and other low-carbon fuel options. Without the inclusion of biofuels and other low-carbon fuels under Phase 3, the agency is picking technology winners and losers as in the nation’s transportation mix. [EPA-HQ-OAR-2022-0985-1577-A1, p. 23]

Organization: Urban, William

The industry upheaval and Herculean infrastructure requirements associated with battery and hydrogen powered trucks could be reduced by 80% while fulfilling 80% of clean air goals with clean fuels such as Dimethyl ether. Dme requires no more complicated storage arrangements or moderate pressure needs than propane. It uses existing ICE designs with a different fuel system. Those in authority need to ask themselves why this is not a no-brainer. [EPA-HQ-OAR-2022-0985-1686.html, p. 1]

Organization: Volvo Group

Incorporation of emission reductions realized from renewable fuels

In January of this year, the Biden Administration released its National Blueprint for Transportation Decarbonization which emphasizes the importance of battery electric, hydrogen, and sustainable liquid fuels for reaching a net-zero economy in 2050. The report notes that renewable diesel fuels are “already being developed using standards to ensure they are safe for use and are fully compatible with existing vehicle fleets and fueling infrastructure and minimize emissions in their full life-cycles” while going on to say that “even greater opportunities lie ahead to leverage existing industrial infrastructure by converting petroleum refineries and other facilities for sustainable fuel production.”8 [EPA-HQ-OAR-2022-0985-1606-A1, p. 13]

8 U.S. Departments of Energy, Transportation, Housing and Urban Development, and U.S. Environmental Protection Agency (2023, January). The U.S. National Blueprint for Transportation Decarbonization, A Joint Strategy to Transform Transportation. Accessed on 14 June 2023 at https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf.

Renewable diesel fuel is a 100% drop in fuel that can use the existing diesel distribution system. When used, it can reduce GHG emissions 50-85% or even more compared to petroleum diesel and while also reducing nitrogen oxide (NOx), particulate matter (PM) and other emissions. One of the biggest challenges to greater renewable diesel use has been its availability; however according to a recent Today in Energy article by the U.S. Energy Information Agency, eight new renewable diesel refineries recently began production which could result in more of a doubling of available supply by 2025.9 [EPA-HQ-OAR-2022-0985-1606-A1, p. 13]

9 U.S. Energy Information Administration. https://www.eia.gov/todayinenergy/detail.php?id=55399

With such growth in volumes, the lack of needed infrastructure investments and the significant levels of emission reductions, it seems counter to the administration’s own

Decarbonization Blueprint not to account for the significant contribution renewable diesel can play in meeting the reductions being sought through the Phase 3 proposal. According to a study released by the Diesel Technology Forum last year, it was found that "accelerating fleet turnover and use of renewable and biodiesel fuels can deliver significantly more benefits (3X) that outweigh those possible from EVs in the region in the study period."10 [EPA-HQ-OAR-2022-0985-1606-A1, p. 13-14]

10 Unknown (2022, July 22). Research Finds More Emissions Benefits at Lower Cost from Accelerated Fleet Turnover and Use of Bio- and Renewable Fuels than Switching to Electrified Medium and Heavy-Duty Trucks. Waste Advantage Magazine. Accessed 14 June 2023 at https://wasteadvantagemag.com/research-finds-more-emissions-benefits-at-lower-cost-from-accelerated-fleet-turnover-and-use-of-bio-and-renewable-fuels-than-switching-to-electrified-medium-and-heavy-duty-trucks/

While we recognize new mechanisms to account and verify the reductions gained through use of renewable diesel would be required, it is certainly no more difficult than trying to ensure the development or expansion of an entirely new vehicle fueling infrastructure that, depending on the power source, may not offer significantly more full life-cycle emission reductions. Achieving our mutual greenhouse gas reduction goals and keeping to no more than 1.5 degrees Celsius (C) increase in global warming will require an "all of the above" approach to emissions reductions. The Volvo Group is investing heavily in zero-emission powertrains and while we want to enable an environment for their utilization, we also want to see emissions reduced in the most cost-effective and quickest way for the benefit of our customers and the country. [EPA-HQ-OAR-2022-0985-1606-A1, p. 14]

Organization: Westport Fuel Systems

Emissions reductions can be achieved with a variety of fuels. The use of renewable, and low carbon fuels such as renewable natural gas (RNG) and hydrogen in internal combustion engines, particularly in the heaviest of vehicle classes, can result in significant reductions in carbon emissions. In our comments, we respectfully encourage the EPA to re-examine its stance on setting CO2 emissions standards for vehicles using tailpipe only emissions. While this may be a viable approach for lighter duty vehicles and some class 8 trucks where many electric models are commercially available and costs are more competitive with conventionally fuelled vehicles due to a mix of incentives and lower costs, this may not be the case for the heavy-duty class 8 sleeper cab segment. In this segment, despite the expected gains in electrification, there is still a need for alternative advanced technology options that can provide the power density and efficiency provided by internal combustion engines, using low carbon fuels. We urge the EPA to recognize the benefits of advanced internal combustion technologies using renewable gaseous fuels, including those with pilot fuels, and their ability to significantly reduce emissions in this segment. Adoption of hydrogen combustion technologies can reduce CO2 emissions by 90% or more. [EPA-HQ-OAR-2022-0985-1567-A1, p. 2]

Long haul road freight is recognised as one of the most challenging transport sectors to decarbonise due to the demanding use profiles, and the pressures of cost competitiveness. [EPA-HQ-OAR-2022-0985-1567-A1, p. 2]

There is considerable expectation that Battery Electric Vehicle (BEV) and Hydrogen Fuel Cell Electric Vehicle (FCEV) technologies can provide the solutions to a future sustainable road freight sector within the next decade, and the trajectory of many US policy initiatives is presumptive of these technologies being ubiquitous across the freight fleet. However, there are applications in heavy-duty long-haul vehicles, specifically long-haul class 8 sleeper cabs, where performance characteristics may not be fully served by these technologies. [EPA-HQ-OAR-2022-0985-1567-A1, p. 2]

While battery electric and fuel cell technologies can play a role, based on our analysis, the most cost-effective approach to decarbonising freight must include a central role for Internal Combustion Engines (ICE), fuelled by RNG or hydrogen (). ICE solutions using Westport Fuel Systems' HPDITM fuel system technology can significantly reduce emissions both at the tailpipe and across the lifecycle. As such, changes to policy frameworks that recognise more than the singular metric of tailpipe emissions will enable a greater diversity of solutions. This approach will better suit the diverse needs of the freight sector, and deliver faster, larger, CO2 reductions, at the lowest cost. [EPA-HQ-OAR-2022-0985-1567-A1, p. 2]

Providing a Level Playing Field for Advanced ICE Technologies

Westport supports a technology neutral performance-based approach to emission reductions and requests that the EPA move further to provide equal compliance pathways for hydrogen combustion technologies. [EPA-HQ-OAR-2022-0985-1567-A1, p. 5]

Although the EPA seeks to make this proposed ruling technology agnostic, the developing policy landscape is moving sharply towards incentives and other subsidies for BEV and FCEVs based on zero tailpipe emissions.3 While incentives are not part of this Rule, they do play a role in influencing the greater policy environment. Companion or complementary regulations, such as the ACT Advanced Clean Truck Act in California and the Inflation Reduction Act, have factored into the decision-making process in the Phase 3 rulemaking around vehicle deployment rates and costing and increasing stringency of emissions. This policy direction prioritizes vehicles with zero tailpipe emissions over other low emissions technologies, including those that use RNG or other carbon neutral or negative fuels. Part of the policy direction to recognize the full impacts of transportation emissions is accounting for well to wheels analysis, the other is to ensure that other technologies are measured on not only emissions but also on cost effectiveness metrics. [EPA-HQ-OAR-2022-0985-1567-A1, p. 5]

3 Clean Vehicle Tax Credits in the Inflation Reduction Act of 2022 https://crsreports.congress.gov/product/pdf/IN/IN11996. The IRA defines "qualified vehicles" for purposes of incentives as "draws electricity from a battery has the capacity to be recharge or is propelled by power derived from certain fuel cells.

EPA Summary and Response:

Summary:

A group of commenters urged EPA to develop a standard that provides certification pathways which recognize environmental benefits of various biofuels (e.g., Clean Fuels Alli., NGV America, Diesel Tech. Forum, Missouri Farm Bur., Westport). These commenters touted biofuels' benefits, including:

- ICE vehicles will remain, and biofuels are a means of curbing their GHG emissions
- biofuels are available now, and are highly cost effective, and do not require supportive infrastructure, meaning that benefits can commence immediately rather than in MY 2027;

- use of biofuels could provide reductions while critical mineral supply chains are developed;
- criteria pollutant emissions are lower than from diesel vehicles;
- biofuels are an especially good alternative for vehicles which are not natural ZEV candidates, such as Class 8 sleeper tractors.

Many of these comments urged EPA to establish standards on a lifecycle basis, and maintained that so measured, CO2 (and, for one commenter, Diesel Tech. Forum, criteria pollutant) emissions would be less. Several of these commenters cited a study of Stillwater Associates from July 2022 asserting that switching to 100% renewable diesel would have three times more CO2 emissions reductions than the BEV scenarios, that MY 2021 diesel engines have greater PM reductions than BEVs, and that NOx reductions need to be determined on a miles traveled basis instead of a per vehicle basis. (API, Volvo, Diesel Tech. Forum). Commenters' views of what should count as lifecycle emissions went not just to upstream production and fuel/electricity generation, but to battery disposal, and overseas mining emissions and other actions. (Energy Vision, Lynden Renewable Fuels, POET). Commenters also noted steps now being taken to reduce upstream emissions related to processing of biofuels, as well as to reduce the carbon intensity of the biofuels themselves. (NACS, POET.)

Others pointed to regulatory and policy support for a biofuel-based compliance pathway. They pointed to the Administration's Blueprint for Decarbonisation, which mentions biofuels and lifecycle reductions favorably, to EPA's 2018 Policy Statement regarding CO2 emissions from combustion of biomass in managed forests as carbon neutral (Clean Flame, citing U.S. Environmental Protection Agency, policy statement,[654] POET), and more generally, to the CAA RFS program, and CARB cap-and-trade program (which counts biofuel emissions as zero) and Low Carbon Fuel standard (MEMA, POET, Energy Vision).

A group of commenters stressed the benefits of Renewable Natural Gas, stating that it is derived from captured methane, a potent GHG, and emitted as the less potent CO2. (TRALA, Lynden Renewable Fuel, Energy Vision, Hexagon Agility.) In addition, other commenters maintained that EPA was improperly ignoring the difference between anthropogenic emissions (from fossil fuels) and biogenic emissions (from plants). The asserted difference by these commenters is that plants remove CO2 from the ambient air, so their later combustion nets out as zero, unlike the case with fossil fuels. (Clean Flame, National Corn Growers Ass'n.) MFN, on the other hand, noted that natural gas fueled vehicles have significantly higher VOC emissions than conventional vehicles (including methane emissions), although slightly lower PM emissions (without needing filters), and lower NOx emissions.

Commenters had various suggestions on how to account for biofuels in a certification pathway. In addition to suggesting EPA develop standards on a lifecycle basis, commenters recommended the following:

- developing a Utility Factor on a case-by-case basis representing the amount of time the vehicle runs on some type of biofuel (POET)
- update GEM to recognize fuel types in addition to the three (gasoline, diesel, CNG) now recognized (Lubrizol)

[654] *Available at* https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf.

- include some type of credit mechanism for biofuels (Natural Gas Veh. For America)
- adopt the same approach as the Flexible Fuel Vehicle standards (POET)

Commenter Urban states that EPA should consider use of dimethyl ether (without further explication).

The American Free Enterprise Chamber of Commerce (Am Free) asserted that EPA's failure to consider use of biofuels is arbitrary, violating the principle that agencies must consider reasonable alternatives as part of a process of reasoned decision-making. This commenter also stated that EPA asserted in the parallel light duty proposed rule that it has authority to impose fuel controls though its requested comment on whether fuel controls should be used in the future as a "complement" to emissions standards (though the commenter conceded that EPA did not request comment on such controls as an alternative to emissions standards), and that this further indicated arbitrariness in the heavy-duty proposal.

American Petroleum Institute stated that "EPA's approach is not consistent with other existing EPA policies (e.g., the Renewable Fuel Standard)".

American Soybean Association stated that the standards should still provide a pathway for ICE that can run on biomass-based diesel, since it will lead to increased utilization of these engines in the agricultural sector.

Clean Fuels Alliance America commented that emissions warranties cannot be voided or impacted because of the use of biodiesel blends.

Lubrizol commented that they support consideration for the creation of a diesel deposit control standard similar to 40 CFR 1090.260.Lynden Incorporated commented that high-horsepower engines are being phased out because of the inability to meeting emissions standards. Lynden and NGVAmerica stated that the emission standards will force manufacturers to subsidize ZEV by increasing the cost of engines. Lynden also recommended that EPA should assist small fleets in replacing pre-2010 diesel engines with modern diesel engines.

National Association of Convenience Stores (NACS), NATSO, and SIGMA, commented that the proposed standards risk zeroing out new innovations in emissions reductions from ICE vehicle, because the standards cannot be met with ICE vehicles alone.

<u>Response:</u>

Implicit (or in some cases, explicit) in many of these comments is that the proposed standard in some manner mandates use of ZEVs. It does not. See Sections I and II of the preamble and RTC 2. In short, the final standards are numerical performance-based standards, and can be met in any manner a regulated entity (i.e. manufacturer) sees fit that achieves compliance with that numerical standard. In assessing a modeled potential compliance pathway that includes a technology mix of ICE vehicle technologies and ZEV technologies, EPA was demonstrating that the final standards were feasible and appropriate; EPA was not requiring that manufacturers utilize that modeled potential compliance pathway. This is the Agency's approach for all of its CAA Title 2 standards, following the template set forth initially by the D.C. Circuit in *NRDC v. EPA*, 655 F. 2d at 332, and echoed many times since in succeeding rules and court opinions. EPA is not mandating the use of the technology included in the technology packages for this compliance pathway, just as EPA has not mandated the technology included in such technology packages in prior rules (and which manufacturers have previously either only partially or not at all adopted in complying with previous rule standards). See generally responses in RTC section 2.1, which notes further that there are many additional examples of compliance pathways to meet the final standards open to manufacturers. See also additional example potential compliance pathways that support the feasibility of the final standards in preamble Section II.F, which include a suite of technologies ranging from ICE engine, transmission, drivetrain, aerodynamics, and tire rolling resistance improvements, to the use of low carbon fuels like CNG and LNG, to hybrid powertrains (HEV and PHEV) and H2-ICE. Low carbon fuels, like CNG and LNG, may be accounted for subject to certain requirements if the use of the fuel results in lower CO_2 emissions in the vehicle exhaust. This similarly applies to biofuels, if the use of the fuel results in lower CO_2 vehicle exhaust emission. However, to use fuels (including biofuels) as part of the engines and vehicles certification, the manufacturer is required to get approval from the EPA and one of the requirements of this approval is that the manufacturer must show that the vehicle and engine only use the specific fuel when operating in-use.[655]

EPA's Phase 3 GHG standards are CO_2 vehicle exhaust emission standards, and EPA considers all comments asserting that EPA must, or should, set or determine compliance with such standards in a manner other than measuring (directly or via GEM) vehicle exhaust CO_2 emissions as comments asserting that EPA must, or should, consider life cycle assessment. For EPA's response to comments on life cycle assessment, see RTC section 17.1. EPA recognizes that changes to fuel requirements can result in changes in emissions but disagrees that such changes are within the scope of this rulemaking or that EPA is required to consider them as alternatives to this rulemaking, which is concerned with vehicle and engine standards under CAA section 202(a). The CAA has a separate and distinct set of requirements for engaging in fuels regulations and EPA has not at this point undertaken the requisite analyses to regulate GHGs under CAA section 211(c). Indeed, section 211(c)(2)(A) provides that fuel may not be regulated to control harmful air pollution except after "consideration of other technologically or economically feasible means of achieving emissions standards under section [202]." Thus, it is entirely appropriate (if not required) for the Administrator to take the technologically and economically feasible steps of this rule before undertaking further controls on fuels to address emissions reduction. In light of this statutory structure, with very different regulatory programs for vehicles standards under section 202 and fuels standards under section 211, EPA disagrees that it is required to consider fundamentally altering this rulemaking from a vehicles rulemaking to a fuels rulemaking. "While an agency must consider and explain its rejection of 'reasonably obvious alternative[s],' it need not consider every alternative proposed nor respond to every comment made. Rather, an agency must consider only 'significant and viable' and 'obvious' alternatives."[656] At this point, given that the EPA has not met the statutory prerequisites for new fuels controls, much less proposed new fuels controls, the adoption of new fuels controls is not a viable alternative. EPA of course continues to separately implement the RFS program, which also has the goal of promoting lower GHG fuels, and the most recent renewable fuel volume standards require the largest volumes of renewable fuels to date to be used for transportation.[657] Similarly, in response to the specific comments on using a utility factor to account for the relative use of non-biofuels and biofuel (for example diesel and biodiesel), the comment that a credit mechanism should be created to account for the LCA, and the comment to adopt the same

[655] *See* the response to the ClearFlame comments in this RTC Section 9.1.
[656] *Nat'l Shooting Sports Found., Inc. v. Jones*, 716 F.3d 200, 215 (D.C. Cir. 2013) (citations omitted).
[657] *See* 88 FR 44468 (July 12, 2023).

approach as the Flexible Fuel Vehicle standards, we disagree that such changes are within the scope of this rulemaking.

Regarding the comment on biogenic emissions, EPA notes that ever since the section 202 Endangerment Finding was made, it has considered GHG pollution as being comprised of six well-mixed gases (one of which is CO2), based on their properties and behaviors in the atmosphere that are relevant to the climate change problem, including characteristics and attributes related to radiative forcing, chemical reactivity, and atmospheric lifetime. As EPA stated, in reiterating this position in the 2016 Endangerment Finding for GHG Emissions from Aircraft, "[i]n the record for the 2009 Endangerment Finding, the Agency stated that 'all CO2 emissions, regardless of source, influence radiative forcing equally once it reaches the atmosphere and therefore there is no distinction between biogenic and non-biogenic CO2 regarding the CO2 and the other well-mixed GHGs within the definition of air pollution that is reasonably anticipated to endanger public health and welfare."[658] EPA finds it appropriate to continue this policy of treating all vehicle exhaust CO_2 emissions equivalently, since once they have been emitted to the atmosphere the CO2 molecules have equivalent impacts on the climate, regardless of the origin and constitution of the fuel prior to combustion.

EPA has reviewed the Stillwater Associates study from July 2022, stating that switching to 100% renewable diesel will provide three times the CO_2 reductions as can be achieved from ZEVs, and determined that the information it provides is not applicable to the vehicle tailpipe standards being set in this rule. First, the final standards in this rule are for new vehicles, so comparing the emissions reductions from the rule to a scenario where 100% of the nation's diesel is switched to renewable diesel is not an apples-to-apples comparison. Second, the upstream emissions modeling performed in the Stillwater Associates study doesn't reflect the impacts of the IRA on emissions from EGUs, which is significant. RIA Chapters 4.1 and 4.2.4 contain more discussion regarding changes in EGU emissions over time driven by economic conditions, Congressional action such as the IRA, and other finalized rules by EPA and others affecting power sector emissions. EPA's power sector model, IPM, models significant reductions in GHG emissions from EGUs in future years. This makes the study's conclusions outdated. Finally, see also RTC section 17.1 for EPA's response to comments regarding life cycle assessment.

In response to the claim that "new technology diesel engines '98% PM reductions compared to EVs' 95% PM reduction assuming power from the U.S. Grid Mix," we first note that EPA is setting GHG emission standards for HD vehicles in this rulemaking, though we also analyze impacts of the rule, including impacts on non-GHG emissions. See Section II.G.4 of the preamble for EPA's consideration of such impacts. Additionally, this commenter's assertion doesn't reflect the impacts of the IRA on emissions from EGUs, which is significant. RIA Chapters 4.1 and 4.2.4 contain more discussion regarding changes in EGU emissions over time.

We disagree with the comment that NOx reductions need to be determined on a miles traveled basis instead of a per vehicle basis. The comment is based on the assumption that ZEV have lower VMT than ICE vehicles, which is not consistent with feasibility assessment that was conducted for the rule. See RIA Chapter 2.5.1 on how we sized the powertrain components of

[658] *See* 81 FR 54422 (August 15, 2016).

ZEV, which includes the sizing of the battery, to meet the duty cycle requirements for each of the 101 vehicle IDs in HD TRUCS.

Regarding the comments that changes to GEM are needed for fuels other than gasoline and diesel to be recognized in GEM, GEM is configured to accept inputs for all carbon-containing fuels. GEM has explicit inputs for gasoline, diesel, natural gas, liquefied petroleum gas, dimethyl ether, and high-level ethanol-gasoline blends. In Table 1 of 40 CFR 1036.550, EPA specifies the reference fuel properties for these fuel types.[659] In addition, footnote "a" to Table 1 of 40 CFR 1036.550 allows for manufacturers to seek approval for reference fuel properties that are not listed in Table 1 of that section. 40 CFR 1036.505 contains the instruction for how manufacturers must generate fuel maps for input in GEM and, with the final addition described in Section III.C of the preamble, specifies that for any fuel type not listed in Table 1 of 40 CFR 1036.550 manufacturers are required to identify the fuel type as diesel fuel for engines subject to compression-ignition standards and as gasoline for engines subject to spark-ignition standards. Thus, the test procedures set out in 40 CFR 1036.505 and 40 CFR 1036.550, allow for carbon-mass-specific net energy content of all carbon containing fuels to be accounted for in GEM. See also our further response to commenter Clear Flame below.

Regarding Am Free's comment comparing the light duty proposal, first, the discussion in the light and medium duty proposal to which the commenter refers dealt with PM control, not with GHG emissions. The light-duty proposal is multi-pollutant; the heavy-duty rule only sets GHG emission standards. Moreover, all the light and medium duty preamble announces is the possibility of a different rulemaking at a later date and requests comments on potential approaches for that rulemaking, not as part of the light duty rulemaking at issue. EPA consequently does not agree that EPA took a meaningfully different approach in the two rules.[660]

Regarding the supply of critical materials, see our response in RTC section 17.2. and Preamble section II.D.2.ii.c.

Clean Fuels Alliance America's comment is outside the scope of this final rule; see existing 40 CFR 1068.115.

The comment from Lubrizol on the consideration for the creation of a diesel deposit control standard is outside the scope of this final rule.

We disagree with the Lynden Incorporated comment that high-horsepower engines are being phased out because of the inability to meet emissions standards. EPA's HD GHG engines standards are work specific and the engine duty cycles are denormalized with the torque curve of the engine, so higher horsepower engines have higher cycle work over the duty cycles, which results in lower CO_2 emission than their lower horsepower counterparts.

We also disagree with the comment from Lynden and NGVAmerica that the emission standards will force manufacturers to subsidize ZEV by increasing the cost of engines. Our analysis include in Preamble Section II and RIA Chapter 2 shows payback periods under the modeled potential compliance pathway that are acceptable for heavy-duty vehicle purchasers.

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[659] Under 40 CFR 1037 (e.g., 1037.520(f)), manufacturers are required to followi the 40 CFR 1036 regulations on test procedures, including fuel mapping and related requirements.
[660] *See generally* 88 FR 29397-98.

The comment from Lynden that recommended EPA should assist small fleets in replacing pre-2010 diesel engines with modern diesel engines is out of scope for this rule.

We disagree with the comment from National Association of Convenience Stores (NACS), NATSO, and SIGMA, that the proposed standards risk zeroing out new innovations in emissions reductions from ICE vehicle, because the standards cannot be met with ICE vehicles alone. As discussed in Preamble Section II and RIA Chapter 2.11, the standards are performance-based and manufacturers could meet the standards with the use of hydrogen engines, hybrids, natural gas engines and improvements to ICE vehicles.

Response to Individual Comments

Comment:

ClearFlame Engine Technologies stated that the proposal to update 40 CFR 1036.505 to clarify that "when certifying vehicles with GEM, for any fuel type not identified in Table 1 of 40 CFR 1036.550, the manufacturer would identify the fuel type as diesel fuel for engines subject to compression-ignition standards" is not sufficient to provide an engine certification pathway for all fuels that are reasonably expected for use in dedicated alternative fuel engines. They state that GEM assumes that the only fuels to be used by heavy-duty engines are gasoline, diesel, and natural gas and EPA must provide a mechanism for certifying dedicated ethanol and other dedicated alternative fuel engines, as it is the scientifically and technically correct way to treat these engines. They state that GEM treats a dedicated ethanol engine as though it is running on high-carbon diesel fuel (in contrast to a CNG engine, which is not treated by GEM as though it is running on diesel). They state that treating a dedicated ethanol engine as though it was running on diesel fuel results in GEM calculations that yield an unintended negative outcome because GEM:

(1) Does not take the biogenic nature of ethanol emissions into account.

(2) Does not take the lower carbon Intensity of ethanol into account.

(3) Does not take other combustion differences (like heating value and H/C ratio) between ethanol and diesel into account.

ClearFlame Engine Technologies believes that GEM currently estimates emissions from ethanol vehicles to be approximately 1.5 times worse than diesel, while GREET, based on national average, calculates ethanol to have 50% of the emissions impact of diesel. They state that, thus, GEM overestimates the climate impact of an ethanol-fueled engine by 3x (1.5/.5). They would like EPA to create a fuel input for ethanol within GEM, which would account for its heating value, H/C ratio, and biogenic carbon ratio. They state that this would enable GEM to accurately account for the different combustion properties and decarbonization benefits of a compression-ignition engine that has been designed to run exclusively on ethanol.

They state that 40 CFR 1036.505 and 40 CFR 1065.701(c)(1) enables a company to request approval to use the following alternative test fuels with EPA approval:

(1) E98 that meets ASTM D4806 (i.e., uses gasoline as its denaturant).

(2) Another form of E98 that does not use gasoline as its denaturant.

(3) Ethanol that includes 5% water (as would result from the output of an unaugmented distillation process).

ClearFlame Engine Technologies requested that EPA add specifications for high-blend ethanol for each of the examples outlined above, to provide certainty to the certification process.

ClearFlame Engine Technologies stated that "possible to achieve the same goal by adding a conversion or correction factor to the calculation of GEM emissions, a fuel-specific fuel Input (such as is being considered for hydrogen) is highly preferred".

They also commented that 40 CFR part 1065, subpart H limits the use of high-blend ethanol as a test fuel to E51-83 fuel that meets the specifications of ASTM D5798.19 and request a high-blend ethanol E98 fuels.

Response:

ClearFlame Engine Technologies requested updates to 40 CFR 1036.505 to allow GEM to treat a dedicated ethanol engine in a manner different than an engine running on diesel. EPA made changes to the base fuel properties within GEM to allow for accounting for the carbon content of E85 fuel via a test procedure technical amendment finalized in 2022.[661] We also note that the footnote "a" in Table 1 to Paragraph (b)(4) of § 1036.550—Reference Fuel Properties allows for approval of other fuels. This allows a manufacturer to request other fuels, like E98, and to account for its carbon mass fraction differences. In this scenario, with a preapproved E98 fuel, the fuel map would be preprocessed with the E98 fuel properties, which would eliminate the commenter's asserted need for any changes to GEM with respect to the ability to generate accurate results for an E98 fuel.

Regarding their comment on well-to-tailpipe emissions, see our response above in this section of the RTC and see RTC chapter 17.1 for our response on life cycle assessment.

EPA is not adding additional reference fuel properties in Table 1 of 40 CFR 1036.550 at this time and this request is outside the scope of this final rule. Please see our response above in this section of the RTC regarding what Table 1 already includes in the existing regulation. Under the existing regulations, the mechanism exists for manufacturers to request approval by EPA for use of these fuels in 40 CFR 1036.550 and 40 CFR 1065.701(c)(1). In addition, equation 4 of 40 CFR 1036.535, already accomplishes the correction for fuels that are not in Table 1 of 40 CFR 1036.550 that was suggested by ClearFlame Engine Technologies. In response to the comment that 40 CFR part 1065, subpart H limits the use of high-blend ethanol, preventing the use of E98 fuels, this is simply not the case. While 40 CFR 1065 subpart H does not directly list E98 as a fuel, 40 CFR 1065.701(c) provides a process to allow a manufacturer to obtain approval for any fuel, provided it meets the qualifications in 40 CFR 1065.701(c)(1).

[661] *See* Improvements for Heavy-Duty Engine and Vehicle Test Procedures rule (87 FR 45259 (July 28, 2022). .

9.2 Phase 2 Vehicle and Engine Technologies

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

In 2012, EPA saw fit to incentivize near zero technologies and embraced their role to support ZEVs while achieving significant GHG reductions. [EPA-HQ-OAR-2022-0985-1571-A1, p. 2]

“EPA believes that these temporary regulatory incentives are justified under CAA section 202(a) as they promote the commercialization of technologies that have, or of technologies that can be critical facilitators of next-generation technologies that have, the potential to transform the light-duty vehicle sector by achieving zero or near-zero GHG emissions and oil consumption, but which face major near-term market barriers.” 1 [EPA-HQ-OAR-2022-0985-1571-A1, p. 2]

1 Federal Register / Vol. 77, No. 199 / October 15, 2012, at 62811

The enormous challenges of decarbonizing the heavy-duty vehicle market will take decades and require all available technologies. AVE encourages EPA to seek additional pathways to incentivize the near-term introduction of as many advanced technologies as possible into future heavy-duty trucks. Prior to the effective implementation of this Proposal, nearly one million Class 8 trucks will be produced. These vehicles will be on American roads for well over 20 years. By expanding the definition of ZEVs even slightly, EPA can ensure greater emission reductions for decades. [EPA-HQ-OAR-2022-0985-1571-A1, p. 2]

Recognizing the challenges of decarbonizing Class 8 trucks, the European Union now includes HD vehicles that emit not more than 5 g/(t.km) or 5 g/(p.km) of CO2 as ZEVs.3 AVE encourages EPA to adopt the EU’s amended standard. Doing so will allow for greater emission reductions in the heavy-duty sector and faster penetration of already commercialized technologies. [EPA-HQ-OAR-2022-0985-1571-A1, p. 2]

3 https://climate.ec.europa.eu/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/reducing-co2-emissions-heavy-duty-vehicles_en#incentive-mechanism-for-zero--and-low-emission-vehicles-zlev

Organization: Advanced Engine Systems Institute (AESI)

AESI supports the EPA proposal to reduce GHG emissions from heavy-duty trucks by setting performance standards that drive the improved efficiency of diesel ICE engines while accelerating the introduction of electric and hydrogen powertrains. AESI believes that certain critical engine and powertrain technologies, which were not economically viable or fully developed 10 years ago and are not considered in EPA’s proposed Phase 3 GHG standards, can be further deployed to reduce the GHG emissions of combustion engines. HD hybrid powertrains, and hydrogen ICE have seen significant advances during the past few years. These technologies are cost effective and can deliver substantial GHG emission reductions. EPA should account for recent data regarding the performance of these carbon reduction technologies in the final rule. [EPA-HQ-OAR-2022-0985-1600-A1, p. 1]

A just released study by the International Council on Clean Transportation (ICCT) finds that ‘cost effective ICE efficiency improvements remain important to the de-carbonization of the HD sector.’ AESI agrees with that conclusion. HD Hybrid powertrains, with existing incentives, can deliver up to a 31% GHG reduction in vocational vehicles and 25% in long haul at a small fraction of the cost of an HD BEV powertrain. It is essential that EPA conduct technical analysis and encourage deployment of these cost-efficient Hybrid powertrains, which can provide an important short-term solution to the de-carbonization of long-haul freight, our most difficult sector challenge in MY 2027-2032. [EPA-HQ-OAR-2022-0985-1600-A1, pp. 1-2]

Organization: California Air Resources Board (CARB)

b. Plug-in Hybrid Technologies

Affected page: DRIA 181

Plug-in hybrid technologies are a bridge technology which offers advantages and disadvantages versus pure BEVs. Plug-in hybrid electric vehicles (PHEV) offer greater flexibility than BEVs and can be operated in a similar manner to existing ICE vehicles today. However, the additional complexity of simultaneously including both ICE and BEV powertrains in each PHEV adds cost versus BEV powertrains, and operational savings from PHEVs are already expected to be lower than for BEVs due to higher fuel and maintenance expenses further reducing potential cost effectiveness. Applications with low daily mileage but occasional high mileage trips such as utility applications may be well served by PHEVs before a full transition to ZEV technologies. Certain recent federal funding opportunities may further support rollout of PHEVs. PHEVs freight vehicles are expected to come to market in the near future before 2027 by manufacturers such as Hyliion.90 ZE-capable PHEV technology is already being fielded in emergency response vehicles in the U.S. by at least three fire apparatus manufacturers.91 Diesel and compressed natural gas PHEVs are also available today in streetsweepers.92 Vehicles using these types of powertrains can address parts of the market which might otherwise default to ICE vehicles in the early years of implementation. Market interest in freight applications of hybrid and PHEV systems is further underscored by explorations of trailer-based hybrid systems to add regenerative braking and plug-in energy to whatever conventional (or ZEV) tractor is connected.93,94,95,96,97,98,99,100 Electrification on board conventional ICE HDVs is already anticipated to increase significantly with the addition of higher voltage chassis electrical systems (48-Volt and above), the announced usage of electric exhaust heaters, and the broad component availability of electric exhaust heaters, electrically heated mixers, and electrically heated catalysts.101,102,103 One manufacturer already announcing electric exhaust heaters for their medium heavy-duty engine (HDE) offering has seen historic market share >85 percent for class 8 engines under 10L104 and similarly dominates the medium HDV market outside of HD pickups and vans.105,106,107,108,109,110 Another example illustrative of existing LD powertrains that could be applicable to launching PHEV technology up into the lightest end of the HD range is the RAM gasoline pickup, which has applied a default 48-Volt mild hybrid on their largest engine offering since MY 2019.111 Adding as little at as 15 kWh of energy storage to any of these types of mild hybrids (less than two-thirds the size of an original Nissan Leaf battery and still smaller than an electric Smart ForTwo battery112) could trigger the IRA commercial vehicle tax credits, likely covering the entire incremental cost of such storage and the cost of the entire hybrid system itself.113 Putting moderate amounts of stored energy on a vehicle (e.g. the 15 kWh needed to qualify for IRA tax credits) can also unlock other non-propulsion user benefits like replacing Auxiliary Power Units, providing export power on jobsites and robustly underpinning the power needs of advanced driver assistance systems. As discussed further in the

HDVs with ICE Technologies in Part I. Section C.2. below, U.S. EPA did not assume significant market penetration of PHEVs in setting the proposed Phase 3 GHG standards. Given these aligned technology availability, user and manufacturer interests and favorable economic drivers, CARB staff suggests U.S. EPA reflect expected PHEV market conditions more accurately (and strengthen stringency accordingly) based on projecting a significant fraction of vehicle sales as PHEVs, a fraction that could foreseeably approach the remaining non-ZEV share of the market. [EPA-HQ-OAR-2022-0985-1591-A1, pp.34-36]

90 Hyliion https://www.hyliion.com/

91 Firerescue1: 'Yesterday's crazy is today's obvious': Electric apparatus in the fire service, June 7, 2022. https://www.firerescue1.com/fire-products/fire-apparatus/articles/yesterdays-crazy-is-todays-obviouselectric-apparatus-in-the-fire-service-2185qDLEvE2k5NNV/

92 Streetsweepers examples.
https://www.elginsweeper.com/products/mechanical/hybrid-broom-bear
https://www.elginsweeper.com/products/mechanical/hybrid-pelican
https://globalsweeper.com/products/mechanical/global-m4-hybrid

93 Charged Electric Vehicles Magazine: Carrier partners with ConMet to add regen braking to Class 7 and 8 trailer wheels, February 7, 2022. https://chargedevs.com/newswire/carrier-partners-with-conmet-to-add-regen-braking-to-class-7-and-8-trailer-wheels/

94 Bosch presents electromobility for semitrailers, August 28, 2018. https://www.bosch-presse.de/pressportal/de/en/bosch-presents-electromobility-for-semitrailers-168963.html

95 HDT Truckinginfo: How Trailers Are Harnessing 'Free' Energy, October 8, 2020. https://www.truckinginfo.com/10127672/harnessing-energy-in-trailers

96 Technology & Maintenance Council: Future Truck Position Paper: 2022-2 — Trailer Energy Harvesting: Regenerative Braking Systems for Trailer Applications, February 11, 2022. https://tmc.trucking.org/blog/future-truck-position-paper-2022-2-—-trailer-energy-harvestingregenerative-braking-systems

97 SAF-Holland Working on Trailer e-Axles for North America, March 6, 2022. https://www.truckinginfo.com/10162828/saf-holland-reports-on-its-trakr-e-axles-for-north-america

98 NACFE: Consider Trailer Technologies and Practices to Improve Efficiency Efforts, last accessed May 26, 2023. https://nacfe.org/research/trailer-general/#powered-axle

99 Trailer Dynamics & Mars Logistics to deploy 500 eTrailers, June 9, 2023. https://www.electrive.com/2023/06/09/trailer-dynamics-mars-logistics-to-deploy-500-etrailers/

100 Green innovation in land transport: Using eTrailers as a game changer for decarbonizing long hauls, October 25, 2022. https://www.dbschenker.com/de-en/insights/news-and-stories/press-releases/using-etrailers-as-a-gamechanger-for-decarbonizing-long-hauls-946138

101 Cummins Announces New X10 Engine, Next in the Fuel-Agnostic Series, Launching in North America in 2026, February 13, 2023. https://www.cummins.com/news/releases/2023/02/13/cummins-announces-new-x10-engine-next-fuelagnostic-series-launching-north

102 Watlow's New ECO-HEAT® Smart Internal Load Bank, October 13, 2015. https://www.watlow.com/about-watlow/news/eco-heat-press-release

103 Transport Topics: Eaton Offers 48-Volt Programmable ECU for Heated Catalysts, June 6, 2022. https://www.ttnews.com/articles/eaton-offers-48-volt-programmable-ecu-heated-catalysts

104 Transport Topics: Cummins Top Supplier of Class 8 Engines in 2020, February 17, 2021. https://www.ttnews.com/articles/cummins-top-supplier-class-8-engines-2020

105 HDT Truckinginfo: Medium-Duty Update: Growing Sales, Diesel Developments, Vertical Integration, October 18, 2016. https://www.truckinginfo.com/157008/medium-duty-update-growing-sales-diesel-developmentsvertical-integration

106 Cummins and Navistar Announce New Long-Term Agreement, August 10, 2020. https://www.cummins.com/news/releases/2020/08/10/cummins-and-navistar-announce-new-long-termagreement

107 Mack MD Series Specs, last accessed June 1, 2023. https://www.macktrucks.com/trucks/md/specs/

108 Daimler Truck AG AND Cummins Inc. Announce Global Plan for Medium Duty Commercial Vehicle Engines, February 23, 2021. https://www.cummins.com/news/releases/2021/02/23/daimler-truck-ag-and-cummins-inc-announceglobal-plan-medium-duty

109 Hino Trucks and Cummins Announce Medium and Heavy-Duty Engine Offering, March 12, 2021. https://www.cummins.com/news/releases/2021/03/12/hino-trucks-and-cummins-announce-mediumand-heavy-duty-engine-offering

110 Cummins and Isuzu Announce Global Mid-Range Powertrain and Advanced Engineering Collaboration, February 5, 2021. https://www.cummins.com/news/releases/2021/02/05/cummins-and-isuzu-announce-global-mid-rangepowertrain-and-advanced

111 Green Car Congress: 2019 Ram drops weight, gains 48V eTorque mild hybrid system, January 15, 2018. https://www.greencarcongress.com/2018/01/20180115-ram.html

112 Used 2013 smart fortwo Electric, last accessed May 26, 2023. https://www.edmunds.com/smart/fortwo/2013/electric/

113 IRS: Commercial Clean Vehicle Credit, last accessed May 26, 2023. https://www.irs.gov/credits-deductions/commercial-clean-vehicle-credit

Organization: Cummins Inc.

VI. Hybrid Certification and Test Procedures

Hybrids are essential to the success of EPA's Phase 3 Greenhouse Gas proposal. Hybrids can bridge the gap between conventional internal combustion engines and future zero emissions technology. They are not as dependent on the electrical grid as battery electric vehicles and are a technology that fleets can use today. Below we have identified several significant EPA certification and compliance barriers that make hybrids much more challenging to certify than either internal combustion engines or fully electric vehicles. [EPA-HQ-OAR-2022-0985-1598-A1, p. 11]

EPA streamlining heavy-duty hybrid certification and compliance requirements would improve the durability of Phase 3 by providing another viable path toward compliance, directionally decreasing the likelihood that the Phase 3 standards would need to be delayed should the recharging infrastructure not be ready. Hybrids can achieve early success by decreasing GHGs during a period in which the recharging infrastructure is still growing toward supporting the shorter range of fully electric vehicles. Hybrids also maximize the use of critical battery materials to achieve greater GHG reductions with a greater number of vehicles. Heavy-duty vehicles will evolve from hybrids to fully electric, and manufacturers should be able to leverage all technology options, without today's disproportionate heavy-duty hybrid certification and compliance barriers. Streamlining and eliminating the certification and compliance barriers for hybrids will also allow manufacturers to take advantage of hybrid credits which will incentivize additional development and further production. Lastly, if the certification and compliance barriers to hybrids are not streamlined, EPA's Phase 3 rule will be at the mercy of the status of the nation's electric grid and heavy-duty BEV charging infrastructure. [EPA-HQ-OAR-2022-0985-1598-A1, p. 11]

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #11: We request comment on whether we should include additional GHG-reducing technologies and/or higher levels of adoption rates of existing technologies for ICE vehicles in our technology assessment for the final rule.

- DTNA Response: DTNA believes it is inappropriate to add additional GHG technologies at this time.[EPA-HQ-OAR-2022-0985-1555-A1, p. 160]

EPA Request for Comment, Request #52: We request comment on ICE vehicle technologies that could support more stringent standards than those proposed (in both tractor and vocational sections)

- DTNA Response: DTNA believes it is inappropriate to require additional GHG technologies for ICE vehicles at this time. [EPA-HQ-OAR-2022-0985-1555-A1, p. 167]

Organization: Diesel Technology Forum (DTF)

a. Hybrid diesel engine technology is readily available, cost efficient (compared to BEVs and FCVs), and can make a significant impact on fuel consumption reduction and CO2 reduction now.

In the proposed rule, the utility of hybrid powertrains as a compliance strategy has not been fully considered. Newer data is being established by SwRI as part of their Clean Hybrid Electric Diesel Engine (CHEDE), a consortium of leading manufacturers and suppliers. Results indicate that particularly for Class 7 trucks (the smallest class of HD trucks), used primarily as garbage trucks, street sweepers, straight trucks such as for furniture delivery, when hybrid technology is incorporated, they can significantly reduce CO2 due their stop-and-go duty cycle. [EPA-HQ-OAR-2022-0985-1618-A1, p. 3]

In the case of hybrids, EPA notes (88 Fed. Reg 25896) that tax credit eligibility of a "qualified commercial clean vehicle" is limited to those powered to a significant extent by a battery-powered electric motor, thereby excluding hybrid powertrains that utilize ICE while including plug-in hybrid electric vehicles. Unfortunately, the IRA legislation failed to take a technology-neutral approach for eligibility in incentivizing investments in all technologies that can substantially reduce GHG, instead favoring only battery-based and electrified technology. [EPA-HQ-OAR-2022-0985-1618-A1, pp. 3 - 4]

This unfortunate defect in the credit eligibility in the legislation does not however preclude EPA from factoring in greater credit and other provisions for ICE vehicles that utilize hybrid electric powertrains in its Phase 3 rule which we strongly encourage. Given the fact that ICE powertrains will continue to play a major role in the commercial trucking sector for decades to come, having more of the future trucks outfitted with hybrid technology would translate into lower GHG emissions perhaps sooner than fuel cell electric or battery electric vehicles. The earlier the technology is adopted, the more impact it can have. [EPA-HQ-OAR-2022-0985-1618-A1, p. 4]

Organization: Eaton

3. GHG regulations need to be based on data, include evaluations of recent technologies, allow multiple pathways for achieving emissions reduction, and remain technology-neutral

While the NPRM describes high penetration of Zero-Emissions Vehicles (ZEV) as the path to achieve low GHG emissions, there are also uncertainties such as infrastructure availability, clean electrical energy or Hydrogen production, robust and affordable Battery Electric Vehicles (BEV) or Fuel Cell Electric Vehicle (FCEV) technology. Therefore, the Phase 3 rule needs to also consider technologies that lower emission for ICE powertrains, based on technology progress since Phase 2 that is not in conflict with the recent low NOx rules. Since 2017, Eaton and other suppliers have developed an array of technologies based on conventional, robust and very cost-effective components, ranging between ICE improvements and hybridization, with reductions in the range of 5% to 50% lower GHG while achieving 2027 EPA NOx limits (in both certification test environment as well as real-world cycles). [EPA-HQ-OAR-2022-0985-1556-A1, p. 2]

The Phase 2 GHG rule proved to be a great success. The rule included engine and vehicle-level standards that drove technology improvements that are currently in production, while additional improvements are planned for production through 2027. Examples include high compression ratio engines, waste heat recovery, cylinder thermal insulation, reduced friction losses, improved aerodynamics, and efficient transmissions to name a few. The industry is on path to achieve the upcoming 2024 and 2027 Phase 2 GHG goals on time. However, the technology landscape has also changed since the Phase 2 regulations were adopted in 2016. In addition to the advent of BEV and FCEV trucks and the deployment of many technologies evaluated for Phase 2, other significant changes in ICE-based powertrains are as follows: [EPA-HQ-OAR-2022-0985-1556-A1, p. 2]

1. GHG benefits associated with compliance with 2027 Low NOx limits

Low NOx technologies were developed for meeting new NOx regulations in 2025 – 2027, that in isolation increase CO2 emissions through increased backpressure of larger catalysts and increased energy for faster heat-up of the catalysts. However, by balancing the trade-off between CO2 and NOx, the ICE and Aftertreatment systems can in fact achieve simultaneously CO2 reductions while achieving the new stringent NOx limits. Eaton components such as Variable Valve Actuation (VVA) and electrical and/or fuel based aftertreatment heater, in conjunction with advanced catalysts and aftertreatment architectures, have demonstrated 1.5% CO2 savings of Federal Test Procedure (FTP) as shown in Figure 1 and up to 5.1% on the Low Load Cycle (LLC), as seen in Figure 2. These results were achieved at the Southwest Research Institute and are published in [1]. [EPA-HQ-OAR-2022-0985-1556-A1, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1556-A1, page 3, for Figures 1 and 2.]

1. McCarthy, J. Jr., Zavala, B. and Matheaus, A., “Technology Levers for Meeting 2027 NOx and CO2 Regulations,” SAE 2023-01-0354, 4/20/2023

2. GHG benefits associated with improved ICE air handling

At the engine level, Eaton has developed and demonstrated technologies that reduce GHG such as Cylinder Deactivation (CDA) and variable Miller cycles, and pairing Exhaust Gas Recirculation (EGR) Pumps with High Efficiency Turbochargers that improve engine open cycle efficiency.

For example, CDA achieves 40% CO2 reductions at idle, and more importantly, 1% CO2 reductions on the 55 mph GHG cycle illustrated in Figure 3 and described in 2017 [2], with further improvements in the meantime. [EPA-HQ-OAR-2022-0985-1556-A1, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1556-A1, page 3, for Figure 3.]

2. McCarthy, J., Jr., "Cylinder Deactivation Improves Diesel Aftertreatment and Fuel Economy for Commercial Vehicles," 17th Stuttgart International Symposium, Vol. 2, pp. 175-202, 3/15/2017

In [3], significant CO2 savings are found on real world driving cycles due to cylinder deactivation: 6% reduced CO2 on the Low Load Cycle, 3% on Orange County Transit Authority cycle, 8% on the New York Bus Cycle and 5% on the Beverage cycle. Finally, CDA offers a 4% to 35% fuel / CO2 savings on the Port Drayage Cycle as shown in Figure 4 and described in [4]. [EPA-HQ-OAR-2022-0985-1556-A1, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1556-A1, page 4, for Figure 4.]

3. Reinhart, T., Matheaus, A., Sharp, C., Peters, B., Pieczko, M. and McCarthy, J. Jr., 'Vibration and emissions quantification over key drive cycles using cylinder deactivation.' Int. J. Powertrains, Vol. 9, No. 4, pp. 315–344, Nov. 16, 2020

4. Joshi, M., Gosala, D., Allen, C., Srinivasan, S., Ramesh, A., VanVoorhis, M., Taylor, A., Vos, K., Shaver, G., McCarthy, J. Jr., Farrell, L. and Koeberlein, E., "Diesel Engine Cylinder Deactivation for Improved System Performance over Transient Real-World Drive Cycles," SAE 2018-01-0880, 4/3/2018

The EPA proposes a 1.5 "intelligent controls" adjustment factor in GEM for engines that include full CDA during coasting where both exhaust and intake valves are closed, justifying it as similar in effect to neutral coasting estimated at 1.5% CO2 reduction. However, the full effect of CDA on CO2 is more significant, as this approach also prevents the cooling of the aftertreatment system through idle flow during coasting, thus avoiding additional fuel spent on thermal management after coasting, as illustrated in Figure 3. On the 55 mph cycle, this effect was measured as 1% incremental fuel or CO2 reduction. Given the significant benefits at low load illustrated in Figure 4, we believe a 2.5 GEM "Intelligent controls" adjustment factor is a conservative adjustment for CDA that includes all cylinders deactivated during coasting. [EPA-HQ-OAR-2022-0985-1556-A1, p. 4]

The ICE has seen improvements for the boosting and EGR systems for reducing CO2 that were not included in Phase 2 GHG assessments. Replacing the production turbocharger, normally designed to also flow EGR for today's engines, with a high efficiency turbocharger while using an EGR pump to flow EGR shows a 5% improvement in fuel economy and CO2 as shown in Figure 5. Significant GHG reductions were measured, up to 5.5% at A-speed, 6.2% at-B speed and 5.3% at C-speeds on the SET test. For the HD FTP, the combination of high efficiency turbocharger and EGR pump showed a 1.7% to 3.6% savings of CO2 [5]. These CO2 gains are additive to the gains from CDA. [EPA-HQ-OAR-2022-0985-1556-A1, p. 4.] [See Docket Number EPA-HQ-OAR-2022-0985-1556-A1, page 4, for Figure 5.]

5. Bitsis, D.C., Matheaus, A., Hopkins, J. and McCarthy, J. Jr., "Improving Brake Thermal Efficiency Using High Efficiency Turbo and EGR Pump While Meeting 2027 Emissions," SAE 2021-01-1154, 9/21/2021

Overall, the technologies developed and tested by Eaton improve ICE GHG emissions in the range of 3% – 7%. Our ICE partners have demonstrated the potential for an additional 3% improvement through their ICE technologies such as higher compression ratios, reduced thermal loss in the cylinder and reduced friction loss. For example, The Volvo Supertruck II showed that up to 1.4% BSFC improvement (i.e., 1.4% CO2 improvement) with optimum LIVC timing [6] on its path for a low CO2 powertrain. [EPA-HQ-OAR-2022-0985-1556-A1, p. 4]

6. McLaughlin, S., Bond, E. and Li, J., “Volvo SuperTruck 2 Pathway to Cost-Effective Commercialized Freight Efficiency,” DOE Annual Merit Review, 6/24/2021.

3. GHG benefits associated with micro- and mild-hybrids (48V systems)

Eaton has demonstrated micro- and mild-hybridization enabled by 48V technology, in the form of 48V energy recovery and management systems that achieve additional 5% – 8% GHG reductions at the vehicle level, by enabling engine-off while coasting (1.5% benefit), anti-idle and hoteling modes (up to 6% benefit for sleepers), and efficient electrical accessories (1.5% benefit), while recovering the energy for these systems from the vehicle dynamics (braking and coasting) [7]. It should be noted that 48V technology is also a key enabler for enhanced value-adding performance, such as electrical HVAC and/or automated and driver assist functions. These results corroborate well with the major US OEM’s demonstrations in the SuperTruck II program. [EPA-HQ-OAR-2022-0985-1556-A1, p. 5]

7. Hergart, C and Brown, M., “Development and Demonstration of Advanced Engine and Vehicle Technologies for Class 8 Heavy-Duty Vehicle (SuperTruck II),” DOE Annual Merit Review, 6/21/2018.

4. GHG benefits associated with hybridization

Eaton has recently demonstrated HD Hybrid technology (HEV) using 600 – 800V technology that improves GHG emissions by 9% on tractor certification cycles and 13%-19% on the vocational cycles, while enabling both anti-idle and hoteling function. The model predictions [8] were recently verified at Oak Ridge National Laboratory on TRL 4 hardware on the powertrain test cell, and TRL 5 was recently achieved in vehicle, with significantly improved performance (acceleration and grade-ability). A similar approach is deployed in the market in Europe by Scania since 2022. [EPA-HQ-OAR-2022-0985-1556-A1, p. 4]

8. Patil C., Thanom W., Dykes E., Kreucher J., Genise T., “Model-based Assessment of Fuel Economy and Performance of a Switchable P2/P3 Hybrid Powertrain for Heavy Truck”, In Proceedings of the Ground Vehicle Systems Engineering and Technology Symposium (GVSETS), NDIA, Novi, MI, Aug. 10-12, 2021.

HEV technology also improves productivity through both faster acceleration (40% reduction in time to road speed), 2x or better grade-ability improvement, and the ability to drive at controlled low speed. It also enables ultra-low NOx emissions (e.g., less than 10 mg NOx/ kWh) by eliminating the high emissions cold start conditions. With a battery pack in the range of 100 kWh, the plug-in hybrid (PHEV) version achieves as much as 25% – 50% GHG reduction. The increased productivity further lowers GHG emissions, though not measured on certification cycles. [EPA-HQ-OAR-2022-0985-1556-A1, p. 5]

HEV and PHEV technologies are particularly attractive for the Class 7 and Class 8 vehicles, in applications such as long-haul freight and performance vocational segments that are the hardest to decarbonize due to the massive energy requirements (750 kWh – 1,200 kWh daily energy needs) and where the lack of an ubiquitous MW-level charging or Hydrogen refueling infrastructure is a formidable barrier to operations. MD BEV applications are already achieving penetration in the market and that creates a supply chain and an infield support structure that can be readily leveraged by HD HEV and PHEV trucks. Such powertrains are in fact composed of

HD ICE mated with MD BEV electrical equipment (150 – 250 kW) and batteries (50- 150 kWh). [EPA-HQ-OAR-2022-0985-1556-A1, p. 5]

Figure 7 illustrates the significant CO2 reduction that are possible. An HEV powertrain in line haul can reduce CO2 by 15% while an urban vocational PHEV can reduce it by 52%. These reductions do not increase NOx, rather, Eaton has shown that it can further reduce NOx to less than 10 mg / hp-hr (vs the 35 mg standard). Improvements in the ICE with cylinder deactivation, EGR pumping etc are not included in this HEV analysis and would further improve CO2. Figure 7 also uses simplified powertrain cost estimates based on ACT Research recent modeling [9], with battery costs estimated at $200/kWh (at pack level, but also considering one battery per truck), and $40,000 BEV incentives quoted by the EPA analysis in the NPRM, prorated based on range for PHEV applications. This analysis shows that the significant GHG reductions (including hoteling and anti-idle credits) are also cost-effective, in some cases being cost neutral to the baseline Diesel ICE powertrain. In this example, the difference between PHEV and HEV is just the battery size (100 kWh vs 30 kWh). [EPA-HQ-OAR-2022-0985-1556-A1, pp. 5 - 6.] [See Docket Number EPA-HQ-OAR-2022-0985-1556-A1, page 6, for Figure 7.]

9. ACT Research Co, "Charging Forward 2024 – 2040 Decarbonization Forecast & Analysis", draft April 2023

Consider multiple pathways to achieve the proposed CO2 emissions level, including ICE improvements and technology packages not considered in Phase 2 and especially the reduction associated with low voltage (48V) and high voltage hybrids. There are multiple pathways for internal combustion-based powertrains to achieve 10-15% GHG reduction in long haul applications and 15-25% reduction in vocational applications, while HEV and PHEV technology enable 25 – 50% GHG reduction, all while still achieving stringent NOx levels for 2027 and beyond. Considering these pathways re-affirms the technology-neutral nature of the rule and allows the market and technology innovation to find the best solutions mix to achieve the proposed emissions goals, while creating and maximizing the economic benefit and reducing compliance cost. [EPA-HQ-OAR-2022-0985-1556-A1, p. 7]

Simplify the Phase 2 certification methodology for PHEV. HEV and PHEV technologies can play significant roles in reducing CO2 and are viable alternative paths for applications that are hard to fully electrify. For PHEV, the current methodology (described in Phase 2) relies on both a Powertrain test and a complex formula to determine the number of charge depleting and charge sustaining cycles per application. The Agency could simplify the latter procedure in the final rule or technical amendments, for example, by defining default utility factor curves for specific applications. [EPA-HQ-OAR-2022-0985-1556-A1, p. 7]

Organization: Howmet Wheel Systems

Comments on Aerodynamics

The Draft Regulatory Impact Analysis for Greenhouse Gas Emissions and Fuel Efficiency Standards for Heavy-Duty Vehicles – Phase 3 ('DRIA') cites "extensive description of aerodynamic improvements for Class 8 tractors" done in previous phases of the regulation. It also describes updated tractor aerodynamic designs from several manufacturers developed as part of the Department of Energy's SuperTruck program that demonstrate aerodynamics that are better than those used in existing MY 2027 standards' Heavy-Duty Greenhouse Gas – Phase 2 technology package for high roof sleeper cab tractors in MYs beyond 2027. 6 [EPA-HQ-OAR-2022-0985-1599-A1, p. 5]

6 “Draft Regulatory Impact Analysis: Greenhouse House Emissions Standards for Heavy-Duty Vehicles – Phase 3,” U.S. Environmental Protection Agency, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf, April 2023.

Howmet agrees with EPA’s focus on aerodynamics, and we note that the state of technology and product offerings supports this focus. As noted previously, Alcoa® Wheels Aerodynamic Steer and Drive Cover Solutions provides an aerodynamic solution that minimizes drag and delivers significant fuel savings which enables commercial transportation customers to secure a combined savings of 1.35 gallons of fuel per 1,000 miles and can be applied at the factory. The drive system’s unique inspection window allows for a clear view of all wheel end components, enabling an operator to conduct safety checks without removing the wheel cover. [EPA-HQ-OAR-2022-0985-1599-A1, p. 5]

Howmet agrees with EPA’s assessment that there is an opportunity for further improvements and increased adoption of factory installed aerodynamic technologies through MY 2032 and believes that wheel covers should be considered as part of that overall aerodynamic design technology package. We further appreciate that the DRIA recognizes both the CO2 emission reduction benefits of improved aerodynamics as well as additional consideration that aerodynamics plays a role in extending the range of ZEV tractors. [EPA-HQ-OAR-2022-0985-1599-A1, p. 5]

Organization: International Council on Clean Transportation (ICCT)

ICE EFFICIENCY TECHNOLOGIES BEYOND THOSE REQUIRED UNDER THE PHASE 2 PROGRAM [EPA-HQ-OAR-2022-0985-1553-A1, p. 16]

ADDITIONAL ICE TECH PACKAGES CAN DELIVER PAYBACK WITHIN TWO YEARS This section is ICCT’s response to EPA’s request for comment on whether to include additional GHG-reducing technologies and/or higher levels of adoption rates of existing technologies in the proposed Phase 2 GHG standards. For the purposes of setting the stringency of the rule, EPA does not assume the adoption of new technologies to improve the efficiency of internal combustion engine (ICE) vehicles beyond those already being deployed to meet the Phase 2 standards. In our view, the proposal can deliver greater benefits with minimal cost by revising the stringency of the proposed standards to reflect the deployment of additional commercially available and cost-efficient technologies like those considered in the Phase 2 standard that manufacturers have not found necessary to deploy. The ICCT conservatively estimates that incorporating such additional technologies in the stringency of its rule – not including engine technology improvements – would generate an additional 537 million tonnes of cumulative CO2 emissions avoided between 2020 and 2050. [EPA-HQ-OAR-2022-0985-1553-A1, p. 16]

Several technologies are available to improve ICE vehicle efficiency beyond what is required to meet existing Phase 2 greenhouse gas standards. In recently published research, ICCT identified significant efficiency improvement potential from a list of technologies with a two-year payback period across tractor and vocational regulatory categories (Buysse et al., 2021; Ragon, Buysse, et al., 2023). EPA considered some of these technologies in its Phase 2 rulemaking, but only a few were incorporated into the stringency of the Phase 2 rule. These technologies are available to further increase ICE vehicle efficiency and should be reflected in the stringency of the Phase 3 final standards. [EPA-HQ-OAR-2022-0985-1553-A1, p. 16]

Buysse, C., Sharpe, B., & Delgado, O. (2021). Efficiency technology potential for heavy-duty diesel vehicles in the United States through 2035. International Council on Clean Transportation. https://theicct.org/publication/efficiency-technology-potential-for-heavy-duty-diesel-vehicles-inthe-united-states-through-2035/

Ragon, P.-L., Buysse, C., Sen, A., Meyer, M., Benoit, J., Miller, J., & Rodríguez, F. (2023). Potential benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles. International Council on Clean Transportation. https://theicct.org/publication/hdv-phase3-ghg-standards-benefits-apr23/

Our research suggests a potential improvement in ICE vehicle efficiency of up to 23% in the highroof sleeper cab vehicle category, reflecting both engine and non-engine improvements. Table 2 shows the efficiency improvement potential of each identified technology. [Refer to Table 2, Two-Year Payback ICE Vehicle Technology Potential Sleeper Cab, on p. 17 of docket number EPA-HQ-OAR-2022-0985-1553-A1] The largest contributions are from engine improvements, followed by aerodynamics, tires, and predictive cruise control. Without engine improvements (e.g., hybridization, alternative fuel injection systems, etc.), a smaller efficiency improvement up to 13% can still be realized. These percentages assume no contribution from trailer technologies such as trailer tires, aerodynamics, or weight reduction. [EPA-HQ-OAR-2022-0985-1553-A1, p. 16]

Our research also suggests a potential ICE vehicle efficiency improvement of up to 31% exists for a diesel-fueled Class 6 multi-purpose vocational vehicle. Table 3 shows the efficiency improvement potential of each technology. [Refer to Table 3, Two-Year Payback ICE Vehicle Technology Potential Class 6-7, on p. 17 of docket number EPA-HQ-OAR-2022-0985-1553-A1] The largest contributions are from engine improvements, followed by stop-start, weight reduction, and tires. Without improving engine technology, efficiency improvements of up to 20% can still be realized. [EPA-HQ-OAR-2022-0985-1553-A1, p. 17]

We identified meaningful efficiency packages across a range of vehicle types. Across tractor regulatory categories, we identified 11%–13% in unrealized efficiency improvements, as well as 6% for heavyhaul tractors. Across vocational vehicle categories, we identified 15%–20% in unrealized efficiency improvements. Original equipment manufacturers (OEMs) like Navistar and Volvo Trucks currently offer ICE products with technology options similar to the ones listed (Advances In International® LT® Series And RHTM Series Drive Improved Fuel Efficiency And Uptime, 2019; Volvo Trucks Makes Latest-Generation D13 Turbo Compound Engine Standard in All VNL 740, 760 and 860 Models, 2020). The benefits of the rule would be greater by encouraging the industry-wide adoption of these technologies. [EPA-HQ-OAR-2022-0985-1553-A1, p. 17]

Advances In International® LT® Series And RHTM Series Drive Improved Fuel Efficiency And Uptime. (2019, October 24). Navistar. https://news.navistar.com/2019-10-24-Advances-In-International-R-LT-R-Series-And-RH-TM-Series-Drive-Improved-Fuel-Efficiency-And-Uptime

Volvo Trucks Makes Latest-Generation D13 Turbo Compound Engine Standard in all VNL 740, 760 and 860 Models. (2020, November). Volvo Trucks USA. https://www.volvotrucks.us/news-and-stories/pressreleases/2020/november/volvo-trucks-makes-latest-generation-d13-turbo-compound-enginestandard-in-all-vnl/

EPA uses projected ZEV adoption as the sole determinant when setting the MY 2028 – MY 2032 GHG standards and neglected cost-effective ICE vehicle technology efficiency improvements. EPA can revise the stringency of its standards to reflect industry-wide ICE vehicle efficiency improvements that are additional to ZEV adoption alone. This would enable unrealized ICE efficiency improvements to be incorporated into the final stringency, while retaining OEMs' flexibility in achieving compliance. Table 4 gives suggested stringency levels based on ICE vehicle efficiency improvements for EPA to consider [Refer to Table 4, ICE Technology Potential for HD Vehicles, on p. 18 of docket number EPA-HQ-OAR-2022-0985-1553-A1.] These efficiency potential projections are described in more detail in Ragon et al. (2023). The use of these technology improvements can only strengthen the EPA proposal if they are treated as additional technologies – not complementary technologies – to the deployment of zero-emission vehicles. We encourage EPA to treat them as such in order to maximize the cost-effective reduction of greenhouse gas emissions achieved from the rule. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 17-18]

Ragon, P.-L., Buysse, C., Sen, A., Meyer, M., Benoit, J., Miller, J., & Rodríguez, F. (2023). Potential benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles. International Council on Clean Transportation. https://theicct.org/publication/hdv-phase3-ghg-standards-benefits-apr23/

Beyond the technology improvements outlined in Table 2 and Table 3, OEMs are demonstrating additional technology packages to improve ICE efficiency in vehicle prototypes. The U.S. Department of Energy's SuperTruck Program acts as a testbed for innovative technology packages to improve the freight efficiency of tractor trailers. Launched in 2010, the first phase of the program aimed to develop and demonstrate long-haul tractor trucks that achieve 50% improvement in overall freight efficiency. By 2016, all SuperTruck I participant OEMs reported efficiency improvements ranging from 80% to 116%. (Adoption of New Fuel Efficient Technologies from SuperTruck, 2016). Through the program, the OEMs developed and validated technologies like improved aerodynamics, low rolling resistance tires, and engine downsizing, and deployed them in their commercial products (Park, 2022). [EPA-HQ-OAR-2022-0985-1553-A1, p. 18]

Adoption of New Fuel Efficient Technologies from SuperTruck. (2016). [Report to Congress]. U.S. Department of Energy. https://www.energy.gov/eere/vehicles/articles/report-adoption-new-fuel-efficienttechnologies-supertruck

Park, J. (2022, January 24). Is SuperTruck Worth the Money? Truckinginfo. https://www.truckinginfo.com/10160190/is-supertruck-worth-the-money

All the major tractor-trailer OEMs (Peterbilt/Cummins, Daimler, Navistar, Paccar, and Volvo) are participating in the second phase of the program, SuperTruck II (Bashir, 2022; Bond & Li, 2022; Dickson & Mielke, 2022; Meijer, 2022; Zukouski, 2022). The second phase doubles the vehicle freight efficiency improvement target to 100% compared with a 2009 baseline and emphasizes cost-effective technologies. All participating OEMs are reporting the development of final trucks that exceed 125% of efficiency improvements, and their designs incorporate 48V mild hybrid, electrification of auxiliary systems, improved aerodynamics, and enhanced waste heat recovery. [EPA-HQ-OAR-2022-0985-1553-A1, p. 18]

Bashir, M. (2022, June 23). Improving Transportation Efficiency through Integrated Vehicle, Engine, and Powertrain Research—SuperTruck 2. 2022 Annual Merit Review. https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace100_Villeneuve_2022_ o_4-30_1116am_ML.pdf

Bond, E., & Li, J. (2022, June 23). Volvo SuperTruck 2 Pathway to Cost-Effective Commercialized Freight Efficiency. 2022 Annual Merit Review. https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace101_bond_2022_o_5-1_129pm_ML.pdf

Dickson, J. A., & Mielke, D. (2022, June 23). Cummins-Peterbilt SuperTruck II. 2022 Annual Merit Review. https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace102_dickson_2022_o_rev2%20-%20TrailLife-GCCC%20IN0110%20REVISED.pdf'

Meijer, M. (2022, June 23). Development and Demonstration of Advanced Engine and Vehicle Technologies for Class 8 Heavy-Duty Vehicle (SuperTruck II). 2022 Annual Merit Review. https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace124_Meijer_2022_o_4-29_1056pm_KF.pdf

Zukouski, R. (2022, June). Navistar SuperTruck II Development and Demonstration of a Fuel-Efficient Class 8 Tractor & Trailer. 2022 Annual Merit Review. https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace103_%20Zukouski_2022_o_4-29_1232pm_ML.pdf

Organization: Manufacturers of Emission Controls Association (MECA)

Component suppliers have continued to innovate, and many technologies that were not even considered as compliance options in the Phase 2 rule are now likely to be deployed on limited engine families in 2024 and more broadly in 2027. Furthermore, engine efficiency technologies – such as cylinder deactivation, advanced driven turbochargers, and hybridization – have also been demonstrated in combination with advanced aftertreatment technologies on heavy-duty diesel engines. Testing has shown the ability of these engine technologies to be optimized to reduce both GHG and criteria pollutant emissions including NOx. [EPA-HQ-OAR-2022-0985-1521-A1, p. 4]

Cylinder Deactivation

Cylinder deactivation (CDA) is an established technology on light-duty vehicles, with the primary objective of reducing fuel consumption and CO2 emissions. This technology combines hardware and software computing power to, in effect, "shut down" some of an engine's cylinders, based on the power demand, and keep the effective cylinder load in the more efficient portions of the engine map reducing fuel consumption. Based on decades of experience with CDA on passenger cars and trucks, CDA is now being adapted to heavy-duty diesel engines. On a diesel engine, CDA is programmed to operate differently than on gasoline engines, with the goal of the diesel engine running hotter in low load situations by having the pistons that are firing do more work. This programming is particularly important for vehicles that spend a lot of time in creep and idle operation modes. During low load operation, the use of CDA results in exhaust temperatures increasing by 50°C to 100°C to maintain effective conversion of NOx in the SCR [1]. In some demonstrations, CDA has been combined with a 48V mild hybrid motor with launch and sailing capability to extend the range of CDA operation over the engine, and this may deliver multiplicative CO2 reductions from these synergistic technologies [2,3]. In another study, CDA combined with an electric heater or fuel burner has been shown to reduce NOx as well as CO2 to levels below the capabilities of each technology individually [4]. CDA has also been synergistically combined with high efficiency turbochargers, and an electrically driven

EGR pump to yield an additional 1.7 to 3.6% reduction in CO_2 [5]. [EPA-HQ-OAR-2022-0985-1521-A1, p. 4]

[1]. Morris, A. and McCarthy, J., “The Effect of Heavy-Duty Diesel Cylinder Deactivation on Exhaust Temperature, Fuel Consumption, and Turbocharger Performance up to 3 bar BMEP,” SAE Technical Paper 2020-01-1407, 2020, https://doi.org/10.4271/2020-01-1407.

[2]. MECA, “Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027,” 2020. Online at https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf.

[3]. Dhanraj, F., Dahodwala, M., Joshi, S., Koehler, E. et al., “Evaluation of 48V Technologies to Meet Future CO2 and Low NOx Emission Regulations for Medium Heavy-Duty Diesel Engines,” SAE Technical Paper 2022-01-0555, 2022, https://doi.org/10.4271/2022-01-0555.

[4]. McCarthy, Jr., J., Zavala, B., and Matheaus, A., “Technology Levers for Meeting 2027 NOx and CO2 Regulations,” SAE Technical Paper 2023-01-0354, 2023, https://doi.org/10.4271/2023-01-0354.

[5]. Bitsis, D.C., Matheaus, A., Hopkins, J. and McCarthy, J. Jr., “Improving Brake Thermal Efficiency Using High Efficiency Turbo and EGR Pump While Meeting 2027 Emissions,” SAE 2021-01-1154, https://doi.org/10.4271/2021-01-1154.

We support the provision in the proposed rule of a 1.5% GEM credit for engines that include full CDA during coasting where both exhaust and intake valves are closed. As presented above, CDA and other advanced engine and powertrain technologies are still developing and often in combination to synergistically yield higher values of CO_2 reduction. As a result, EPA should allow manufacturers to request variable GEM credit values for CDA and for other engine and powertrain technologies based upon the submission of performance data. [EPA-HQ-OAR-2022-0985-1521-A1, p. 5]

Advanced Turbochargers

Advances in turbochargers are providing a variety of available design options enabling lower CO_2 emissions by improving thermal management capability, such as: i) state of the art aerodynamics, ii) electrically actuated wastegates that allow exhaust gases to by-pass the turbocharger to increase the temperature in the aftertreatment, and iii) advanced ball bearings to improve transient boost response. More advanced turbochargers are designed with a variable nozzle that adjusts with exhaust flow to provide more control of intake pressure and optimization of the air-to-fuel ratio for improved performance (e.g., improved torque at lower speeds) and fuel economy. These variable geometry turbochargers (VGT), also known as variable nozzle turbines (VNT) and variable turbine geometry (VTG), also enable lower CO_2 emissions through improved thermal management capability to enhance aftertreatment light-off. Finally, modern turbochargers have enabled engine and vehicle manufacturers the ability to downsize engines, resulting in fuel savings without sacrificing power and/or performance. [EPA-HQ-OAR-2022-0985-1521-A1, p. 5]

The latest high-efficiency turbochargers are one of the more effective tools demonstrated in the DOE SuperTruck program [6]. In addition to affecting the power density of the engine, turbochargers play a significant role in NOx and CO_2 regulations compliance. Continuous improvement in turbocharger technology is making it possible to run very lean combustion (high air/fuel ratios), which reduces CO_2, particulate and engine-out NOx. [EPA-HQ-OAR-2022-0985-1521-A1, p. 5]

[6]. Navistar, "Final Scientific/Technical Report for SuperTruck Project: Development and Demonstration of a Fuel-Efficient, Class 8 Tractor & Trailer Engine System," 2016.

Turbo-compounding

Turbo-compounding is a variant of turbocharger technology that allows for the energy from the exhaust gas to be extracted and mechanically added to the engine crankshaft. Alternatively, waste exhaust energy can also be extracted by using an electric turbine to recover the waste exhaust energy electrically (see Driven Turbochargers) and used to increase primary turbocharger response and efficiency or to power other electric vehicle systems. [EPA-HQ-OAR-2022-0985-1521-A1, p. 5]

Mechanical turbo-compounding has been employed on some commercial diesel engines, and EPA estimated penetration to reach 10% in the U.S. by the time the Phase 2 GHG Regulation is fully implemented in 2027 [7]. An early 2014 version of a turbo-compound-equipped engine was used during the first stage of testing at SwRI under the CARB HD Low NOx Test Program, and the results from this engine with advanced aftertreatment have been summarized in several SAE technical papers [8, 9, 10]. While turbo-compounding has the potential to reduce fuel consumption, it can result in lower exhaust temperatures that can challenge aftertreatment performance. Therefore, it is important to consider turbo-compound designs that incorporate bypass systems during cold start and low load operation or electrically driven turbo-compounding systems where the unit can be placed after the aftertreatment system. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 5 - 6]

[7]. U.S. EPA, "Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles -- Phase 2," Federal Register, pp. 73478-74274, 25 October 2016.

[8]. C. Sharp, C. C. Webb, G. Neely, J. V. Sarlashkar, S. B. Rengarajan, S. Yoon, C. Henry and B. Zavala, "Achieving Ultra Low NOx Emissions Levels with a 2017 Heavy-Duty On- Highway TC Diesel Engine and an Advanced Technology Emissions System - NOx Management Strategies", SAE Technical Paper 2017-01-0958, https://doi.org/10.4271/2017-01-0958, SAE International Journal of Engines, vol. 10, no. 4, pp. 1736-1748, 2017.

[9]. C. Sharp, C. C. Webb, G. Neely, M. Carter, S. Yoon and C. Henry, "Achieving Ultra Low NOx Emissions Levels with a 2017 Heavy-Duty On-Highway TC Diesel Engine and an Advanced Technology Emissions System - Thermal Management Strategies", SAE Technical Paper 2017-01- 0954, https://doi.org/10.4271/2017-01-0954, SAE International Journal of Engines, vol. 10, no. 4, pp. 1697-1712, 2017.

[10]. C. Sharp, C. C. Webb, S. Yoon, M. Carter and C. Henry, "Achieving Ultra Low NOx Emissions Levels with a 2017 Heavy-Duty On-Highway TC Diesel Engine - Comparison of Advanced Technology Approaches", SAE Technical Paper 2017-01-0956, https://doi.org/10.4271/2017-01-0956, SAE International Journal of Engines, vol. 10, no. 4, pp. 1722-1735, 2017.

Driven turbochargers

Driven turbochargers can be used to control the speed of the turbomachinery independently of the engine's exhaust flow and vary the relative ratio between engine speed and turbo speed. Driven turbochargers may be utilized for several reasons, including performance, efficiency, and emissions. Considered an 'on-demand' air device, a driven turbocharger also receives transient power from its turbine. During transient operation, a driven turbocharger will behave like a supercharger and consume mechanical or electrical energy to accelerate the turbomachinery for improved engine response. At high-speed operation, the driven turbocharger will return mechanical or electrical power to the engine in the form of turbo-compounding, which recovers excess exhaust power to improve efficiency [11]. This cumulative effect lets a driven turbocharger perform all the functions of a supercharger, turbocharger, and turbo-compounder. [EPA-HQ-OAR-2022-0985-1521-A1, p. 6]

[11]. Suelter, B., Itou, T., Waldron, T., and Brin, J., "Optimizing Steady State Diesel Efficiency and Emissions Using a SuperTurboTM on an Isuzu 7.8L Engine," SAE Technical Paper 2019-01-0318, 2019, https://doi.org/10.4271/2019-01-0318.

NOx emission control uniquely benefits from the application of driven turbochargers in several ways, including the ability to decouple EGR from boost pressure, reduce transient engine-out NOx, and improve aftertreatment temperatures during cold start and low load operation. [EPA-HQ-OAR-2022-0985-1521-A1, p. 6]

Bypassing a driven turbine can provide quick temperature rises for the aftertreatment while still delivering the necessary boost pressure to the engine through supercharging, which also increases the gross load on the engine to help increase exhaust temperature [11]. Testing has shown that routing engine exhaust to the aftertreatment by bypassing a turbocharger is one of the most effective methods to heat up the aftertreatment [2]. [EPA-HQ-OAR-2022-0985-1521-A1, p. 6]

[11]. Suelter, B., Itou, T., Waldron, T., and Brin, J., "Optimizing Steady State Diesel Efficiency and Emissions Using a SuperTurboTM on an Isuzu 7.8L Engine," SAE Technical Paper 2019-01-0318, 2019, https://doi.org/10.4271/2019-01-0318.

[2]. MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027," 2020. Online at https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf.

Electrification: Mild Hybridization

In the near future, 48-volt mild hybrid electrical systems and components are expected to make their way onto medium and heavy-duty vehicles. These 48-volt systems can be found on many light- duty vehicle models (primarily in Europe) from Mercedes, Audi, VW, Renault and PSA. In the U.S., FCA is offering a 48-volt system on the RAM 1500 pick-up and the Jeep Wrangler under the eTorque trademark. Because the safe voltage threshold is 60 volts, which is especially important when technicians perform maintenance on the electrical system, 48-volt systems are advantageous from an implementation standpoint. From a cost perspective, 48-volt systems include smaller starter and wire gauge requirements, offering cost savings from a high voltage architecture of a full hybrid. The U.S. Department of Energy's SuperTruck II program teams employed 48-volt technologies on their vehicles to demonstrate trucks with greater than 55% brake thermal efficiency. A recent study demonstrated through model-based simulations that a 48-volt technology package combined with advanced aftertreatment can achieve a composite FTP emission level of 0.015 g/bhp-hr [3]. [EPA-HQ-OAR-2022-0985-1521-A1, p. 6]

[3]. Dhanraj, F., Dahodwala, M., Joshi, S., Koehler, E. et al., "Evaluation of 48V Technologies to Meet Future CO2 and Low NOx Emission Regulations for Medium Heavy-Duty Diesel Engines," SAE Technical Paper 2022-01-0555, 2022, https://doi.org/10.4271/2022-01-0555.

Similar to the passenger car fleet, truck OEMs are considering replacing traditional mechanically driven components with equivalent or improved electric versions to gain efficiency. Converting electrical accessories from 12-volts to 48-volts reduces electrical losses and this is particularly advantageous for components that draw more power, such as pumps and fans. The types of components that may be electrified include electric turbos, electronic EGR pumps, AC compressors, electrically heated catalysts, electric cooling fans, oil pumps and coolant pumps, among others. Another technology that 48-volt systems could enable is electric power take-offs rather than using an engine powered auxiliary power unit or idling the main engine during hoteling while drivers rest. MECA members supplying commercial 48V components for commercial vehicles believe that the technology may be feasible to apply to a limited number of engine families by 2024, and it is likely to see greater penetration by 2027, especially on Class 8 line-haul where full hybridization is less practical. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 6 - 7]

Mild hybridization covers a range of configurations, but a promising one includes an electric motor/generator, regenerative braking, electric boost and advanced batteries. Stop/start deployment also provides a thermal management benefit to the aftertreatment by preventing cooling airflow through the aftertreatment during hot idle conditions. In this way, 48-volt mild hybridization is complementary technology to CDA and start-stop capability, allowing the combination of multiple technologies on a vehicle to yield synergistic benefits to reduce CO2 by an additional 5-8% at the vehicle level by enabling engine-off while coasting (1.5% benefit), anti-idle and hoteling modes (up to 6% benefit for sleepers), and efficient electrical accessories (1.5% benefit), while recovering the energy for these systems from the vehicle dynamics (braking and coasting) [12, 13]. By shutting off the engine at idle or motoring using start/stop, micro hybrid technology can help to reduce CO2 while maintaining aftertreatment temperature by avoiding the pumping of cold air through the exhaust. Capturing braking energy and storing it in a small battery for running auxiliary components when the engine is off offers another CO2 reducing strategy for OEMs to deploy. [EPA-HQ-OAR-2022-0985-1521-A1, p. 7]

[12]. M. Dorobantu, "Affordable Simultaneous Emissions and Efficiency Improvements from an Integrated Powertrain Systems Perspective", 2019 SAE Government and Industry Conference.

[13]. Hergart, C and Brown, M., "Development and Demonstration of Advanced Engine and Vehicle Technologies for Class 8 Heavy-Duty Vehicle (SuperTruck II)," DOE Annual Merit Review, 6/21/2018.

In lighter medium-duty applications, advanced start-stop systems have been developed that use an induction motor in a 48-volt belt-driven starter-generator (BSG). When the engine is running, the motor, acting as a generator, will charge a separate battery. When the engine needs to be started, the motor then applies its torque via the accessory belt and cranks the engine instead of using the starter motor. The separate battery can also be recharged via a regenerative braking system. In addition to the start-stop function, a BSG system can enhance fuel economy even during highway driving by cutting off the fuel supply when cruising or decelerating. Such systems can also be designed to deliver a short power boost to the drivetrain. This boost is typically 10 to 20 kW and is limited by the capacity of the 48V battery and accessory belt linking the motor to the crankshaft. New designs are linking the BSG directly to the crankshaft and allowing additional power boost of up to 30kW to be delivered, giving greater benefits to light and medium commercial vehicles [2]. [EPA-HQ-OAR-2022-0985-1521-A1, p. 7]

[2]. MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027," 2020. Online at https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf.

Electrification: Full hybridization and electric vehicles

Full hybrid configurations are currently found on a growing number of models of light-duty passenger cars and light trucks in the U.S. and a limited number of medium-duty trucks and urban buses. These include models that can also be plugged-in (PHEVs) to enable electric operation for a determined "all- electric" range (AER). A full hybrid (HEV) can enable enhanced electrification of many of the components described above for mild hybrid vehicles as the higher voltages allow for more parts to be electrified and to a larger degree. Full hybrids also employ larger electric motors and batteries, which support greater acceleration capability and regenerative braking power. Full hybrid and plug-in hybrid vehicles have made the highest penetration into vocational applications such as parcel delivery, beverage delivery and food distribution vehicles because they can take advantage of regenerative braking in urban driving [14] and operate from a central location. Model predictions of HD HEV 600-800V technology recently verified at Oak Ridge National Laboratory [15] have shown that GHG emissions reductions of 9% on tractor certification cycles and 13%-19% on the vocational cycles, while enabling both anti-idle and hoteling function. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 7 - 8]

[14]. CARB, "Draft Technology Assessment: Heavy-Duty Hybrid Vehicles," 2015.

[15]. Patil C., Thanom W., Dykes E., Kreucher J., Genise T., "Model-based Assessment of Fuel Economy and Performance of a Switchable P2/P3 Hybrid Powertrain for Heavy Truck", In Proceedings of the Ground Vehicle Systems Engineering and Technology Symposium (GVSETS), NDIA, Novi, MI, Aug. 10-12, 2021.

We expect to see the increasing application of strong / parallel and serial hybrids combined with a low NOx engine to reduce CO2 emissions in several vocational applications. Integrated electric drivetrain systems, consisting of a fully qualified transmission, motor and power electronics controller, are now commercially available. With power levels of over 160kW and the ability to meet high torque requirements, these systems enable electrification of medium-duty commercial vehicles. There is also an increasing number of electric drivetrain solutions up to and over 300kW that are suitable for Class 8 vehicles that can be used with either hybrid [16], battery or fuel cell power sources [2]. [EPA-HQ-OAR-2022-0985-1521-A1, p. 8]

[16]. "Hyliion and Cummins optimizing Cummins ISX12N natural gas engine as generator for Hypertruck ERX powertrain", https://www.greencarcongress.com/2022/06/20220629-hyliion.html.

[2]. MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027," 2020. Online at https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf.

Organization: MEMA

MEMA and its members support the objectives of the agency to improve national air quality through improvements to heavy duty trucks. The supplier industry directly manufactures vehicle components and systems that enable the transformation of the transportation sector to more environmentally friendly vehicles. The industry also supports advancements in internal combustion engine technologies, needed to serve the vocational and long-haul sectors where zero-tailpipe emission vehicles are not yet feasible due to weight, load, and infrastructure limitations. [EPA-HQ-OAR-2022-0985-1570-A1, p. 1]

Lightweighting Will Continue to be Important and Should be Encouraged. Lightweighting is an important part of the overall strategy for improving vehicle emissions performance. The use of lighter weight materials (high strength steel, aluminum, plastics, polymer composites, carbon fiber, magnesium, etc.) and designs - otherwise known as mass reduction or lightweighting - continues to be an important cost-effective strategy in meeting emissions reduction standards. Lightweighting is well-recognized to increase trucking efficiency and there are three primary ways that this occurs:

- By lowering rolling resistance, less energy is needed to start the vehicle moving and then overcome the friction of its contact with the road.
- By allowing carriers to add more cargo to each truck, which reduces the number of trucks on the road and/or trips that need to be made.
- By facilitating the adoption of other efficiency and emissions reductions technologies higher payloads through utilization of heavier components for battery, fuel cell, and efficient engines as well as other emissions reductions, improvements are possible, and can negate the concerns about the added weight of those technologies.

Furthermore, lightweighting also includes the unsprung mass of suspension and brake components as well as, but not limited to, wheels. The North American Council for Freight Efficiency's Confidence Report on Lightweighting noted that the aluminum wheel is the, "...single most effective product for saving weight on both a tractor and trailer." [EPA-HQ-OAR-2022-0985-1570-A1, p. 13]

11 North American Council for Freight Efficiency, 'Confidence Report on Lightweighting,' January 10, 2021 https://nacfe.org/wp-content/uploads/2021/02/Lightweighting-Confidence-Report-Feb2021.pdf

We commend EPA for continuing to recognize the contributions of wheel-related weight reductions and non-wheel-related weight reductions to the agency's overall emissions reductions goals. This is reflected in Table 6 to ci 1037.520 and Table 8 to ci 1037.520 of the proposed rule which provide specific vehicle weight reduction credit inputs. The NPRM relies on prior assumptions around lightweighting that were part of the Regulatory Impact Analysis for Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2 as the weight reduction credits for Phase 2 appear to have been extended to Phase 3. [EPA-HQ-OAR-2022-0985-1570-A1, p. 13]

EPA should recognize that suppliers have introduced new technologies and products since the Phase II rule was finalized in 2016 and seek comments from suppliers to update the agency's assumptions around weight reduction inputs to reflect the latest available technologies on the marketplace. For example, lightweight forged aluminum wheel producers have continuously improved their product offerings to the heavy-duty truck, bus, and trailer markets. More recent generations of products - introduced to the market since the Phase 2 was promulgated - offer weight savings of nearly 10% as compared to similar steer or dual-drive, and wide base wheels which were part of the analysis EPA previously conducted. [EPA-HQ-OAR-2022-0985-1570-A1, p. 13]

Recommendation: EPA should continue to grant credit for lightweighting and weight reduction and update GHG Ph2 assumptions on lightweighting in the GHG Ph3 GEM model. [EPA-HQ-OAR-2022-0985-1570-A1, p. 13]

Organization: Moving Forward Network (MFN) et al.

7.3.1. Assessing the impact of CNGVs

There is no clean or safe natural gas fuel source. Natural gas based options are false solutions, with upstream and downstream pollution impacts for frontline and fenceline communities from production, distribution, etc., and the ensuing infrastructure required for the fuel. To assess the harms from these vehicles, we rely upon data from EPA's heavy-duty in-use test program and required emissions tests. For fuel efficiency, we assume that these vehicles are just as energy-efficient as their diesel-fueled alternatives. This is an optimistic assessment, as EPA notes that CNGVs can be expected to be 5-15 percent less efficient (81 FR 73925), but differences in required emissions control to meet newly finalized federal standards could reduce this efficiency gap in the future. [EPA-HQ-OAR-2022-0985-1608-A1, p. 47]

To assess the impacts of NGVs, we utilize the default values in GREET to assess the upstream emissions associated with the production and distribution of methane. EPA's HDIUT shows that CNGVs today emit lower levels of NOX but significantly higher levels of VOCs than modern diesel trucks. There are also modest increases in PM2.5 emissions since CNGVs can meet current particulate matter standards without the need for particulate filters found on modern diesel vehicles. We anticipate little improvement to current CNGVs to meet future NOX standards; therefore, we assumed that emissions would be the lesser of current values or the future in-use requirements for NOX, PM2.5, and VOC. [EPA-HQ-OAR-2022-0985-1608-A1, p. 47]

We also used data from the HDIUT program to correct for the direct emissions of greenhouse gases—while EPA intended for CNGVs to reduce excess methane emissions beginning with the Phase 1 program, manufacturers have instead been taking advantage of the credit program to offset these additional methane reductions with CO2 credits (81 FR 73925). We assume this trend will continue and use hydrocarbon speciation data to assign a relationship between direct VOC and CH4 emissions, 104 converting CH4 into CO2-equivalent greenhouse gas emissions consistent with the global warming potentials used in GREET. [EPA-HQ-OAR-2022-0985-1608-A1, p. 47-48]

104 Section 3.6 in EPA. Speciation of total organic gas and particulate matter emissions from onroad vehicles in MOVES3. EPA-420-R-22-017. (2022). https://www.epa.gov/system/files/documents/2022-07/420r22017.pdf.

9.1.1. Compression-ignition engine technologies (diesel)

EPA appropriately identifies manufacturers' plans to deploy new engines in order to meet the 2027 NOX standards finalized last year. 88 Fed. Reg. at 25958. However, in its analysis, the Agency inappropriately freezes the progress of diesel engines at the bare minimum requirements on the books today, with no improvement required beyond the 2027 Phase 2 diesel engine standards and no assumed improvement in any truck technology beyond 2027 Phase 2 ICE vehicle requirements. This is inconsistent with both the literature and the Agency's own analysis of what is possible in the 2027-2032 time period. [EPA-HQ-OAR-2022-0985-1608-A1, p. 65]

In its Phase 2 regulation, EPA identified multiple pathways and approaches to achieving the Phase 2 diesel engine regulations (Phase 2 FRIA 2.7.10 and 2.7.11). In assessing what is achievable, the Agency relied significantly upon manufacturer-submitted data from the

SuperTruck research program in partnership with the Department of Energy (Phase 2 FRIA 2.7.5). However, the second phase of the SuperTruck program has far exceeded the level of efficiency deployed in the data EPA relied upon, particularly for engines: the Navistar and Cummins/Peterbilt teams were able to demonstrate 55 percent brake-thermal efficiency (BTE), compared to the 50 percent target for the first phase, while Daimler, Volvo, and PACCAR all demonstrated over 50 percent BTE, with a clear pathway towards the 55 percent target. 116 The PACCAR team's progress is particularly illuminating, as they undertook an additional challenge to meet "ultra low NO X " targets consistent with EPA's recent regulation as part of their overall efficiency effort, indicating that these levels of thermal efficiency are not incompatible with achieving the 2027 standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 65]

116 Zukouski, R. Navistar. SuperTruck II: Development and demonstration of a fuel-efficient class 8 tractor & trailer. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace103_%20Zukouski_2022_o_4-29_1232pm_ML.pdf; Mielke, D. 2022 Annual Merit Review: Cummins/Peterbilt SuperTruck II. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace102_dickson_2022_o_rev2%20-%20TrailLife-GCCC%20IN0110%20REVISED.pdf; Bashir, M. Daimler: Improving transportation efficiency through integrated vehicle, engine, and powertrain research - SuperTruck 2. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace100_Villeneuve_2022_o_4-30_1116am_ML.pdf; Bond, E. Volvo SuperTruck 2: Pathway to cost-effective commercialized freight efficiency. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace101_bond_2022_o_5-1_129pm_ML.pdf; Meijer, M. Development and demonstration of advanced engine and vehicle technologies for class 8 heavy-duty vehicle ([PACCAR] SuperTruck II). Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace124_Meijer_2022_o_4-29_1056pm_KF.pdf

Eaton partnered with the PACCAR team in the development of its SuperTruck II truck, and they have demonstrated that it is possible to outperform simultaneously the 2027 NOX standards and the Phase 2 CO2 standards through a number of different aftertreatment and powertrain combinations. 117 A recent research paper by Eaton demonstrates various combinations of control technologies manufacturers can tune CO2 and NOX emissions over different regulatory cycles to develop a technology package that is suitable for compliance, including packages that can achieve CO2 reductions beyond Phase 2 while meeting EPA's future 2027 standards. 118 [EPA-HQ-OAR-2022-0985-1608-A1, p. 66]

117 Dorobantu, M. Eaton considerations on MD/HD GHG Phase 3. Presentation, OIRA-Eaton meeting, March 23. (2023). https://www.reginfo.gov/public/do/eoDownloadDocument?pubId=&eodoc=true&documentID=215442

118 McCarthy, J., et al. Technology levers for meeting 2027 NOX and CO2 regulations. SAE Technical Paper 2023-01-0354. (2023). https://doi.org/10.4271/2023-01-0354.

One of the strategies deployed by Eaton is a 48V electric heater, which could be deployed easily with a 48V mild hybrid powertrain, again illustrating the complementary technology packages available to manufacturers. The 48V mild hybrid powertrain can not just power accessories, including those related to emissions control, but it can also help reduce engine-out NOX. This was also demonstrated through testing by FEV as a strategy particularly relevant to

MHDVs, whose engines are required to meet tighter NOX standards than those of HHDVs. 119 [EPA-HQ-OAR-2022-0985-1608-A1, p. 66]

119 Fnu, D., et al. Application of 48V mild-hybrid technology for meeting GHG and low NOX regulation for MHD vehicles. SAE Technical Paper 2023-01-0484. (2023). https://doi.org/10.4271/2023-01-0484.

9.1.2. Spark-ignition technologies (gasoline)

A significant opportunity for increased improvement lies in spark-ignition (SI) engines, for which Phase 2 required no engine improvements beyond the 2016 SI engine standard. The weakness in EPA's Phase 2 targets for SI engines and vehicles is apparent in looking at the compliance credits to-date, particularly for Ford Motor Company, the largest SI engine supplier. Ford has run a credit surplus in every year of the vocational engine program, but this surplus exploded in MY2020 with the release of its latest 7.3L V8 engine, codenamed "Godzilla." 120 Even though the engine platform is relatively low-tech (naturally aspirated, pushrod V8), utilizing variable cam timing and a variable-displacement oil pump, it's a significant improvement in efficiency. The engine was also designed with fuel economy at load in mind for applications like towing. A smaller engine built on the same platform replaced the older base engine in 2023, no doubt increasing Ford's over compliance. [EPA-HQ-OAR-2022-0985-1608-A1, p. 66]

120 EPA. Final Phase 1 EPA Heavy-Duty Vehicle and Engine Greenhouse Gas Emissions Compliance Report (Model Years 2014-2020). (2022). Appendix B: Individual Manufacturer Detailed Credit Summaries. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1016962.PDF?Dockey=P1016962.pdf.

General Motors is not standing still, either—their fifth-generation small-block V8 platform is getting a next-generation update to a 5 percent improvement over the current generation, 121 and the current generation is already a credit generator for its heavy-duty vehicles under the Phase 2 program. 122 No further details are available about the heir to the current iron-block direct-injection L8T variant found in its heavy-duty offerings, but again this underscores the significant amount of fuel efficiency still available from heavy-duty gasoline engines. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 66 - 67]

121 Wren, W. This is why GM is launching a new small block V8. Autoweek (online). (February 3, 2023). https://www.autoweek.com/news/industry-news/a42746723/why-gm-is-launching-a-new-small-block-v8/.

122 U.S. EPA. Final Rule for Phase 2 Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles. (2022). https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-phase-2-greenhouse-gas-emissions-standards

9.1.4. Non-powertrain technologies

In the Phase 2 regulation, EPA identified numerous improvements to every class of heavy-duty vehicle which could be applied in the timeframe of the rule (through 2029), including non-engine technologies to reduce road load regardless of the propulsion source. Most of these technologies were not exhausted in setting the standards. Given the longer timeframe of this rule (through 2032) and the steady increase from 2021-2029 for which EPA applied these technologies, EPA should naturally have continued to assume a steady increase in such technology adoption over the course of the Phase 3 rule, particularly since they are largely powertrain agnostic and thus affected neither by the 2027 NOX rule nor a transition to electric trucks. [EPA-HQ-OAR-2022-0985-1608-A1, p. 68]

As EPA identified in Phase 2, many of these are evolutionary technologies that have gradually improved over time: aerodynamics, rolling resistance, weight reduction, accessory load reduction, etc. There are also technologies which have seen a gradual increase in market share that is likely to continue, such as 6x2 axles and neutral idling. [EPA-HQ-OAR-2022-0985-1608-A1, p. 68]

Below, we've summarized a simple extrapolation of EPA's Phase 2 GEM analysis, wherein we assume no changes to the 2027 engine or transmission but have simply extrapolated the continuous evolution of improvements to vehicles from 2021-2029, through 2032, for each regulatory class at the pace EPA adopted in finalizing the Phase 2 regulation, and run these technology deployment scenarios through EPA's GEM Compliance model. As can be seen by Tables 4 and 5, even without the improvements identified above or any wholesale shifts in the market, ICE-powered trucks would be expected to improve by up to 8.4 percent by 2032 just by continuing the same pace of improvement from Phase 2 with already-identified technologies. This is the barest of minimal level of improvement EPA should assume ICEVs are capable of in Phase 3 because it doesn't reflect synergies with improvements identified above for gasoline and diesel-powered vehicles that would be deployed to achieve 2027 NOX standards such as 48V hybridization and cylinder deactivation. [EPA-HQ-OAR-2022-0985-1608-A1, p. 68]

Any improvement in ICEVs not considered by EPA in setting its standards is a one-to-one decrease in the market share of ZEVs needed for compliance. If manufacturers continue at the pace set by the Phase 2 program, with no additional changes to reflect the increase in available technology, EPA's Phase 3 proposal would yield at least 7 percent fewer electric trucks in the regulatory timeframe (27.0 percent compared to 29.2 percent for 2027-2032). Since these technologies were already identified by EPA in setting the Phase 2 standards, they are all available at scale by 2027—if manufacturers instead accelerated the pace to the 2032 levels identified, this alone would lead to a 16.9 percent reduction in electric trucks required (24.3 percent compared to 29.2 percent for 2027-2032). For comparison, EPA's weaker alternative is based on a 21.3 percent reduction (23.0 percent compared to 29.2 percent for 2027-2032). Thus, just by ignoring its own Phase 2 analysis, EPA's rule could lead to electric truck deployment comparable to the proposed weaker alternative. 127 [EPA-HQ-OAR-2022-0985-1608-A1, p. 68.] [See Table 4, Phase 2-based Tractor-Trailer Improvement and Table 5, Phase 2-based Tractor-Trailer Improvement located on p. 69 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

127 It is crucial to emphasize that this exercise ignores other aspects of EPA's rule which will also lead to a reduced share of electric trucks, including the current, inappropriate treatment of H 2 ICEVs as 0 g/ton-mile vehicles.

Organization: Odyne Systems LLC

Ensure that PHEV systems can be easily qualified to provide credits if they significantly improve driving fuel economy by increasing mpg by over 40% compared to non-electrified propulsion systems, regardless of whether PHEV systems use parallel or series configurations.

Odyne encourages the EPA to continue to focus on GHG reductions rather than specific powertrain configurations. Some PHEV systems can be effectively integrated into medium and heavy-duty chassis without modifications to exhaust systems or engine control systems and without major powertrain modifications, significantly improving fuel efficiency while minimizing increases in vehicle manufacturing costs. [EPA-HQ-OAR-2022-0985-1623-A1, p. 4]

Organization: PACCAR, Inc.

PACCAR requests that EPA clarify its cylinder deactivation proposal. EPA proposes to credit vehicles with engines that include full cylinder deactivation during coasting at a rate of 1.5 percent under "Intelligent Controls" in the Greenhouse Gas Emissions Model (GEM). EPA should clearly define "full cylinder" in this context by specifying that "full" refers to the scenario where both the intake and exhaust valves are closed, and not deactivation of all cylinders. [EPA-HQ-OAR-2022-0985-1607-A1, p. 10]

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

EPA, the DOE or the national labs should conduct a comparative analysis on PHEV and BEV costs with a stakeholder input or working group and collect more data from truck makers as part of the final regulation. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

EPA should consider a scenario in the final rulemaking that reduces the total costs. Specifically, this new scenario should include a modest number of PHEV trucks as that will impact the cost analysis by reducing the cost of charging infrastructure, the amount of critical minerals and by using BEV batteries in strong PHEVs (see appendices C and D in this letter.) Further, a modest amount of bidirectional charging for BEVs and PHEVs should be included as this has a positive total cost of ownership and further reduces costs. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

Summary of our main recommendations

1) We understand that utility factor (UF) data is available for EPA to calculate the UF for light-duty PHEVs. But due to lack of product, this is not possible for heavy-duty PHEVs. For this reason, we support EPA's proposal that this be done on a case-by-case basis by EPA using data from a truck manufacturer. We also support EPA not including the upstream GHG emissions from battery manufacturing in this rule. However, there are very substantial benefits in reduced GHG from battery manufacturing emissions for a plug-in hybrid electric truck having a much smaller battery than a long-range battery electric truck as well as other environmental and supply chain benefits. Based on this, we recommend that this large benefit of PHEV trucks be considered informally when EPA is determining the utility factor for a truck manufacturer and that EPA should not be conservative when determining the UF for the plug-in hybrid electric truck. See Appendix C for additional details on the GHG reduction benefits of smaller batteries and a comparison of GHG emissions from long-range BEVs and strong PHEVs. [EPA-HQ-OAR-2022-0985-1647-A2, pp. 4 - 5] [[See Docket Number EPA-HQ-OAR-2022-0985-1647-A2, pages 13-14, for Appendix C]]

4) EPA, the DOE or the national labs should conduct an analysis on the value and feasibility of PHEVs as a platform for low-carbon alternative fuels (e.g., adequate supply of feedstocks) including whether to allow PHEVs with 85% or more low carbon liquid biofuels blended with gasoline or diesel to be treated as zero-emission vehicles (ZEVs) in future regulations and incentives. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

9) EPA should take special care in the final regulation to encourage work trucks that idle most of the day (power take-off operations) as PHEVs, especially strong PHEVs are a good candidate for this market and some of the only PHEV trucks in class 4-8 so far.2 This may require modifying the test cycles to capture the long-duration times that these trucks use batteries to power their booms and other equipment. [EPA-HQ-OAR-2022-0985-1647-A2, p. 3]

2 For example, utility trucks made by Odyne or the former EDI.

10) The EPA should encourage manufacturers to share anonymized actual data from the Strong PHEVs so that in future years, the EPA can make informed decisions based upon real world data. [EPA-HQ-OAR-2022-0985-1647-A2, p. 3]

3) In the longer term, EPA, the DOE or the national labs should conduct a comparative analysis on PHEV and BEV costs with a stakeholder input or working group). PHEVs can be made in a less costly manner than shown in most analyses. Technical maturity, engineering advances, supply chain issues, changes in mineral prices, war and scale-up issues are impacting the costs of BEV and PHEV up-front and operating costs. Today, costs are rapidly changing, especially for batteries. In addition, Argonne National Lab's recent report8 shows that PHEVs are less expensive than BEVs for cars, and our experts at Strong PHEV coalition assert that several additional technical modifications can lower the cost of PHEVs that most analyses do not consider. We think this likely applies to plug-in hybrid trucks but recognize that more analysis is needed. A common mistake we find in reports is not understanding the difference between a strong PHEV and other PHEVs because a strong PHEV can use the same batteries as a BEV which results in significant cost savings. See Appendix D for a more detailed explanation. [EPA-HQ-OAR-2022-0985-1647-A2, p. 6] [[See Docket Number EPA-HQ-OAR-2022-0985-1647-A2, page 15, for Appendix D]]

8 https://www.anl.gov/argonne-scientific-publications/pub/167396

4) In the longer term, EPA, the DOE or the national labs should conduct an analysis on the value of PHEVs as a platform for low-carbon alternative fuels including whether to allow PHEVs with 85% or more low carbon liquid biofuels blended with gasoline to be treated as zero-emission vehicles (ZEVs) in future EPA regulations. The issue to be studied is feedstock availability in the long run for both diesel and gasoline substitutes that could be used in PHEVs to make them have lower life cycle emissions. Related environmental issues could be studied. Justification: Some biomass feedstocks used in gasoline can't or won't be used in diesel or jet fuel powered transportation. This should result in large amounts of unused feedstocks because biomass feedstocks for spark-ignited engines will not be needed in the long run (e.g.,2050). However, using some of these existing feedstocks would make future PHEVs have even lower full fuel cycle GHG emissions than they have today. Strong plug-in hybrid cars and light trucks using gasoline already can have lower GHG than long range electric cars and light trucks due to the GHG emissions from battery manufacturing and the slightly poorer fuel economy of long-range BEVs. (See appendix C in this letter). [EPA-HQ-OAR-2022-0985-1647-A2, p. 6]

6) In order to show additional ways that costs can be reduced and that hard-to-reach markets are served, we respectfully request that EPA develop a scenario in the final rulemaking that reduces the total costs. Specifically, this new scenario should include a modest number of PHEV trucks as that will impact the cost analysis by reducing the cost of charging infrastructure, the amount of critical minerals and by using BEV batteries in strong PHEVs. This scenario could

reduce the number of BEVs and FCEVs by a small amount (say 10% collectively) and be instead served by a mix of Strong PHEV trucks and other PHEV trucks. The PHEV battery costs should be based on using BEV batteries as explained in appendix D in this letter. The use of away-from-home DC fast chargers should be modestly reduced, and the cost of the PHEV including total cost of ownership should be based on work by Argonne national lab for light-duty PHEVs.9 [EPA-HQ-OAR-2022-0985-1647-A2, p. 7]

9 Ibid

Finally, bidirectional charging using DC off-board chargers should be assumed in our recommended alternative cost analysis for a reasonable percentage of BEVs and PHEVs in order to further reduce the total cost of ownership. [EPA-HQ-OAR-2022-0985-1647-A2, p. 7]

10) The EPA should encourage manufacturers to share anonymized actual data from Strong PHEVs so that in future years, the EPA can make informed decisions based upon real world data. Strong PHEV trucks are further behind in commercialization compared to BEV trucks and fuel cell EV trucks, so more data would be useful to EPA. [EPA-HQ-OAR-2022-0985-1647-A2, p. 8]

Benefits of Strong PHEVs

Allowing PHEV trucks to be in the proposed regulation helps low-income truck drivers (class 2b - 8)

- The flexible nature of Strong PHEV trucks and cars makes them an important solution for low-income drivers of used PHEV trucks and cars. Many drivers need flexibility in their choice of vehicle because they either change residences often, change jobs often, work two or more jobs or live in areas where charging at night is difficult. This applies to some vocational vehicles that park at home, or commercial businesses that don’t have easy access to charging or that move relatively often. In addition, we understand that low-income drivers in the California Clean Cars for All program preferred PHEVs (e.g., Volt and BMW i3 REX) over BEVs and we think this will hold true for PHEV trucks. Eventually used PHEV trucks will enter the market and they will be attractive to low- and moderate-income owners and renters of trucks. Small businesses often rent their home base or move their business and a PHEV truck provides needed flexibility for this hard-to-reach market segment. [EPA-HQ-OAR-2022-0985-1647-A2, p. 9]

Because of the urgency of the climate and air pollution crises worldwide and the challenges of predicting consumer acceptance, it is important to take an all-hands-on-deck approach and have multiple types of zero-emission truck technologies in the final regulation including Strong PHEVs.

- Strong PHEVs offer more options for consumers which means a faster path to zero CO2 worldwide.
- Many areas of the world are relying on EPA’s leadership to commercialize new zero carbon solutions to transportation such as Strong PHEVs.
- The longer-term goal should be PHEVs with 100% zero carbon electricity generation for almost all of their electric miles, and advanced biofuels or other ultra-low carbon fuel for the remaining miles.
- The experience of the last fifteen years has shown that many residential and commercial users of vehicles will first adopt a PHEV instead of a BEV. In addition, we believe that

long range PHEVs are a no-regrets solution for EPA to encourage in the long term. In other words, uncertainty in speed of adoption of battery EVs and fuel cell EVs, especially by fast followers and late adopters, requires agencies such as EPA to be fuel and technology neutral in their regulations.

- We believe the uncertainty in CARB's report on 2045 fuel neutrality10 argues for EPA to be broad minded and nimble in adopting regulations, plans and incentives to reach the 2045 carbon neutrality goal and implies long-term use of low carbon fuels with Strong PHEVs. In addition, reaching very high levels of ZEV sales in the next decade frees up large amounts of biofuels for use in spark-ignited and compression-ignited engines such as the strong PHEVs allowed in the proposed rule. [EPA-HQ-OAR-2022-0985-1647-A2, pp. 9 - 10]

10 E3 report for CARB at 11. " Many key uncertainties remain around the achievement of carbon neutrality in California. One of these uncertainties is the optimal use and deployment of zero-carbon fuels in hard-to-electrify sectors, including certain high temperature industrial processes, heavy-duty long-haul trucking, aviation, trains and shipping. These fuel uses may be met with a combination of fossil fuels, hydrogen, synthetic zero-carbon fuels or biofuels. It is still uncertain how the relative costs of these technologies will evolve over time. As the cost of wind and solar decline, the cost of renewable hydrogen production is also falling, making hydrogen a more attractive solution than biofuels for some applications. The market for sustainable biofuels remains nascent, making it uncertain how much sustainable biomass supply will be available, and what the best uses for these biomass resources will be through mid-century." https://ww2.arb.ca.gov/resources/documents/achieving-carbonneutrality-california-final-report-e3

Allowing PHEV trucks in the HDV regulation provides a better solution especially for commercial vehicles that provide services during major catastrophes and daily emergencies.

- Because Strong PHEV trucks are dual fuel that means they are particularly suited to provide services for society to recover from wildfires, earthquakes, hurricanes, floods, riots, and other catastrophes, as well as provide needed services in more typical daily emergencies (e.g., police, ambulance, fire, power outage recovery). PHEVs for some of their fleet provide the flexibility they need to deal with catastrophes and emergencies as public servants. CARB's Advanced Clean Truck program recognized this by providing exemptions for emergency vehicles, and this emphasizes the need for dual fuel vehicles that can provide the flexibility that some fleets need.
- Because PHEVs and Strong PHEVs are dual fuel vehicles, they provide truck owners who also sometimes use their truck for personal use or who park their work truck at home with a second fuel to travel in case of emergencies. Further, many PHEVs will come with vehicle-to-load and vehicle-to-building technology that will allow emergency power for their home or a few appliances. [EPA-HQ-OAR-2022-0985-1647-A2, p. 10]

Strong PHEV trucks are an excellent solution for many parts of the world and a long commercialization period is needed to scale up this technology.

- In addition, we believe that at least some truck manufacturers will find a better business case to reach scale and get higher levels of vehicle adoption by producing both PHEVs and BEVs than only producing battery electric vehicles. Such a result is good for truck and car maker competition, for consumers and the planet. [EPA-HQ-OAR-2022-0985-1647-A2, p. 10]

Strong PHEV trucks are an excellent solution for the unique needs of rural areas, mountainous areas and cold weather areas.

- Strong PHEV trucks are potentially a better option for the portion of the US and other countries that cover small and mid-size towns where trip distances (when needed) exceed urban megacity regions.
- Strong PHEVs do well compared to other ZEVs in mountainous areas or cold weather regions around the world because they are dual fuel vehicles and technology exists to make the second fuel ultra-low carbon.
- While many trips in these regions are local, fleet vehicles do take long distance trips, including to remote areas, where charging is lacking or inadequate. Mountainous terrain and very cold weather both significantly reduce the range of battery EVs, but PHEVs are not impacted. Even California's recently adopted Advanced Clean Fleet regulation defers compliance for government fleets in 25 of the State's 58 "low population counties." This is an acknowledgement that the State's rural counties will not have the infrastructure to support ZE trucks and buses in the near term. [EPA-HQ-OAR-2022-0985-1647-A2, p. 10]

Strong PHEVs are needed in this regulation for trucks that tow or haul for work or recreation.

- Due to the large energy requirements of towing, Strong PHEVs are better than other ZEVs. In addition, Strong PHEVs as dual fuel vehicles offer advantages when towing over mountains and rural areas where charging or hydrogen refueling is not common or not feasible from a business case perspective. (Many class 2b vehicles serve as both work and personal transportation and this is a relatively large class of vehicles.) Mountain grades are particularly known for reducing the all-electric range of battery EVs, but PHEVs are dramatically less impacted and/or have better access to refueling.
- Larger trucks may not tow but face the same issue in mountainous terrain when hauling a full payload and would benefit from a strong PHEV truck. [EPA-HQ-OAR-2022-0985-1647-A2, p. 11]

Allowing Strong PHEV trucks to be eligible should result in less need and cost for away-from home charging stations for commercial fleets.

- Strong PHEVs do not need public charging and can rely on fleet-only or, in some cases, home-only charging which reduces the societal cost (e.g., grid upgrades, public incentives for charging stations). For example, this translates to less expense for and impact on the grid including new transformers, distribution feeders and substations compared to battery EVs. PHEVs reduce the need for fast charge stations and potentially for other types of away-from-home charging stations.
- Strong PHEVs charging in residential or fleet applications have less cost to the grid because they typically charge at home or depots at lower kW levels than battery electric vehicles. [EPA-HQ-OAR-2022-0985-1647-A2, p. 11]

Allowing Strong PHEV trucks to be eligible will help with several scale-up issues including reducing the pressure to quickly scale up away-from-home and depot DC fast chargers and facilities for battery production and mineral extraction.

- Strong PHEVs do not need public charging (depot or home only charging is adequate) and use smaller batteries which means more efficient use of mineral resources especially in the near-term. See Appendix C in this letter. [EPA-HQ-OAR-2022-0985-1647-A2,

p. 11] [[See Docket Number EPA-HQ-OAR-2022-0985-1647-A2, pages 13-14 for Appendix C]]

Allowing Strong PHEV trucks to be eligible can help fleet operators avoid a weight penalty

- For trucks and buses, large battery packs will add weight (a weight penalty). For the fleet operator, they will likely have to purchase a larger truck - such as a Class 4 instead of a Class 3, in order to have the same payload. This becomes a bigger issue in use cases such as class 8 refuse haulers where lack of payload means second truck will be need to be purchased (two trucks replacing the original truck). [EPA-HQ-OAR-2022-0985-1647-A2, p. 11]

Allowing Strong PHEV trucks to be eligible will help reach skeptical consumers and other late adopters.

- Strong PHEVs provide the flexibility that is key to convincing the hard-to-convince fleets to adopt advanced technology. Many consumers for political or personal reasons are very skeptical about BEVs and FCEVs, but we have found that Strong PHEVs appeal to them. [EPA-HQ-OAR-2022-0985-1647-A2, p. 11]

We support the more stringent electric range, emission control and testing requirements placed on PHEVs in regulations in general, including, but not limited to, new requirements to limit high power cold starts, increase minimum all electric range, require higher engine turn-on speeds in order to meet the US06 driving cycle test, more stringent requirements on particulate matter. These requirements enable Strong PHEVs to have very low criteria pollutants over their lifetime and improve the consumer driving experience. [EPA-HQ-OAR-2022-0985-1647-A2, p. 12]

Regarding the reduced GHG benefit of manufacturing smaller batteries, we do not have data for large trucks (PHEVs vs BEVs), but we believe the analyses below for light-duty PHEVs and BEVs show this benefit and it should apply to large trucks. Strong PHEV battery utilization maximizes value of battery manufacturing and materials capacities. PHEV trucks, especially, Strong PHEV trucks, can electrify most daily commuting miles while occasionally using some gasoline, while BEVs have a lot of battery capacity that only gets “used” on very long trips. We assert that this could be considered wasted or underutilized lithium and other battery minerals. Thus, because PHEVs use their batteries more, the USA gets more EV miles per tonne of lithium by driving PHEVs and Strong PHEVs as shown below. [EPA-HQ-OAR-2022-0985-1647-A2, p. 13. Refer to the graph on p. 13 of docket number EPA-HQ-OAR-2022-0985-1647-A2.]

For light-duty PHEVs, our coalition has found that many researchers incorrectly find that PHEVs are high cost compared to BEVs. However, Argonne National Lab’s recent report16 shows that light-duty PHEVs are less expensive than BEVs for cars, and our experts at Strong PHEV coalition assert that several additional technical modifications can lower the cost of PHEVs that most analyses do not consider. We think this likely applies to plug-in hybrid trucks but recognize that more analysis is needed. For example, A common mistake we find in reports is not understanding the difference between a strong PHEV and other PHEVs because a strong PHEV can use the same batteries as a BEV which results in significant cost savings. The chart below shows how a light-duty PHEV should use the same batteries as a BEV and not have to use a special low-volume production battery with a different (higher) power to energy ratio. We believe this finding should translate to class 2b to 8 trucks, and that most PHEV trucks will need BEV batteries. [EPA-HQ-OAR-2022-0985-1647-A2, p. 15.] [Refer to the graph on p. 15 of docket number EPA-HQ-OAR-2022-0985-1647-A2.]

16 See footnote 7.

Organization: U.S. Tire Manufacturers Association (USTMA)

USTMA appreciates that the proposed HD Phase 3 regulations consider the ongoing technological innovation in the HD vehicle space.2 USTMA advocates and supports technologies that improve fuel economy but not when there are unintended consequences that can affect driver safety and tire performance as explained below. [EPA-HQ-OAR-2022-0985-1635-A1, p. 2]

2 88 Fed. Reg. 25926 at 25930 (April 27, 2023)

The NPRM states, “The proposed standards do not mandate the use of a specific technology, and EPA anticipates that a compliant fleet under the proposed standards would include a diverse range of technologies (e.g., transmission technologies, aerodynamic improvements, engine technologies, battery electric powertrains, hydrogen fuel cell powertrains, etc.). The technologies that have played a fundamental role in meeting the Phase 2 GHG standards will continue to play an important role going forward as they remain key to reducing the GHG emissions of HD vehicles powered by internal combustion engines.”3 [EPA-HQ-OAR-2022-0985-1635-A1, p. 2]

3 88 Fed. Reg. 25926 at 25932 (April 27, 2023)

USTMA supports aerodynamic improvements in fleets. However, recent evolutions in vehicle aerodynamic designs and emissions equipment have created conditions that contribute to heat build-up in tires and that can adversely impact tire performance. It is critical to closely monitor and manage tire heat-contributing factors that are within the operator’s control. [EPA-HQ-OAR-2022-0985-1635-A1, pp. 2 - 3]

To improve fuel economy, OEM and aftermarket manufacturers recently have introduced aerodynamic body features on their vehicles such as ground clearance air dams and side fairings. These aerodynamic features may have the unintended consequence of reducing airflow in the fender wells, which prevents the dissipation of heat and increases tire operating temperatures. These recent developments in truck technology have resulted in an increase in the number of tire claims related to heat damage. The tire industry has been evaluating tire performance on late model vehicles equipped with certain newer aerodynamic configurations and found both front fender well and tire operating temperatures to be significantly higher than ambient air temperatures. [EPA-HQ-OAR-2022-0985-1635-A1, p. 3]

Testing conducted by some USTMA members at equivalent tire operating conditions concluded that these higher than ambient air temperatures associated with certain newer aerodynamic configurations significantly decreases tire performance across multiple products and manufacturers, which is further impacted by more severe operating conditions that increase internal tire operating temperatures. For years, the tire industry has warned that operating tires over-loaded, under-inflated, or at high speeds could cause excessive heat to build up in tires. Factors contributing to tire heat are additive and due to the introduction of aerodynamic technologies, the list of factors is expanding. The tire industry believes that recent aerodynamic technology and these more severe operating conditions create an unprecedented high heat environment that substantially contributes to reducing the life span of tires on certain vehicles. [EPA-HQ-OAR-2022-0985-1635-A1, p. 3]

EPA Summary and Response:

Summary:

A group of commenters noted that further improvements to ICE engine and vehicle fuel efficiency are feasible, cost effective, and readily available. These commenters, for the most part, did not specify what numeric standards predicated on ICE vehicle and engine improvements would be, with the exception of several commenters urging that standard stringency be increased to reflect feasible improvements to ICE vehicle fuel efficiency (ICCT, MFN and others, quantifying those improvements; see summaries and responses in RTC chapter 2.4).

Many commenters spoke to the advantages of hybridization (including both strong hybrids and PHEVs). In addition to dramatically improved fuel efficiency compared to diesel vehicles, which commenters estimated at 31% for vocational vehicles and 25% for long haul tractors (Advanced Engine Systems Inst., Eaton) and 5-50% reductions when combined with other improvements, commenters noted:

- Much lower purchase price than ZEVs since a much smaller battery is needed (Strong Plug-In Hybrid Coalition)
- Significantly less supportive electrical infrastructure needed, and so easier and quicker to implement (Cummins)
- A good fit for applications like Class 8 tractors, work vehicles with long idle times, and stop and go duty cycles for which ZEVs are less suitable (Diesel Technology Forum, Eaton, Strong Plug-In Hybrid Coalition)
- A good alternative for lower income purchasers (Strong PHEV Coal.)
- Useful in areas or conditions for which ZEVs are either less suitable or unlikely to be adequately supported, including rural areas and cold weather areas (Strong PHEV Coal.)
- There is no cargo capacity penalty, unlike BEVs (Strong PHEV Coal.)
- Battery capacity is used more efficiently than a BEV (Strong PHEV Coal. (using a EV mile per ton of lithium ratio)
- Considered on a lifecycle basis, CO_2 emissions may be less than a BEV due to less resources expended in battery production (Strong PHEV Coal.)
- A potential bridge technology, especially given that some may be eligible for the commercial vehicle tax credit (CARB)

These commenters had a number of suggestions as to how hybrid performance could be reflected in a Phase 3 standard. These included:

- Acknowledging that there is insufficient data to develop a Utility Factor for HDV hybrids, either include a case-by-case factor based on user engineering judgment, or include a credit for PHEV with long documented battery ranges, possibly reflecting the lifecycle advantages of PHEVs in either that Utility Factor or credit (Strong PHEV Coal.)
- Include either credits or some other type of incentive for hybrids (Diesel Tech. Forum)

Some of these commenters urged modifications to the current hybrid certification regime:

- Streamline the testing regime (Odyne, Cummins)
- Simplify the Phase 2 formula, for example by defining a utility factor curve (Eaton)
- Increase the GEM credit for ePTO (Odyne, Strong PHEV Coal. (urging modification of test cycles to capture the long duration times when the batteries are in use)

Strong PHEV Coalition voiced its support for the following test protocols: “the more stringent electric range, emission control and testing requirements placed on PHEVs in regulations in general, including, but not limited to, new requirements to limit high power cold starts, increase minimum all electric range, require higher engine turn-on speeds in order to meet the US06 driving cycle test, more stringent requirements on particulate matter”, noting further that “[t]hese requirements enable Strong PHEVs to have very low criteria pollutants over their lifetime and improve the consumer driving experience.”

Commenters also mentioned other engine and vehicle improvements available now. Engine improvements included cylinder deactivation (including in combination with Miller cycle engines) (Eaton), high efficiency turbo charging with EGR (Eaton), 48V mild hybrid (ICCT, MECA, MFN), and lightweighting (MEMA). Several commenters mentioned improvements available from use of advanced aerodynamic technologies (Howmet, ICCT), although USTMA commented that new vehicle technologies should consider unintended consequences for driver safety and tire performance. Specifically, USTMA described concerns with aerodynamic designs and emissions equipment creating conditions that may contribute to heat build-up in tires and may adversely impact tire performance. USTMA indicated aerodynamic features such as ground clearance air dams and side fairings may reduce air flow in fender wells resulting in increased tire operating temperatures.

Several of these commenters requested changes to the way some of these technologies are credited in GEM. MEMA indicated that the Phase 2 assumption on lightweighting reflected in GEM need updating (“EPA should recognize that suppliers have introduced new technologies and products since the Phase II rule was finalized …and seek comments from suppliers to update the agency’s assumptions around weight reduction inputs to reflect the latest available technologies on the marketplace. For example, lightweight forged aluminum wheel producers have continuously improved their product offerings to the heavy-duty truck, bus, and trailer markets. More recent generations of products - introduced to the market since the Phase 2 was promulgated - offer weight savings of nearly 10% as compared to similar steer or dual-drive, and wide base wheels which were part of the analysis EPA previously conducted”, recommending that “EPA should continue to grant credit for lightweighting and weight reduction and update GHG Ph2 assumptions on lightweighting in the GHG Ph3 GEM model”). Eaton provided information to support their assertion that cylinder deactivation is also not properly assessed in GEM, recommending a 2.5 “intelligent control” adjustment factor rather than the current factor of 1.5.

ICCT and MFN asserted that various engine and vehicle improvements should be reflected in standard stringency. MFN stated that even just assuming further year-over-year improvements equivalent to those in Phase 2 through MY 2027, there should be a further 8.4% improvement reflected in the Phase 3 standard stringency. MFN also noted the ready availability of improvements for SI engines, stating that Phase 2 required no engine improvements beyond the 2016 SI engine standard.

AVE commented that “By expanding the definition of ZEVs even slightly, EPA can ensure greater emission reductions for decades.” DTNA responded to EPA’s request for comment on whether EPA should include additional GHG-reducing technologies of existing technologies for ICE vehicles in our technology assessment for the final standards, that DTNA believes it is inappropriate to add additional GHG technologies at this time.

PACCAR commented that in the proposed changes to 40 CFR 1037.520(j)(1), EPA should clearly define “full cylinder”.

Strong PHEV Coalition commented that the battery costs for PHEVs should be the same as BEVs and that we should include the benefits of bidirectional charging in our TCO. Investigate use of strong PHEVs with low carbon fuels, including the possibility that this combination should be considered zero emission, and, generally, distinguish strong PHEVs from other PHEVs (Strong PHEV Coal.)

Response:

We agree with the comments that there are technologies other than ZEVs that can be used to meet the final standards. Regarding the stringency of the final standards, EPA has undertaken a balanced and measured approach to setting performance-based standards under our CAA section 202(a)(1)-(2) authority. See Preamble Section II and RTC 2. In short, the final standards can be met in any manner a regulated entity (*i.e*. manufacturer) sees fit that achieves compliance with that numerical standard. In assessing a modeled potential compliance pathway that includes a technology mix of ICE vehicle technologies and ZEV technologies, EPA was demonstrating that the final standards were feasible and appropriate; EPA was not requiring that manufacturers utilize that modeled potential compliance pathway. In fact, as discussed in Preamble Section II.F.4, we have assessed additional example potential compliance pathways that support the feasibility of the final standards, which include a suite of technologies ranging from ICE engine, transmission, drivetrain, aerodynamics, and tire rolling resistance improvements, to the use of low carbon fuels like CNG and LNG, to hybrid powertrains (HEV and PHEV) and H2-ICE. See also responses in RTC 9.1 and 2.1 further responding to the explicit or implicit incorrect assertion that the Phase 3 rule mandates use of ZEVs.

As for the comment related to recognizing the emissions performance of hybrid powertrains, the current procedures in Subpart F of 40 CFR 1036 provide such a pathway. These procedures rely on a powertrain test procedure that EPA has refined over the years. The procedure defines how to generate a fuel map for use in GEM for both hybrid and plug-in hybrid powertrains. While the commenters’ request for the future addition of hybrid powertrain utility factors is not within the scope of this rulemaking, we agree that the future addition of EPA- defined utility factor curves could be an improvement to the procedure and are committed to working with stakeholders to consider defining these curves in the future. In the meantime, as commenters acknowledge, the test procedures allow for manufacturers to get approval for a utility factor curve. In addition, the powertrain test procedure may be used to demonstrate the criteria pollutant performance of hybrids on the FTP, SET, and LLC duty cycles. As for comments on streamlining the powertrain test procedures, EPA continually works towards developing improved, less burdensome test procedures and intends to continue to work with manufacturers and stakeholders towards that end, including in future rulemaking actions. See RTC Section 24 and Preamble Section III.C for more information on powertrain testing.

In response to the commenters that EPA should increase the GEM credit for ePTO through changes in the duty cycle, we didn't propose changes to or reopen the duty cycles so this comment is out of scope in this final rule.

With respect to the comments on credit multipliers for hybrids, please see Preamble Section III.A and response to comment Section 10.3.1.

As for the comments that engine and vehicle improvements are available now, the test procedures in 40 CFR 1037.520 and Subpart F of 40 CFR 1036 provide a pathway for manufacturers to get credit for the use of these technologies. These test procedures are designed to capture the performance of many different technologies from engine improvements to vehicle lightweighting and technologies that reduce the aerodynamic drag of vehicles. As noted above, nothing in the Phase 3 rule precludes compliance strategies utilizing these technologies.

We do not agree with commenters advocating for more stringent standards reflecting further improvements to ICE vehicles and engines beyond the Phase 2 2027 improvements in our modeled compliance pathway, as our assessment is that manufacturers do not have the resources to pivot between different technology improvement strategies within the lead time provided by the Phase 3 program (e.g., the modeled potential compliance pathway versus an additional example potential compliance pathway discussed in Preamble Section II.F.4). See also RTC Section 2.4.

Regarding the comments from MEMA that EPA should update the credit for lightweighting, we provide a pathway in the existing regulations for manufacturers to seek approval for such cases. 40 CFR 1037.520(e)(5) states: "You may ask to apply the off-cycle technology provisions of § 1037.610 for weight reductions not covered by this paragraph (e)."

As for the comment from Eaton that the 1.5% credit doesn't reflect the full CO2 reduction of cylinder deactivation, we note the existing fuel mapping test procedures in 40 CFR 1036.540 and 40 CFR 1036.545 are test procedures that can be used and are designed to capture the CO2 benefits from integrating multiple technologies, like the use of CDA (cylinder deactivation, the technology noted in the comment) to minimize additional fuel for thermal management.

EPA agrees with USTMA regarding the need to maintain safe tire operation with the use of HD vehicle emission reduction technologies; however, USTMA did not provide specific data or describe specific emission reduction technologies that result in safety issues.

In response to AVE comment on expanding the definition of ZEV, EPA is not defining ZEV in our regulations in this rulemaking and the final rule is not requiring ZEVs, but rather is setting performance-based standards.

Regarding DTNA's comment, see discussion in Preamble Section II.G as well as our response in RTC Section 2.4 responding to comments advocating for more stringent standards than those proposed.

We agree with PACCAR's comment that "full cylinder" should be clarified and have finalized changes to 40 CFR 1037.520(j)(1), to clearly define "full cylinder". See Preamble Section III.C.3.viii for more information.

In response to the comments on critical minerals, see RTC Section 17.2.

We agree with Strong PHEV Coalition that the costs for batteries in PHEVs should be the based on the cost of batteries in BEVs and have included this approach in our assessment of those technologies in our additional example potential compliance pathways supporting the feasibility of the final CO_2 standards in RIA Chapter 2.11. We agree with Strong PHEV Coalition that bidirectional charging and related technologies may offer numerous benefits and potentially save money for fleets, as discussed further in RIA Chapter 1.6.4, RTC 6.4 and RTC Section 7. We did not quantitatively include these benefits in our analysis for the rule so to the extent that fleets monetize such benefits, our costs analysis may be considered conservative.

In response to the comment from Strong PHEV Coalition that PHEVs should be considered zero emissions if fueled with low carbon fuels see our response to LCA in RTC 9.1 and RTC 17.

Finally, existing 40 CFR 1037.610 provides a pathway for manufactures to seek approval for alternative test procedures for technologies that are not reflected in GEM and that will result in measurable, demonstrable, and verifiable real-world CO2 emission reductions.

9.3 H2 ICE Vehicles

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

AVE seeks stronger support for hydrogen engine platforms as a way for the U.S. to meet its environmental goals. [EPA-HQ-OAR-2022-0985-1571-A1, p. 5]

AVE supports EPA's recognition of hydrogen internal combustion engines (H2-ICE) as emitting zero CO2 at the tailpipe. Still, EPA is limiting support for this technology in propulsion systems "…where a diesel pilot is used for combustion."14 This limitation is not reasonable given that CO2 emissions from pilot ignition are minimal. More importantly, EPA should recognize that advanced aftertreatment solutions, emission control technology, and selective catalytic reduction systems exist to further reduce tailpipe emissions to almost untraceable levels where a diesel pilot is used. [EPA-HQ-OAR-2022-0985-1571-A1, p. 5]

14 Federal Register / Vol. 88, No. 81 / Thursday, April 27, 2023 / at 26021

H2-ICE is ideal for high load and high utilization vehicle applications where BEV or fuel cell solutions cannot meet the long haul, heavy load requirements or the need for quick refueling. H2-ICE trucks have an advantage over BEVs in operating within long range fleet conditions because it can haul heavier loads for longer periods of time. [EPA-HQ-OAR-2022-0985-1571-A1, p. 5]

Furthermore, H2-ICE technology is more mature and economically feasible, so it is a fast-to-market propulsion solution, ready to be rapidly deployed in high volume. H2-ICE has the ability to quickly transform the heavy-duty marketplace at many weight classes as a scalable retrofit to existing internal combustion engines overcoming enormous costs to fleet owners. H2-ICE is a zero-tailpipe emission technology. By including H2-ICE in its clean transportation strategy, the EPA will create demand that will nurture and grow the developing hydrogen fuel market, which in turn, will help accelerate hydrogen fuel cell adoption. [EPA-HQ-OAR-2022-0985-1571-A1, p. 5]

When analyzing predictions for U.S. energy consumption through 2050, support for H2-ICE deployment becomes more prescient. According to the U.S. Energy Information Administration, U.S. petroleum consumption will continue to increase by nearly 13% from 2021 levels (see chart below). The best pathway forward is by supporting all GHG reducing technologies. [EPA-HQ-OAR-2022-0985-1571-A1, p. 6.] [See Docket Number EPA-HQ-OAR-2022-0985-1571-A1, page 6, for the referenced chart.]

We recommend that EPA fully analyze how H2-ICE can dramatically offer faster more cost-effective compliance with future standards. H2-ICE technology is being developed and deployed all over the world and has the opportunity to bring significant manufacturing growth and investment to the U.S. [EPA-HQ-OAR-2022-0985-1571-A1, p. 6]

Organization: American Council for an Energy-Efficient Economy (ACEEE)

H2-ICEVs are likely to provide smaller efficiency gains over diesel vehicles than H2-FCEVs provide and could even result in GHG emissions increases relative to diesel well into the time frame of the Phase 3 rule, as indicated by Table 2.28 Yet EPA states in the proposal that, “a new technology under development that would reduce GHG emissions from heavy-duty vehicles with ICEs is hydrogen-fueled internal combustion engines (H2–ICE)” (FR 25960). EPA’s enthusiasm is premature. [EPA-HQ-OAR-2022-0985-1560-A1, p. 14.]

28 GREET does not currently include HD H2-ICEs. We obtained the (rough) values shown in Table 2 for such a vehicle by scaling the diesel combination truck values by E10/liquid H2 LD (SI) ICE vehicle ratios from GREET 2022.

EPA should not incentivize hydrogen-fueled vehicles without strong evidence that hydrogen fuel for transportation will be clean in the foreseeable future. For H2-ICEVs in particular, for which intrinsic efficiency advantages are modest, actual GHG benefits may be negative, and potential future benefits are based largely on changes to the fuel rather than to the vehicle, the zero-upstream incentive is inappropriate. It would offer manufacturers the same compliance benefit for an H2-ICEV as for a BEV or FCEV but require only relatively small changes to the engine, as described At FR 25960. The fact that H2-ICEVs produce NOx makes conferring ZEV benefits on them all the more inappropriate. Low-carbon hydrogen-fueled vehicles are best incentivized through performance-based standards. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 14 - 15.]

Organization: American Petroleum Institute (API)

While still in the early stages of development and prove out, hydrogen-based vehicles (FCEVs and H2-ICE) are a promising technology that many stakeholders are considering. API members are engaged in hydrogen projects to support development of hydrogen focused technology. Companies are partnering with HD OEMs to explore commercial business opportunities to build demand for commercial vehicles and industrial applications powered by hydrogen. Demonstration projects target hard-to-abate applications like rail and marine, with a goal to develop viable large-scale businesses and advance a thriving hydrogen economy. [EPA-HQ-OAR-2022-0985-1617-A1, p. 8.]

Organization: BorgWarner Inc.

BorgWarner supports hydrogen engine development and expanding hydrogen infrastructure.

BorgWarner supports efforts to accelerate development of the hydrogen transportation sector. We are concerned, however, that regulations may not go far enough to allow the technology to develop quickly. EPA should support both H2FC and H2ICE platforms because they complement the overall deployment of hydrogen infrastructure. H2FC and H2ICE address different vehicle use cases; however, both utilize the same hydrogen infrastructure. [EPA-HQ-OAR-2022-0985-1578-A1, p. 3]

Both technologies currently have market challenges. The cost of H2FC is still quite high and needs more time before reaching price competitiveness. Currently, the H2ICE market is nearly nonexistent in the U.S. because of the lack of refueling infrastructure and H2ICE product is not yet released commercially. It is also facing headwinds as California and EPA regulations do not presently recognize H2ICE as a zero-tailpipe emissions technology. [EPA-HQ-OAR-2022-0985-1578-A1, p. 3]

EPA's proposal is inclusive of H2ICE in its clean transportation strategy, however, EPA is proposing strict limitations based on pure hydrogen as the fuel, as well as counting trace amounts of tailpipe CO2. [EPA-HQ-OAR-2022-0985-1578-A1, p. 3]

Hydrogen has one of the lowest lifecycle emissions of any powertrain option when using renewable hydrogen. Certain stakeholders may be concerned that H2ICE does not result in 100% zero tailpipe emissions. There are, however, new technologies, such as aftertreatment in higher performing selective catalytic reduction (SCR) systems, emissions controls, and air-fuel controls, which can nearly eliminate particulate matter and remaining tailpipe emissions to background levels. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4]

The H2ICE market is maturing in other regions of the world, where policymakers recognize H2ICE as a viable and critical technology to address air quality and environmental issues. The U.S. is already losing its innovation leadership for hydrogen trucks and will continue to miss this opportunity if H2ICE is not included in the clean transportation transformation. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4]

A heavy-duty vehicle powered by a hydrogen combustion engine will produce close to zero CO2 when compared to current Class 8 trucks. By comparison, natural occurring processes in nature like a human breathing produce a limited amount of CO2 (1kg per day of CO2 for average human) or decaying plants (plants release ½ the CO2 they absorb in total life). [EPA-HQ-OAR-2022-0985-1578-A1, p. 4]

Currently, there are no on-road demonstration vehicles being supported in the U.S. that can help regulators fully understand and assess H2ICE as a solution to meeting climate goals. We recommend the EPA incentivize and partner with technology providers to demonstrate H2ICE's capabilities and GHG emissions reductions. [EPA-HQ-OAR-2022-0985-1578-A1, p. 4]

Defining vehicle emissions exclusively at the tailpipe creates a de facto technology mandate and excludes technologies that could make a timely real-world difference in CO2 emissions. As stated above, H2ICE is a cost-effective advanced technology that is under development and more ready to be rapidly deployed in high volumes to make an impact on the environment. [EPA-HQ-OAR-2022-0985-1578-A1, p. 6]

BorgWarner supports EPA’s decision to include H2ICE as a clean vehicle technology. An additional benefit of H2ICE is how the technology can be readily adapted from existing systems and therefore, could be used as a strategy to significantly decrease CO2 faster for the current HD fleet and help advance the development of fuel cell vehicles. [EPA-HQ-OAR-2022-0985-1578-A1, p. 6]

Organization: California Air Resources Board (CARB)

3. HDVs with Hydrogen Internal Combustion Engine (H2 ICE)

Affected pages: 25960-25961 and 26022

The NPRM is proposing to include vehicles with engines using fuels other than carbon-containing fuels as another potential technology to meet Phase 3. U.S. EPA is proposing to amend 40 CFR 1037.150(f) to include H2 ICE as a zero-tailpipe emission technology and exempt H2 ICE technologies from CO2-related emission testing. [EPA-HQ-OAR-2022-0985-1591-A1, p.43]

CARB staff asks that U.S. EPA consider that manufacturers may respond to Phase 3 by making H2 ICE instead of deploying HD ZEVs. Although H2 ICE engines have near zero CO2 tailpipe emissions, their NOx emissions are of concern as is the sustainability of their use of finite supplies of low carbon hydrogen. As indicated above, California needs significant NOx and CO2 reductions to meet its air quality and climate goals and hence is taking rigorous actions that will accelerate the deployment of HD ZEVs. Since federal certified trucks sold outside of California contribute about 50 percent of the total HD trucks NOx emissions in California, standards applicable in other States (including U.S. EPA’s standards) nonetheless remain crucially important, and California would benefit from greater deployment of ZEVs elsewhere. In addition, H2 ICE engines are less efficient than FCEVs, meaning they will require substantially greater amounts of hydrogen needed to perform the same amount of work over real-world duty cycles. This additional hydrogen will result in greater upstream GHG emissions. U.S. EPA should consider requiring quantification of H2 ICE hydrogen fuel use via fueling map disclosure, just as it does for all previous combustion fuels, a requirement which is necessary for U.S. EPA and others to properly assess the upstream GHG emissions from H2 ICE technologies. U.S. EPA has existing precedent for measuring vehicle energy usage even if the energy carrier does not contain carbon as seen in the plug-in hybrid and ZE LDV test procedures. Hydrogen should not be given a special exemption in HD for its lack of carbon when similar metrics are already reported for electricity and hydrogen used on-board a LDV. U.S. EPA CO2 standards should intentionally account for potential H2 ICE adoption rates by including estimated costs and emissions impacts of this projected H2 ICE technology for use to meet the Phase 3 emission standards in the final rulemaking. It appears that U.S. EPA’s small assumed technology penetrations of H2 ICE do not analyze the possibility of such technology potentially becoming the default approach for certain high energy demand sectors for which industry is promoting H2 ICE with statements like “These [H2 ICE] engines look like engines, they sound like engines, and fit where engines normally fit.”141 More than one HDV manufacturer is public about bringing H2 ICE class 8 engines in the 2027 timeframe,142,143 and development continues on other similarly sized engines.144,145,146 U.S. EPA should conduct sensitivity analysis of the emissions risks should industry elect to produce many H2 ICEs. U.S. EPA should also consider commensurate production caps to limit such potential risks, particularly if U.S. EPA is not going to fully assess those risks at this time. [EPA-HQ-OAR-2022-0985-1591-A1, pp.43-44]

141 HDT Truckinginfo: Cummins Debuts 15L Hydrogen Engine, May 11, 2022. https://www.truckinginfo.com/10170361/cummins-debuts-15l-hydrogen-engine

142 KoreaTechToday: HD Hyundai Infracore plans to commercialize Hydrogen Combustion Engines in Korea, April 6, 2023. https://www.koreatechtoday.com/hd-hyundai-infracore-plans-to-commercialize-hydrogen-combustionengines-in-korea/

143 Cummins Inc. Debuts 15-Liter Hydrogen Engine at ACT EXPO, May 9, 2022. https://www.cummins.com/news/releases/2022/05/09/cummins-inc-debuts-15-liter-hydrogen-engineact-expo

144 Iveco Group: FPT Industrials New XC13 Hydrogen Combustion Engine Makes Its Field Debut At Flachau Ski World Cup Together With Prinoth, January 24, 2023. https://www.ivecogroup.com/media/brand_press_releases/2023/EMEA-(English)/FPT/fpt_industrials_new_xc13_hydrogen_combustion_engine_makes_its_field_debut_at_flachau_ski_world_cup_together_with_prinoth

145 Volvo Penta & CMB.TECH partner on dual-fuel hydrogen engines, June 10, 2022. https://www.volvopenta.com/about-us/news-page/2022/oct/volvo-penta-cmb-tech-partner-on-dualfuel-hydrogen-engines/

146 An H2 ICE Concept for the Very Heavy (16L) Applications by Volvo Group, 2023 https://wiener-motorensymposium.at/en/papers/935d57c0-6904-49e0-8e2d-427faa573d40

Organization: Cummins Inc.

Hydrogen engines will help ready the infrastructure and market for fuel cells by creating demand for hydrogen before fuel cells are commercially ready. [EPA-HQ-OAR-2022-0985-1598-A1, p. 9]

Organization: Daimler Truck North America LLC (DTNA)

Treatment of H2-ICE Vehicles. DTNA supports EPA’s proposal to deem tailpipe CO2 emissions from vehicles with H2-ICE to be zero and not to require GHG emission testing for such engines or their input to vehicle certification applications.23 EPA rightly recognizes that these engines emit nearly zero CO2, with any CO2 almost entirely from ambient environmental sources. DTNA supports these proposed changes as a minimum step to help enable H2-ICE penetration. [EPA-HQ-OAR-2022-0985-1555-A1, p. 17]

23 See id. at 25,960; 26,022 (proposing changes to 40 C.F.R. § 1037.150(f) to specify that tailpipe CO2 emissions from vehicles with engines fueled with neat hydrogen ‘are deemed to be zero’).

The Company also agrees with EPA’s decision not to include H2-ICE vehicles in the technology packages that form the basis of its CO2 standard stringency proposal. Not only is this technology still in the development stage, but its increased costs, fleet hesitance to adopt alternative powertrain solutions, and most importantly, the lack of available fueling infrastructure will limit the early rollout of H2-ICE vehicles to customers and applications best suited to them. [EPA-HQ-OAR-2022-0985-1555-A1, p. 17]

In addition, many of the potential early adopters of H2-ICE technology are the same ones that EPA assumes will adopt other ZEV technologies. As explained in these comments, the ZEV penetration rates assumed in the Proposed Rule are likely already overly-optimistic and unobtainable. Proposing additional CO2 standard stringency to reflect anticipated H2-ICE vehicle proliferation would thus be inappropriate. While it is possible that H2-ICE vehicles will displace BEVs and fuel cell electric vehicles (FCEVs) over the long-term, particularly in applications for which BEVs and FCEVs are not well-suited, the timeframe for such a shift is not at all certain, thus it would be unreasonable to base the proposed CO2 standards on significant H2-ICE penetration at this time. [EPA-HQ-OAR-2022-0985-1555-A1, p. 17]

EPA can and should further reduce regulatory burdens for H2-ICE technologies by making changes to how H2-ICE vehicles are certified, as detailed below in Section IV.A of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 18]

This rulemaking presents an important opportunity to foster innovation and accelerate penetration of innovative technologies with zero CO2 emissions and near-zero NOx emissions such as H2-ICE engines. [EPA-HQ-OAR-2022-0985-1555-A1, p. 77]

H2-ICE technology provides an important pathway to rapid penetration of vehicles with effectively zero CO2 emissions and near-zero NOx emissions. This rulemaking presents an opportunity for EPA to encourage innovation in alternate fuel engine development generally, and H2-ICEs specifically. Currently H2-ICE new technology is in the primitive proof-of-concept stage of innovation, and regulatory pathways are needed to bring this new near-zero CO2 and NOx technology to the market. Such technology could bring carbon-neutral transportation to sectors that are not currently ripe for battery or fuel-cell applications, given the current state of technology development. It could also create a use-case for widespread hydrogen fueling, which could spur the development of hydrogen infrastructure and lay the groundwork for future fuel cell vehicles, which would rely on the same infrastructure. The Company also believes that H2-ICE is a favorable technology, even in the long term, for vehicles with high power demands and high daily mileage requirements (which BEVs and FCEVs may not serve well). DTNA's vision for H2-ICE applicability in a zero-emissions future is illustrated in Figure 10 below: [EPA-HQ-OAR-2022-0985-1555-A1, p. 77] [Refer to Figure 10 on p. 77 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Importantly, this technology can be implemented more rapidly, using existing products, processes, and technical expertise. In concept, H2-ICEs are very similar to existing combustion engines and can leverage the extensive technical expertise manufacturers have developed with existing products—in many cases, using the same components for many key systems. Similarly, these products can be built on the same assembly lines, by the same workers and with existing supply chains already in place, preventing costly plant retooling and preserving good-paying American manufacturing jobs. H2-ICEs thus have an important role to play in facilitating the ZEV transition with minimal supply chain and economic disruptions. [EPA-HQ-OAR-2022-0985-1555-A1, p. 77]

Although H2-ICE technology is promising, it is in an infant state, and near-term penetration potential is relatively low. By developing a regulatory framework that facilitates H2-ICE development, EPA could speed the adoption of such technology. This could be achieved by eliminating regulatory obstacles to market introduction of H2-ICEs. Specifically, EPA should use the opportunity presented in this rulemaking to create a favorable regulatory environment for these engines by providing relief in areas such as DF testing, GHG certification and testing requirements (under Parts 1036 and 1037), and expensive diagnostic requirements. [EPA-HQ-OAR-2022-0985-1555-A1, p. 78]

H2-ICE is a promising concept, with effectively zero CO2 emissions and extremely low criteria pollutant emissions. [EPA-HQ-OAR-2022-0985-1555-A1, p. 78]

DTG has performed a concept study of H2-ICE by converting a diesel engine to adapt all the relevant hardware components to accommodate H2 combustion. The results are shown in Figure 11. Along with effectively zero CO2 emissions, near-zero NOx emissions are also possible with H2-ICE innovative technology. Engine-out NOx levels are extremely low when compared to diesel emissions, and the temperatures created are extremely favourable for adapting existing SCR aftertreatment technologies—leading to further NOx reductions. [EPA-HQ-OAR-2022-0985-1555-A1, p. 78] [Refer to Figure 11 on p. 78 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Similarly, when measured at the tailpipe, CO2 emissions from these vehicles are extremely low—two orders of magnitude lower than a conventionally-fueled heavy duty engine. Figure 12 below shows a typical breakdown of CO2 emissions as measured at the tailpipe of an H2-ICE. Most of these emissions are ambient in nature (e.g., from the ambient air, or from the carbon content of urea) and do not represent a net increase of CO2 to the environment. EPA already allows the removal of background CO2 from emissions calculations; in these conditions, H2-ICE engines are as close as practical to zero, and are competitive with BEVs and FCEVs from a total carbon lifecycle perspective. Accordingly, DTNA supports EPA's proposal to declare H2-ICE engines as zero CO2. [EPA-HQ-OAR-2022-0985-1555-A1, p. 78] [Refer to Figure 12 on p. 79 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Other regulatory bodies already provide regulatory relief for H2-ICE engines, incentivizing their adoption. [EPA-HQ-OAR-2022-0985-1555-A1, p. 79]

As manufacturers move aggressively towards decarbonization, global consistency in the regulatory approach to ZEVs is essential to provide the certainty and predictability necessary to spur investment, especially in markets that are likely to adopt such technologies first. European Union (EU) regulators have already recognized the advantages of H2-ICE engines, and the EU framework provides a path for these engines to be certified as 'zero-emission heavy-duty vehicles' by defining such vehicles as follows:

- 'Zero-emission heavy-duty vehicle' means a heavy-duty vehicle without an internal combustion engine, or with an internal combustion engine that emits less than 1 g CO 2 /kWh as determined in accordance with Regulation (EC) No 595/2009 and its implementing measures, or which emits less than 1 g CO 2 /km as determined in accordance with Regulation (EC) No 715/2007 of the European Parliament and of the Council and its implementing measures.146 [EPA-HQ-OAR-2022-0985-1555-A1, p. 79]

  146 See Regulation (EU) 2019/1242, Art. 3(11) (June 20, 2019).

It is also expected that the EU regulations will be further updated to more explicitly recognize these engines as a zero-emission technology. Such recognition provides significant benefits for manufacturers by reducing regulatory burdens, as well as development and certification costs, and by otherwise incentivizing commercialization. [EPA-HQ-OAR-2022-0985-1555-A1, p. 79]

Similarly, CARB ZEV standards for passenger cars and light-duty trucks already recognize extremely low-emissions from H2-ICEs, providing a mechanism for manufacturers to generate credits for producing such vehicles that can be applied towards their ZEV sales obligations:

- (E) Credit for Hydrogen Internal Combustion Engine Vehicles. A hydrogen internal combustion engine vehicle that meets the requirements of subdivision 1962.2(c)(2) and has a total range of at least 250 UDDS miles will earn an allowance of 0.75, which may be in addition to allowances earned in subdivision 1962.2(c)(3)(A), and subject to an overall credit cap of 1.25.147 [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

  147 See 13 CCR § 1962.2(c)(3)(E).

We recommend that EPA recognize, as CARB and the EU have, the potential of H2-ICE engines to play an important role in the zero-emission transition, and to take further steps to reduce regulatory burden and incentivize manufacturers to introduce this technology. As a global manufacturer with deep roots in U.S. and European markets, Daimler Truck AG and DTNA support global alignment in recognizing H2-ICE as a zero-emission technology. [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

DTNA supports EPA's proposal to declare neat H2-ICE as zero-CO2. EPA could further reduce manufacturer burden, and thereby accelerate the penetration of zero-CO2 technologies in the commercial truck sector, by removing the most costly and onerous engine certification requirements. [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

Currently the market for H2-ICE technology, especially in the near-term, is limited. Since H2 infrastructure does not exist in any significant quantity, it is expected that manufacturers will face difficulties recouping their H2-ICE investment costs, and a high regulatory burden may prevent manufacturers from bringing these technologies to market. [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

In the Proposed Rule, EPA proposes to declare H2-ICE products as zero-CO2 without the need to perform costly GHG testing—for engine regulations or for their input to vehicle certification. EPA rightly recognizes that these engines emit nearly zero CO2, with any CO2 almost entirely from ambient environmental sources. DTNA supports these proposed changes as a minimum step to help enable H2-ICE penetration. [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

By making additional changes to how H2-ICE vehicles are certified, EPA could further reduce regulatory burdens in a manner that would help to ensure the success of these new technologies, enabling immediate carbon reductions at low cost and while preserving American jobs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

First, we recommend that EPA recognize vehicles powered by H2-ICEs as effectively zero-emission, placing them in a category similar to BEVs and FCEVs, which do not require costly certification, demonstration, diagnostic, and compliance requirements. The Company does not believe such compliance obligations have any value with respect to H2-ICE emissions performance, since the engines already emit effectively no CO2, NOx, PM, and other constituent pollutants of concern—even in degraded or failed states, based on the fundamental physics governing this combustion cycle and fuel. ZEV recognition for these products would significantly incentivize their production, as they would qualify for emissions credits and advanced credit multipliers in the same manner as BEVs and FCEVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 80]

Alternatively, if EPA decides to continue to require H2-ICEs to be certified under its program for traditional combustion engines, we recommend that EPA significantly reduce the certification burden by making the following modifications to its certification requirements:

- Reduced DF validation burden and Durability requirements.
    - DF validation is extremely expensive and burdensome, and carries a several-year lead-time to complete for new technologies.
    - EPA could allow manufacturers to attest to durability and useful life requirements.
    - EPA could consider an assigned DF for criteria pollutants for H2-ICE engines.
    - EPA could consider a reduced Useful Life standard for H2-ICE in the HHD category, consistent with how SI engines in the LHD and MHD categories are treated. [EPA-HQ-OAR-2022-0985-1555-A1, p. 81]
- Simplified OBD regulation.
    - The development and demonstration of an OBD system, as required in EPA's Section 1036.110, is extremely time consuming, expensive, and risky for manufacturers.
    - It also drives significant material cost to the engine, as sensors are added purely for the purpose of diagnostic requirements.
    - The combustion mechanisms of an H2-ICE mean that, even in a failed condition, increased emission potential is extremely limited. CO2, PM, and hydrocarbon emissions are effectively zero in any combustion regime with H2 fuel, and even in the case of a failed catalyst, engine-out NOx emissions are extremely low with this technology. The value of an OBD system in an H2-ICE-powered vehicle is extremely limited—especially when considered in light of its cost.
    - EPA could reduce this burden by requiring the OBD system only to detect circuit faults and failed actuators—which make up the vast majority of real world failures—and avoid requirements for threshold diagnostics and rationality checks which add cost and complexity and are onerous to develop and demonstrate.
    - At a minimum, EPA should allow manufacturers to propose an alternate monitoring plan for H2-ICE engines, avoiding monitors for failures which good engineering judgement shows a significant impact to emissions is unlikely or impossible. If a manufacturer can demonstrate, either with good engineering judgement, or with testing, that a particular failure mode cannot cause the engines emissions to exceed the thresholds regulated in 1036.110, the EPA should exempt the manufacturer from monitoring for those failure modes.[EPA-HQ-OAR-2022-0985-1555-A1, p. 81]

EPA has an important opportunity in this rulemaking to encourage the development of technologies with effectively zero CO2 emissions today, in applications that might not otherwise be ripe for ZEV penetration in the foreseeable future. DTNA recommends that EPA work with manufacturers to determine the best path to enable these technologies. [EPA-HQ-OAR-2022-0985-1555-A1, p. 81]

EPA Request for Comment, Request #42: We welcome comment, including additional data, on our approach and assessment of HD ICE vehicle M&R costs.

- DTNA Response: See DTNA Response to Request # 20, above. [Refer to section 2 of this comment summary] [EPA-HQ-OAR-2022-0985-1555-A1, p. 165]

EPA Request for Comment, Request #70: We request comment on this proposed revision to include H2 ICE in 40 CFR 1037.150(f).

- DTNA Response: DTNA supports EPA's proposal to include H2-ICE engines in 40 CFR 1037.150(f), as discussed in Sections II and IV.A. of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172]

Organization: Environmental Defense Fund (EDF)

c) H2 ICE vehicles emit NOx and should not be considered full ZEVs.

While BEVs and FCEVs do not generate any intended emissions at the tailpipe, H2-ICE vehicles still emit nitrogen oxides (NOx) and should be required to employ aftertreatment devices analogous to those required for diesel engines (primarily SCR). Even if EPA considers H2-ICE vehicles as a carbon-free technology, they should not be considered a full ZEV. [EPA-HQ-OAR-2022-0985-1644-A1, 86]

Organization: Manufacturers of Emission Controls Association (MECA)

Hydrogen-Fueled Internal Combustion Engines

Another promising technology that is being commercialized to both reduce the NOx and carbon footprint of heavy-duty vehicles is the hydrogen internal combustion engine (H2ICE). These engines, when coupled with advanced NOx aftertreatment, have the potential to meet the MY 2027 NOx limits while emitting zero tailpipe carbon emissions when operated on hydrogen fuel and zero lifecycle carbon emissions when operated on renewable green hydrogen. There is broad industry support for internal combustion engines fueled with clean hydrogen and most engine manufacturers and component suppliers are conducting significant development work and testing with ongoing on-road demonstrations in Europe and North America. H2ICEs are attractive options for commercial trucking where challenges exist in applying current BEV or H2FC technology. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 8 - 9]

One of the main benefits of H2ICE is their lower upfront capital costs due to the leveraging of existing investments in manufacturing capacity in engines, emission controls and powertrain as well as vehicle servicing. H2ICE vehicles share many components with today's diesel and natural gas-powered vehicle fleet, including the base engine, installation parts, powertrain components and aftertreatment system architectures. Furthermore, H2ICE can borrow technology from currently available natural gas engines, such as cylinder heads, ignition systems, fuel injection, turbochargers, cooled exhaust gas recirculation (EGR), and engine control unit/software, among others. Nearly all on-road and off-road engine OEMs, along with their suppliers, are developing H2ICE for commercial introduction in the MY 2026-2027 timeframe. [EPA-HQ-OAR-2022-0985-1521-A1, p. 9]

Suppliers of on-vehicle hydrogen storage tanks are looking at this H2ICE transition technology to grow the manufacturing capacity for 350 bar and 700 bar high pressure hydrogen tanks and bring down their costs. This will accelerate the introduction of fuel cell trucks that will rely on the same high pressure fuel tanks and hydrogen infrastructure that they will share with H2ICE trucks. Truck and engine manufacturers are targeting the introduction of H2ICE trucks at least 10 years before fuel cell trucks will become cost competitive. The early introduction of H2ICE trucks will help to accelerate the build-out of the hydrogen infrastructure and allow fleets to seamlessly transition from operating H2ICE trucks to operating fuel cell trucks in their fleet. [EPA-HQ-OAR-2022-0985-1521-A1, p. 9]

Organization: MEMA

Furthermore, EPA should support both hydrogen fuel cell technology and H2ICE because they complement the overall deployment of hydrogen infrastructure. FCEV and H2ICE address different vehicle use cases; however, both utilize the same hydrogen infrastructure. [EPA-HQ-OAR-2022-0985-1570-A1, p. 5]

MEMA supports EPA's proposal to include H2ICE in the GEM model credited as a zero CO2 technology. MEMA believes H2ICE has potential as another technology that fits within a performance-based standard regulatory framework to decarbonize applications that are more challenging to electrify from a performance standpoint. H2ICE holds promise as a bridge technology to encourage building out hydrogen infrastructure that will be shared with FCEV applications. [EPA-HQ-OAR-2022-0985-1570-A1, p. 15]

We also note that the California Air Resources Board has few exceptions, most temporary, for ICE in its Advanced Clean Fleets' program and ask EPA to encourage CARB to respect technological limitations and provide more exceptions beyond case-basis. [EPA-HQ-OAR-2022-0985-1570-A1, p. 15]

Recommendation: EPA should retain the technology multiplier for FCEV and include H2ICE in the GEM model with zero CO2 emissions. EPA should also encourage CARB to find space for H2ICE within its ZEV mandate regulatory structure which is set up to allow exemptions from conventional ICE to fill technology readiness gaps. [EPA-HQ-OAR-2022-0985-1570-A1, p. 15]

Organization: Moving Forward Network (MFN) et al.

EPA must not allow alternative combustion fuels ("false solutions") to be included in their zero-emission definition. Instead, EPA should adhere to the precautionary approach, which turns traditional environmental policy on its head. Instead of asking, "How much harm is allowable?" the precautionary approach asks us to consider, "How little harm is possible?" The precautionary approach urges a full evaluation of available alternatives to prevent or minimize harm. 90 [EPA-HQ-OAR-2022-0985-1608-A1, p. 38]

90 Rachel's Democracy & Health News (formerly Rachel's Environment & Health News). #770 -- Environmental Justice and Precaution, May 29, 2003. (July 31, 2003). http://web.archive.org/web/20071219020722/http://www.rachel.org:80/bulletin/index.cfm?issue_ID=2359 any discussion must include specific parameters.

Since the Agency focuses solely on reducing CO2 the Agency focuses solely on reducing CO2 and not cumulative impacts and other pollutants, harmful technologies like hydrogen combustion technologies and natural gas remain options. Although hydrogen combustion technology may not produce CO2 when combusted, it does produce other pollutants, including nitrogen oxide (NOx) emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 38]

Unfortunately, the Agency's proposal does not appropriately take into account the impact hydrogen combustion engines will have on the communities this rule is meant to protect. For example, EPA's proposal accounts for hydrogen ICE vehicles as having zero tailpipe emissions, even though upstream emissions from the production and distribution of hydrogen can be significant. This is particularly concerning because 99 percent of hydrogen is produced from fossil fuels, and only 0.02 percent of hydrogen produced today is green hydrogen (derived from using 100% renewable energy to split hydrogen from water molecules). 91 [EPA-HQ-OAR-2022-0985-1608-A1, p. 38]

91 Sasan Sadaat and Sara Gersen. Reclaiming Hydrogen for a Renewable Future. (August 2021). p. 21-30. https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice_2021.pdf.

Additionally, hydrogen (despite the color; blue, green, etc.) itself can indirectly contribute to greenhouse gas emissions through leakage from within its infrastructure system throughout the various lifecycle stages (e.g., storage, refueling, and transportation stages). According to a 2022 study on the climate consequences of hydrogen leakage, hydrogen leakage may significantly diminish the climate benefits linked to hydrogen. In fact, if leaks are high …fossil-derived hydrogen may initially yield more warming than would the use of the fossil fuel system it replaces. 92 There was a study by the International Council on Clean Transportation (ICCT) that analyzed the life cycle greenhouse gas emissions of hydrogen across eleven hydrogen pathways. This study found that a wide range of carbon intensities exist and also found that some methods have an even greater carbon intensity than diesel fuel (e.g., coal gasification). 93 [EPA-HQ-OAR-2022-0985-1608-A1, p. 38]

92 Ilissa B. Ocko and Steven P. Hamburg. Climate consequences of hydrogen emissions. Atmos. Chem. Phys. V. 22. Iss. 14. p. 9349–9368. (2022). https://doi.org/10.5194/acp-22-9349-2022

93 ICCT. Life Cycle Analysis of Greenhouse Gas Emissions of Hydrogen, and Recommendations for China. (October 19, 2022). https://theicct.org/publication/china-fuels-lca-ghgs-hydrogen-oct22/

EPA should apply the precautionary principle when thinking about compliance pathways and structure this regulation to provide certainty that alternative, safer, and more environmentally friendly and truly zero-emissions options for transportation are applied. A pathway to ensure this could be by incentivization of EVs powered by increasingly renewable electricity. Another such regulatory design strategy is a multipollutant rule which would set vehicle emissions standards not just for greenhouse gas emissions, as proposed, but for NOX and PM2.5 as well. This is the strategy currently deployed by the administration for light- and medium-duty vehicles (88 FR29184-446), and a design for a heavy-duty program easily integrated into the agency's current regulatory structure was presented to EPA as part of the EO 12866 process for the Phase 3 GHG rule. 94 [EPA-HQ-OAR-2022-0985-1608-A1, p. 39]

94 Union of Concerned Scientists. EO 12866 Meeting 2060-AV50. UCS - Multipollutant HDV proposal - 2023-03-15.pdf. (March 15, 2023). https://www.reginfo.gov/public/do/eoDownloadDocument?pubId=&eodoc=true&documentID=213242.

Regardless of the hydrogen fuel type (green, blue, or otherwise), it is clear that combustion-based hydrogen technology allows for direct and unintended consequences and harm to environmental justice communities as a heavy-duty vehicle fuel source. [EPA-HQ-OAR-2022-0985-1608-A1, p. 39]

In addition, it appears that EPA did not account for emissions from petroleum refineries in analyzing the scenarios due to potential uncertainty about refinery behavior due to reduced diesel demand. However, leaving out the potential benefits from reduced demand for diesel (and reduced refining of petroleum producers needed) undercuts the overall emission reduction benefits (and climate and public health benefits) from switching to battery electric trucks on an increasingly cleaner grid. In contrast, emissions from hydrogen that may largely be produced by SMR technologies at refineries (even with the Inflation Reduction Act investments) would also not be captured in EPA's analysis. EPA's assumptions that the historical investments from Congress will lead to a shift to cleaner hydrogen production pathways as well as manufacturer compliance through ZEVs is insufficient, especially since the proposed rule structure doesn't include upstream emissions accounting - which would provide increased certainty that compliance would occur through truly clean technologies. The basis for this assumption alone is wholly insufficient, and the Agency must finalize a version of the rule that appropriately addresses this and discourages compliance by using technologies that will continue to pollute communities and harm the public. [EPA-HQ-OAR-2022-0985-1608-A1, p. 39]

EPA's current, ill-conceived crediting of H 2 ICEVs as 0 g/ton-mile is inconsistent with these vehicles' climate and public health impact, as noted in Section 7.3.2. When fueled by today's dominant source of hydrogen (as identified by EPA, DRIA Figure 1-11), H2 ICEVs have virtually no climate benefit over a Phase 2 diesel vehicle, and there is no public health benefit regardless of the source of the fuel. This suggests that EPA's current regulatory approach to H2 ICEVs is misguided and misaligned with the Agency's requirement under the Clean Air Act to "establish emission standards for air pollutants from new motor vehicles or new motor vehicle engines, which, in the Administrator's judgment, cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare." [EPA-HQ-OAR-2022-0985-1608-A1, p. 39]

While we do not support using natural gas as a fuel source, we note that EPA acknowledged the need for an assessment process that could better account for lifecycle impacts. To assess the path forward for H 2 ICEVs, the Agency should consider its approach to natural gas vehicles in Phase 2. In that case, the Agency conducted a thorough lifecycle analysis of CNGVs and LNGVs to assess the full lifecycle harms compared to diesel (Phase 2 FRIA, Chapter 13). EPA then adopted specific test procedures for CNGVs and LNGVs to mitigate the upstream harms from the vehicles (81 FR 73931). Finally, EPA adopted standards that "in essence, applies a one-to-one relationship between fuel efficiency and tailpipe CO2 emissions for all vehicles, including natural gas vehicles" (81 FR 73524). In the case of hydrogen combustion, EPA is now proposing to break with its prior approach. Given the evidence on the lifecycle impacts of H 2 ICEVs, EPA should instead hew to a model that treats energy efficiency of the gaseous fuel equivalently for combustion vehicles. In this way, manufacturers could still submit a fuel map (g/s), and then for certification purposes, the g/s hydrogen would be converted to an energy-equivalent consumption of gasoline or diesel, depending on the intended service class and engine cycle (40 CFR § 1036.140). The CO2 rates for certification would then be based on the rates for the diesel or gasoline-equivalent engine, using the respective CO2 rates for diesel or gasoline. [EPA-HQ-OAR-2022-0985-1608-A1, p. 40]

EPA already allows manufacturers to use fuel flow rate as a determinant in establishing CO2 measurements, so this alteration fits within EPA's well-established Phase 2 test procedures. This would simply adopt a corrective factor for use within GEM for vehicle certification to more accurately reflect the relative emissions impacts of H 2 ICEVs with other combustion-powered vehicles. [EPA-HQ-OAR-2022-0985-1608-A1, p. 40]

To account for tailpipe pollution from combustion vehicles, we have used data traces from the GEM-modeled truck runs to obtain information about engine loads. For today's diesel vehicles, we have largely relied upon the updated MOVES model to reflect the latest real-world information for levels of pollution at different engine operating conditions. For future combustion vehicles, we have accounted for the real-world emissions required under the in-use standards for EPA's latest emissions standards for heavy-duty engines, including additional emissions allowance under the temperature adjustment and interim adjustment. These tailpipe emissions are considered over the average lifetime of the vehicle, accounting for differences in warranty and lifetime requirements for emissions controls but acknowledging, as EPA's MOVES model does, that emissions control equipment is susceptible to tampering and mal-maintenance, particularly outside the mandated warranty period. Obviously, for electric trucks, tailpipe emissions remain zero throughout the vehicle's entire lifetime. To assess upstream emissions from the grid, we use the latest version of EPA's eGRID model (eGRID2021). For future grid emissions, we rely primarily on modeling done by the National Renewable Energy Laboratory (NREL) for its Cambium project. 100 For all sources of energy, we use the latest version of the GREET model to estimate the upstream emissions of all pollutants of concern. 101 [EPA-HQ-OAR-2022-0985-1608-A1, p. 43-44]

100 Gagnon, P., et al. Cambium Documentation: Version 2021. Technical Report NREL/TP-6A40-81611. (2021). https://www.nrel.gov/docs/fy22osti/81611.pdf.

101 Argonne National Laboratory. The Greenhouse Gases, Regulated Emissions, and Energy use in Technologies (GREET) Model. Version 2022 rev 1. (2022). https://greet.es.anl.gov/.

7.3. Emissions of gaseous-fuel powered trucks

BEVs are not the only non-diesel technology considered by EPA in the proposed rule—hydrogen is identified as a potential alternative fuel, either through vehicles powered by hydrogen internal combustion engines (H 2 ICEVs) or through fuel cell electric vehicles (FCEVs). Additionally, combustion vehicles powered by compressed methane (compressed natural gas vehicles, or CNGVs) are an alternative considered in the Agency's Phase 2 and Phase 3 rulemakings. [EPA-HQ-OAR-2022-0985-1608-A1, p. 47]

7.3.2. Assessing the impact of hydrogen-powered vehicles

While there are no direct tailpipe emissions from FCEVs, H2 ICEVs emit both NOx and PM2.5 directly. The available data indicate that such engines will need emissions controls (at the very least, exhaust gas recirculation 105) to achieve the required level of emissions for combustion engines finalized last year, just as their diesel counterparts. Thus we assume, as in the case for future diesel vehicles, that direct emissions will exactly achieve the real-world requirements of those standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 48]

105 Section 7.1.1 in North American Council for Freight Efficiency (NACFE). Hydrogen trucks: Long haul's future? (2023). https://nacfe.org/research/electric-trucks/hydrogen/.

There are additional impacts from hydrogen throughout its life cycle–from creation, storage, transportation, and waste–and those impacts remain uncertain. The infrastructure for developing this fuel is likely to put already overburdened communities at risk based on the historical precedent of other fueling infrastructure. To assess the impacts of hydrogen-fueled trucks, we utilize the default values in GREET, as above, to assess the upstream emissions associated with the production and distribution of hydrogen. [EPA-HQ-OAR-2022-0985-1608-A1, p. 48]

In order to assess the potential harms or benefits of hydrogen-powered trucks, we consider two different possible sources for hydrogen representing the predominant source of hydrogen today, produced from cracked methane gas and a more sustainable form of hydrogen, produced from electrolysis and powered by solar energy. For both of these cases, we have assumed the hydrogen is produced in central plants, which is the dominant method of producing hydrogen today. This hydrogen must then also be compressed and transported for sale. [EPA-HQ-OAR-2022-0985-1608-A1, p. 48]

For efficiency, we assume that H2 ICEVs will achieve the same level of energy efficiency as a Phase 2 diesel truck—while this may be optimistic since the thermal efficiency of an Otto-cycle engine is significantly less than a compressed-ignition engine, the limited data on H 2 ICEVs does seem to indicate this as reasonable. 106 For the efficiency of the fuel cell, we use the vehicle-level efficiency of the BEV (i.e., excluding charger-related losses) and assume a fuel cell efficiency of 60 percent based on data from light-duty FCEVs. 107 [EPA-HQ-OAR-2022-0985-1608-A1, p. 48]

106 Section 7.1.1 in NACFE. (2023).

107 Kurts, J. et al. Fuel cell electric vehicle durability and fuel cell performance. Technical report NREL/TP-5400-73011. (2019). https://www.nrel.gov/docs/fy19osti/73011.pdf.

Greenhouse gas emissions and public health impacts for drayage trucks are summarized in Figure 6. These data make clear that not only does the production method of hydrogen matter, but the type of vehicle in which it is deployed is critical in determining the harms of that fuel. Most importantly, if H2 ICEVs are fueled on hydrogen from natural gas, they would provide virtually no benefit to the climate over a Phase 2-compliant diesel vehicle, and the public health impacts from such a vehicle could actually be worse. Consistent with EPA's approach in Phase 2, CNGVs are found to be roughly comparable to diesel trucks in terms of greenhouse gas emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 49] [Refer to Figure 6, Comparison of drayage trucks powered by different fuels on p. 49 of docket number EPA-HQ-OAR-202-1608-A1.]

When it comes to the greenhouse gas emissions from hydrogen-powered trucks, today's dominant form of hydrogen is virtually indistinguishable from diesel: the only climate benefit from FCEVs comes as the result of the substantial improvement in efficiency resulting from an electric powertrain, and for H2 ICEVs there is almost no climate benefit whatsoever over Phase 2. Regarding public health, the adverse impacts of fossil fuel extraction are notable—for H2 ICEVs powered by hydrogen generated from methane, the public health outcomes are actually worse than diesel. Even if hydrogen for these vehicles were made from electrolysis powered by solar energy, the processing steps involved in compressing and distributing the fuel would still yield significant harm such that for an H2 ICEV the direct impacts would be just as harmful as a future diesel truck. The lack of tailpipe emissions and more efficient use of hydrogen mitigate some of these factors in an FCEV, which shows an emissions profile more comparable to a BEV. However, even in an FCEV there is a more than a two-fold increase in harm if the hydrogen is generated from methane as opposed to solar-powered electrolysis. [EPA-HQ-OAR-2022-0985-1608-A1, p. 49]

It is clear from this analysis that H2 ICEVs are no better than diesel trucks when it comes to public health and has no climate benefits over Phase 2 vehicles when fueled by the dominant source of hydrogen today. Their treatment under the Phase 3 program should be comparable to other combustion vehicles rather than vehicles that lack tailpipe emissions (see Section 6.4). [EPA-HQ-OAR-2022-0985-1608-A1, p. 50]

9.1.3. Hydrogen combustion engines

EPA has acknowledged the existence of vehicles powered by hydrogen combustion engines (H2 ICEVs), but the agency has misstated the emissions impacts of these vehicles. As noted earlier, H 2 ICEVs emit PM 2.5, contrary to the Agency's assertion. 123 This is a critical oversight because of the importance of particulate matter with respect to public health. While gaseous H 2 fuel lacks hydrocarbons, there is a significant body of research on hydrogen combustion showing that particulate matter is generated in the combustion process, most likely from the lubricants. 124 In fact, in-cylinder direct injection of hydrogen, which avoids the substantial power losses of pre-cylinder injection and enhances the efficiency of the engine, can lead to even greater PM 2.5 emissions than a gasoline engine. 125 [EPA-HQ-OAR-2022-0985-1608-A1, p. 67]

123 H2–ICE is a technology that produces zero hydrocarbon (HC), carbon monoxide (CO), and CO2 engine-out emissions. 88 Fed. Reg. at 25960.

124 Miller, A.L., et al. Role of lubrication oil in particulate emissions from a hydrogen-powered internal combustion engine. Environ. Sci. Technol. V. 41. No. 19. (2007). p. 6828-6835. https://doi.org/10.1021/es070999r.

125 Thawko, A., and L. Tartakovsky. The mechanism of particle formation in non-premixed hydrogen combustion in a direct-injection internal combustion engine. J. Fuel. V. 327. (2022). p. 125187. https://doi.org/10.1016/j.fuel.2022.125187.

Cummins, the largest engine manufacturer in the United States, has announced plans to bring a direct-injection engine to market in the timeframe of EPA's proposed rule. 126 Yet, the Agency has excluded them from its analysis. As the Agency astutely acknowledges, manufacturers have a predilection towards the deployment of H2 ICEVs: they take advantage of assets that are already being utilized for the production of diesel engines. 88 Fed. Reg. at 25960. As a recent ICCT report shows, H2 ICEVs have a total cost of ownership advantage over FCEVs under low hydrogen prices. Given the clear incumbency advantage for the combustion platform vis-à-vis manufacturers' investments, it is likely that, even under a hydrogen price where FCEVs offered a theoretical TCO advantage, manufacturers may neglect to give purchasers such a choice, particularly when there is no regulatory advantage. [EPA-HQ-OAR-2022-0985-1608-A1, p. 67]

126 Wolfe, M. Hitting the gas on hydrogen tech for commercial trucks. SAE International. (May 3, 2022). https://www.sae.org/news/2022/05/hydrogen-technology-commercial-trucks.

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Hydrogen Internal Combustion Engines

Hydrogen internal combustion engines are listed as a potential technology for compliance with the GHG standards. We request that EPA further evaluate the disbenefits associated with using hydrogen-fueled ICEs. NOx emissions related to hydrogen combustion should be more fully evaluated prior to finalizing the rule. We note that with the persistent ground-level ozone problems in the Northeast Corridor and other urban areas across the country where on-road transportation emissions dominate the NOx emissions inventory, NOx emissions from hydrogen combustion in ICEs can delay progress towards achieving ozone air quality standards. In addition, hydrogen-fueled ICE vehicles will use considerably more hydrogen than FCEVs and have greater leakage potential of hydrogen within the fueling infrastructure. Because of this, there can be significant issues with hydrogen ICEs related to use of scarce resources of low carbon hydrogen and greater upstream emissions associated with the production and transport of hydrogen. We request EPA evaluate these issues prior to finalizing the rule and institute production caps for hydrogen-fueled ICEs if the issues cannot be fully evaluated.[EPA-HQ-OAR-2022-0985-1562-A1, p. 13-14]

Organization: Westport Fuel Systems

Westport supports the reduction of transportation emissions and is continually working to create products that reduce emissions, especially in hard to decarbonize sectors, such as long-haul heavy-duty applications. We understand the importance of setting standards on CO2 emissions but stress the importance of creating a level playing field and leaving space for a variety of technologies including those that utilize combustion technologies. [EPA-HQ-OAR-2022-0985-1567-A1, p. 1]

Compared to a reference diesel heavy-duty truck, analysis of purely tailpipe CO2 (Tank To Wheel, TTW) yields the expected 100% reduction via FCEV. The H2 HPDI ICE vehicle exhibits very high tailpipe CO2 reductions (93% to 95%) but falls short of the zero tailpipe CO2 metric used in the majority of policies due to the use of small quantities of diesel for ignition, the use of which is fundamental to the high efficiency and power density of H2 HPDI compared to H2 spark ignition ICE. [EPA-HQ-OAR-2022-0985-1567-A1, p.4]

Due to the high efficiency of HPDI, H2 HPDI can deliver equivalent CO2 reductions as fuel cell vehicles, though even with green hydrogen neither technology results in zero CO2 on a Well to Wheel basis including vehicle manufacturing emissions. [EPA-HQ-OAR-2022-0985-1567-A1, p. 4]

While the transition to battery electric vehicles or fuel cell electric may be appropriate in some lighter vehicle classes, it is not yet viable for Class 8 sleeper cabs. Flexibility to acknowledge the benefits of advanced combustion technologies is needed to create space for low emissions vehicles in this segment. In the Rule, the EPA has addressed hydrogen combustion ICEs and has acknowledged CO2 emissions benefits from mono fuel hydrogen engines, however it has not defined the role of Hydrogen ICE technologies that utilize pilot fuel. [EPA-HQ-OAR-2022-0985-1567-A1, p. 5]

To fully recognize the benefits of hydrogen ICE vehicles in reducing heavy duty truck emissions, we propose the following options and their details for consideration and further discussion.

1. Adopt the European Union proposed definition of ZEV, which encompasses hydrogen combustion engines and vehicles.

OR

2. Recognize vehicles with less than 10% energy use as a pilot fuel perform the same as monofuel hydrogen combustion engines and designate them as having zero CO2 emissions.

OR

3. Create a new category for near zero emissions heavy-duty vehicles that are powered by internal combustion engines and pilot fuel of less than 10%. [EPA-HQ-OAR-2022-0985-1567-A1, p. 5]

1. The EU Approach to Hydrogen Combustion Heavy Duty Vehicles

In February 2023, as part of the review of its CO2 Standards for heavy-duty vehicles, the European Commission has proposed the following definition of zero-emission heavy-duty vehicle:

‘zero-emission heavy-duty vehicle’ means a heavy- duty motor vehicle with not more than 5 g/(t.km) or 5 g/(p.km) of CO2 emissions as determined in accordance with Article 9 of Regulation (EU) 2017/2400. [EPA-HQ-OAR-2022-0985-1567-A1, p. 6]

which is a change from the previous limit of 1 g CO2/kWh. This change was proposed because it was found that due to the “heterogenous structure of the total truck fleet”, it wasn’t “possible to fully predict whether for all niche uses, technological developments will be quick enough to ensure that zero-emission tailpipe technology is a viable choice.” The importance of this is to highlight that some flexibility in regulation is being proposed to allow for future technologies that may be needed to accommodate different vehicle types and uses, and that a one size fits all approach may not be in the best interest of reducing overall emissions. This designation also impacts the ability of vehicles to qualify for incentives. [EPA-HQ-OAR-2022-0985-1567-A1, p. 6]

Access to the ZEV label is critical to the customer value proposition. The proposed ZEV definition will provide regulatory and economic support to a wider portfolio of technologies, leading to higher market adoption of high performing, CO2 reducing solutions in the new vehicle market. It offers the potential for heavy-duty vehicles powered by different H2 ICE technologies, including both monofuel hydrogen and H2 HPDI engines, to be considered as ZEV. [EPA-HQ-OAR-2022-0985-1567-A1, p. 6]

For the European market, regulatory approaches are also being developed for the type-approval of hydrogen combustion engines, both monofuel hydrogen and H2 HPDI which is being considered as a type of dual fuel engine “Type 1A” according to UNECE Regulation 49 (R49). This is a specific designation for engine technologies that use less than 10% diesel fuel over parts of the test cycle and do not idle on diesel nor have a diesel operational mode. The operation of H2 HPDI equipped engines share many similarities with that of monofuel, especially in regard to power output being purely determined by control of hydrogen injection. [EPA-HQ-OAR-2022-0985-1567-A1, p. 6]

Table 1 below has been provided to illustrate a comparison of the attributes of a Hydrogen monofuel ICE and H2 HPDI based on an EU analysis on EU vehicle classes but still provides relevant information for the EPA. [EPA-HQ-OAR-2022-0985-1567-A1, p. 6.] [See Docket Number EPA-HQ-OAR-2022-0985-1567-A1, page 7, for Table 1.]

Preliminary testing of the H2 HPDI product has so far been conducted using European engine test cycles and protocols. As Table 1 illustrates, initial testing using European test cycles has estimated that CO2 emissions are reduced by approximately 93% to 95% relative to diesel engines. Tailpipe emissions including aftertreatment are estimated to be 30-40 g/kWh. Of note, the Well to Wheel CO2 reduction relative to diesel is the same as for hydrogen monofuel ICE engines. It is also expected to be very similar to FCEVs. [EPA-HQ-OAR-2022-0985-1567-A1, pp. 6 - 7]

Additional preliminary data has established that the system exhibits attributes that are equivalent or better than monofuel engines in key areas, such as higher efficiency, power density and equivalent well to wheel CO2 reductions as monofuel engines (the higher efficiency of H2 HPDI compensates for the WTW CO2 impacts of the pilot fuel). [EPA-HQ-OAR-2022-0985-1567-A1, p. 7]

Going back to the EPA Rule, Westport estimates that on average vehicles equipped with the H2 HPDI system will be more that 90% lower than the MY 2032 fleet target for the Class 8 vehicle class as illustrated in the proposed rule. Further testing using appropriate US test cycles must be conducted for more accurate results. [EPA-HQ-OAR-2022-0985-1567-A1, p. 7]

2. Recognize Hydrogen ICE Vehicles with less than 10% Pilot Fuels as Zero CO2 Emissions in the Same Way As Monofuel Hydrogen ICE [EPA-HQ-OAR-2022-0985-1567-A1, p. 8]

The EPA in the Phase 3 Rule has addressed the development of mono fuel hydrogen combustion technologies but has not provided a pathway for evaluating other combustion technologies such as those that use pilot fuels. [EPA-HQ-OAR-2022-0985-1567-A1, p. 8]

In the Rule, monofuel hydrogen combustion engines using “neat’ hydrogen are considered to have no engine out emissions and it is being proposed that their tailpipe emissions are “deemed to be zero” for CO24. Westport proposes that this treatment be extended to other hydrogen combustion technologies including those with pilot fuels of 10% or less. [EPA-HQ-OAR-2022-0985-1567-A1, p. 8]

4 See: Phase 3 Proposed Rule, page 26022, section ii. Vehicles With Engines Using Fuels Other than Carbon Containing Fuels and page 25958, Section II, D.1. Technologies to Reduce GHG Emissions From HD Vehicles With ICEs

Given the low emissions expected from H2 HPDI, as illustrated by preliminary results in Table 1 above, it would be reasonable to also consider it as a monofuel (zero CO2) vehicle given the pilot fuel energy used is less than 10% and does not significantly impact CO2 emissions. Remaining combustion emissions are dealt with through aftertreatment systems. [EPA-HQ-OAR-2022-0985-1567-A1, p. 8]

3. Work with Other Agencies to Create a Near Zero Emissions Technology Category for Hydrogen ICEs with Pilot Fuel for the Class 8 Segment [EPA-HQ-OAR-2022-0985-1567-A1, p. 8]

In response to providing feedback that emissions should be less stringent for some market segments where high energy content is needed for certain applications, we urge the EPA to consider the benefits of creating a new class of emission reducing vehicles, "near zero emissions technologies", which would include hydrogen internal combustion engines with diesel pilot to be considered on par with Zero Emissions Vehicles in the Class 8 segment. Broadening the ZEV definition to create a "carve out" for specific vehicle segments such as Class 8, where few options are available until 2032 (25% deployment rate) will allow more technologies with very low CO2 emissions to be recognized as viable technologies in other regulatory and legislative incentive programs (like those implemented by CARB and the IRA) that Phase 3 helps to inform. This action could accelerate the transition of these heavy fuel users away from diesel fuel faster than the proposed timeline of 2030 where EPA shows a 10% adoption rate and 2030 with a 25% rate in this segment. These targets if accurate still leave the remainder of vehicles in this class (75%+) using non-ZEV technologies in 2032. [EPA-HQ-OAR-2022-0985-1567-A1, p. 8]

The H2 HPDI system, having less than 10% diesel, contributes nominally to CO2 emissions. Westport has longer term plans to further reduce the percentage of pilot fuel over time. [EPA-HQ-OAR-2022-0985-1567-A1, p. 9]

The EPA has proposed the introduction of "Neat" hydrogen monofuel vehicles and has combined dual fuel (mixed fuels that contain carbon) and pilot diesel engines5 to determine test procedures. [EPA-HQ-OAR-2022-0985-1567-A1, p. 9]

5 See: Phase 3 Proposed Rule, page 26021, xi. Updates to 40 CFR Part 1036 definitions.

Pilot diesel ignition, such as used in the H2 HPDI is less than 10% of fuel use and thus CO2 and criteria emissions are substantially lower than a diesel ICE vehicle or a traditional dual fuel vehicle. HPDI technology uses diesel for ignition only and it is not mixed with hydrogen as a blend. The CO2 emissions resulting from pilot ignition is considered nominal overall. H2 HPDI cannot operate on diesel fuel alone at any time other than service mode. [EPA-HQ-OAR-2022-0985-1567-A1, p. 9]

Future testing on a full U.S. cycle with mixed loads will be needed to further optimize the system. However, in the interim period before 2032, any technology with at least 90 % reductions in CO2 emissions should be recognized as contributing significantly to emissions reductions efforts and should be considered as near zero. A similar approach was adopted by California relating to low NOx engines, which were given consideration as "near zero" NOx and had access to deployment incentives. Access to incentives has been a key factor in the deployment of all alternative technologies in many markets. [EPA-HQ-OAR-2022-0985-1567-A1, p. 9]

The EPA has already recognized that H2 ICE engines share similar components and can leverage existing manufacturing capabilities and supply chains to produce these products, in addition requiring simpler and smaller aftertreatment systems.6 More hydrogen powered vehicles will also help to build out fuelling infrastructure. [EPA-HQ-OAR-2022-0985-1567-A1, p. 9]

6 See: Phase 3 Proposed Rule, page 25960, Section II, D.1. Technologies to Reduce GHG Emissions From HD Vehicles With ICEs

H2 HPDI has the potential to be production-ready and deployed relatively quickly, given natural gas versions of this technology are commercially available in Europe today. The emissions reduction potential of this technology can be realized sooner than 2030 when EPA projections estimate a ZEV adoption rate of 10% of vehicles in sleeper cab tractors with 15% in 2031 and 25% in 2032. [EPA-HQ-OAR-2022-0985-1567-A1, p. 10]

Development of a US Test Protocol for Pilot Ignited Engines such as H2 HPDI

We encourage the EPA to engage in further discussions and analysis on the benefits of Hydrogen combustion technologies and develop a test protocol for the type approval of pilot ignited engines such as H2 HPDI. [EPA-HQ-OAR-2022-0985-1567-A1, p. 10]

The EPA has proposed changes to engine test procedures 40 CFR part 1037 for certain highway heavy duty engines in 40 CFR parts 1036 and 1065. To our knowledge, there are currently no test procedures for a product like H2 HPDI. As mentioned earlier, in the EU there is a task force focused on H2 ICE, including H2 pilot ignited hydrogen CI engines, to aid in the development of procedures for testing hydrogen combustion engines. It is important to have applicable testing procedures and protocols specifically for hydrogen combustion that recognize that testing is different from procedures established for natural gas or diesel engines and vehicles. In addition, guidelines for equipment may need to be established, because the same equipment used in testing procedures for diesel and natural gas may not be sensitive enough to detect the low emissions produced by hydrogen combustion. In absence of a test procedure, it may not be possible to homologate and commercialize engines equipped with an H2 HPDI fuel system. [EPA-HQ-OAR-2022-0985-1567-A1, p. 10]

EPA Summary and Response:

Summary:

AVE, API, BorgWarner, DTNA, MECA, MEMA, and Westport Fuel Systems commented in support of the changes to 40 1036.150(f) and 40 1037.150(f) deeming CO2 emissions zero for engines fueled with neat hydrogen. In addition, some commenters stated that EPA did not go far enough to support H2-ICE and should deem CO2 emissions zero for engines fueled with neat hydrogen that also have a diesel pilot. These comments included comments from DTNA that we should follow the EU framework, that defines a CO2 emissions level to qualify the engines are deemed to be zero CO2. Westport Fuel Systems commented that engines with less than 10% energy coming from carbon -containing fuels also should be deemed to be zero.

Westport also commented that access to the ZEV label is critical to the customer value proposition. Westport also commented that they are not aware of any test procedures for a product like H2 HPDI (high pressure direct injection).

MEMA supports including H2ICE as a technology with zero CO2 emissions and suggested that EPA add an H2-ICE credit multiplier, similar to FCEV. MEMA also requested that EPA “encourage CARB” to include H2ICE in its regulatory program.

DTNA commented that standards should not be based on the use of H2-ICE, since there is too much uncertainty on the adoption of H2-ICE.

DTNA comments included specific changes to the Deterioration Factor (DF) and On Board Diagnostic (OBD) requirements for H2-ICE. For DF the commenter requested EPA allow manufacturers to attest to durability and useful life requirements, that EPA assigned the DF for criteria pollutants, and that EPA revise our regulations to include a reduced useful life standard.

For OBD, DTNA commented that EPA should simplified the OBD requirements in 40 CFR 1036.110. They suggest that EPA could reduce this burden by requiring the OBD system only to detect circuit faults and failed actuators, and avoid requirements for threshold diagnostics and rationality checks. DNTA also commented that EPA should allow manufacturers to propose an alternate monitoring plan for H2-ICE engines.

CARB and MFN commented that they do not support treating H2-ICE as zero emissions technology.

EDF commented that even if EPA considers H2-ICE vehicles as a carbon-free technology, they should not be considered a full ZEV.

CARB commented that including H2 ICE as ZEVs for GHGs even though they're not ZEVs for criteria pollutants, could become a default option, which is not great for California. CARB also commented that hydrogen engines are less efficient than FCEVs which could have upstream impacts. CARB commented that EPA should consider requiring fuel maps for H2-ICE to allow for tracking of hydrogen production. CARB commented that EPA consider production caps for H2-ICE that are deemed to have zero CO2 emissions.

MFN doesn't support treating H2-ICE as zero emissions technology. MFN commented that hydrogen itself can indirectly contribute to greenhouse gas emissions through leakage from within its infrastructure system and throughout the various lifecycle stages (e.g., storage, refueling, and transportation stages). With further regard to lifecycle emission impacts, MFN notes that 99 percent of hydrogen is produced from fossil fuels, and only 0.02 percent of hydrogen produced today is green hydrogen (derived from using 100% renewable energy to split hydrogen from water molecules). MFN goes on to cite an ICCT study that analyzed the life cycle greenhouse gas emissions of hydrogen across eleven hydrogen pathways. MFN states that this study found that a wide range of carbon intensities exist and also found that some methods have an even greater carbon intensity than diesel fuel (e.g., coal gasification). See ICCT. Life Cycle Analysis of Greenhouse Gas Emissions of Hydrogen, and Recommendations for China. (October 19, 2022). https://theicct.org/publication/china-fuels-lca-ghgs-hydrogen-oct22/. . MFN further indicated that Steam Methane Reforming – i.e., using fossil fuels to generate hydrogen – is high GHG emitting and that EPA's assumptions that IRA incentives would result in so-called green hydrogen (MFN's terminology) are overly sanguine. MFN commented that EPA acknowledged the need for an assessment process that could better account for lifecycle impacts of natural gas and commented that to assess the path forward for H2 ICEVs, the Agency should consider its approach to controlling refueling and evaporative emissions from natural gas vehicles in Phase 2.

NESCAUM commented that hydrogen-fueled ICE vehicles will use considerably more hydrogen than FCEVs and have greater leakage potential of hydrogen within the fueling infrastructure. NESCAUM commented that because of this, there can be significant issues with hydrogen ICEs related to use of scarce resources of low carbon hydrogen and greater upstream emissions associated with the production and transport of hydrogen. ACEEE noted that H2-ICEVs have modest efficiency advantages at best. They believe the zero-upstream incentive is inappropriate since benefits are largely based on the carbon intensity of the hydrogen, not to mention the NOx. They suggest that low-carbon hydrogen-fueled vehicles are best incentivized through performance-based standards.

Response:

As explained in Preamble Sections I and II and RTC Section 2, the final standards can be met in any manner a regulated entity (i.e. manufacturer) sees fit that achieves compliance with that numerical standard. In assessing a modeled potential compliance pathway that includes a technology mix of ICE vehicle technologies and ZEV technologies, EPA was demonstrating that the final standards were feasible and appropriate; EPA was not requiring that manufacturers utilize that modeled potential compliance pathway. In fact, as discussed in Preamble Section II.F.4, we have assessed additional example potential compliance pathways that support the feasibility of the final standards, which include a suite of technologies ranging from ICE engine, transmission, drivetrain, aerodynamics, and tire rolling resistance improvements, to the use of low carbon fuels like CNG and LNG, to hybrid powertrains (HEV and PHEV) and H2-ICE. See also responses in RTC 9.1 and 2.1 further responding to the explicit or implicit incorrect assertion that the Phase 3 rule mandates use of ZEVs. Thus. OEMs have many different potential technology mixes that can utilize to achieve compliance with the final Phase 3 standards, including a mix of technologies that includes H2-ICE. Regarding NOx emissions from H2-ICE, the HD 2027 Low NOx Rulemaking set NOx and other criteria pollutant standards (40 CFR 1036.104) that all HD engines must meet. Manufacturers of H2-ICE will be required to demonstrate that the engines meet the part 1036 standards, including the criteria pollutant standards set in the HD2027 final rule, and thus H2ICE engines will be required to be equipped with advanced emissions control devices for both PM and NOx.

Several comments, notably MFN's, stressed the potential adverse environmental implications of H2 ICE vehicles if upstream emissions are taken into account and hydrogen production is fossil fuel based. EPA is reasonably projecting that the IRA will work as intended in incentivizing the production of clean hydrogen. Additionally, we have conducted a comparative analysis of the potential impacts of various hydrogen production methods in our assessment of emissions impacts of the Phase 3 rule. More specifically, our emissions inventory modeling assumes that hydrogen fuel produced for the HD FCEVs in our modeled potential compliance pathway would be produced via grid electrolysis as a simplifying assumption.[662] To further analyze the environmental implications of future methods of hydrogen production, for the FRM, we also performed a comparative analysis to assess how emissions between multiple alternative hydrogen production pathways could compare. RIA Chapter 4.8. We concluded that "[r]elative to the emission inventory impacts presented earlier in this chapter…, we therefore expect that an emission inventory impacts analysis which assumes more hydrogen produced via SMR to estimate decreased upstream GHG emissions in earlier years and increased upstream GHG emissions in further out years. Given that these are offsetting trends and given the uncertainty inherent in projecting how the hydrogen needed to fuel FCEVs will be produced, we feel that our modeling assumption that all hydrogen will be produced via grid electrolysis does not meaningfully skew the overall GHG emission inventory impacts attributable to the final standards."

[662] *See* RIA Chapter 4.3.

We disagree with CARB's comment that EPA should consider requiring fuel maps for H2-ICE to allow for tracking of hydrogen production, as at this time our assessment is that there are more direct ways to track hydrogen production for use in vehicles. As for setting production caps for H2-ICE that are deemed to have zero CO2 emissions, we are finalizing performance-based standards for CO_2 and so disagree with an approach that would limit a particular technology beyond meeting such performance-based standards.

Regarding the various comments that upstream emissions associated with hydrogen production should be reflected in the standards themselves, as opposed to emissions modeling for assessing the impacts of the final rule, please see our response to comments on life cycle assessment in RTC 17.1. We also note that we disagree with any assertion that we should treat only H2 ICE technology differently for purposes of assessing lifecycle emissions.

Regarding comments on hydrogen leakage, commenters did not provide data and we do not have data on the leakage rate of FCEVs versus H2-ICEVs.

Regarding the comment from Westport on labeling vehicles with H2 ICEs, we are finalizing performance-based standards, not setting a ZEV mandate, and we are not defining the term ZEV in 40 CFR 1037. Regarding the comments on available test procedures for H2 HPDI engines, we are finalizing changes to 1065 to address this issue. See Preamble Section III.C.5 for more information on engine testing and certification with fuels other than carbon-containing fuels.

Regarding comments that H2-ICE is not as efficient, with respect to hydrogen use, as a FCEV, we reiterate that the Phase 3 GHG standards are CO2 vehicle exhaust emission standards. We acknowledge that a recent study by FEV identified that a Class 8 tractor with a 500-mile range using an H2-ICE powertrain would use 84 kg of H2 while a fuel cell electric vehicle would use 77 kg of H2. We account for the difference in efficiency between FCEVs and vehicles with H2-ICEs in our assessment of H2-ICE vehicles, as described in RIA Chapter 2.11.

We disagree with the comments that EPA should encourage H2-ICE that are also fueled with a carbon containing fuel by deeming CO_2 emissions from these engines to be zero. As with the EU proposal and the proposal from Westport Fuel systems, this designation would need to be based on results from testing. For example, we cannot determine that an engine will have CO_2 emission below a certain threshold or have less than 10% of its fuel come from carbon containing fuels without testing that engine. In addition, the final changes to 40 CFR 1036.150(f) and 40 CFR 1037.150(f) are not defining these H2-ICE engines/vehicles that use neat hydrogen as zero emissions engines/vehicles, but rather are providing an option for manufacturers to be exempt from testing these engines/vehicles for certain pollutants. As explained in Preamble Section III.C, this testing exemption for certain pollutants can be clearly defined for engines that use neat hydrogen, as the fuel does not contain carbon (e.g., zero engine-out CO2 emissions). Finally, the test procedures in 40 CFR 1036, 40 CFR 1037, and 40 CFR 1065 define how to test engines that are fueled with a mix of hydrogen and carbon containing fuels, so the test procedures provide a pathway for the CO_2 reduction from these engines to be credited at certification. EPA's approach of deeming emissions for certain pollutants at a specific level is reasonably reserved for technologies where it is clear, without additional testing, that the emissions are zero or near zero.

We disagree with the comment from MEMA that an advanced technology credit multiplier should apply to H2-ICE. As noted in Section III.A.2 of the final rule preamble, the proposal regarding Phase 2's credit multipliers was limited to evaluating whether to end their existing Phase 2 phase out date earlier or leave existing end date in place. We did not propose or request comment on extending credit multipliers to apply for other technologies under the Phase 2 program (and did not reopen that aspect of the Phase 2 multipliers) and did not propose or request comment on including credit multipliers as part of the Phase 3 program for any technology. Thus, these comments requesting new multipliers are out of scope for this final rule.

Regarding the comment from DTNA that the standards should not be based on the use of H2-ICE technology in addition to ZEV technologies included in the proposals compliance pathway to support the feasibility of the Phase 3 standards, please see our response in RTC Section 9.2 regarding the stringency of the final performance-based standards. See also RIA I and Preamble Section II regarding our assessment of H2-ICE technology in supporting the feasibility of the Phase 3 final standards.

Comments from DTNA that the DF and OBD requirements should be streamlined/reduced for H2-ICE are outside the scope of this final rule, however we also note that we disagree. Both the DF and OBD requirements are in place for engines to ensure that engines meet the criteria pollutant standards in 40 CFR 1036. Specifically, the DF requirements provide a means for manufacturers to demonstrate that the emissions standards will be met through useful life. The OBD requirements are in place such that malfunctions in the emissions control systems are detected and fixed quickly. As mentioned by other commenters, even H2-ICE that use neat hydrogen do emit certain pollutants, including but not limited to NOx and PM, so the requirements in 40 CFR 1036 remain critical for their intended purposes. The comments that EPA should reduce the useful life for H2-ICE are out of scope as we didn't propose or request comment on any changes to the useful life for engines under the emissions standards in 40 CFR 1036.

For addition information on the final changes to 40 CFR 1036.150(f) and 40 CFR 1037.150(f), see Preamble Section III.C.2.xviii and Section III.C.3.ii, respectively.

9.4 Other Technologies

Comments by Organizations

Organization: American Chemistry Council Fuel Additives Task Group (FATG)

The FATG supports EPA's recognition that multiple technologies can lead to a reduction in greenhouse gas emissions and supports the use of performance-based standards. The longevity of the internal combustion engines (ICE) of the current commercial fleets means that they, and carbon-based liquid fuels, will continue to play an important role in the transportation needs of the United States. There is ongoing research to continue to improve the thermal efficiency of diesel internal combustion engines3. There is also an increasing diversity of fuels in the distillate market and biobased and renewable fuels are growing in usage to help reduce the carbon intensity of the fuel pool. Fuel additives have and will continue to play a vital role in the optimization of the fuel and engine system combination with the aim of reducing carbon emissions. [EPA-HQ-OAR-2022-0985-1573-A1, p. 1]

3 DOE, "The Road Ahead Toward a Net-Zero-Carbon Transportation Future" Co-Optima Findings and Impact FY15-FY21. link

Fuel Additive Benefits

Fuel additives provide benefits to the environment and the consumer4. Additive technologies help enhance desired performance capabilities and suppress undesirable properties in fuel, which in turn leads to improved function and performance. Diesel additives have been used for almost 100 years at all points in the diesel distribution system, from the refinery, through pipelines and terminals, to the distributors, fleets, and aftermarket end users. These additives allow fuel producers, distributors, and marketers to not only meet certain basic specification requirements5 for engines, but also to provide additional protection to critical distribution and vehicle components, and to improve the overall performance of the fuel powering the diesel engine. [EPA-HQ-OAR-2022-0985-1573-A1, pp. 1 - 2]

4 Additive Technical Committee, “Fuel Additives: Use and Benefits,” Document 113, September 2013. link

5 For example ASTM D975, EN590.

The most common performance-enhancing additives for diesel and biomass based diesel and blends currently used in the United States include cold flow improvers, lubricity improvers, injector, and fuel system detergents6.

- In regions with low winter temperatures, cold flow improvers help with pour point and filter blocking issues associated with all fuels and blends.
- Refineries employ corrosion inhibitors to help protect storage tanks and pipelines against corrosion to prevent asset leakage during transport, lubricity improvers to help protect engine components against wear, and conductivity improvers to help safely move fuel through the supply chain minimizing risk of Static Discharge Ignition.
- Diesel detergents can help avoid deposits during normal operation of equipment associated with diesel and renewable duels. [EPA-HQ-OAR-2022-0985-1573-A1, p. 2]

6 ACC FATG, “FATG Diesel Additives and Fuel Issues.” 2018. link

Fuel additives help to optimize the functional efficiency of the internal combustion engine leading to the reduction of fuel consumption. Often, additive suppliers combine these and other components into customized multi-functional diesel additive packages in order to simplify additives injection and storage needs. [EPA-HQ-OAR-2022-0985-1573-A1, p. 2]

Organization: American Chemistry Council Product Approval Protocol Task Group (PAPTG)

Engine and driveline lubricants are an important component of heavy duty vehicle design and have been demonstrated to impact fuel economy and durability performance. To help ensure that vehicle performance remains as close to the design and certification level as possible, ACC suggests that EPA include language in the proposed standard which recognizes and highlights the importance of using the appropriate OEM or industry certified lubricants in factory fill and service fill (aftermarket) applications. [EPA-HQ-OAR-2022-0985-1574-A1, p. 1]

Organization: Lubrizol Corporation (Lubrizol)

Each of the Blueprint’s strategies can yield extremely low-carbon performance. However, the lifecycle emissions of each technology should be considered and integrated into the Final Rule. We are concerned about the unintended consequences of a “tailpipe-only” approach that neglects upstream emissions and other emissions impacts of future engines and vehicles. Our concern is equally valid, whether the technology is an ICE vehicle operating on petroleum diesel, an ICE vehicle operating on a SLF, an ICE vehicle operating on hydrogen, a battery-electric vehicle, or fuel cell vehicle. The end goal should be a heavy-duty vehicle market that emits as few GHGs as possible, on a lifecycle basis. [EPA-HQ-OAR-2022-0985-1651-A2, p. 2]

As we have noted in our comments on prior EPA rule-makings, Lubrizol remains concerned about real-world, in-use emission levels over the full useful life of the engines and vehicles we serve. We encourage EPA to include provisions in the Final Rule that will help ensure that the appropriate fuel additives and lubricants are used throughout the useful life of future engines and vehicles that will be manufactured to meet the requirement of the Final Rule in years to come. [EPA-HQ-OAR-2022-0985-1651-A2, p. 3]

1) The Final Rule Should Help Ensure that the Highest Quality Lubricants Are Used Throughout Useful Life

Lubrizol is committed to ensuring that OEMs have the engine, axle, and transmission lubricants and oils that they will need to ensure that their engines will meet the final Phase 3 GHG standards, both for certification purposes and throughout their useful life. [EPA-HQ-OAR-2022-0985-1651-A2, p. 3]

Compared with prior generations of internal combustion engines (“IC engines”), future IC engines will operate with extremely high temperatures, high pressure, high shear, and other extremely sensitive operating environments. In order to operate efficiently, durably, and with low emissions, these IC engines will need to use the appropriate engine oil or lubricant at all times throughout their useful life. [EPA-HQ-OAR-2022-0985-1651-A2, p. 3]

Using the wrong lubricant can impact the engine’s performance and durability, as well as the performance and durability of the vehicle’s emissions control systems and Emissions-Related Components.4 Numerous studies have been done in the past that highlighted the relationship between lubricant composition and emission system durability. It can be expected that lubricant compatibility will become even more important when the next generation of emission control systems and Emissions-Related Components is deployed to meet the Phase 3 GHG standards, especially in combination with the new NOx standards that will be in place, starting in MY 2027. [EPA-HQ-OAR-2022-0985-1651-A2, p. 3]

4 The list of “Emissions-Related Components” is contained in 40 C.F.R. Park 1068, Appendix I.

Under Section 207 of the Clean Air Act, OEMs are required to provide emissions-related warranties.5 These warranties are typically limited to the Emissions-Related Components that are listed in 40 C.F.R. Part 1068, Appendix I. However, using the appropriate lubricant or oil is critical to the performance of many of the components on the Appendix I list.6 Thus, while we recognize that these warranties would not require specific oils or lubricants to be used, we do believe that OEMs can and should require their customers to use the same or higher quality oil or lubricant that was used by the OEM in its certification testing as part of their warranty requirements to protect their Emissions-Related Components. This can be accomplished by adding lubricants or engine oils to the list of covered components in the proposed new language for 40 C.F.R. Section 1037.120(c).7 Indeed, the new language directs emission-related warranties to covers other added emission-related components to the extent they are included in an OEM’s application for certification, as well as any other components whose failure would increase a vehicle's CO_2 emissions. Because the use of a sub-standard lubricant or engine oil would deviate from the lubricant or oil used in the OEM's certification application and could lead to increased CO_2 emissions, it should not be allowed to be used under the OEM's emissions-related warranties. [EPA-HQ-OAR-2022-0985-1651-A2, pp. 3 - 4.]

5 Proposal at 25949, citing 42 U.S.C. 7541.

6 Appendix A to these comments provides a list of references to studies that review the impact of lubricants and oils on the performance of various emission control technologies and "Emission-Related Components." [See Docket Number EPA-HQ-OAR-2022-0985-1651-A2, pages 8-9, for Appendix A.]

7 Proposal at 26124-26125. "The emission-related warranty also covers other added emission-related components to the extent they are included in your application for certification, and any other components whose failure would increase a vehicle's CO_2 emissions."

Lubrizol strongly urges EPA to include language in the Final Rule that will achieve this goal. For example, EPA could require emissions-related warranties to include regular service intervals for oil changes, as well as require that engines are consistently using the appropriate higher-performing lubricant oil for each particular engine - at all times throughout its useful life. Such specified lubricants would provide the engine with the appropriate level of performance, engine protection, and protection of emission control technology, according to objective characteristics as determined by the OEMs. These characteristics could be in the form of an OEM performance specification or an industry category defined by an entity like the American Petroleum Institute (API) or the European Automobile Manufacturers' Association (ACEA), along with a maximum viscosity level. (As we have stated in previous comment letters, and to be clear, Lubrizol does not suggest that EPA should specify particular lubricant brands or servicing locations as a warranty requirement.) [EPA-HQ-OAR-2022-0985-1651-A2, p. 4]

OEMs already use these higher performing lubricants in the development and certification of their powertrain systems. They rely on them to demonstrate that their engines will meet EPA's requirements throughout the full useful life of their engines and emissions systems. By requiring OEMs to take steps to ensure that the same category and maximum viscosity level that is used for certification and initial fill is used when the vehicle is serviced to maintain vehicle powertrains, engines, emission control technologies, and Emissions-Related Components," EPA will help ensure that engines maintain their emissions durability throughout their useful life, thereby helping to ensure that real world emissions remain at the levels EPA seeks to achieve in the Final Rule. [EPA-HQ-OAR-2022-0985-1651-A2, p. 4]

In addition, Lubrizol urges EPA to require OEMs to communicate important maintenance information related to engine oils and lubricants to their customers in three ways. [EPA-HQ-OAR-2022-0985-1651-A2, p. 4]

First, EPA should require OEMs to include maintenance information related to engine oils and lubricants in their owner's manuals. The owner's manual is relied upon by heavy-duty vehicle owners or operators to describe appropriate engine maintenance, applicable warranties, and any other information related to operating or maintaining the engine or vehicle. By requiring information about the minimum lubricant and oil performance specifications in the owner's manual, EPA will be taking an important step towards reducing mal-maintenance, better service experiences for independent repair technicians, specialized repair technicians, owners who repair their own equipment, and possibly vehicle inspection and maintenance technicians. Most important, we believe that this step will provide greater assurance of long-term in-use emission reductions by reducing likelihood of occurrences of tampering. [EPA-HQ-OAR-2022-0985-1651-A2, pp. 4 - 5]

Second, Lubrizol urges EPA to require lubricant specification information on an engine label that is placed at the appropriate place in the engine compartment. The agency has had similar requirements in the past, such as when EPA required vacuum hose diagrams to be included on the emission labels. [EPA-HQ-OAR-2022-0985-1651-A2, p. 5]

Third, both the owner's manual and engine label should include an internet link that would enable owners or operators to obtain this information online. For example, manufacturers could include a Quick Response Code or "QR Code" in the owner's manual and on the emission label that would direct repair technicians, owners, and inspection and maintenance facilities to a website which provides critical emissions systems information at no cost. This information should include engine-specific lubricant requirements, including the recommended lubricant, service intervals, and other relevant information that is necessary to ensure that the correct high-performing lubricant is used throughout the engine's useful life. Providing this information will help ensure that the engine and emissions control systems are adequately protected during all modes of operation throughout their useful lives. [EPA-HQ-OAR-2022-0985-1651-A2, p. 5]

Organization: Odyne Systems LLC

Odyne supports efforts by the EPA to reduce medium and heavy-duty vehicle GHG emissions. [EPA-HQ-OAR-2022-0985-1623-A1, p. 1]

Ensure delegated assembly can be used to transfer credits to truck chassis OEMs by intermediate or final stage manufacturers that install emissions reduction components and systems, such as PHEV and ePTO systems.

Trucks are built in a multi-stage manufacturing process. Chassis manufacturers may not be aware of the final application or truck configuration when the truck is built initially, making it difficult to know whether to install an ePTO. Later in the vehicle manufacturing process, after the application has been determined, intermediate-stage or final-stage manufacturers may install ePTO or PHEV systems that reduce GHGs. To encourage the installation of ePTO and PHEV systems on incomplete vehicles at other vehicle manufacturing stages, the regulatory benefits for those systems need to accrue to the chassis OEM through delegated assembly provisions or some other method. [EPA-HQ-OAR-2022-0985-1623-A1, p. 3]

Ensure that testing requirements for ePTO systems are effective and streamlined to encourage greater use of ePTO technology. Streamlined, effective, and affordable verification requirements will help ePTO system manufacturers sell systems enabling trucks to meet more stringent GHG regulations. Required test procedures that are too expensive, narrow, or complex can unnecessarily impede the sale and use of effective emission-reducing products for trucks. [EPA-HQ-OAR-2022-0985-1623-A1, p. 4]

Increase credits for ePTO systems that reduce GHG and NOx emissions over a wider variety of use cases and duty cycles.

Electric power take-off systems that reduce emissions over a wider variety of use cases and duty cycles should be given greater regulatory benefit over less capable systems. Specifically, charge-depleting ePTO systems that also reduce emissions through hybrid ePTO operation once batteries become depleted should be given greater regulatory credit than systems that don't effectively function if not plugged in or if batteries become depleted. Some ePTO systems will not provide GHG reductions if not plugged in or if batteries need recharging in the field due to depletion from atypically large amounts of energy use at worksites or extended mutual aid events where the grid is unavailable. [EPA-HQ-OAR-2022-0985-1623-A1, p. 4]

Organization: Volvo Group

NOx regulation impacts on engine greenhouse gas emissions

With respect to the engine standards, EPA's stringency setting for the 2027 model year did not provide any consideration for EPA's new NOx standards within the Clean Trucks Plan finalized in December of last year. This regulation includes an 82.5% greater stringency in NOx in 2027 in addition to increased useful life and warranty periods, resulting in the need to provide a significantly higher margin on certified engine levels to meet those extended useful life periods. [EPA-HQ-OAR-2022-0985-1606-A1, p. 14]

Reductions in NOx have a direct impact on greenhouse gas emissions for compression ignition combustion engine technology. NOx can be mitigated with on-engine technologies or aftertreatment devices. Engine based NOx reduction is achieved by reducing peak temperature during combustion, inherently less efficient combustion by modifying fueling such as retarding timing or increasing exhaust gas recirculation. Aftertreatment systems have grown in volume significantly also, requiring advanced reductant mixing geometries and complex packaging, all increasing exhaust backpressure which further decreases engine efficiency. Additionally, the aftertreatment system must be warmed to enable chemical reactions to reduce NOx, and the warming of the catalyst via any means requires fuel energy. [EPA-HQ-OAR-2022-0985-1606-A1, p. 14]

The key technology required to achieve 2027 NOx emission levels could increase actual fuel consumption up to 25% for some applications, with vehicles in all applications experiencing some level of increased fuel consumption. Today's diesel engines are very advanced in technology and further refinements are planned. However, many OEMs are approaching 50% brake thermally efficient capable engines and are near the theoretical limit of the capabilities of a combustion engine. Therefore, any further engine specific requests for reduction in greenhouse gas emissions or increase in fuel economy will not be reliable, cost effective or even theoretically possible if we maintain the requirement to comply with ultra-low NOx emission requirements. [EPA-HQ-OAR-2022-0985-1606-A1, p. 14]

In summation, Volvo Group firmly supports EPA's proposal not to promulgate additional engine standards beyond the 2027 model year standards finalized with Phase 2. We believe this is justified given the Clean Trucks Plan's significant impact on fuel economy and greenhouse gas performance that will need to be clawed back just to meet the Phase 2 MY 2027 National Highway Traffic Safety Administration (NHTSA) and EPA fuel economy (FE) and greenhouse gas standards. Additionally, as the Phase 2 and proposed Phase 3 benefits are calculated solely on a complete vehicle level, separate engine standards provide no additional benefit; rather they artificially inflate costs and unreliability by forcing technologies onto the engine, as opposed to allowing manufacturers to utilize potentially lower cost and risk technologies on the vehicle that provide the same, or greater benefit. [EPA-HQ-OAR-2022-0985-1606-A1, p. 14-15]

EPA Summary and Response:

Summary:

A number of commenters noted the importance of fuel additives and high quality lubricants to the performance of both ICE and ZEV vehicles. (American Chemistry Council Fuel Additives Task Force, American Chemical Council Product Approval). Lubrizol made the same points, but offered detailed suggestions of how use of high quality lubricants could be incorporated into the commercial, and potentially regulatory, warranty process. Specifically,

"Under Section 207 of the Clean Air Act, OEMs are required to provide emissions-related warranties.5 These warranties are typically limited to the Emissions-Related Components that are listed in 40 C.F.R. Part 1068, Appendix I. However, using the appropriate lubricant or oil is critical to the performance of many of the components on the Appendix I list. Thus, while we recognize that these warranties would not require specific oils or lubricants to be used, we do believe that OEMs can and should require their customers to use the same or higher quality oil or lubricant that was used by the OEM in its certification testing as part of their warranty requirements to protect their Emissions-Related Components. This can be accomplished by adding lubricants or engine oils to the list of covered components in the proposed new language for 40 C.F.R. Section 1037.120(c)… Because the use of a sub-standard lubricant or engine oil would deviate from the lubricant or oil used in the OEM's certification application and could lead to increased CO2 emissions, it should not be allowed to be used under the OEM's emissions-related warranties."

Lubrizol then offered suggestions as to how EPA could effectuate this goal:

"EPA could require emissions-related warranties to include regular service intervals for oil changes, as well as require that engines are consistently using the appropriate higher-performing lubricant oil for each particular engine - at all times throughout its useful life. Such specified lubricants would provide the engine with the appropriate level of performance, engine protection, and protection of emission control technology, according to objective characteristics as determined by the OEMs. These characteristics could be in the form of an OEM performance specification or an industry category defined by an entity like the American Petroleum Institute (API) or the European Automobile Manufacturers' Association (ACEA), along with a maximum viscosity level.

In addition, Lubrizol urges EPA to require OEMs to communicate important maintenance information related to engine oils and lubricants to their customers in three ways:

"First, EPA should require OEMs to include maintenance information related to engine oils and lubricants in their owner's manuals.. ..

Second, Lubrizol urges EPA to require lubricant specification information on an engine label that is placed at the appropriate place in the engine compartment. The agency has had similar requirements in the past, such as when EPA required vacuum hose diagrams to be included on the emission labels. …

Third, both the owner's manual and engine label should include an internet link that would enable owners or operators to obtain this information online."

Odyne requested that EPA's delegated assembly rules or some other methods be used to transfer credits to truck chassis OEMs by the intermediate or final assembler where ePTO or PHEV are installed. Odyne described that chassis manufacturers may not be aware of the final application or truck configuration before they ship the chassis for the next stage of manufacturing, and that downstream or secondary manufacturers are in a better position to determine the application and decide whether to install ePTO or PHEV systems that reduce GHG emissions. Odyne advocated for allowing those secondary manufacturers to gain regulatory benefits from installing ePTO and PHEV systems to encourage greater use of those technologies.

Odyne stated that required test procedures are too expensive, narrow, or complex, which can unnecessarily impede the sale and use of emission-reducing products for trucks. Odyne advocated for more effective and streamlined testing requirements to encourage greater use of ePTO technology.

Odyne also noted that some ePTO and PHEV systems are able to effectively reduce GHG and NOx emissions even when their battery is depleted, and that these systems should have more credit-generating recognition than ePTO and PHEV systems which are less effective in depleted battery mode.

Volvo supported EPA's proposal not to increase the Phase 2 engine standards, noting that increased engine standards stringency would be especially problematic given the need to achieve the recent HD2027 NOx standards.

Response:

Lubrizol's comment is out of scope. We note that their comment suggests that they would like to ensure more frequent oil changes, but EPA's minimum maintenance intervals do not serve that purpose. Rather, we are specifying *minimum* maintenance intervals to prevent the manufacturers from creating unrealistic expectations for maintenance from users beyond what is necessary for maintenance and at intervals that would be less likely to occur in-use. Furthermore, we also note that lubricants are a consumable product and are not considered to be components.

Regarding the comments on the importance of fuel additives and high-quality lubricants, the existing requirements in 40 CFR 1037.135(c)(7) require the label to include this information: "Identify any requirements for fuel and lubricants that do not involve fuel-sulfur levels."

In addition, existing 40 CFR 1036.135(d) and 40 CFR 1037.135(d), state that the label may include any additional information to ensure that the engine and vehicle will be properly maintained.

With these existing requirements we believe that users have the information needed to ensure that the correct fuel additive and lubricants are used. While outside the scope of this rulemaking, we also note that we disagree that lubricants should be included in the list of covered components in 40 CFR 1037.120(c).

Regarding commenters requests for revisions to delegated assembly or other provisions, these requested revisions are outside the scope of this rulemaking. We note that, under the current regulations, EPA adopted provisions for delegated assembly at 40 CFR 1037.621 and for partially complete vehicles at 40 CFR 1037.622 in recognition of multiple manufacturers sequentially producing vehicles in a certified configuration. In all cases, we depend on the certifying manufacturer to properly account for all emission-related features in the documentation for certification. This includes nine months after the end of the model year to track all adjustments and additions at different stages of manufacturing before delivery to the ultimate purchaser, resulting in a credit report that properly describes how the certifying manufacturer complies with emission standards. In the case of delegated assembly at 40 CFR 1037.621, the original manufacturer ensures that secondary manufacturers take necessary steps to finish vehicle assembly in a way that conforms to the original manufacturer's plans as documented in their compliance demonstration. In the case of provisions for partially complete vehicles at 40 CFR 1037.622, we allow original manufacturers to shift all the compliance obligations to a secondary manufacturer. In either case, the certifying manufacturer has the obligation to comply based on the final vehicle configuration. We note that any future consideration of revisions to the existing provisions would likely involve evaluation of requirements needed to ensure EPA could accurately quantify credits for incremental technology improvements and have compliance oversight to ensure that the secondary manufacturer is properly executing their responsibilities for the emission controls they are adding. For example, without certification there would be no mechanism for recalling defective systems.

EPA adopted the current test procedures through a rulemaking process that included engagement with and consideration of submitted comments from stakeholders. The procedures as adopted are targeted to achieve effective measurements for evaluating the performance of vehicles and vehicle systems in determining whether vehicles meet emission standards. Odyne expressed dissatisfaction with EPA's published procedures, but failed to make any specific suggestions. We continue to be open to feedback on suggested changes to measurement procedures for potential consideration in future rulemakings.

10 ABT Program

10.1 General ABT

Comments by Organizations

Organization: Advanced Engine Systems Institute (AESI)

EPA should maintain the off-cycle credit procedures that encourage innovation in technology, opening additional pathways which include increasingly cost-effective solutions that have not been validated yet in the market. [EPA-HQ-OAR-2022-0985-1600-A1, p. 2]

Organization: Allergy & Asthma Network et al.

EPA Should Ensure Real-World Benefits

We have also noted that even when vehicle manufacturers comply with the rules on paper, there remains the possibility of cheating or tampering with emissions controls for any non-zero-emission vehicle. The stronger the final standards and the more of a nationwide transition to zero-emission heavy-duty vehicles results from them, the lower the possibility of tampering with gas- or diesel-powered vehicle pollution controls. [EPA-HQ-OAR-2022-0985-1532-A1, p. 4]

Organization: American Council for an Energy-Efficient Economy (ACEEE)

EPA should ensure that credits from Phase 2 do not undermine the Phase 3 standards

Manufacturers' credits carried over from the Phase 2 program could substantially affect the efficacy of Phase 3. The proposal states: "In considering feasibility of the proposed standards, EPA also considers the impact of available compliance flexibilities on manufacturers' compliance options" (FR 26002). Yet EPA has not offered any projection of the credit balances to be carried over from Phase 2 to Phase 3, much less indicated how these credits might affect the levels of electrification achieved or the potential for backsliding on ICEV emissions under the proposed standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 17]

For the final rule, EPA should present its analysis of likely credit balances in Phase 3 and adjust the stringency of the standards accordingly to ensure they deliver the intended CO2 reductions and technology advancement under the program. [EPA-HQ-OAR-2022-0985-1560-A1, p. 17]

Organization: California Air Resources Board (CARB)

2. Standards for Qualifying Small Businesses

Affected pages: 26022 and 26124 (1037.150(c))

The NPRM proposes the following language:

"(v) Small manufacturers may bank emission credits only by certifying all their vehicle families within a given averaging set to the Phase 3 standards that apply for the current model year." [EPA-HQ-OAR-2022-0985-1591-A1, p.27]

CARB staff suggests adding the limitation that small manufacturers certified to the Phase 3 custom chassis standards are not eligible to bank credit. The existing Phase 2 GHG regulation does not allow manufacturers who certify to the custom chassis standards to bank or trade emission credits. Therefore, this limitation should also apply to small manufacturers certified to the custom chassis standards. Banking credit under an exemption allowing the weaker custom chassis standards could inadvertently create windfall credits from vehicles that would barely meet or not at all meet the governing vocational standards if that same vehicle were produced by a large manufacturer. While allowing flexibility for the small manufacturers, CARB staff encourages U.S. EPA to not erode the stringency of the program by also awarding bankable credits on top of the direct flexibility of the custom chassis provision. [EPA-HQ-OAR-2022-0985-1591-A1, p.27]

Organization: Clean Air Task Force et al.

2. The averaging, banking, and trading program continues to be an important way for manufacturers to maintain flexibility in meeting EPA's greenhouse gas emission standards.

Like its Phase 1 and Phase 2 HD GHG emission standards, and standards for certain criteria HD emissions dating back to 1985, EPA's proposed standards rely on an ABT approach allowing manufacturers to meet the standards by averaging emissions across subcategories of their HD vehicles. EPA has employed similar approaches in certain standards issued under section 202 of the Clean Air Act since 1983, including in its light-duty vehicle GHG standards beginning in 2010. Given its longstanding use of this approach under section 202, EPA's proposal emphasizes that EPA is "not reopening the general availability of ABT" or the general structure of the compliance provisions it uses to enforce and implement the ABT approach. 88 Fed. Reg. at 25952 n.211; id. at 26008 n.567. [EPA-HQ-OAR-2022-0985-1640-A1, p. 16]

We agree with EPA's determination that there is no reason to reopen the question whether it is permissible to use an ABT approach under section 202. EPA has not only repeatedly used ABT in section 202 standards but also repeatedly explained that ABT is consistent with and gives full effect to the requirements of section 202 as well as the Clean Air Act's compliance and enforcement provisions applicable to standards issued under section 202. Under such circumstances, it is eminently reasonable for EPA not to reconsider a question that has been settled for decades. See Growth Energy v. EPA, 5 F.4th 1, 13 (D.C. Cir. 2021).

Organization: Colorado Department of Transportation et al

- EPA requested comment on the use of credits, including consideration of a program similar to CARB's ACT credit provisions. Aligning with the ACT rule can help ensure consistency, and avoid weakening the effectiveness of the rule. [EPA-HQ-OAR-2022-0985-1530-A1, pp. 2-3]

Organization: Eaton

While existing technologies offer multiple pathways to compliance, the EPA should maintain the off-cycle credits procedures that encourage innovation in technology, opening additional pathways and allow for increasingly cost-effective solutions that have not been validated yet in the market or not yet realized. As was the case with previous regulations, once the first generation of new technology was introduced, driven by increasingly stringent limits, the market learned and quickly corrected issues while also significantly reduced costs. Therefore, it is key to the success of the regulations to maintain flexibility in the form of ABT credits as well as off-cycle credits. [EPA-HQ-OAR-2022-0985-1556-A1, p. 6]

Organization: Environmental Defense Fund (EDF)

b) EPA Properly Decided Not to Reopen its Longstanding Use of Averaging, Banking, and Trading in its Rules

EPA has used an ABT approach in standards for light- and heavy-duty vehicles since the 1980s, including the Phase 1 and Phase 2 medium- and heavy-duty GHG rules that this proposal builds upon.28 Within this decades-long history, EPA has repeatedly explained why such an approach is reasonable and consistent with the text of Section 202.29 Based on EPA's settled and longstanding use of ABT in its Section 202 rules and ABT's well-established basis in the statute, the agency's decision not to reopen "the general availability of ABT" is reasonable.30 [EPA-HQ-OAR-2022-0985-1644-A1, p. 14]

28 76 Fed. Reg. 57106, 57127-28 (Sept. 15, 2011) (HD Phase 1 GHG standards); 81 Fed. Reg. 73428, 73495 (Oct. 25, 2016) (HD Phase 2 GHG standards).

29 See, e.g., 55 Fed. Reg. 30584, 30593-94 (1990) (EPA explaining in the context of its 1990 programs for HD banking and trading of NOx and particulate matter why it "continues to believe . . . that trading and banking are consistent with the statutory aims").

30 88 Fed. Reg. 25952 n. 211.

Organization: Manufacturers of Emission Controls Association (MECA)

Off-Cycle Provisions for Innovative Technologies

MECA strongly supports the generation of credits through the off-cycle provisions for innovative technologies so manufacturers can deploy all possible technologies to address the CO2 emission limits. The value of the credits must be verified by actual technology testing submitted to EPA. We believe that in the absence of advanced technology credit multipliers, a broader range of advanced technologies will see greater implementation by manufacturers to ensure their compliance. For this reason, MECA believes off-cycle provisions should be retained as an option under a performance-based regulatory framework. [EPA-HQ-OAR-2022-0985-1521-A1, p. 10]

Organization: Navistar, Inc.

Navistar supports EPA's proposal to include ABT provisions, which provides manufacturers the flexibility necessary to meet the proposed GHG standards.

Averaging, banking and trading ('ABT') provisions provide manufacturers with the needed flexibility to plan investments and manage product costs, while at the same time meeting stringent GHG standards. Heavy-duty commercial fleets are incredibly diverse. Navistar's customers have an enormous variety of applications and we essentially produce custom vehicles for their use in large quantities. This means the engineering task of creating the right zero emissions vehicle for a particular application is an achievable, but still very significant task. Many fleets are confronted with the challenge of upgrading their charging infrastructure while at the same time considering investments in new diesel vehicles. The proposed rule's ABT provisions provide manufacturers a degree of flexibility necessary to meet the diverse range of heavy-duty applications and customer needs. [EPA-HQ-OAR-2022-0985-1527-A1, p. 4]

Navistar agrees with EPA's statements on the importance of providing manufacturers with compliance flexibilities through the inclusion of ABT provisions. Specifically, EPA stated that the 'proposed performance-based standards with ABT provisions give manufacturers a degree of flexibility in the design of specific vehicles and their fleet offerings, while allowing industry overall to meet the standards and thus achieve the health and environmental benefits projected for this rulemaking.' 88 Fed. Reg. at 26002. EPA noted further that it has considered:

- [T]he averaging portion of the ABT program in the feasibility assessments for previous rulemakings and continues that practice here. We also continue to acknowledge that the other provisions in ABT that provide manufacturers additional flexibility also support the feasibility of the proposed standards. By averaging across vehicles in the vehicle averaging sets and by allowing for credit banking across years, manufacturers have the flexibility to adopt emissions-reducing technologies in the manner that best suits their particular market and business circumstances. … It is clear that manufacturers are widely utilizing several of the credit programs available, and we expect that manufacturers will continue to take advantage of the compliance flexibilities and crediting programs to their fullest extent, thereby providing them with additional tools in finding the lowest cost compliance solutions in light of the proposed standards. [EPA-HQ-OAR-2022-0985-1527-A1, p. 4]

88 Fed. Reg. at 26002 (emphasis added). Flexibility is particularly important in the early years of this rule. In Navistar's view, that is the period most likely to be impacted by infrastructure shortfalls. Flexibility is needed to allow infrastructure to reach a certain scale, such as the availability of public charging on key transportation routes or concentrations of key depot charging availability. Public charging infrastructure is particularly significant and must come first to give fleets that operate over long-distance routes the confidence to electrify their fleets. Maximum flexibility is necessary, both in time and across vehicle categories. We strongly encourage EPA to expand the flexibilities in the proposed rule to allow manufacturers and, crucially, customers who will need to develop the necessary infrastructure to be able to manage through balancing across averaging sets and model years with enough flexibility to mitigate potential issues outside of the control of the manufacturer and customer, particularly infrastructure development. [EPA-HQ-OAR-2022-0985-1527-A1, pp. 4-5]

Organization: Truck and Engine Manufacturers Association (EMA)

CARB Advanced Clean Trucks (ACT) Rule – The EPA GHG Phase 3 regulation, like the current Phase 2 rule, is a national requirement on vehicle OEMs to sell vehicles across all 50

States that comply, in the aggregate, with a set of stringent GHG standards. The regulations require OEMs to track all sales and to "score" each vehicle type for its GHG performance. The aggregated scores are submitted annually to EPA to demonstrate compliance with the regulation. [EPA-HQ-OAR-2022-0985-2668-A1, p. 49]

California will be implementing a ZEV-truck sales mandate, the Advanced Clean Trucks (ACT) Rule, starting in 2024. Other states are adopting that regulation as well. The ACT regulation will mandate a yearly increase in the percentage of trucks sold that must be ZEVs. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

EPA has requested comment on the interaction between the two regulations when it comes to the tracking and reporting of vehicle sales and the associated credits and debits that are earned by each. EMA sees the regulations as being distinct. Both regulations require the tracking of vehicles and reporting of all vehicles sold, either at a national or state level (for California and all other states that adopted the ACT regulation). There is no necessary interaction between the regulations. The sales at a state level, regardless of the state, contribute to the total sold within the U.S. based on the structure of these regulations. EMA believes there is no need for any regulatory ties between them. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

EPA Summary and Response:

Summary:

ACEEE requested that EPA provide information regarding the credit balances it projects will be carried over from Phase 2 to Phase 3 and that EPA adjust the stringency of the standards in the final rule to account for those credits.

Allergy & Asthma Network et al. also expressed concern with ICE emission controls tampering and states that a "nationwide transition" to ZEVs lowers the possibility of tampering.

CARB noted that the proposed interim provision (40 CFR 1037.150(c)(2)) allowing small business manufacturers to continue to be subject to the Phase 2 MY 2027 and later standards did not include a limitation on the use of ABT if those small business manufacturers certified to custom chassis standards. CARB pointed out that the custom chassis provisions for vocational vehicles in 40 CFR 1037.105(h) disallows banking and trading of credits from vehicles certified to the custom chassis standards and they requested the same limitation apply to small business manufacturers certifying custom chassis vehicles.

Clean Air Task Force et al. agreed with EPA's decision not to reopen the general ABT in this proposal and agreed that EPA adequately justified its use of the ABT approach for the proposed standards. Clean Air Task Force et al. also provided a history of EPA's use of ABT in previous rules and suggested EPA could further note the existing regulations that already provide a more detailed description of how ABT relates to the CAA testing, certification, warranty, in-use compliance, and penalty provisions.

Colorado Department of Transportation et al. commented that aligning with the credit program of the ACT rule can "ensure consistency, and avoid weakening the effectiveness of the rule".

EDF noted EPA's long history of using ABT in its rulemakings and commented that EPA's decision not to reopen the availability of ABT was "reasonable".

Navistar commented in support of EPA's continued use of ABT, noting that the ABT provisions are a necessary flexibility for manufacturers to plan investments, manage costs, and meet the "diverse range of heavy-duty applications and customer needs". Navistar noted that ABT will be particularly important in the early years of the rule when infrastructure is growing and fleets are gaining confidence in the new vehicles. Navistar encouraged EPA to expand the flexibilities to across averaging sets and model years.

AESI, Eaton, and MECA expressed support for existing off-cycle credit provisions.

EMA commented that there is no need for a regulatory tie between the ACT regulation and a future federal regulation in terms of sales and credit reporting. They also state: "The sales at a state level, regardless of the state, contribute to the total sold within the U.S. based on the structure of these regulations."

Response:

We note that some of the general comments in this Section 10.1 referred to credit multipliers and averaging sets, which we respond to in more detail in Section 10.3 of this Response to Comment document.

Without reopening the general issue of necessity for ABT programs, we appreciate the comments from Clean Air Task Force et al., Eaton, EDF, and Navistar in acknowledging the continued value of our ABT provisions. , We share Allergy & Asthma Network et al.'s concern over tampering and agree that reducing the number of HD ICE vehicles in use would reduce the number of HD vehicles available for conventional tampering methods; however, we remind the commenter that we are finalizing performance-based standards and manufacturers can choose to comply with a mix of technologies that may continue to include HD ICE vehicles.

ACEEE requested that EPA share a projection of credits that manufacturers will have available in MY 2027 and that the agency consider available credits when setting the stringency of MY 2027 and later standards. While we do have record of manufacturers' credit balances for the current model year, we do not have sufficient information to make an accurate projection of how manufacturers will apply those credits moving forward. We have considered the potential for large credit balances to be carried over from Phase 2 into Phase 3 as a result of the Phase 2 credit multipliers, which informed some of the restrictions we are applying for credits from multipliers in Section 10.3 of this Response to Comment document. As described in Section II.G of the Preamble to this final rule, and Section 10.2.1 of this RTC document, we considered averaging in setting the emission standards for previous rulemakings and continue that practice in this rule. While we also considered the existence of other aspects of the ABT program (e.g., banking, trading) as supportive of the feasibility of the Phase 3 GHG standards, we did not rely on those other aspects in justifying the feasibility of the standards.

Regarding the Colorado DOT et al. comment about aligning with CARB's ACT credit provisions, the commenter did not provide enough specificity for the aspects of the CARB program with which they wish EPA to align. See Section 2 of this RTC document for comments and responses relating to other considerations of CARB ACT provisions and other incentive programs and see Section 10.3.2 for comments and our response relating to CARB's weight class modifiers for the ACT program.

CARB's request to restrict small manufacturers from banking and trading credits generated from certifying custom chassis vehicles is outside the scope of this rulemaking. CARB correctly noted that the broader custom chassis provisions (specifically 40 CFR 1037.105(h)(2)) disallow banking and trading of custom chassis credits. However, in Phase 2, we explicitly provided qualifying small manufacturers the flexibility to bank and trade from any averaging set (See 81 FR 73688 and 74061, October 25, 2016). In this rulemaking, we did not reopen these existing provisions for qualifying small manufacturers in this rulemaking and thus the existing Phase 2 provisions' flexibilities for qualifying small manufacturers continue to apply. We may consider new or revised small business provisions and flexibilities in a future rulemaking.

We appreciate AESI's, Eaton's, and MECA's support for the off-cycle credit provisions. We did not reopen the existing off-cycle credit provisions in the proposed rule and manufacturers will continue to have the option to pursue off-cycle credits for future advanced technologies.

10.2 ABT in Setting Standards

10.2.1 Fleet averaging methodology

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

BACKGROUND

A. Clean Air Act Section 202 And EPA's Fleetwide-Averaging Approach

Section 202(a) of the Clean Air Act authorizes EPA to promulgate "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [EPA's] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). Those standards must apply to "such vehicles and engines for their useful life." Id. The standards cannot take effect until "after such period as [EPA] finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period," id. § 7521(a)(2)— commonly known as the "feasibility" requirement. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 6 - 7]

EPA has previously invoked its Section 202(a) authority to set maximum motor-vehicle emission levels for criteria pollutants (i.e., pollutants for which minimum acceptable standards have been established, such as particulate matter, ozone, and nitrogen oxides)—and, more recently, for greenhouse gases ("GHGs"). See Massachusetts v. EPA, 549 U.S. 497, 532 (2007). But instead of prescribing maximum levels of particular pollutants that each vehicle within a covered "class" may emit, in prior regulations EPA has set maximum fleetwide-average emission levels, which consider a manufacturer's fleet collectively. 40 C.F.R. §§ 1037.701(a), 1037.710(a)–(b). EPA annually determines each manufacturer's compliance with those fleetwide-average standards, issuing "deficits" (resulting in civil penalties) to manufacturers whose fleets fail these average standards and "credits" to those whose fleets emit less than EPA allows. Id. §§ 1037.241(a), 1037.710(c); see id. § 1068.101(a)(1). Credits can be used immediately to offset deficits in a manufacturer's other fleets, "banked" to offset deficits in future years, or “trad[ed] . . . between manufacturers.” Id. §§ 1037.710(a), 1037.715(a), 1037.720(a). EPA refers to this approach as its “averaging, banking, and trading (ABT) program.” 88 Fed. Reg. at 25,929. This regulatory creation largely mirrors the system Congress enacted in the Corporate Average Fuel Economy provisions of the Energy Policy and Conservation Act. [EPA-HQ-OAR-2022-0985-1660-A1, p. 7]

B. The Proposed Heavy-Duty Rule

That fleetwide-averaging approach is at the heart of EPA’s proposed rule at issue—which sets stringent new GHG-emission standards for heavy-duty vehicles (such as delivery trucks, refuse haulers, and buses) for model years 2027 and beyond, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25,926 (Apr. 27, 2023)—and its parallel proposed rule for light and medium-duty motor vehicles, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184 (May 5, 2023). Although prior EPA rules issued under Section 202 have employed fleetwide averaging—including a light-duty motor-vehicle rule for earlier model years, currently being litigated, see Texas v. EPA, No. 22-1031 (D.C. Cir.)—EPA’s proposed Heavy-Duty and Light- and Medium-Duty rules do so in a fundamentally different way to achieve a different end. Previously, averaging was presented as merely a flexibility. Now, prompted by an Executive Order calling for a massive shift to “zero-emission vehicles” by 2030 and directing EPA to undertake rulemakings on these issues with that goal in mind, Exec. Order 14,037, 86 Fed. Reg. 43,583 (Aug. 5, 2021); see 88 Fed. Reg. at 25,929 & n.12, EPA openly seeks in both rules to shift a substantial portion of motor-vehicle production toward vehicles that produce zero GHG emissions in operation. Fleetwide averaging is the linchpin of that ambition—it is this that allows EPA to reverse engineer its preferred outcomes. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 7 - 8]

To that end, the proposed Heavy-Duty rule would revise the existing GHG standards for model year 2027 and introduce new standards for heavy-duty vehicles (varying by type and use) for model years 2028 through 2032, which become more stringent each year. 88 Fed. Reg. at 25,929, 25,932. Although the proposed rule portrays those emission standards as “performance-based” and as allowing manufacturers to choose which emissions-control technologies to adopt, id. at 25,972, EPA has stated openly that it expects manufacturers to shift from internal-combustion engines toward battery-electric or fuel-cell vehicles, id. at 25,932. By 2032, EPA projects that 50 percent of vocational vehicles and 35 percent of day-cab tractors will be battery-electric or fuel-cell vehicles, and that 25 percent of sleeper-cab tractors will be fuel-cell vehicles. See id. at 25,933. In a break from its historic practice, EPA now overtly proposes to wield its Section 202 authority over emission levels to mandate the adoption of alternatives to internal-combustion engines—replacing pollutant-emitting motor vehicles that Section 202 governs with other, non-emitting vehicles that the statute does not cover. The proposed Heavy-Duty rule seeks to accomplish that unprecedented transformation on a highly compressed timeline, remaking the heavy-duty sector within less than a decade. [EPA-HQ-OAR-2022-0985-1660-A1, p. 8]

EPA cannot justify the proposed rule’s attempted transformation of the heavy-duty-vehicle sector as an application of its fleetwide-averaging approach to emissions. Fleetwide averaging itself contravenes the Clean Air Act. At a minimum, it is not clearly and unmistakably authorized as a back-door means of remaking the auto industry, as the major-questions doctrine requires. [EPA-HQ-OAR-2022-0985-1660-A1, p. 9]

B. EPA May Not Mandate Electrification Through Fleetwide Averaging

EPA has no clear congressional authorization for the proposed rule's electrification mandate. Under Section 202 of the Clean Air Act, EPA may "prescribe . . . standards" applicable to GHG emissions "from any class or classes of new motor vehicles or new motor vehicle engines" that EPA determines "cause, or contribute to, air pollution." 42 U.S.C. § 7521(a)(1); see also Massachusetts v. EPA, 549 U.S. 497, 532 (2007); 74 Fed. Reg. 66,496 (Dec. 15, 2009). Section 202 specifies that "[s]uch standards shall be applicable to such vehicles and engines for their useful life . . . whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control such pollution." 42 U.S.C. § 7521(a)(1). Nothing in the statutory text clearly authorizes EPA to mandate a compulsory shift toward zero-emission vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 12 - 13]

EPA has attempted to ground its electrification mandate in its standard-setting authority under Section 202 through fleetwide averaging. Averaging and its corollaries in EPA's ABT program—crediting (whereby manufacturers can use "credits" generated for one fleet that surpassed the emissions level to offset a deficit in another fleet), banking (saving credits earned one year to offset deficits in future years), and trading (selling credits to competitors for money)— are crucial to EPA's effort to mandate electrification. The proposed rule specifies emissions standards that would operate not as maximum-emission thresholds for particular pollutants that any individual vehicle must meet, but rather as fleetwide-average emission levels that manufacturers' fleets must collectively satisfy. See 88 Fed. Reg. at 25,956 ("In this proposal, we continue to expect averaging would play an important role in manufacturer strategies to meet the proposed standards."). That averaging approach is essential to EPA's electrification mandate because it plainly would not be feasible for EPA to set maximum permissible GHG emissions at zero for individual vehicles: the "cost of compliance" with a zero-emissions mandate for every heavy-duty vehicle would doom such a requirement. 42 U.S.C. § 7521(a)(2). Instead, by allowing lower-emitting vehicles in a manufacturer's fleet to offset higher-emitting vehicles (in its own fleet or that of another manufacturer, through trading of credits), and by setting very stringent fleetwide-average GHG-emission standards that no conventional motor vehicle could satisfy, EPA's proposed rule forces manufacturers to produce a significant number of zero-emission (i.e., electric) vehicles. See 88 Fed. Reg. at 26,002; see also id. at 26,015 ("BEVs and PHEVs generate credits that can be traded among manufacturers and used to offset debits generated by vehicles using other technologies that do not themselves meet the proposed standards."). [EPA-HQ-OAR-2022-0985-1660-A1, p. 13]

The Clean Air Act, however, does not authorize EPA to employ that fleetwide- averaging approach at all—much less with the unmistakable clarity the major-questions doctrine demands. EPA's contrary interpretation has no foundation in the statutory text and would make a hash of the statutory structure, which repeatedly uses language that makes sense only in the context of emissions standards applicable to individual vehicles. Even if fleetwide averaging were permissible as a general matter, it cannot be exploited to shoehorn zero-emission vehicles—i.e., vehicles that do not "cause, or contribute to, air pollution," 42 U.S.C. § 7521(a)(1), and thus fall outside Section 202 entirely—into the fleetwide-average calculation as a means of mandating electrification. [EPA-HQ-OAR-2022-0985-1660-A1, p. 14]

1. The Clean Air Act Does Not Permit Fleetwide Averaging

Nothing in the text of Section 202 authorizes a fleetwide-averaging approach. To the contrary, Section 202's relevant provision authorizes emissions standards for "any class or classes of new motor vehicles or new motor vehicle engines" that EPA determines "cause, or contribute to, air pollution." 42 U.S.C. § 7521(a)(1) (emphases added). Those standards must "be applicable to such vehicles and engines for their useful life." Id. The text thus permits EPA to adopt a standard applicable to all of the vehicles (or engines) in a particular class. Whatever discretion EPA may exercise in defining a "class" of vehicles, the text requires standards for the vehicles in that class, not for the class as a collective. [EPA-HQ-OAR-2022-0985-1660-A1, p. 14]

The absence of any affirmative authorization for fleetwide averaging should come as no surprise because, as EPA acknowledged four decades ago, "Congress did not specifically contemplate an averaging program when it enacted the Clean Air Act." 48 Fed. Reg. 33,456, 33,458 (July 21, 1983). EPA's entire averaging edifice is based on the purported fact that the Act "does not explicitly preclude standards" based on fleetwide averaging. 54 Fed. Reg. 22,652, 22,665 (May 25, 1989) (emphasis added). Under the major-questions doctrine, however, the absence of a statutory prohibition on the approach the agency seeks authority to pursue is categorically insufficient: EPA needs "'clear congressional authorization' for the power it claims," West Virginia, 142 S. Ct. at 2609 (citation omitted), not congressional silence on the subject. Even outside of major- questions cases, congressional silence is not an invitation to make things up. See Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208, 223 (2009) ("statutory silence, when viewed in context," often is "best interpreted as limiting agency discretion"); Marx v. Gen. Revenue Corp., 568 U.S. 371, 381 (2013) ("[I]t is fair to suppose that Congress considered the unnamed possibility and meant to say no to it[.]" (citation omitted)); Univ. of Tex. Sw. Med. Ctr. v. Nassar, 570 U.S. 338, 353 (2013). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 14 - 15]

In any event, the Clean Air Act refutes EPA's view that Congress left the door open to fleetwide averaging. Other provisions in Section 202 itself and Title II as a whole make clear that fleetwide averaging is fundamentally incompatible with the statutory structure and design. [EPA-HQ-OAR-2022-0985-1660-A1, p. 15]

Other portions of Section 202 confirm Section 202(a)(1)'s focus on emission standards applicable to individual vehicles. For example:

- Under 42 U.S.C. § 7521(b)(1)(A), the standards for light-duty vehicles and engines in model years 1977–79 must provide that "emissions from such vehicles and engines may not exceed 1.5 grams per vehicle mile of hydrocarbons and 15.0 grams per vehicle mile of carbon monoxide." Id. (emphasis added). This provision contemplates that "such vehicles"—i.e., individual light-duty vehicles—will not exceed these limits. Under an averaging approach, however, individual vehicles would be permitted to exceed these statutorily mandated standards.
- Similarly, 42 U.S.C. § 7521(b)(3) authorizes EPA to grant waivers from certain nitrogen-oxide emission "standards," see id. § 7521(b)(1)(B), for no "more than 5 percent of [a] manufacturer's production or more than fifty thousand vehicles or engines, whichever is greater." Id. § 7521(b)(3). The provision thus provides a default rule under which every vehicle must meet a per-vehicle emissions standard, then permits a waiver from that default rule for up to 5 percent of the fleet. Averaging is inconsistent with this provision, which depends on a set number of individual vehicles meeting the standards.
- And under 42 U.S.C. § 7521(m)(1), EPA must require manufacturers to install "diagnostic systems" on "all" new light-duty vehicles and trucks that are capable of

identifying malfunctions that "could cause or result in failure of the vehicles to comply with emission standards established under this section." Requiring diagnostic equipment on "all" vehicles makes no sense on an averaging approach; each vehicle must have a diagnostic system that ensures that vehicle's "compl[iance] with emission standards established under [Section 202]," id., yet under EPA's averaging approach, no particular vehicle need be in compliance. [EPA-HQ-OAR-2022-0985-1660-A1, p. 15]

Beyond Section 202 itself, averaging is also deeply in tension with "the design and structure of [Title II] as a whole." Util. Air, 573 U.S. at 321 (citation omitted). Consider Title II's provisions addressing testing, warranties, and penalties:

- Testing. EPA must "test . . . any new motor vehicle or new motor vehicle engine" to determine whether "such vehicle or engine" conforms with Section 202 emissions standards. 42 U.S.C. § 7525(a)(1). If the "vehicle or engine conforms to such regulations," EPA must issue the manufacturer a "certificate of conformity." Id. And a manufacturer may not sell a vehicle or engine not "covered by a certificate of conformity." Id. § 7522(a)(1). These provisions are not compatible with fleetwide-averaging for at least two reasons: first, the use of singular terms "vehicle" and "engine"—along with "any" and "such"—indicates that testing individual vehicles is required; and second, EPA cannot determine compliance with Section 202 standards before issuing a certificate of conformity—as the statute contemplates— under a fleetwide-averaging approach. (Instead, conformity is determined at "the end of the model year," when the manufacturer knows the quantity of "vehicles . . . produced in each vehicle family during the model year." 40 C.F.R. §§ 1037.705(c), 1037.250(a))
- Warranties. Title II's warranty provisions require a manufacturer to "warrant to the ultimate purchaser and each subsequent purchaser" "at the time of sale" that each new vehicle complies with applicable Section 202 standards. 42 U.S.C. § 7541(a)(1). Under an averaging approach, however, a manufacturer cannot determine compliance "at the time of sale," because actual compliance with an average standard can be determined only at year's end. Manufacturers may be able to make a rough predictive judgment ex ante, but they would be effectively warranting an unknown.
- Penalties. Under 42 U.S.C. § 7524(a), any violation of applicable standards "shall constitute a separate offense with respect to each motor vehicle or motor vehicle engine," with each offense subject to a civil penalty of up to $25,000. But under a fleetwide-averaging approach, "each motor vehicle or motor vehicle engine" cannot violate applicable emissions standards—only the fleet as a whole. [EPA-HQ-OAR-2022-0985-1660-A1, p. 16]

EPA also finds no quarter for fleetwide averaging in the case law. The best it can muster is a single decision that found no "clear evidence that Congress meant to prohibit averaging." Thomas, 805 F.2d at 425 (emphasis added); see 88 Fed. Reg. at 25,929 & n.9. But as explained above, under the major-questions doctrine, the absence of a "clear" prohibition is irrelevant: on the contrary, Congress must have specifically and clearly authorized the action. See West Virginia, 142 S. Ct. at 2609. Moreover, the Thomas court recognized inconsistencies between averaging and other statutory provisions, including Title II's "testing and certification provision, 42 U.S.C. § 7525," discussed above. 805 F.2d at 425 n.24. The court reserved judgment on that issue only because "it was not raised by any party before the agency." Id. EPA's best (indeed, only cited) case thus provides no support for construing Section 202 to authorize averaging. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 16 - 17]

2. EPA Cannot Use Fleetwide Averaging To Mandate Electrification

Even if Section 202 authorized fleetwide averaging in some circumstances, that approach cannot be used, as EPA proposes, to blend together the emissions levels of conventional, pollutant-emitting vehicles with vehicles that (according to EPA) emit zero pollutants. By its terms, Section 202(a)(1) authorizes EPA to promulgate “standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution.” 42 U.S.C. § 7521(a)(1) (emphases added). The text’s focus on the “emission” of pollutants that “cause . . . air pollution” demonstrates that Congress intended to cover only vehicles that actually emit the relevant pollutant—and to authorize EPA to set standards for the quantity of pollutants those vehicles may acceptably emit. Nothing in the text authorizes EPA to dragoon heavy-duty vehicle manufacturers into producing a separate line of vehicles that do not themselves emit the regulated pollutant at all. [EPA-HQ-OAR-2022-0985-1660-A1, p. 17]

EPA has elsewhere contended that the statute’s reference to “classes” of vehicles or engines permits it to treat polluting and non-polluting vehicles on the same footing. See EPA Br. 76–78, Texas. v. EPA, No. 22-1031 (D.C. Cir. Feb. 24, 2023). But that term cannot rescue EPA’s flawed interpretation. The relevant feature of a “class” of “motor vehicles” that “cause, or contribute to, air pollution” is that the vehicles in the class all emit the relevant pollutant. 42 U.S.C. § 7521(a)(1). A vehicle that emits zero pollutants is necessarily not part of that class. Given EPA’s own assumption that electric vehicles do not emit pollutants, electric vehicles cannot be among the “class or classes of new motor vehicles or new motor vehicle engines” that EPA may consider in setting Section 202 standards and they therefore may not be factored into a fleetwide average. If EPA were right, the relevant “category” EPA purports to be regulating would vanish at the point when EPA reaches the President’s goal that 100 percent of the heavy-duty fleet be “zero-emissions vehicles.” [EPA-HQ-OAR-2022-0985-1660-A1, pp. 17 - 18]

Organization: American Petroleum Institute (API)

iii. EPA has no authority under CAA §§ 202(a)(1) and (2) to establish emissions standards based on the average performance of two emissions control technologies.

The Proposed Rule is fundamentally different from the Phase 1 and Phase 2 GHG standards for heavy-duty vehicles in the manner in which the emission standards are established. EPA explains that the prior Phase 2 GHG standards for HD vehicles were not premised on the application of hybrid powertrains or ZEV technology. 88 Fed. Reg. at 25957. In contrast, the HD 3 proposal “include[s] both ICE vehicle and ZEV technologies.” Id. at 25958. [EPA-HQ-OAR-2022-0985-1617-A1, p. 20]

In particular, averaging is incorporated into EPA’s standard setting analysis in the Proposed Rule. EPA for each model year and for each vehicle type conducts an analysis of what standards could be met by traditional ICE vehicles and whether ZEVs are available for that model year for that vehicle type and, if so, at what volume. EPA then proposes an emissions standard for each model year and vehicle type that is a blended rate of the ICE value and the ZEV value (which is presumed to be zero) that is based on EPA's projection of how much of the market could be met with ZEVs. Id. at 25991-2. [EPA-HQ-OAR-2022-0985-1617-A1, p. 21]

EPA asserts that it "has long included averaging provisions for complying with emission standards in the HD program and in upholding the first HD final rule that included such a provision the D.C. Circuit rejected petitioner's challenge in the absence of any clear evidence that Congress meant to prohibit averaging." 88 Fed. Reg. at 25950. That is the only legal justification EPA asserts for using averaging in standard setting. [EPA-HQ-OAR-2022-0985-1617-A1, p. 21]

The use of averaging in standard setting is legally flawed for two reasons. First, EPA's asserted legal justification is inadequate. It is true that EPA has long used emissions averaging as a compliance method under its vehicle emissions standards. But here EPA is doing more – EPA uses averaging in setting the standards themselves. EPA provides no explanation of its legal authority for this novel approach. [EPA-HQ-OAR-2022-0985-1617-A1, p. 21]

Second, and in any event, EPA does not have legal authority to consider emissions averaging in standard setting. CAA § 202(a)(1) authorizes EPA to establish emission standards for "classes" of motor vehicles. In this case, EPA has used emissions data from two distinctly different classes of vehicles (ICE-powered vehicles and BEVs) in setting a single standard. That exceeds EPA's authority under CAA § 202(a)(1). Moreover, using averaging is unreasonable because there is no identifiable vehicle configuration that corresponds to EPA's proposed standards. That means the industry as a whole would have to certify at least two fundamentally different types of vehicles to satisfy the proposed standards. As a result, EPA is effectively setting two different standards for the same pollutant for the same class of vehicles under the guise of establishing a unitary standard for a single class of vehicles. [EPA-HQ-OAR-2022-0985-1617-A1, p. 21]

Furthermore, CAA § 202(a)(3)(A)(i) requires that HD standards reflect the "greatest degree of emissions reduction achievable through the application of technology which the EPA determines will be available." 42 U.S.C. § 7521(a)(3)(A)(i). Congress specifically directed EPA to set emissions for vehicles, not fleets of vehicles. Congress further required EPA to test these "motor vehicles or motor vehicle engines" to ensure they "conform to the standards." 42 U.S.C. § 7525(a)(2); see also id. § 7525(a)(1) (requiring certificates of conformity for specific vehicles). And Congress authorized EPA to grant waivers from certain nitrogen-oxide emissions standards "of no more than 5 percent of [a] manufacturer's production or more than fifty thousand vehicles or engines, whichever is greater." The testing of specific vehicles or engines and the presence of the waiver provisions cannot be implemented as intended under an averaging structure in which a significant portion of the fleet can be above the emissions standard so long as other vehicles perform sufficiently well to create average compliance. [EPA-HQ-OAR-2022-0985-1617-A1, p. 21]

Organization: American Thoracic Society (ATS)

The ATS further recommends EPA use caution when adopting any fleet averaging approaches. The ATS is concerned that if heavy duty truck manufacturers are allowed to meet emission reductions requirements through averaging of emission over an entire fleet, it will create perverse incentives for sellers and purchasers alike leading to a reduction in zero-emission vehicle sales. [EPA-HQ-OAR-2022-0985-1517-A1, p. 4]

Organization: Clean Fuels Development Coalition et al.

B. EPA lacks clear authority to use fleetwide averaging.

The reality, moreover, is that Congress has expressly precluded EPA from using Section 202(a) to phase out internal-combustion vehicles. EPA achieves that result only by misconstruing the standard-setting tools at its disposal. The text and structure of Section 202, and of Title II more broadly, unambiguously require that emission standards under Section 202(a) apply to individual vehicles, not to manufacturers' fleets on average. EPA claims to find authority for fleetwide averaging in Section 202(a), which authorizes the agency to issue "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles ... which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). This says nothing about averaging across fleets. [EPA-HQ-OAR-2022-0985-1585-A1, p. 8]

EPA has already conceded as much. When the agency first adopted fleetwide averaging, it recognized that "Congress did not specifically contemplate an averaging program when it enacted the Clean Air Act." 48 Fed. Reg. 33,456, 33,458 (July 21, 1983). And "[j]ust as the statute does not explicitly address EPA's authority to allow averaging, it does not address the Agency's authority to permit banking and trading." 54 Fed. Reg. 22,652, 22,665 (May 25, 1989); see also 55 Fed. Reg. 30,584, 30,593 (July 26, 1990) (same). That is the end of the analysis. The statute does not "explicitly" allow averaging and so EPA lacks "clear congressional authorization" to enact the proposal. [EPA-HQ-OAR-2022-0985-1585-A1, p. 9]

Indeed, even if the phasing out of the internal combustion engine were not a major question, EPA's claim to authority here is unlawful. As discussed below, the Clean Air Act's text and structure are incompatible with averaging (and banking and trading). But even on the terms EPA itself has articulated, its interpretation is impermissible. When a statute "says nothing about" a potential regulatory power, it "would be improper to conclude that what Congress omitted from the statute is nevertheless within its scope." Univ. of Texas Sw. Med. Ctr. v. Nassar, 570 U.S. 338, 353 (2013); see also Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208, 223 (2009) ("statutory silence, when viewed in context," is in many situations "best interpreted as limiting agency discretion," not creating it). After all, "[a]n agency … 'literally has no power to act' … unless and until Congress authorizes it to do so by statute." FEC v. Cruz, 142 S. Ct. 1638, 1649 (2022). And agencies no less than courts have a "duty to respect not only what Congress wrote but, as importantly, what it didn't write." Va. Uranium, Inc. v. Warren, 139 S. Ct. 1894, 1900 (2019) (plurality op.). "And supplying the extra words 'on average' would have a significant substantive effect: 'roller coaster riders must be 48 inches tall' means something very different from 'roller coaster riders must be 48 inches tall on average.'" Opening Brief of Private Petitioners at 41, Texas v. EPA (D.C. Cir. No. 22-1031). [EPA-HQ-OAR-2022-0985-1585-A1, p. 9]

The inference against EPA's claim to be able to write into its authority a fleetwide averaging power is especially strong because Congress knows full well how to create such a program—it did so not only in EPCA, but also in other provisions of Title II of the Clean Air Act. See 2

U.S.C. § 7545(k)(l)(B)(v)(II) (directing EPA to take certain actions if “the reduction of the average annual aggregate emissions of toxic air pollutants in a [designated district] fails to meet” certain standards). Simply put: “if Congress had wanted to adopt an [averaging] approach” for motor vehicle standards under Section 202(a), “it knew how to do so.” SAS Inst., Inc. v. lancu, 138 S. Ct. 1348, 1351 (2018). That Congress didn’t is dispositive. See Marx v. Gen. Revenue Corp., 568 U.S. 371, 381 (2013) (“[I]t is fair to suppose that Congress considered the unnamed possibility and meant to say no to it[.]”); Russello v. United States, 464 U.S. 16, 23 (1983); Rotkiske v. Klemm, 140 S. Ct. 355, 360-361 (2019) (“Atextual judicial supplementation is particularly inappropriate when, as here, Congress has shown that it knows how to adopt the omitted language or provision.”).6 To quote Justice Frankfurter: “It is quite impossible…when Congress did specifically address itself to a problem…to find secreted in the interstices of legislation the very grant of power which Congress consciously withheld.” Youngstown Sheet & Tube Co. v. Sawyer, 343 U.S. 579, 609 (1952) (Frankfurter, J., concurring) [EPA-HQ-OAR-2022-0985-1585-A1, pp. 9 - 10]

6 At the very least, EPA should await the Supreme Court’s decision in Loper Bright Enterprises v. Raimondo (22-451), which will consider “[w]hether the Court should overrule Chevron or at least clarify that statutory silence concerning controversial powers expressly but narrowly granted elsewhere in the statute does not constitute an ambiguity requiring deference to the agency.”

Add to this that the “silence” argument is simply not correct. That fleet-wide averaging is not permitted—and is in fact forbidden—is confirmed by multiple parallel provisions from the Clean Air Act. For example, the testing requirements that accompany the Section 202(b) standards confirm that those standards apply to all vehicles individually. EPA must “test any emission control system incorporated in a motor vehicle or motor vehicle engine . . . to determine whether such system enables such vehicle or engine to conform to the standards required to be prescribed under [Section 202(b)].” 42 U.S.C. § 7525(a)(2). If the system complies with the testing, then EPA must issue a “‘verification of compliance with emission standards for such system.” Id. These provisions plainly require standards that apply to individual vehicles.7 The fundamental premise of this testing regime is that a vehicle can meet individually applied emission standards. Thus “the broader context of the statute as a whole,” Robinson v. Shell Oil Co., 519 U.S. 337, 341 (1997), confirms that EPA is out over its skis here. [EPA-HQ-OAR-2022-0985-1585-A1, p. 10]

7 See also, Petitioners Brief, Texas et al. v. EPA et al., No. 22-1031 at 51–62 (D.C. Cir., Nov. 3, 2022) (detailing myriad ways in which statutory text, structure, and related provisions confirm that fleetwide averaging is not authorized).

C. Even if EPA could use fleetwide averaging, this cannot be used to force electrification.

Part of the reason EPA has traditionally been granted deference in its averaging schemes is because the agency has historically used averaging as an accommodation to regulated parties, allowing them flexibility that the statute does not in fact permit in exchange for setting standards that themselves go beyond what is permissible. Thus, while some commentors have pointed out the illegality of this scheme, vehicle manufacturers have not opposed EPA’s averaging approach because it provided them with the flexibility necessary to achieve otherwise unachievable standards. But in this new proposal EPA is not offering an extra statutory accommodation, but is instead taking an additional step away from the statutory text by using fleetwide averaging to mandate electrification. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 10 - 11]

In prior rules, the use of fleet-wide averaging meant that a vehicle manufacturer could comply by making some vehicles that emitted more and others that emitted less. But the proposal is now setting emissions standards in such a way that no fleet of internal combustion engine vehicles can meet the standards. This means that averaging no longer provides flexibility, but instead amounts to a de facto mandate to incorporate electric vehicles to comply with its proposed standards. [EPA-HQ-OAR-2022-0985-1585-A1, p. 11]

When considering EPA's authority to use averaging, courts have consistently found important that the averaging was a flexibility. See NRDC v. Thomas, 805 F.2d 410, 425 (D.C. Cir. 1986) ("EPA's argument that averaging will allow manufacturers more flexibility in cost allocation while ensuring that a manufacturer's overall fleet still meets the emissions reduction standards makes sense.") (emphasis added); White Stallion Energy Ctr., LLC v. EPA, 748 F.3d 1222, 1253 (D.C. Cir. 2014) (permitting averaging across multiple utility units under 42 U.S.C. § 7412(d) because averaging is a "more flexible, and less costly alternative."). [EPA-HQ-OAR-2022-0985-1585-A1, p. 11]

But in the proposed rule averaging does not represent an "alternative" or "flexibility," rather—just as in the Clean Power Plan—it is deployed as a tool for reverse engineering a preferred outcome by setting targets that cannot be achieved by disfavored fuel sources. "The proposed CO2 emission standards for each model year are calculated" by "project[ing the] fraction of ZEVs that emit zero grams CO2/ton-mile at the tailpipe" and "by multiplying the [remaining] fraction of ICE-powered vehicles in each technology package by the applicable existing MY 2027 CO2 emission standards." DRIA at 247–48. In other words, either a manufacturer builds electric vehicles to comply with the standards or it goes out of business. Even with extreme deference to an agency interpretation, this result is impermissible. [EPA-HQ-OAR-2022-0985-1585-A1, p. 11]

II. EPA lacks the Statutory Authority to Ignore Upstream Emissions for Electric Vehicles.

EPA has statutory authority to prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). This presents an interpretive dilemma. On the one hand, if electric vehicles are not "vehicles" "which cause, or contribute to" a given type of air pollution, then EPA may not set standards for them. Id. On the other, if electric vehicles are "vehicles" "which cause, or contribute to" a given type of air pollution, then EPA must set "standards applicable to the[ir] emissions." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 12]

The proposal tries to solve this problem by splitting the baby.8 EPA reasons that electric vehicles are vehicles that "cause or contribute to air pollution," but EPA just chooses to set their contribution to zero. This cannot be right. Cf. C.S. Lewis, That Hideous Strength 291 (Samizdat ed., 2015) ("Just imagine a man who was too dainty to eat with his fingers and yet wouldn't use forks!"). If electric vehicles truly emit no emissions, then they are not the sort of vehicle EPA can regulate. [EPA-HQ-OAR-2022-0985-1585-A1, p. 12]

8 Of course, the point of the story about Solomon is that the baby wasn't split. See 1 Kings 3:16- 28 ("Give the living child to the first woman, and by no means put him to death; she is his mother.").

Organization: Valero Energy Corporation

a) The statutory structure confirms EPA lacks statutory authority to use fleetwide averaging to mandate ZEVs.

EPA's proposal would require electrification by setting average emission standards for manufacturers' nationwide fleets and "averaging" in more and more zeros to represent the electric vehicles it wants to see in future years. Manufacturers that exceed the standards may bank credits and trade them to other manufacturers that fall short. [EPA-HQ-OAR-2022-0985-1566-A2, p. 64]

EPA relies on NRDC v. Thomas, 805 F.2d 410 (D.C. Cir. 1986), for the proposition that it is authorized to average HDVs. That case found EPA could average a manufacturer's different engine families. Id. at 425. It did so, however, with some caveats. First, its reasoning was based on a deference to EPA's interpretation of the statute "in the absence of clear evidence Congress meant to prohibit averaging." This standard, of course, is directly contrary to the standard applicable in this case in which EPA is proposing regulations that affect a major question—clear Congressional authority to permit averaging to mandate electric vehicles. Second, the parties failed to raise a textual argument against averaging. Id. at n.24 ("Although it was not raised by any party before the agency, and accordingly cannot be dispositive here … there is an additional argument against emissions averaging. The Act's testing and certification provision, 42 U.S.C. § 7525, speaks of 'any,' 'a,' or 'such' motor vehicle or engine being tested and certified. With averaging, some vehicles or engines would not be required to comply with the standards and would not be subject to NCPs for failing to so comply. This practice appears inconsistent with the requirement that 'any,' 'a,' or 'such' vehicle or engine be tested and required to comply with emissions standards."). [EPA-HQ-OAR-2022-0985-1566-A2, p. 64]

On the other hand, EPA has previously acknowledged that the Act is silent on the mechanisms of averaging, banking, and trading (ABT). When EPA first adopted fleetwide averaging, it recognized that "Congress did not specifically contemplate an averaging program when it enacted the Clean Air Act." 48 Fed. Reg. 33,456, 33,458 (July 21, 1983). And "[j]ust as the statute does not explicitly address EPA's authority to allow averaging, it does not address the Agency's authority to permit banking and trading." 54 Fed. Reg. 22,652, 22,665 (May 25, 1989); see 55 Fed. Reg. 30,584, 30,593 (July 26, 1990) (same). By definition, then, the Act does not address—let alone clearly authorize—the use of averaging, banking, and trading to electrify the Nation's vehicle fleet. [EPA-HQ-OAR-2022-0985-1566-A2, p. 64]

That should be the end of the analysis. Section 202 of the Clean Air Act does not itself "direct [conventional vehicles] to effectively cease to exist." West Virginia, 142 S. Ct. at 2612 n.3. EPA has instead relied on mechanisms that are not themselves spelled out in the statute and that have never before been used to mandate HD electric vehicles. Just as in West Virginia, EPA has nothing "close to the sort of clear authorization" necessary for such a transformational policy shift. 142 S. Ct. at 2614. [EPA-HQ-OAR-2022-0985-1566-A2, p. 64]

But in truth, the problem is far worse for EPA than that. As explained below, the Act unambiguously precludes fleetwide-average emission standards under Section 202(a). And even if the statute permitted some fleetwide averaging, it does not allow EPA to take the additional step of incorporating non-emitting vehicles into emission averages and thus forcing the market toward electric vehicles. The proposal is not merely stretching vague statutory language. It is defying clear statutory text. [EPA-HQ-OAR-2022-0985-1566-A2, p. 65]

The text and structure of Section 202, and of Title II more broadly, unambiguously require that emission standards under Section 202(a) apply to individual vehicles, not manufacturers' fleets on average. EPA claims to find authority for fleetwide averaging in Section 202(a), which authorizes EPA to issue "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles ... which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a). [EPA-HQ-OAR-2022-0985-1566-A2, p. 65]

On its face, that provision authorizes EPA to set standards for vehicles that emit harmful air pollutants. It says nothing about averaging across fleets. As noted, when EPA first adopted fleetwide averaging, it acknowledged that "Congress did not specifically contemplate an averaging program when it enacted the Clean Air Act." 48 Fed. Reg. at 33,458. EPA claimed to have the authority because the Act "does not explicitly preclude standards" based on averaging. 54 Fed. Reg. at 22,666 (emphasis added). EPA was wrong. "[T]he broader context of the statute as a whole," Robinson v. Shell Oil Co., 519 U.S. 337, 341 (1997), makes clear that Section 202(a) does not permit fleetwide averaging. And, even if EPA could somehow show that the statute tacitly or implicitly allows (or does not expressly preclude) averaging, that would still be insufficient to meet the necessary clear congressional authority to use fleetwide averaging as a means to force a transition from internal-combustion engines to ZEVs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 65]

a. Other provisions in Section 202 demonstrate that emission standards may not be based on averaging.

Title II is replete with provisions that necessarily apply to vehicles individually, not to fleets on average. That is evident first in the emission standards prescribed by Section 202 itself. For example, in Section 202(b), the Act sets forth specific light-duty vehicle emission standards that EPA must promulgate in "regulations under" Section 202(a). 42 U.S.C. § 7521(b). For vehicles in model years 1977 to 1979, the standards must provide that "emissions from such vehicles and engines may not exceed 1.5 grams per vehicle mile of hydrocarbons and 15.0 grams per vehicle mile of carbon monoxide." Id. § 7521(b)(l)(A). [EPA-HQ-OAR-2022-0985-1566-A2, p. 65]

Those provisions require that the "regulations under [Section 202(a)]" apply to "vehicles and engines," not "vehicles and engines on an average basis across a fleet." Construing those provisions to allow averaging would, in effect, add words to the statute that change its meaning. Neither courts nor agencies may "supply words ... that have been omitted." Antonin Scalia & Bryan Garner, Reading Law: The Interpretation of Legal Texts 93 (2012); accord Rotkiske.v. Klemm, 140 S. Ct. 355, 360-361 (2019). And supplying the extra words "on average" would have a significant substantive effect: "roller coaster riders must be 48 inches tall" means something very different from "roller coaster riders must be 48 inches tall on average." [EPA-HQ-OAR-2022-0985-1566-A2, p. 65]

The testing requirements accompanying the Section 202(b) standards confirm that those standards apply to all vehicles. In particular, EPA must "test any emission control system incorporated in a motor vehicle or motor vehicle engine ... to determine whether such system enables such vehicle or engine to conform to the standards required to be prescribed under [Section 202(b) of the Act].” 42 U.S.C. § 7525(a)(2). If the system complies, EPA must issue a “verification of compliance with emission standards for such system.” Id. Those requirements plainly contemplate standards that apply to individual vehicles and their emission-control systems. Not only does the statutory text frame the inquiry as whether an individual “vehicle” or “engine” conforms to the emission standards, but the provision’s foundational premise-that an emission-control system can enable a vehicle to meet emission standards depends on individually applied standards. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 65 - 66]

Other parts of Section 202 further demonstrate that emission standards under Section 202(a) cannot rely on averaging. Section 202(b)(3), for example, authorizes EPA to grant waivers from certain nitrogen-oxide emission standards—which, again, are standards “under” Section 202(a), see 42 U.S.C. § 7521(b)(l)(B)—for no “more than 5 percent of [a] manufacturer’s production or more than fifty thousand vehicles or engines, whichever is greater.” Id. § 7521(b)(3). This provision would be nonsensical under a fleetwide-averaging regime. It contemplates a default under which every vehicle meets a standard, then gives manufacturers a waiver from that default for up to 5% of the fleet. But under fleetwide averaging, no waiver is needed. Instead, a vast proportion of a manufacturer’s fleet—perhaps 50% or more—effectively has a “waiver” so long as a sufficient number of vehicles outperform the standard. Likewise, Section 202(g), which specifies an increasing “percentage of each manufacturer’s sales volume” of each model year’s vehicles that must comply with specified emission standards, is fundamentally incompatible with averaging. Id. § 7521(g)(l). [EPA-HQ-OAR-2022-0985-1566-A2, p. 66]

Similarly, under Section 202(m), EPA must require manufacturers to install on “all” new light-duty vehicles and trucks “diagnostic systems” capable of identifying malfunctions that “could cause or result in failure of the vehicles to comply with emission standards established under this section.” Id. § 7521(m)(l). As this requirement makes clear, individual vehicles must “comply with emissions standards established under [Section 202].” Id. Otherwise, requiring diagnostic equipment on “all” vehicles makes no sense. In a fleetwide-averaging regime, this requirement would be pointless, as the deterioration or malfunction of an individual vehicle’s emission-related systems would provide virtually no information about whether the fleet as a whole is compliant. [EPA-HQ-OAR-2022-0985-1566-A2, p. 66]

b. Title II’s compliance and enforcement provisions for emission standards confirm that EPA cannot use fleetwide averaging.

Fleetwide averaging also clashes with “the design and structure of [Title II] as a whole.” Utility Air, 573 U.S. at 321 (citation omitted). Title II sets forth a comprehensive, interlocking scheme for enforcing emission standards through testing, certification, warranties, remediation, and penalties. Fleetwide-average standards are incompatible with these provisions, which are “designed to apply to” individual vehicles and “cannot rationally be extended” to fleets. Id. at 322. [EPA-HQ-OAR-2022-0985-1566-A2, p. 66]

Testing and Certification. Under Title II, EPA must “test, or require to be tested in such manner as [it] deems appropriate, any new motor vehicle or new motor vehicle engine submitted by a manufacturer to determine whether such vehicle or engine conforms with the regulations prescribed under [Section 202].” 42 U.S.C. § 7525(a)(l). If the ‘‘vehicle or engine conforms to such regulations,” EPA must issue the manufacturer a “certificate of conformity.” Id. EPA may later test a manufacturer’s vehicles and engines, and if “such vehicle or engine does not conform with such regulations and requirements, [EPA] may suspend or revoke such certificate insofar as it applies to such vehicle or engine." Id. § 7525(b)(2)(A)(ii). A manufacturer may not sell a vehicle or engine not "covered by a certificate of conformity." Id. § 7522(a)(l). [EPA-HQ-OAR-2022-0985-1566-A2, pp. 66 - 67]

Fleetwide averaging is incompatible with these requirements in at least two respects. First, by using the singular terms "vehicle" and "engine," along with "any" and "such," the statute contemplates that individual vehicles may be tested, determined to "not conform" with the standards, and have their certificates of conformity suspended or revoked. In a fleetwide-averaging regime, testing an individual vehicle or engine does not enable EPA to determine whether it "conforms with the regulations prescribed under [Section 202]," 42 U.S.C. § 7525(a)(l), because conformity turns not on an individual vehicle's emissions but on the fleet's average performance overall. Second, fleetwide averaging also makes it impossible to determine compliance with applicable emission standards before a vehicle is sold, as required to obtain the certificate of conformity needed for a sale. See 42 U.S.C. § 7522(a)(l). Under fleetwide-average standards, a vehicle's "conform[ity] with the regulations prescribed under [Section 202]" cannot be determined until the manufacturer calculates its production-weighted average at "the end of each model year," when the manufacturer knows the quantity and model of "vehicles produced and delivered for sale." 40 C.F.R. §§ 86.1818-12(c)(2)(2), 86.1865-12(i)(l), (j)(3). [EPA-HQ-OAR-2022-0985-1566-A2, p. 67]

For similar reasons, fleetwide averaging is inconsistent with the statutory definition of an "emission standard," which "limits the quantity, rate, or concentration of emissions of air pollutants on a continuous basis." 42 U.S.C. § 7602(k). It is impossible to know on a "continuous basis" whether a manufacturer's fleet complies with EPA's proposed average standards, because a manufacturer cannot calculate its production-weighted average until the end of the year. Simply put, an after-the-fact compliance regime is incompatible with the Act's testing and certification scheme. [EPA-HQ-OAR-2022-0985-1566-A2, p. 67]

Warranties and Remediation. Fleetwide-average standards similarly clash with Title II's warranty provisions. Under Section 207, a manufacturer must ‘‘warrant to the ultimate purchaser and each subsequent purchaser" "at the time of sale" that each new vehicle complies with applicable regulations under [Section 202]. 42 U.S.C. § 7541(a)(l) (emphasis added). Yet, as with certificates of conformity, manufacturers cannot warrant conformity with fleetwide-average emission standards at the time of sale, because compliance can be determined only at the end of the year. See 40 C.F.R. § 86.1865-12(i)(l) (requiring manufacturers to compute their "production weighted fleet average" by "using actual production [data]" for the year in question). [EPA-HQ-OAR-2022-0985-1566-A2, p. 67]

Fleetwide-average emission standards are also inconsistent with Title II's remediation and notification provisions. Those provisions state that if EPA "determines that a substantial number of any class or category of vehicles or engines ... do not conform to the regulations prescribed under [Section 202]," the manufacturer must remedy "the nonconformity of any such vehicles or engines." 42 U.S.C. § 7541(c)(l). If "a motor vehicle fails to conform," the manufacturer bears the cost. Id. § 7541(h)(l). Further, "dealers, ultimate purchasers, and subsequent purchasers" must be given notice of any nonconformity, id. § 7541(c)(2), which requires identification of specific nonconforming vehicles. None of this is possible where the nonconformity is tied to a fleet on average. [EPA-HQ-OAR-2022-0985-1566-A2, p. 67]

Penalties. Finally, EPA's fleetwide-averaging regime is inconsistent with the statute's penalty provision. Under Section 205, any violation "shall constitute a separate offense with respect to each motor vehicle or motor vehicle engine," with each offense subject to its own civil penalty of up to $25,000. 42 U.S.C. § 7524(a) (emphasis added). Under EPA's approach, however, no individual vehicle or engine violates the applicable standard, only the fleet as a whole. The statute provides no method for calculating penalties when a fleet fails to meet its fleetwide-average standard-because it does not authorize fleetwide-average standards. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 67 - 68]

c. The broader text and history of Title II confirm that the rule exceeds EPA's authority through fleetwide averaging.

Other indicia of statutory meaning demonstrate that the proposed rule exceeds EPA's statutory authority under Section 202(a). Elsewhere in Title II, Congress showed that it knew how to legislate with respect to "average annual aggregate emissions." 42 U.S.C. § 7545(k)(l)(B)(v)(II) (directing EPA to take certain actions if "the reduction of the average annual aggregate emissions of toxic air pollutants in a [designated district] fails to meet" certain standards). [EPA-HQ-OAR-2022-0985-1566-A2, p. 68]

Thus, "if Congress had wanted to adopt an [averaging] approach" for motor vehicle standards under Section 202(a), "it knew how to do so." SAS Inst., Inc. v. Iancu, 138 S. Ct. 1348, 1351 (2018); see Rotkiske, 140 S. Ct. at 360-361 ("Atextual judicial supplementation is particularly inappropriate when, as here, Congress has shown that it knows how to adopt the omitted language or provision."). It did not choose that approach in Section 202(a). [EPA-HQ-OAR-2022-0985-1566-A2, p. 68]

The Energy Policy Conservation Act, enacted just two years before the 1977 Clean Air Act amendments, reinforces that conclusion. There, Congress directed the Secretary of Transportation to issue regulations setting "average fuel economy standards for automobiles manufactured by a manufacturer" in a given model year. 49 U.S.C. § 32902(a). That Congress has not used similar language in Section 202(a) of the Clean Air Act is a "telling clue" that the Act does not permit fleetwide averaging. Epic Sys. Corp. v. Lewis, 138 S. Ct. 1612, 1626 (2018). [EPA-HQ-OAR-2022-0985-1566-A2, p. 68]

The Clean Air Act's history also reflects Congress's understanding that emission standards would apply to all vehicles individually. Congress was so focused on reducing emissions at the level of the individual vehicle that, in the 1970 amendments, Congress permitted EPA to test any individual vehicle as it comes off the assembly line. See Pub. L. No. 91-601, § 8, 84 Stat. 1676, 1694-1696. Such a vehicle-by-vehicle test was meant to supplement the pre-1970 testing of prototypes. Congress explained that while testing of prototypes ''will continue," "tests should require each prototype rather than the average of prototypes to comply with regulations establishing emission standards." H.R. Rep. No. 91-1146, at 6 (1970). And if Congress forbade averaging across prototypes, it certainly did not permit averaging across entire fleets. [EPA-HQ-OAR-2022-0985-1566-A2, p. 68]

d. Related provisions confirm that Section 202(a) does not authorize averaging of non-emitting electric vehicles.

Other provisions of the Clean Air Act drive home the lack of statutory authorization to mandate electrification as well. In the Clean Air Act Amendments of 1990, Congress spoke directly to the phase-in of electric vehicles on America's roads. Congress instructed EPA to establish standards for "clean-fuel vehicles" operating on "clean alternative fuel," including "electricity." Pub. L. No. 101-549, § 229, 104 Stat. 2399, 2513 (codified at 42 U.S.C. §§ 7581(2), (7), 7582(a)). Congress required that certain areas of the country with the worst pollution would have to "phase-in" a "specified percentage" of "clean-fuel vehicles" using "clean alternative fuels" (defined to include "electricity") in certain fleets. 42 U.S.C. § 7586; see id. § 758l(a). The 1990 amendments highlight that Congress knows how to clearly establish standards that apply to electric vehicles, and to directly require that such vehicles be phased into a particular fleet. But Congress chose to do so only on a targeted, regional basis. The contrast between the 1990 amendments and Section 202(a) highlights the absence of any statutory authority for EPA's rule. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 68 - 69]

Other related statutes also suggest the same. In the Energy Policy Act of 1992, Congress directed NHTSA to set fuel-economy standards based on averages, but prohibited NHTSA from setting fuel-economy standards that average in the fuel economy of electric vehicles. See Pub. L. No. 102-486 §§ 302, 403, 106 Stat. 2776, 2870-2871, 2876 (later codified at 49 U.S.C. § 32902(h)). This prohibition bars NHTSA from doing exactly what EPA is doing here: misusing its regulatory authority to force a transition from conventional vehicles to electric vehicles by artificially tightening the "average" standard a fleet must meet. Of course, when Congress finalized the language of Section 202(a)(l) in 1977, it had no need to explicitly block EPA from considering electric vehicles, because it did not contemplate that EPA would set emission standards using averaging in the first place (or that EPA would be setting standards for greenhouse gases). The prohibition on NHTSA nevertheless underscores just how far EPA is reaching here: it is straining statutory language to seize a power that Congress expressly denied to a sister agency that actually has authority to promulgate fleetwide-average standards. [EPA-HQ-OAR-2022-0985-1566-A2, p. 69]

e. EPA's lack of authority for a credit-trading scheme further confirms its lack of authority to set fleetwide averages.

The proposal's credit banking and trading program is critical to EPA's electrification mandate. But the agency also lacks authority under Title II to establish a credit scheme as part of its emission standards under Section 202(a). [EPA-HQ-OAR-2022-0985-1566-A2, p. 69.]

As with fleetwide averaging, EPA has previously acknowledged that Title II says nothing about banking and trading credits in connection with motor-vehicle emission standards. See 54 Fed. Reg. at 22,665. What EPA has ignored, however, is that Title II is not silent regarding banking and trading in other contexts. Indeed, in multiple other provisions under Title II, Congress expressly authorized the use of bankable and tradable credits. See, e.g., 42 U.S.C. § 7545(k)(7) (reformulated gasoline credits); § 7545(o)(2)(A)(ii)(II)(cc), (5)(A)(i) (renewable fuel credits); id. § 7545(o)(2)(A)(ii)(II)(cc), (5)(A)(ii) (biodiesel credits); id. § 7545(o)(2)(A)(ii)(II)(cc), (5)(A)(iii) (small refineries credits); id. § 7586(f) (clean-fuel fleet-operator credits); id. § 7589(d) (California pilot test program's clean-fuel vehicle manufacturer credit). [EPA-HQ-OAR-2022-0985-1566-A2, p. 69.]

Under EPA's proposed approach, those provisions would all be superfluous, because EPA already had the discretion to adopt a credit-trading regime for any program. If Congress had wanted to permit credits in connection with emission standards under Section 202(a), it knew how to and would have done so expressly. See SAS Inst., 138 S. Ct. at 1351. [EPA-HQ-OAR-2022-0985-1566-A2, p. 69.

For all these reasons, courts have cast substantial doubt on EPA's authority to set fleetwide-average emission standards. As the D.C. Circuit Court of Appeals explained in NRDC v. Thomas, 805 F.2d 410 (D.C. Cir. 1986), the "engine specific thrust" of Title II's "testing and compliance provisions" is evident both in Congress's choice to "spea[k] of 'any,' 'a,' or 'such' motor vehicle or engine" in the text of the statute and in the "troubling" legislative history recounted above. Id. at 425 n.24. The arguments were not dispositive in Thomas only because the parties there had failed to present them. Id. But the Court nevertheless recognized that the arguments were relevant to "future proceedings." Id.. [EPA-HQ-OAR-2022-0985-1566-A2, p. 69.]

f. At a minimum, EPA may not use fleetwide averaging to require electrification.

Despite the absence of statutory authorization for fleetwide averaging, EPA has long employed that mechanism without significant industry pushback. That is likely because fleetwide averaging has generally been offered as an accommodation to regulated parties, allowing them flexibility that the statute does not in fact permit. In its current proposal, however, EPA is not offering an extra-statutory accommodation. It is taking an additional step away from the statutory text by using fleetwide averaging to mandate electrification. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 69 - 70.]

To be clear, in prior rules EPA set an average emission standard and allowed manufacturers to make some vehicles that emitted more and some that emitted less. Here, EPA has set tailpipe greenhouse-gas emission standards at a level so stringent that manufacturers must incorporate an increasing percentage of HD electric vehicles—which EPA treats as zero-emission vehicles—into their averages in order to comply with the "standards." See p. 13, supra. Put differently, the agency is proposing an emission standard that is artificially low because it incorporates electric vehicles, which EPA treats as emitting zero pollutants for averaging purposes. [EPA-HQ-OAR-2022-0985-1566-A2, p. 70.]

Whatever the permissibility of fleetwide averaging, the text and structure of Title II make plain that EPA cannot manipulate averaging as a means to force production of an increasing market share of electric vehicles. Section 202 does not grant EPA the power to make the internal-combustion engine go the way of the horse and carriage. At the very least, Section 202 is hardly clear in granting that awesome power—which is what matters under West Virginia. For automobiles as for power plants, EPA has purported to discover in the Clean Air Act the authority to "forc[e]" manufacturers to "cease making" a particular type of energy "altogether." 142 S. Ct. at 2612. We have seen that play recently before, and it should end the same way. [EPA-HQ-OAR-2022-0985-1566-A2, p. 70.]

<u>EPA Summary and Response:</u>

<u>Summary:</u>

AmFree et al. provided some background on EPA's use of fleetwide averaging in past regulations. AmFree et al. questions EPA's legal authority under the CAA for use of averaging in setting standards, suggests that non-emitting vehicles are not covered under the statute, and claims the rule constitutes a transformative change which implicates the Major Question Doctrine, and remakes the sector on a highly compressed timeline of less than a decade. AmFree et al. suggests the proposed standards are not "performance-based" when EPA states that it expects a shift from ICEs to EVs. AmFree et al. argues that fleetwide averaging is necessary (as no "conventional" individual vehicle could meet the Phase 3 standards) and not a flexibility in EPA's approach for this rule, unlike past rules' use of fleetwide averaging, and is used "in a fundamentally different way to achieve a different end" to mandate a shift of a substantial portion of production to certain preferred technologies (referencing one or more of the following in different parts of their comment: ZEVs, zero GHG emission vehicles, electrification, and/or alternatives to ICE). AmFree et al. further stated the following:

- Even if fleetwide averaging were permissible as a general matter, it cannot be exploited to shoehorn zero-emission vehicles—i.e., vehicles that do not "cause, or contribute to, air pollution,"[663] and thus fall outside Section 202 entirely—into the fleetwide-average calculation as a means of mandating electrification.
- "Congress did not specifically contemplate an averaging program when it enacted the Clean Air Act."[664]
- Under the Major Questions Doctrine, EPA needs "'clear congressional authorization' for the power it claims (to promulgate such a mandate, including through employing fleetwide averaging),"[665] not congressional silence on the subject, and it lacks such authorization.
- ... averaging is also deeply in tension with "the design and structure of [Title II] as a whole."[666] referencing provisions on testing, warranties, and penalties.

API, AFPM, Clean Fuels Development Coal., and Valero offered similar arguments challenging EPA's authority to implement any of the proposed provisions regarding fleetwide averaging and averaging in setting standards (and, to some extent, certain commenters (e.g. Valero also raise these arguments for banking and trading).

More specifically, first, the commenters acknowledge that EPA has included ABT in prior Title II emission standards rules for decades. The difference here, in their view, is that in prior rules, ABT has been offered as a flexibility, whereas here it is an integral part of the standard-setting mechanism. (AmFree et al., API, Clean Fuels Dvl. Coal.)

Second, these commenters all maintained that the ABT standard-setting feature of the rule was part and parcel of the transformational change to mandate electrification of the heavy duty sector, triggering the Major Question Doctrine. The commenters argued that since EPA concedes there is no explicit delegation in the statute regarding utilization of ABT, EPA lacks authority to use it here.

Third, the commenters argue that not only does the statute not explicitly authorize the use of ABT, but its text indicates that EPA lacks such authority. The commenters argue that section 202(a)(1) itself applies to "class" or "classes" of new motor vehicles. They argue that because BEVs and ICE vehicles are distinctly different types, they cannot be averaged together, and

[663] 42 U.S.C. § 7521(a)(1).
[664] 48 Fed. Reg. 33,456, 33,458 (July 21, 1983).
[665] *West Virginia*, 142 S. Ct. at 2609 (citation omitted).
[666] *Util. Air Regul. Group*, 573 U.S. at 321 (citation omitted).

moreover that “class” implies a singular standard, since a class cannot be treated as a collective (AmFree et al., AFPM). Commenters argue further that “the relevant feature of a “class” of “motor vehicles” that “cause, or contribute to, air pollution” is that the vehicles in the class all emit the relevant pollutant.[667] A vehicle that emits zero pollutants is necessarily not part of that class”. (AmFree et al., AFPM; to the same effect, API and Valero). The commenters suggest that no single vehicle configuration can meet the standards, so OEMs would have to certify two “fundamentally different vehicle types” to do so. (API). They indicate that EPA is essentially trying to add the words “on average” to the statute and that doing so would significantly change the meaning.

Looking beyond section 202(a)(1), these commenters point to other provisions which they claim are either fundamentally inconsistent with the standards including averaging, or, by alluding to or otherwise authorizing averaging, show that that Congress knew how to authorize averaging when it wished EPA to have that authority, so the absence of that authorization in section 202(a)(1) indicates EPA lacks the authority (invoking the so-called Russello canon of statutory construction). Provisions these commenters indicate are inconsistent with ABT are the following, as the commenters characterize the provisions:

- 42 U.S.C. § 7521(b)(l) requires that the “regulations under [Section 202(a)]” apply to “vehicles and engines,” not “vehicles and engines on an average basis across a fleet.” And supplying the extra words “on average” would have a significant substantive effect: “roller coaster riders must be 48 inches tall” means something very different from “roller coaster riders must be 48 inches tall on average.” The testing requirements accompanying the Section 202(b) standards confirm that those standards apply to all vehicles. In particular, EPA must “test any emission control system incorporated in a motor vehicle or motor vehicle engine ... to determine whether such system enables such vehicle or engine to conform to the standards required to be prescribed under [Section 202(b) of the Act].”[668] If the system complies, EPA must issue a “verification of compliance with emission standards for such system.”[669] Those requirements plainly contemplate standards that apply to individual vehicles and their emission-control systems. Not only does the statutory text frame the inquiry as whether an individual “vehicle” or “engine” conforms to the emission standards, but the provision’s foundational premise-that an emission-control system can enable a vehicle to meet emission standards depends on individually applied standards. (Chamber of Commerce, Valero). They also argue that 42 U.S.C. section 7521(b)(3) indicates that each individual vehicle or engine must meet a standard before EPA can grant a waiver based on use of innovative powertrain technologies (Chamber of Comm., API, Clean Fuels Dvl. Coal.). Valero argues more specifically that “Section 202(b)(3) authorizes EPA to grant waivers from certain nitrogen-oxide emission standards—which, again, are standards “under” Section 202(a), see 42 U.S.C. § 7521(b)(l)(B)—for no “more than 5 percent of [a] manufacturer’s production or more than fifty thousand vehicles or engines, whichever is greater’, but this provision makes no sense under a fleetwide-averaging regime: “It contemplates a default under which every vehicle meets a standard, then gives manufacturers a waiver from that default for up to 5% of the fleet. But under fleetwide averaging, no waiver is needed.

[667] 42 U.S.C. § 7521(a)(1).
[668] 42 U.S.C. § 7525(a)(2).
[669] *Id.*

Instead, a vast proportion of a manufacturer's fleet—perhaps 50% or more—effectively has a "waiver" so long as a sufficient number of vehicles outperform the standard."

- 42 U.S.C. § 7521(g)(l) indicates that specific percentages of vehicles must comply with the standards each model year, whereas they argue an averaging regime would allow higher percentages not to achieve if offset on a fleetwide basis. (Valero).
- 42 U.S.C. § 7521(m)(l) references diagnostic system requirements for light-duty vehicles and trucks applicable to "all" light duty vehicles, which system must be capable of identifying "failure of the vehicles to comply with emission standards under this section". The argument is that with a fleet average standard, the diagnostic results of any individual vehicle convey no useful information about compliance with an averaging-based standard. (AmFree et al., Valero, Chamber of Commerce).
- 42 U.S.C. § 7525(a)(l) and 7525(b)(2) direct EPA to test and certify individual motor vehicles or engines as meeting the applicable standards. They argue that since a manufacturer submits their ABT report at the end of the model year, a manufacturer doesn't truly know if its vehicles comply when they are sold. (AmFree et al., Chamber of Comm., API, Valero).
- 42 U.S.C. § 7541(a)(l) indicates that manufacturers must warrant that each new vehicle sold complies with the regulations "at the time of sale." They argue manufactures can't know a compliance from a fleet average perspective until they calculate their production-weighted averages at the end of the year. (AmFree et al., Chamber of Comm., Valero).
- 42 U.S.C. § 7541(c) states that manufacturers must remedy nonconforming vehicles and engines if EPA determines a "substantial number" of a class do not conform to the regulations. They argue it is not possible to do this when many vehicles are inherently not meeting the standard under an averaging program. (Valero).
- 42 U.S.C. § 7524(a) refers to civil penalties as separate offenses for each vehicle or engine. They argue the provision does not provide a method to calculate penalties for fleetwide-average standards where an entire fleet may fail to meet the standards. (AmFree et al., Chamber of Comm., Valero).
- 42 U.S.C. § 7602(k) defines an emission standard as a limit that applies on a continuous basis. They argue manufacturers don't know their compliance continuously under an averaging program, because they don't calculate the production-weighted average until the end of the model year. (Valero).
- They argue Congress directed EPA to test individual vehicles and explicitly forbade testing the average of prototypes in their 1970 amendments, which would have similarly applied to a broader averaging across fleets (citing H. Rep. No. 91-1146 at 6).

The commenters cite the following provisions (as characterized by the commenters) as evidence that Congress knew how to specify an averaging or ABT regime when it wished agencies to utilize one:

- 42 U.S.C. § 7545(k) explicitly directs EPA to consider "average annual aggregate emissions" for toxic air pollutants.
- Various Clean Air Act provisions specifically speak to averaging and credits. Commenters argue these are unnecessary provisions if such authority can be implied

absent an express delegation, and in any case, they are an indication that Congress knew how to specify use of ABT. [670]

- Relatedly, 42 U.S.C. §§ 7581 (7), 7582(a), 7586, 7589(d), which are among the clean-fuel vehicle provisions added as part of the 1990 CAA Amendments, direct EPA to establish standards that phased in a percentage of clean-fuel vehicles, including those fueled by clean alternative fuels such as electricity. Sections 7586(f) and 7589(d) refer to credit generation explicitly, which they argue indicates that Congress could authorize credit-based standards when it wished to. They argue Congress specifically chose to phase in electric vehicles "on a targeted, regional basis" which is in contrast to section 202(a). They also argue the definition of "clean alternative fuel" itself, in 42 U.S.C. section 7581(2) refers to "electricity", indicating that Congress knew how to specify use of electrification when it wished to.
- They argue that 49 U.S.C. § 32902(h) directs NHTSA to set fleet average fuel-economy standards, but "prohibited NHTSA from setting fuel-economy standards that average in the fuel economy of electric vehicles" and EPA was not given a similar restriction in 202(a) because Congress "did not contemplate that EPA would set emission standards using averaging in the first place." (Valero).

These commenters stated that they acknowledge that the D.C. Circuit has upheld EPA's use of ABT in Title II programs but distinguish these cases on several grounds. These commenters stated that if the rule triggers the Major Question Doctrine, then these cases indicate that ABT is not explicitly authorized. In addition, these commenters stated that these cases mistakenly consider Congressional silence as creating a gap which EPA has authorized discretion to fill. They also asserted that the dicta in *NRDC v. Thomas* footnote 24 cites to the CAA certification provisions[671] as contemplating a vehicle-by-vehicle certification regime and recognizes inconsistencies between averaging and other statutory provisions (noting the court "reserved judgment on that issue only because 'it was not raised by any party before the agency'").

ATS cautioned that a fleet averaging approach could "create perverse incentives" for sellers and purchases that could reduce zero-emission vehicle sales.

<u>Response:</u>

Many commenters maintained that both under the major questions doctrine and normal principles of statutory construction, standards using a fleet averaging form are impermissible under the Act. EPA disagrees with these comments for several reasons as explained in section I.C of the preamble and as further detailed below. First, EPA has employed fleetwide averaging in standard-setting and compliance since 1985. The final rule merely maintains and did not reopen the existing ABT programs, such that these comments are untimely and outside the scope of this final rule. Without reopening the ABT program, we respond to the comments raised substantively as well. Second, ABT is consistent with the standard-setting authority conferred by Congress in section 202(a)(1) and (2). Indeed, ABT furthers the goals of the statute in enabling manufacturers to achieve any given level of emissions reductions with lower costs and more flexibility. Third, ABT is consistent with the compliance and enforcement provisions of the Act. Commenters are simply wrong that ABT precludes compliance and enforcement vis-a-vis individual vehicles; rather, the regulatory program explicitly requires compliance by individual

[670] *See*, *e.g.*, CAA sections 211(k)(7), 211 (o)(2)(A)(ii)(II)(cc), 211(o)(5).
[671] CAA section 206.

vehicles, and EPA can and does enforce the program's requirements with respect to such individual vehicles. Fourth, the fact that Congress required EPA or other agencies to provide for tradable credits in some other programs outside of the motor vehicle emissions control context is not relevant in ascertaining the agency's authority to provide for ABT in our motor vehicle programs. Fifth, the statute does not preclude EPA regulating all HD vehicles—regardless of whether they emit or have an ICE powertrain—in the same class. Indeed, EPA previously defined the class as HD vehicles in the 2009 Endangerment Finding and did not reopen that finding in this proceeding. Moreover, the commenters' preferred classification is unreasonable as it would delay the adoption of effective and available pollution control technologies and forgo large benefits for the public health and welfare. EPA responds to comments about the major questions doctrine in RTC 2.1.[672]

Response 10.2.1.a: The Comments Are Untimely.

These comments are untimely and beyond the scope of this final rule. EPA did not reopen in this rulemaking whether it is permissible to use an averaging approach to setting standards under section 202(a)(1)-(2), or the general ABT program's flexibilities. EPA disagrees that EPA's approach in this rulemaking is novel from past rulemakings: EPA has not only repeatedly used averaging in setting standards under section 202(a)(1)-(2), including in setting the most recent HD GHG Phase 2 standards in 2016,[673] and noted the importance of ABT program flexibilities overall, but also repeatedly has explained that ABT is consistent with and gives full effect to the requirements of section 202 as well as the broader statutory scheme, including Title II's compliance and enforcement provisions applicable to such HD vehicles. Under such circumstances, it is eminently reasonable for EPA not to reconsider a question that has been settled for decades.[674] Additionally, as further discussed in this response and Section 2 of this RTC document, as well as in the final rule Preamble Sections I and II, the commenter's assertions of a change from EPA's historical approach rest on a false assertion that this rule mandates adoption of a specific compliance pathway; rather, the HD Phase 3 standards are performance-based standards with many potential compliance pathways, of which we provide several examples to further support that EPA is agnostic as to what technologies are ultimately applied in complying with the HD GHG Phase 3 standards.[675]

[672] Commenter AFPM attached its brief in *Texas v. EPA*, No. 22-1031 (D.C. Cir.) to its comments and referenced arguments therein. To the extent applicable, EPA also incorporates its responsive brief in that case by reference. EPA's Br., *Texas v. EPA*, No. 22-1031 (D.C. Cir.).

[673] *See, e.g.*, 81 FR 73715 ("[W]e have developed the final vocational vehicle standards using the same methodology as for all of the other Phase 2 standards, where we apply fleet average technology mixes to fleet average baseline vehicle configurations, and each average baseline and technology mix is unique for each vehicle subcategory.").

[674] *See Growth Energy v. EPA*, 5 F.4th 1, 13 (D.C. Cir. 2021).

[675] Commenters frame this assertion of a mandate in several different ways, all of which the rule's administrative record shows are false. Our additional example potential compliance pathways comprised of vehicles with ICE (relative to the reference case) that all emit criteria and GHG pollutants show that the Phase 3 standards are not a "ZEV" mandate, "Zero GHG vehicle" mandate, or "non-ICE" mandate, and also show that they are not an "electrification" mandate (even if one were to adopt this false premise of electrification as only applicable to PHEVs, BEVs, and FCEVs, which is incorrect as ICE vehicles also have electrified components, since at least one example potential compliance pathway is comprised of vehicles without those technologies relative to the reference case).

Commenters' claims that this rule is novel in treating ABT as integral to standard-setting, while prior rules viewed ABT only as a flexibility, are misplaced. As an initial matter, EPA considered only the availability of averaging, but not banking or trading, in identifying the level of the standards.[676] EPA has relied on the availability of averaging in countless standard-setting rulemakings since 1985. For example, the 1985 rule found that averaging was a key consideration in supporting the technological feasibility and lead-time of the standards. That rule stated:

> Particulate trap technology is heretofore untried on the fleet level. EPA believes that the … standard which, through averaging, effectively requires use of traps on 70 percent of all heavy-duty vehicles will significantly reduce the risk of widespread noncompliance while allowing manufacturers to gain valuable experience with this new technology. To promulgate this standard without allowing averaging … would increase the technological risk associated with the standard because traps would have to be used in even the most difficult design applications.[677]

Numerous subsequent rules have followed the same approach.[678] For example, the 1990 rule stated that "the standards were set with averaging in mind, making averaging integral to the standard."[679] Further, EPA has always viewed averaging as integral to standard-setting in the HD GHG program. For example, the HD Phase 2 GHG final rule stated that "ABT programs are more than just add-on provisions included to help reduce costs. They can be, as in EPA's Title II programs generally, an integral part of the standard setting itself.…Without ABT provisions (and other related flexibilities), standards would typically have to be adjusted to accommodate issues of feasibility and available lead time."[680]

Moreover, the legality of averaging under section 202(a) has already been litigated in *NRDC v. Thomas*, 805 F. 2d 410 (D.C. Cir. 1986), where the court of appeals ruled in favor of the agency. Commenters rely heavily on footnote dicta from that case to allege that the court identified potential statutory inconsistencies but did not reach them only because they were not raised in the litigation. We address the substance of these points later in our response. However, we note here that the footnote dicta were comprehensively addressed by EPA's 1989 proposal[681]

[676] While banking and trading provide manufacturers with additional flexibilities in meeting the standards, they are not necessary to EPA's judgment as to the feasibility of the standards. *See* preamble II.G. As such, they are also severable from the final standards.
[677] 50 FR 10634-35.
[678] *See also, e.g.*, 2010 LD GHG final rule, 75 FR 25412-13 (describing setting fleet average LD GHG standards, as EPA had previously set for Tier 2 NOx standards, and the integral role of ABT in standard setting itself for Title II engine and vehicle programs); 65 FR 6698, 6743-46 (Feb. 10, 2000) (Tier 2) ("An ABT program is an important factor that EPA takes into consideration in setting emission standards that are appropriate under section 202 of the Clean Air Act."); 64 FR 58471, 58481 (Oct. 29, 1999) (describing how EPA set the 2004 and later model year NOX+NMHC standards for HD diesel engines (62 FR 54694) in consideration of modified ABT provisions: "The final rule also contained modified ABT provisions for heavy-duty diesel engines … .").
[679] 55 FR 30594.
[680] 81 FR 73495/3 (Oct. 25, 2016); *see also* HD Phase 1 GHG Final Rule, 76 FR at 57127 (Sept. 15, 2011).
[681] 54 FR 22652, 22665-66 (May 25, 1989) ("EPA does not believe that the statutory text or legislative history cited by the court necessarily means that the CAA requires or that Congress intended that every vehicle or engine family emit at the same level. As the court itself noted, the Act gives EPA broad latitude in the testing of vehicles and, more fundamentally, in the formulation of standards. EPA promulgated the HDE NOx and PM emissions standards as

and 1990 final rule,[682] where we also received copious comments on this specific issue. Any party wishing to challenge EPA's authority for averaging in light of the Agency's interpretation of *NRDC v. Thomas* had ample opportunity to do so following EPA's promulgation of the 1989 and 1990 rulemakings, and yet, no party did so.

EPA also disagrees with commenters who claim this is the first time EPA has considered electrified technologies in establishing standards based on averaging. As we explain in Preamble I.B-C and our major questions doctrine response in RTC 2.1, all vehicles—including all ICE vehicles—today are electrified to some extent, and electrification exists on a large spectrum. The agency has considered powertrain electrification specifically since at least the 1998 NLEV rule and the 2000 Tier 2 standards. In the HD GHG program itself, EPA has previously adopted vehicle standards under 202(a)(1)-(2) where compliance pathways supporting the standards reflected inclusion of powertrain electrification technologies and included averaging with ICE vehicle technologies. For example, in promulgating the HD GHG Phase 2 standards in 2016, we explained that in the technology mix for the compliance pathway supporting the final standards for the full implementation year of MY 2027, we projected an overall vocational vehicle adoption rate of 12 percent mild hybrid electrified vehicles, which we estimated will be 14 percent of vehicles certified in the Multi-Purpose and Urban subcategories.[683] We also explained that the stringency of the HD GHG Phase 2 standards was derived on a fleet average technology mix basis and that the emission averaging provisions of ABT meant that the regulations did not require all vehicles to meet the standards. [684] No one challenged EPA's authority to adopt such standards relying on averaging or a technology mix that included electrified technologies in judicial challenges to the HD GHG Phase 2 rule.

EPA also notes that given the lengthy pedigree of the ABT program, manufacturers have come to rely on it for compliance with many of EPA's motor vehicle programs. As we explain in Preamble II.C.4, the majority of certified vehicle families (93%) and manufacturers (29 out of 40) rely on ABT to comply with the Phase 2 GHG rule.[685] Unsurprisingly, no directly regulated manufacturer is opposing the agency's authority for ABT or to establish standards with a fleet

averaged standards. It thus follows that in testing 'any' engine for compliance with those standards, EPA may hold particular engine families to different control levels as part of an averaged set of engine families so long as the engine families' average emission levels meet the applicable standard.").

[682] 55 FR 30584, 30593-94 (July 26, 1990) ("In [*NRDC v. Thomas*], the court upheld averaging, but expressed some reservations about averaging in light of a statutory provision and some legislative history not raised by the parties to the case. The court pointed out that under averaging some vehicles would not be required to comply with the standards and that this appeared inconsistent with the requirement that "any," a" or "such" vehicle or engine be tested and required to comply with emission standards. At the same time the court noted that the statutory language was ambiguous and that the testing and certification provisions empower the Agency to test vehicles and engines in the manner it 'deems appropriate' so as to conform to the prescribed standards. EPA fully discussed in the preamble to the proposed rule why the statute and its legislative history should be read to allow the Agency discretion to determine the manner of testing and certification of vehicles. EPA also found that the broad type of averaging represented by trading and banking would be consistent with the Congressional scheme. … EPA continues to believe that the statute provides the Agency discretion in this matter, and that trading and banking are consistent with the statutory aims.").

[683] 81 FR at 73708.

[684] 81 FR at 73715; *see also* 77 FR at 62854-55 and 62856-57 (October 15, 2012) (company by company projection of potential compliance pathways for MY 2021 and 2025 light duty vehicle GHG emission standards, indicating hybrid electrified vehicle penetrations of up to 15% for some companies).

[685] Most of the manufacturers that did not use ABT produced vehicles that were certified to the optional custom chassis standards where the banking and trading components of ABT are not allowed, and averaging is limited.

average form. Major manufacturers generally support ABT, and as we summarize in RTC 2.1, they specifically support EPA's decision to average ICE vehicles with ZEVs in establishing the standards. Indeed, many manufacturers affirmatively asked EPA to expand the ABT program in discrete ways to allow them additional flexibility, a topic which we address in RTC 10.3 and Preamble Section III.A. While the agency has authority to change its policies when warranted, commenters have advanced no persuasive justification for reopening ABT at this time, particularly in light of manufacturers' reliance interests and the ABT program's ability to effectuate greater emissions reductions at lower costs. Indeed, their comments do not appear to even recognize the considerable reliance interests of directly regulated entities, recycle legal arguments that the agency considered and rejected long ago in the 1990 rule,[686] and effectively concede that abandoning averaging would delay the application of pollution control technologies and forgo otherwise feasible emission reductions. The little that commenters do say about manufacturers' interests is fundamentally wrong. They erroneously claim that the reason manufacturers have not pushed back on ABT is because the manufacturers view it solely as an extra-statutory accommodation that allows them greater flexibility. In this rulemaking, EPA relied solely on averaging (and not banking or trading) in supporting the feasibility of the standards, and EPA thinks manufacturers understand very well how the agency has relied on averaging to establish countless standards since 1985. In sum, commenters have not adduced sufficient reasons to adopt a policy, much less revisit a longstanding, foundational part of the motor vehicle program with a forty-year pedigree.

We reiterate that EPA did not reopen this issue in this rulemaking and the comments are outside the scope of the rule. In responding, EPA notes that we are not here "undertak[ing] a serious, substantive reconsideration of the existing" position.[687] EPA's response is intended solely to clarify and correct the misstatements and misrepresentations made by commenters concerning EPA's historical approach to averaging in standard setting and ABT program flexibilities, how EPA's ABT program is implemented, and the corresponding statutory basis. In providing this response, EPA also notes the extraordinary nature of commenters' claims: given the widespread use of ABT across EPA's section 202(a) programs, commenters—none of whom are regulated entities under section 202(a)—are implying that the agency has continually violated countless Title II compliance provisions for nearly forty years. That is completely false, and the agency wants to set record straight.

Response 10.2.1.b: Section 202 (a) Delegates Authority to EPA to Adopt Standards With a Fleet Average Form.

[686] *See, e.g.*, 55 FR 30584, 30593-94.

[687] *Growth Energy v, EPA*, 5 F. 4th 1, 21 (D.C. Cir. 2021). *See also Pub. Emps. for Env't Resp. v. EPA*, 77 F.4th 899, 913 (D.C. Cir. 2023) ("PEER cites no cases, and we are aware of none, in which an agency reopened an issue by merely responding to a petition for rulemaking submitted by a third party" citing *Am. Rd.& Transp. Builders Ass'n v. EPA*, 705 F.3d 453, 457 (D.C. Cir. 2013) ('[A]n agency's response to a petitioner's comments cannot provide the sole basis for reopening'); *Banner Health v. Price*, 867 F.3d 1323, 1341 (D.C. Cir. 2017) (quoting *Kennecott Utah Copper Corp. v. U.S. Dep't of Interior*, 88 F.3d 1191, 1213 (D.C. Cir. 1996)) ("As here, when an 'agency merely responds to ... unsolicited comment[s] by reaffirming its prior position, that response does not' open the agency's position up to a challenge. Moreover, an agency does not 'reopen an issue by responding to a comment that addresses a settled aspect of some matter, even if the agency had solicited comments on unsettled aspects of the same matter.'").

Commenters maintained that section 202(a) does not mention averaging, banking, and trading. They assert that, whether under standard principles of statutory construction or under the major questions doctrine, Congressional silence is not tantamount to a delegation of authority.

The commenters are correct that section 202(a)(1) does not include the words "averaging, banking, and trading."[688] But the standard-setting framework in section 202(a)(1) readily encompasses performance-based standards that are based on consideration of averaging. We address the statutory text in this subsection 10.2.1.b. In later subsections, we explain how such standards fit well within the Act's implementation and enforcement mechanisms, and how other provisions in section 202 and elsewhere confirm EPA's authority under section 202(a)(1) to set such standards.

Section 202(a)(1) mandates that EPA "prescribe … standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles…". The Supreme Court has made clear that fleet average and other requirements applicable at the fleet-wide (as opposed to individual vehicle) level are "standards" within the meaning of Title II of the Act. In *Engine Mfrs. Ass'n v. S. Coast Air Quality Mgmt. Dist.*, 541 U.S. 246 (2004),[689] the Court indicated that "standards" encompass "fleet average emission requirements," which "decrease over time, requiring manufacturers to sell progressively cleaner mixes of vehicles, and under which "[m]anufacturers retain flexibility to decide how many vehicles in each emission tier to sell in order to meet the fleet average."[690] The Court also found that "standards" include other types of fleet-wide requirements like mandates that fleet owners purchase vehicles of a given type,[691] and that a certain percentage of a manufacturer's new vehicle sales must consist of vehicles of a given type.[692]

Section 202(a)(1) also applies to "class or classes of new motor vehicles." "Class or classes" necessarily refers to groups of vehicles, as opposed to individual vehicles. So Section 202(a)(1) is naturally read to authorize EPA to set standards for groups of vehicles, which would include a manufacturer's fleet of vehicles that are in this group.

Regulation under Section 202(a)(1) is also conditioned on the Administrator finding that emissions from a class or classes of motor vehicles "cause, or contribute to, air pollution which

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[688] EPA's response here focuses on averaging. However, "trading and banking are simply forms of averaging between manufacturers and over time. Thus, they pose similar legal issues." 54 FR 22665. With respect to the arguments raised by the adverse comments, EPA believes trading and banking are justified on similar bases as averaging. *See also generally* 54 FR 22665-67 (discussing the legal bases for trading and banking), 55 FR 30593-99 (same). In addition, EPA disagrees that banking and trading are necessary to standard-setting rather than being a flexibility for these Phase 3 standards. EPA did not rely on banking and trading to justify the feasibility of the standards. See preamble II.G.

[689] The Court in. *S. Coast Air Quality Mgmt. Dist* was construing CAA section 209(a), which refers to "any standard relating to control of emissions from new motor vehicles". This language is similar to the text of section 202(a). The *South Coast* Court made clear that there is no reason to read "standard" in section 202(a) differently than in section 209(a)): "A 'standard' is defined as that which 'is established by authority, custom, or general consent, as a model or example; criterion; test.' This interpretation is consistent with the use of 'standard' throughout Title II of the CAA (which governs emissions from moving sources) to denote requirements such as numerical emission levels with which vehicles or engines must comply, *e.g.*, [CAA section 202] (a)(3)(B)(ii), or emission-control technology with which they must be equipped, *e.g.*, [CAA section 206](a)(6)." *Id*. at 253.

[690] *Id*. at 250, n.3.

[691] *Id*. at 250, 258.

[692] *Id*. at 255.

may reasonably be anticipated to endanger public health or welfare." In enacting section 202(a)(1), Congress was concerned with classes of motor vehicles contributing to dangerous air pollution, not with individual vehicles doing so. Indeed, it is ordinarily only emissions from a group of vehicles (i.e., a class) not a single vehicle that could cause dangerous air pollution. As we explain further in Section 10.2.1.f, this is also how EPA has long interpreted the statute, including in making the 2009 GHG endangerment finding for motor vehicles. This further indicates that EPA may regulate the class of vehicles as a whole, including at the fleet-wide level, not just individual vehicles.

The statute explicitly subjects regulation under Section 202(a)(1) to the requirements of Section 202(a)(2), which states that "[a]ny regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Fleet average standards relate directly to Section 202(a)(2)'s considerations of technical feasibility, cost, and lead time. As we explain in RTC 10.2.1.a above, EPA has found for decades that establishing fleet average standards allows the agency to set standards at a given stringency for lower cost. It also affords regulated entities more flexibility in determining how to meet those standards, accommodating practical realities of vehicle redesign cycles and market fluctuations, and allowing additional lead-time for a portion of the fleet to meet the standards if the regulated entity decides to have another portion of the fleet achieve the standards more rapidly.[693] Similarly, the ability to generate credits promotes earlier introduction of advanced technologies, furthering the Act's emission reduction and technology advancement goals.

The D.C. Circuit reviewed and upheld EPA's use of averaging in promulgating section 202(a) standards in *NRDC v. Thomas*, 805 F.2d 410 (D.C. Cir. 1986). Observing that there was no "clear congressional prohibition of averaging," the Court held that "the EPA's argument that averaging will allow manufacturers more flexibility in cost allocation while ensuring that a manufacturer's overall fleet still meets the emissions reduction standards makes sense."[694] While the Court noted in dicta that its analysis did not consider certain potential arguments not raised by the litigants—arguments which we addressed in a subsequently rulemaking[695] and which we discuss later in this response—its holding was unquestionably to uphold EPA's averaging program.

Congress subsequently ratified EPA's and the Court's interpretation in the 1990 Clean Air Act Amendments. "Congress is presumed to be aware of an administrative or judicial interpretation of a statute and to adopt that interpretation when it re-enacts a statute without change."[696] Ratification is particularly applicable here because there is explicit evidence in both the House and Senate legislative history indicating that Congress knew of EPA's and the Court's

[693] *See also White Stallion Energy Ctr., LLC v. EPA*, 748 F.3d 1222, 1253 (D.C. Cir. 2014) (allowing averaging across multiple utility units under CAA section 112(d), which "neither expressly allows nor disallows emissions averaging," where averaging is a "more flexible, and less costly alternative" than unit-by-unit compliance, even though "this may allow individual units to exceed the emissions limitation"), *rev'd on other grounds, Michigan v. EPA*, 576 U.S. 743 (2015).
[694] *NRDC v. Thomas*, 805 F.2d at 425.
[695] 55 FR 30584, 30593-94 (July 26, 1990); 54 FR 22652, 22665-66 (May 25, 1989).
[696] *See Lorillard v. Pons*, 434 U.S. 575, 580 (1978).

interpretation on this issue.[697] Legislative history from the House recognized that, under the Clean Air Act:

> EPA has promulgated regulations for averaging (50 Fed. Reg. 10606) and for banking and trading (55 Fed. Reg. 30584). Cognizant of these rules and the Court's decision in NRDC v. Thomas, 805 F.2d 410 (D.C. Cir. 1986) the House-Senate conferees chose not to amend the Clean Air Act to specifically prohibit averaging, banking and trading authority.
>
> Averaging, banking and trading programs, in fact, have very positive impacts on air quality. Such programs preserve the requirement that each family of engines must meet or exceed a preassigned standard. Furthermore, averaging programs create an incentive to produce engines lower than the applicable standard, and encourage the development and early use of improved emission control technologies, and the development and sale of alternative-fueled vehicles. Such programs also aid manufacturers in reducing the costs of controlling emissions.[698]

As such, "[t]he intention was to retain the status quo," that is, the agency's continued application of averaging in establishing the standards following *NRDC v. Thomas*.[699] Similar legislative history is found in the Senate.[700]

The text of the Act further corroborates Congress's ratification of EPA's use of averaging in setting section 202(a) standards. In section 219 of the Act, Congress directed EPA to establish standards for urban buses pursuant to section 202(a). Section 219(b)(1) provides:

> The standards under section 7521(a) of this title applicable to urban buses shall require that, effective for the model year 1994 and thereafter, emissions of particulate matter (PM) from urban buses shall not exceed 50 percent of the emissions of particulate matter (PM) allowed under the emission standard applicable under section 7521(a) of this title as of November 15, 1990, for particulate matter (PM) in the case of heavy-duty diesel vehicles and engines manufactured in the model year 1994.

The referenced 1994 HD PM standard (i.e., "the emission standard applicable under section 7521(a) of this title as of November 15, 1990, for particulate matter (PM) in the case of heavy-duty diesel vehicles and engines manufactured in the model year 1994") was a standard with a fleet average form. Indeed, it was one of the standards litigated in *NRDC v. Thomas* on the issue of averaging.[701] Thus, Congress expressly recognized an EPA standard with an averaging form and endorsed such a standard as the basis for further standard-setting under section 202(a).

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[697] 136 Cong. Rec. 35,367 (1990), 1990 WL 1222469, at *1; 136 Cong. Rec. 36,713 (1990), 1990 WL 1222468, at *1.
[698] 136 Cong. Rec. 35,367, 1990 WL 1222469, at *1.
[699] *Id.*
[700] 136 Cong. Rec. 36,713, 1990 WL 1222468, at *1. (Congress, noting *NRDC v. Thomas*, instead opted to let the existing law "remain in effect.").
[701] *See NRDC v. Thomas*, 805 F.2d 410, 425 (D.C. Cir. 1986) ("The NRDC challenges the EPA's program of emissions averaging for the 1991 and 1994 PM standards and the 1991 NOx standard.").

Pursuant to this provision, EPA promulgated urban bus standards, and those standards provided for averaging, as well as banking and trading.[702]

Following the 1990 Amendments, EPA continued to establish many other motor vehicle standards based on averaging, and the use of ABT became a well-settled part of the regulatory landscape. Consistent with this, in enacting the Energy Independence and Security Act of 2007, Congress specifically recognized the possibility of fleet average GHG standards. The statute generally barred Federal agencies from acquiring "a light duty motor vehicle or medium duty passenger vehicle that is not a low greenhouse gas emitting vehicle."[703] It directed the Administrator to promulgate guidance on such "low greenhouse gas emitting vehicles," but explicitly prohibited vehicles from so qualifying "if the vehicle emits greenhouse gases at a higher rate than such standards allow for the *manufacturer's fleet average grams per mile of carbon dioxide-equivalent emissions for that class of vehicle*, taking into account any emissions allowances and adjustment factors such standards provide."[704] In other words, Congress explicitly contemplated the possibility of fleet-average GHG standards for motor vehicles.[705]

In light of the clear congressional authorization for averaging, EPA also does not agree with commenters who claim that averaging is precluded by the major questions doctrine. We further address the applicability of the major questions doctrine in RTC 2.1. We also disagree with commenters who claim that EPA is relying on silence as an implicit delegation of authority.[706] EPA is not asserting authority for ABT based on statutory silence; as explained above, the basis for ABT is the statutory text of section 202(a)(1)-(2), read in light of the context, purpose, and history.[707]

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702 *See* 58 FR 15781, 15784, 15787.

703 42 USC 13212(f)(2)(A).

704 42 USC 13212(f)(3)(C) (emphasis added).

705 42 USC 13212 does not specifically refer back to section 202(a). However, we think it is plain that Congress intended for EPA to consider relevant section 202(a) standards in implementing section 13212. *See* 42 USC 13212(f)(3)(B) ("In identifying vehicles under subparagraph (A), the Administrator shall take into account the most stringent standards for vehicle greenhouse gas emissions applicable to and enforceable against motor vehicle manufacturers for vehicles sold anywhere in the United States.").

706 In addition, the commenters' selective quotation from *Entergy v. Riverkeeper*, 556 U.S. 208, 223 (2009), is inapposite. That case *upheld* EPA's determination that the delegation for EPA to issue standards reflecting "best technology available for minimizing adverse environmental impact" allowed standards based on cost-benefit analysis, notwithstanding that such an authorization appears nowhere in the statutory text. *Id*. at 218, 226. The commenters cite the following language from the opinion in support of their argument: "sometimes statutory silence, when viewed in context, is best interpreted as limiting agency discretion." Id. at 223. The following sentence of the opinion, however, states that "[f]or the reasons discussed earlier, § 1326(b)'s silence cannot bear that interpretation." *Id*. The Court thereupon concluded, "This extended consideration of the text of § 1326(b), and comparison of that with the text and statutory factors applicable to four parallel provisions of the Clean Water Act, lead us to the conclusion that it was well within the bounds of reasonable interpretation for the EPA to conclude that cost-benefit analysis is not categorically forbidden." *Id*. In any case, this case is not applicable because EPA is not relying on statutory silence here.

707 Notwithstanding commenters' selective citations of past preambles, the agency has never touted statutory silence as the basis for the ABT program. We have, as we do today, noted the fact that the statute does not explicitly specify an ABT program. But in promulgating such programs, we have also consistently justified them in light of the text and purpose of the Act. *See, e.g.,* 55 FR 30593-99 (describing in detail the legal bases for ABT and concluding on page 30599 that "EPA believes that trading, banking and expanded averaging are consistent with and support the goals and provisions of the Act. Compliance with the technology forcing 1991 and 1994 NOX and PM emissions

Response 10.2.1.c: Standards with a Fleet Average Form Are Consistent with the Statutory Context and Structure.

As explained above, in section 202(a)(1), Congress delegated to EPA the authority to adopt standards for new motor vehicles and to revise the standards as appropriate. Specifically, Congress entrusted to the Administrator the determination of the class or classes of vehicles subject to the standards, the form of the standard, the lead time provided, the consideration of the costs of compliance, and, taking these elements and other factors into account, the stringency of the standards. As we explain further in RTC 2.1, this delegation provides EPA the flexibility needed to appropriately address the widely varying circumstances that can arise under section 202, such as developments in the need for emissions control, technologies, and their costs. This provision's authority readily encompasses the kind of fleet averaging standards EPA has adopted over many years and covering many different types of vehicles and pollutants.

At various points, Congress directed EPA to exercise its section 202(a) authority to adopt certain specific standards.[708] These various provisions identify the specific group of vehicles to which they apply, as well as the specific model years, pollutants, and stringency of the standards. Although Congress limited EPA's discretion for those specific vehicles, model years, and pollutants, even in those cases Congress recognized and adopted provisions reflecting a variety of the flexibilities authorized in standard setting under section 202(a). For example, Congress directed that EPA provide for waivers; alternative standards for small volume manufacturers; phase-ins over time based on a percentage of a manufacturer's production; as well as standards that changed over the useful life of the vehicles.

In addition, Congress specifically addressed to what extent if any EPA's authority to revise these standards in the future, including under its general section 202(a)(1) authority, was limited. In general, Congress placed only a few limitations on EPA's future standard setting. Congress typically specified that EPA's future revisions of the standards for these vehicles and pollutants had to preserve a specified degree of stringency and in some cases, Congress specified the number of model years before revisions were allowed. But these provisions do not constrain EPA's general authority to set standards under section 202(a)(1) in other circumstances. Most importantly for purposes of this response, none of these provisions limit fleetwide averaging or otherwise limit EPA's authority to structure the form of future section 202(a)(1) standards in this rulemaking.

These provisions place no other limits on EPA's standard setting under section 202(a)(1). They did not limit EPA's ability to structure the form and level of future standards for these vehicles and pollutants, only the stringency and lead time. Through these provisions Congress placed no limits at all on EPA's authority to set standards under section 202(a)(1) for other vehicles and other pollutants. Congress directly addressed the specific limits it placed on EPA's future standard setting, and those are the only limits it imposed on the authority it provided EPA in setting standards under section 202(a).

standards will be enhanced, emissions will be reduced, not increased, and the important role of NCPs will not be supplanted. Furthermore, as indicated in the discussion above, EPA does not think that banking, trading or expanded averaging contradict the provisions of section 206 regarding certification and testing.").

[708] *See, e.g.*, CAA section 202(a)(3)(A)(i), 202(b), (g), (h).

EPA's past fleet averaging standards, as well as the standards at issue in this rulemaking, are fully consistent with the grant of authority in section 202(a)(1). In no case do these standards violate the limited conditions Congress placed on future standard setting in the provisions discussed in section 202.

We now discuss each of these provisions that commenters cite. Commenters refer to section 202(a)(3)(A)(i) as evincing Congressional intent not to include averaging as part of the standard setting process for heavy duty vehicles. But, this provision, like section 202(a)(1), refers to standards for emission from "classes" of heavy-duty vehicles (and from "categories" as well). This language is most naturally applicable to groups of vehicles like fleets.[709]

Commenters viewed sections 202(b)(1) and 206(a)(2) as showing incompatibility with standards predicated on averaging. The argument goes that section 202(b)(1) commands standards for "vehicles and engines," and that the testing of "any emission control system incorporated in a motor vehicle or engine" provisions in section 206(a)(2) only make sense on a per vehicle basis. They further point to the 5 percent waiver authority in section 202(b)(3) and the testing provision for section 202(b) standards found in section 206(a)(2). They maintain that the waiver provision is unnecessary in a fleet averaging regime since well over 5% of a manufacturer's vehicles could be above a fleet average limit without the need of a waiver, and note further that the testing provision is written in the singular ("vehicle or engine"), and so can only be read to mean vehicle-by-vehicle testing.

These arguments are misplaced. First, section 202(b)(1) is an explicit and narrow exception to EPA's general standard-setting authority under section 202(a)(1), which applies "[e]xcept as otherwise provided in subsection (b)." Section 202(b)(1) establishes standards for certain pollutants, model years, and classes of vehicles. It thus cannot derogate from the general scope of authority in section 202(a)(1). Specifically, it does not address HDV standards for GHGs and therefore has no applicability to the final standards at issue here. Moreover, on its face, section 202(b)(1) accords with fleet-average standards because it specifically refers to standards for certain classes of vehicles (e.g., light-duty vehicles for certain model years), as opposed to individual vehicles; the provision also uses the term "such vehicles and engines," which naturally refers back to the classes identified in the provision.

CAA section 206(a)(2) adds nothing to the commenters' argument. That provision requires EPA in some cases to test emission-control systems to determine whether they enable vehicles to conform with standards Congress prescribed in section 202(b). As such, section 206(a)(2) prescribes duties relating to standards under section 202(b), and as just discussed, that section has no bearing on the section 202(a) authority beyond the specific circumstances to which it applies, circumstances inapplicable here. Moreover, in section 206(a)(2), Congress had a specific reason to speak to individual vehicles. Added in 1970, it enabled a private party that developed a new "emission control system," such as a new catalyst, to submit a vehicle or engine incorporating that system for testing "to determine whether such system enables such vehicle or engine to conform to the [Subsection 202(b)] standards."[710] It was sensible for Congress to establish this mechanism for testing new technologies in the context of specific vehicles and individuals, rather than fleets. But there is no basis in section 206(a)(2) to think Congress meant

[709] *See also* Response 10.2.1.b and Response 10.2.1.f.
[710] CAA section 206(a)(2); *see* Environmental Policy Division of the Congressional Research Service, Volume 1, 93d Cong., 2d Sess., A Legislative History of the Clean Air Amendments of 1970, at 128, 200 (Comm. Print 1974).

to prohibit fleet averages even under section 202(b), let alone section 202(a). To the extent that it is relevant, section 206(a)(2) confirms that Congress intended EPA to consider all feasible emission-control technologies, even those that had not been developed as of 1970.

The commenters' reference to section 202(b)(3) is also mistaken. That provision allows EPA to impose standards less stringent than subsection (b)(1) standards for nitrogen-oxides emissions for up to 5% of production of model-years 1977-1979 light-duty vehicles, where an automaker "demonstrates that such waiver is necessary to permit the use of an innovative power train technology." Under subsection (b)(3), an automaker identifies its total production for the year and the specific emission standards to which each vehicle was certified. EPA would then assess whether at least 95% of the fleet met the subsection (b)(1)(B) standard and whether the rest met the subsection (b)(3) standard. But this would be true whether each of those standards was a vehicle specific standard, a fleet-average standard, or both. None of these approaches would be inconsistent with subsections (b)(1) and (b)(3). More basically, nothing in either subsection speaks to EPA's authority under section 202(a)(1). We reiterate that nothing in section 202(b), including the waiver provision in (b)(3), has any applicability beyond the specific circumstances to which it applies, which circumstances are inapplicable here.

Nor does anything in section 202(g) constrain standards with a fleet average form. This provision—as well as the parallel provision in section 202(h) —is another example of Congress directing EPA to use its section 202(a) authority in a specific manner, for specific vehicles (light-duty trucks and light-duty vehicles), pollutants (NMHC, CO, NOx, and PM), and model years. Under this provision for these specified pollutants and model years, such vehicles must meet one or the other of the specified phase-in standards. These provisions say nothing about EPA's authority to establish standards for different types of vehicles, pollutants, or model years. It is worth noting, however, that the phase-in of standards Congress specified in section 202(g) is an example of the range of forms available to EPA. As we explain further below in RTC 10.2.1.d.3, a phase-in form of a standard requiring specified percentages of a manufacturer's production of vehicles to meet a standard is similar to the fleet averaging-based form used in this rule.

Commenters also assert that compliance with a fleet average is inconsistent with the definition of "emission standard" in section 302(k): "a requirement … which limits the quantity, rate, or concentration of emissions of air pollutants on a continuous basis." The argument is that one cannot "know" "on a continuous basis" whether a manufacturer is meeting its fleet-average standard. It is not clear that the definitions in section 302 apply to Title II,[711] but even if they do, the emission standard definition requires standards to *apply* continuously, not that compliance be *measured* continuously. In general, fleet-average standards (including the vehicle specific numerical standards that apply both when the vehicle is new and when it is in use) control emissions from vehicles on a continuous basis. More specifically, as explained in Response 10.2.1.d., the Family Emission Limit for GHGs to which individual heavy-duty vehicles are certified are both applicable continuously and measurable at any time throughout the vehicle's useful life.

Finally, we note that the commenters' reliance on specific provisions in section 202 to limit EPA's more general authority under section 202(a)(1)-(2) is at odds with normal tenets of

[711] *Motor & Equip. Mfrs. Ass'n*, 627 F.2d at 1112 n.35. The commenters' arguments are also inconsistent with the Supreme Court's interpretation of "standard' in the context of Title II provisions on controlling emissions from motor vehicles in *South Coast*, as explained in Response 10.2.1.b. above.

statutory construction. Broad grants of discretionary authority like section 202(a)(1) are generally not limited by other narrower provisions focused on particular situations.[712] Moreover, Congress has expressly indicated what limitations the specific provisions impose on future EPA standard setting, but they do not impose any limitations which preclude fleet average standards, indicating that no such limitations should be implied. [713]

Response 10.2.1.d: Standards Using a Fleet Average Standard Form Fit the Act's Implementation and Enforcement Provisions

A number of commenters viewed fleet average standards as fundamentally incompatible with the certification of conformity provisions of section 206. They maintain that these provisions are written as vehicle specific: they refer to "engine" and "vehicle" in the singular, and they require a determination "whether such vehicle or engine" (referring back to the individual vehicle or engine) "conforms with the [section 202 emission standards]." They argue that testing of an individual vehicle, however, does not indicate whether or not a fleet average is achieved, since in their view conformity cannot be determined until the conclusion of a model year. For similar reasons, these commenters claim that fleet average standards are inconsistent with section 203(a)(1), which prohibits sale of a vehicle or engine not "covered by a certificate of conformity," and section 205(a), under which any violation of applicable standards "shall constitute a separate offense with respect to each motor vehicle or motor vehicle engine."

These commenters further maintain that fleetwide-average emission standards are inconsistent with Title II's remediation and notification provisions. Those provisions state that if EPA "determines that a substantial number of any class or category of vehicles or engines...do not conform to the regulations prescribed under [Section 202]," the manufacturer must remedy "the nonconformity of any such vehicles or engines."[714] If "a motor vehicle fails to conform," the

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[712] See *Catawba Cnty. v. EPA*, 571 F.3d 20, 36 (D.C. Cir. 2009) ("[A] congressional mandate in one section and silence in another often suggests … a decision not to mandate any solution in the second context, i.e., to leave the question to agency discretion."); *Corbett v. Transportation Sec. Admin.*, 19 F.4th 478, 489 (D.C. Cir. 2021*), cert. denied*, 143 S. Ct. 395 (2022) ("Petitioner turns the holding in *Alabama Realtors* on its head by asking this court to apply limiting constructions to provisions plainly granting TSA broad authority to act by drawing on entirely separate provisions that appear throughout 49 U.S.C. Chapter 449.…There is no viable canon of construction that endorses this interpretive approach."); *Helicopter Ass'n Int'l, Inc. v. FAA*, 722 F.3d 430, 435 (D.C. Cir. 2013) (holding that specific statutory provisions amplifying the FAA's regulatory authority merely indicated that Congress intended to address the matters subject to regulation in several different ways, not to limit the statute's broad grant of authority); *Farrell v. Blinken*, 4 F.4th 124, 136–37 (D.C. Cir. 2021).

[713] *See Odhiambo v. Republic of Kenya*, 764 F. 3d 31 (D.C. Cir. 2014) ("the [Foreign Sovereign Immunities Act] is the sole way for a plaintiff suing a foreign sovereign to invoke the jurisdiction of U.S. courts, and the exceptions enumerated by the FSIA are exhaustive."); cf. *Law v. Siegel*, ––– U.S. ––––, 134 S.Ct. 1188, 1196, 188 L.Ed.2d 146 (2014) (enumeration of exemptions "confirms that courts are not authorized to create additional exceptions")."*; Air Transp. Ass'n of Am., Inc. v. United States Dep't of Agric.*, 37 F.4th 667, 677 (D.C. Cir. 2022) (standing for the proposition that one does not infer a limitation from a provision authorizing a different sort of activity: "[t]he section containing the "commensurate" language is a limitation on how much can be collected in fees from a particular user class. It is not a limitation on how those fees may be spent. Therefore, Appellants' argument that fees collected from multiple user classes cannot be comingled in a fund that pays for the inspections of fee-paying user classes fails because the FACT Act does not prohibit this form of cross-subsidization"); *GPA Midstream Ass'n v. United States Dep't of Transp.*, 67 F.4th 1188, 1196 (D.C. Cir. 2023) ("Section 4 creates neither a condition precedent nor a ban. As the petitioners themselves explain at length in their opening brief, § 4 does not apply to gathering pipelines. Section 4 by its plain terms applies only to "transmission pipeline facilities." We do not understand how § 4 could plausibly be read to create a condition precedent for a different type of pipeline facility.").

[714] CAA section 207(c)(l).

manufacturer bears the cost.[715] Further, "dealers, ultimate purchasers, and subsequent purchasers" must be given notice of any nonconformity,[716]which requires identification of specific nonconforming vehicles. These commenters maintain that none of this is possible where the nonconformity is tied to a fleet average.

EPA disagrees with these comments. The regulatory provisions for demonstrating compliance with emissions standards have been successfully implemented for decades, including provisions in our regulations for demonstrating compliance through our ABT program. Commenters who alleged inconsistency with the compliance and enforcement provisions fundamentally misapprehend the nature of EPA's HD GHG program and its ABT regulations, where compliance and enforcement do in fact apply to individual vehicles, consistent with the statute. Both the emission standard and FEL are specified in each vehicle's individual certificate of conformity, and apply both at certification and throughout that vehicle's useful life. As appropriate, EPA can suspend, revoke, or void certificates for individual vehicles. Manufacturers' warranties apply to individual vehicles. EPA and manufacturers perform testing on individual vehicles, and recalls can be implemented based on evidence of non-conformance by a substantial number of individual vehicles within the class. The details of the certification and enforcement process are set out in the remainder of this Response 10.2.1.d. The ultimate conclusion is that the regulatory scheme—including the use of FELs as the applicable in-use standard for all of the vehicles a manufacturer produces, combined with the pre-production testing, pre-production projection of production before certification, the required reporting of actual production and calculation of credits or deficits at the end of the model year, plus the ability to test in-use for compliance—fully satisfies the compliance and enforcement requirements of the statute.

Response 10.2.1.d.1: Overview of HD GHG Certification and Compliance

For the standards at issue in this rulemaking, as well as those adopted in many previous rulemakings for heavy duty vehicles, manufacturers may choose to demonstrate compliance with the applicable emission standard by using the regulatory provisions for averaging, banking, and trading.[717] They do so by dividing their vehicles into "families" or "subfamilies". For each family or subfamily, the manufacturer must designate a "Family Emission Limit", which is an "emission level…to serve in place of the otherwise applicable emission standard" for each family or subfamily.[718] The designated FEL applies to every vehicle within a family or sub-family and must be complied with throughout the vehicle's useful life. Manufacturers choosing to demonstrate compliance with the applicable emission standards using the ABT program must show compliance based on (among other things) production levels and emissions level of FELs.[719]

Each family or subfamily has a designated FEL, and credits are generated if the FEL is lower than the applicable standard, and debits are generated if the FEL is higher than the applicable

[715] CAA section 207(h)(l).
[716] CAA section 207(c)(2),
[717] 40 CFR 1037.241(a)(2).
[718] 40 CFR 1037.801 (definition of "Family emission limit").
[719] *See* 40 CFR 1037.705(b).

standard.[720] The manufacturer can use those credits to offset higher emission levels from vehicles in the same averaging set such that the averaging set meets the standards on "average", ''bank'' the credits for later use, or ''trade'' the credits to another manufacturer. In other words, under the existing ABT program, a manufacturer has two obligations – (1) all vehicles are certified to and must comply throughout their useful life with the FEL applicable to that vehicle's family or subfamily, and (2) the manufacturer's vehicles must comply with the applicable emission standard as a group, e.g., using a production-weighted average of the various FELs across the applicable averaging set.[721] Across an averaging set, all vehicle families must show a net zero or positive credit balance as detailed in the existing regulation.[722]

Before certification, manufacturers submit test results demonstrating projected compliance of their vehicles with the manufacturer's chosen FELs for each vehicle family and sub-family. Manufacturers also demonstrate that the projected production levels of each family and sub-family and the associated calculation of projected emission credits are in compliance with the applicable emission standard, averaged across the averaging set. If EPA determines that this initial demonstration is satisfactory, it issues a certification of conformity specifying the applicable vehicle standard and FEL for that vehicle family. The certificate is conditioned on a manufacturer's further demonstration of compliance based on its actual model year production, its demonstration of positive and negative credits for each vehicle family, and the ultimate demonstration that the net balance of emission credits across its vehicle families in each averaging set are either zero or positive.

The certificate of conformity itself contains the applicable emission standard for that category and subcategory of vehicle and the range of allowable FELs for vehicles in that family. See an example of an actual certificate of conformity appended at the end of this comment response.

In addition to the testing performed before production to obtain the certificate of conformity, in-use testing may be used by EPA to determine if vehicles comply with the FEL to which they are certified. If EPA determines that a substantial number of the vehicles in a family or subfamily do not meet their FEL in-use, EPA can, for example, issue a recall order under section 207(c)(1).

Response 10.2.1.d.2: Detailed Description of Existing General Part 1037 ABT Program

We now provide a more detailed description of the HD GHG ABT program. Prior to certification, manufacturers divide their vehicles into "families", which correspond to the categories and subcategories for vocational vehicles and for tractors.[723]For HD vocational vehicles, the subcategories are Urban, Rural, and Multi-purpose for each of the following: Light HDV, Medium HDV, and Heavy HDV. For HD tractors, day cabs and sleeper cabs are further

[720] "[F]or each family or subfamily…positive credits [are generated] for a family or subfamily that has an FEL below the standard." 40 CFR 1037.705(b).
[721] We explain later in Response 10.2.1.d.2 what averaging sets are, and further discuss their significance.
[722] Manufacturers must show "that [the manufacturer's] net balance of emission credits from all [the manufacturer's] participating vehicle families in each averaging set is not negative". 40 CFR 1037.730(c)(1), and 40 CFR 1037.241(a)(2) ("vehicle families within an averaging set are considered in compliance with the CO_2 emissions standards, if the sum of positive and negative credits for all vehicle configurations in those vehicles lead to a zero balance or a positive balance of credits").
[723] *See* 40 CFR 1037.230(a) ("divide your product line into families of vehicles based on regulatory subcategories").

subcategorized by roof height.[724] Manufacturers submit test results for ten (10) configurations from each vehicle family.[725] These ten test results are to be from vehicles representative of production vehicles[726] and are to include the highest and lowest results.[727] This range of test results establishes a range of "Family Emission Limits" (FEL), which is an "emission level…to serve in place of the otherwise applicable emission standard."[728] Families are then often further divided into sub-families – a sub-family being vehicles within a family that have identical emission levels.[729] The ten test results establish the "highest and lowest FELs to which [the manufacturer's] subfamilies will be certified."[730] The FELs which a manufacturer specifies "may not be less than the result" of the emission testing specified in 40 CFR 1037.520.[731] Based on the range of allowable FELs, manufacturers then identify the emission standards or FELs to which the vehicles in the vehicle family will be certified.[732]

There is one further refinement. Vehicle families are further grouped by "averaging sets": LHD, MHD, and HHD.[733] The manufacturer's application for certification must show that the individual families or subfamilies are projected to comply throughout their useful life with the FEL chosen by the manufacturer for that family or subfamily. The certification demonstration

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[724] 40 CFR 1037.105 and 1037.106. Engine types are also subcategorized in 1037.105, although this is not relevant for purposes of the text discussion.
[725] 40 CFR 1037.205(o)(1). A "configuration" is "a unique combination of vehicle hardware and calibration … within a vehicle family." 1037.801.
[726] Since most heavy duty vehicles are built to order, testing of prototypes and estimating production are necessary whether or not a manufacturer is certifying on an averaging basis. *See* Comment of ATA in RTC 4.1 noting that HDVs are invariably highly customized.
[727] 40 CFR 1037.235(a) and 1037.205(o)(1).
[728] 40 CFR 1037.801.
[729] 40 CFR 1037.230(b).
[730] 40 CFR 1037.205(k).
[731] 40 CFR 1037.105(d) (vocational vehicles); 40 CFR 1037.106(d) (tractors).
[732] *See* 40 CFR 1037.205(k) ("[i]dentify the emission standards or FELs to which you are certifying vehicles in the vehicle family"); *see also* 40 CFR 1037.710 (b) ("You may certify one or more vehicle families…to an FEL above the applicable standard") and 1037.750 (b) (a manufacturer "may certify [its] vehicle family or subfamily to an FEL above an applicable standard based on a projection that [it] will have enough emission credits to offset the deficit for the vehicle family". As EPA explained more than three decades ago, "Within a given manufacturer's product line, averaging allows certification of one or more engine families at levels above the applicable emission standard, provided their increased emissions are offset by those from one or more families certified below the same emission standard, such that the average emissions from all the manufacturer's families (weighted by horsepower and production) are at or below the level of the emission standard. This allows a manufacturer to optimize its emission compliance strategies and minimize compliance costs. The specific mechanism by which this is accomplished is certification of the engine family to a family emission limit (FEL) set by the manufacturer. The FEL may be above or below the emission standard, but not higher than an emission ceiling set by EPA. The FEL essentially replaces the emission standard for certification, assembly-line testing (SEA) and recall purposes." 55 FR at 30585 (July 26, 1990). Similarly, *see* 54 FR at 22666 (May 25, 1989) ("EPA does not believe that the statutory text or legislative history cited by the court necessarily means that the CAA requires or that Congress intended that every vehicle or engine family emit at the same level. As the court itself noted, the Act gives EPA broad latitude, in the testing of vehicles and, more fundamentally, in the formulation of standards. EPA promulgated the HDE NOx and PM emissions standards as averaged standards. It thus follows that in testing "any" engine for compliance with those standards, EPA may hold particular engine families to different control levels as part of an averaged set of engine families so long as the engine families' average emission levels meet the applicable standard."). Although EPA was speaking in the context of standards for engines, the statements are equally applicable to vehicle standards.
[733] 40 CFR 1037.740 (via cross references in 40 CFR 1037.801 and 1037.701(a)(2)).).

must also show, based on projected production levels, that the manufacturer's vehicles will comply with the applicable standard across their vehicle families across the averaging set.[734]

The certificate itself is vehicle-specific, and identifies the vehicle family, emission standard applicable to the type of vehicle in that family (i.e., the subcategory-specific emission standard in 40 CFR 1037.105 and 1037.106), the applicable averaging set, the range of FELs for that vehicle family expressed as the range established from pre-certification testing, and conditions to which the certificate remains subject. Thus, in the certificate appended below, the vehicle is in the class 8 low-roof sleeper cab tractor subcategory with weight over 33,000 pounds; it is in the heavy heavy-duty averaging set; the CO_2 emission standard for this type of vehicle is 72.3 g CO_2/ton mile;[735] and the range of FELs for this family is 113.2 and 55.7 g/ton-mile. The certificate further specifies that it is subject to conditions, including all of the provisions in section 1037 subpart H specifying requirements for averaging.[736]

Manufacturers certifying using the ABT pathway must then submit an end-of-year report to EPA. The report shows the manufacturer's calculation of positive or negative credits for each family.[737] Credits are generated relative to the emissions standard: "for each family or subfamily…positive credits [are generated] for a family or subfamily that has an FEL below the standard."[738] Negative credits (i.e., debits) are the reverse: families or subfamilies with an FEL above the standard generated a deficit (a negative credit). Id. The report also must show "that [the manufacturer's] net balance of emission credits from all [the manufacturer's] participating vehicle families in each averaging set is not negative".[739]

If a manufacturer is not able to demonstrate that it meets the applicable standard through averaging across its families, it may use surplus credits from prior years (banking), or credits obtained from other manufacturers (trading) to offset its credit deficit and show compliance.[740] If that is not done, the manufacturer must designate which families or subfamilies are causing the deficit in credits compared to the standard.[741]

Putting this together, under the ABT certification pathway, prior to certification a manufacturer performs tests to show that the vehicles in that family will meet the FEL standard the manufacturer assigns for those vehicles. The manufacturer also makes a demonstration prior to certification that the levels of production for the various families will result in compliance

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[734] *See* 40 CFR 1037.241(a)(2) ("your vehicle families within an averaging set are considered in compliance with the CO2 emissions standards…if the sum of positive and negative credits for all vehicle configurations in those vehicle families lead to a zero balance or a positive balance of credits"); *see also* 1037.725(a), (b) (application for certification must include, among other things, "the FELs you select for the vehicle family or subfamily", and "a statement that…you will not have a negative balance of emission credits for any averaging set when all emission credits are calculated at the end of the year").
[735] 40 CFR 1037.106(b), Table 1.
[736] *See also* 40 CFR 1037.255(a) ("[w]e may make the approval subject to additional conditions").
[737] 40 CFR 1037.730(b)(6).
[738] 40 CFR 1037.705(b).
[739] 40 CFR 1037.730(c)(1) and 1037.241(a)(2) ("vehicle families within an averaging set are considered in compliance with the CO_2 emissions standards, if the sum of positive and negative credits for all vehicle configurations in those vehicles lead to a zero balance or a positive balance of credits"). As explained in section III.A.3 of the preamble, and RTC 10.3.2 below, the Phase 3 rule contains a temporary flexibility whereby, among other things, credits generated by HDVs can be used across all of the HDV averaging sets in MYs 2027-2032.
[740] 40 CFR 1037.715, 1037.720.
[741] *See* example set out in 40 CFR 1037.730(b)(7).

with its projected fleet average for each vehicle family averaging set by averaging set. Vehicle families and subfamilies are then certified to the applicable standard and FEL. Conditions are placed on the certificates to ensure compliance with the fleet average after the year's production is completed. The production-weighted sum of the families and their FELs within each averaging set must be equal to or less than the applicable emission standard.

Should manufacturers run a credit deficit for the year for any vehicle family for any averaging set, and fail to utilize the various options in the rules for eliminating a credit deficit within a specified amount of time, EPA may void the certificate of the relevant vehicle family or subfamily. 40 CFR 1037.745. Conditions on certificates of conformity expressly provide that EPA can void certificates.[742] The vehicles whose certificates have been voided are then considered not covered by the certificates,[743] and the manufacturer is potentially subject to civil penalties for committing an act prohibited under CAA section 203 – introducing vehicles into commerce that are not covered by a certificate of conformity.

EPA may perform in-use testing "of any vehicle subject to the standards".[744] This in-use testing is compared to the FEL to which the vehicle is certified.[745]

Response 10.2.1.d.3: These Provisions Conform to All Requirements of the Act

The ABT program has been in place for decades and has worked admirably in practice. The elements of the program—including the certification of individual vehicles to an FEL, the requirement that vehicle families in an averaging set meet (or surpass) the emission standards across that averaging set, the system of pre-certification testing, the conditioning of certificates of conformity on end-of year demonstrations of compliance— are entirely consistent with the Act, including all the provisions cited by commenters.[746]

The argument that the regulatory approach is unlawful because conformity cannot be determined until the end of the model year is incorrect. Congress itself used this kind of approach when it mandated certain standards under section 202. For example, Congress mandated phase-ins over time of certain emission standards for certain vehicles and model years.[747] Each of these provisions requires that a specified percentage of a manufacturer's production has to meet a specified standard. This made the level of a manufacturer's production

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742 *See* appended certificate ("It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1068").
743 *See, e.g.,* 40 CFR 1068.101(a)(1).
744 40 CFR 1037.401(a).
745 *See* 40 CFR 1037.241(a)(2) ("Note that the FEL is considered to be the applicable emissions standard for an individual configuration"). *See also* 40 CFR 1037.250(a) (which facilitates individual compliance by requiring manufacturers to report "by vehicle identification number and vehicle configuration and identify the subfamily identifier").
746 *See* CAA section 206(a)(1) (which leaves to EPA the means of determining "whether such vehicle…conforms with" the section 202 emissions standards and authorizes the Administrator to "test, or require to be tested in such manner as he deems appropriate" for purposes of vehicle certification); *see also EDF v. Thomas*, 805 F.2d 410, 425 n. 24 (D.C. Cir. 1986) (noting this discretion).
747 Sections 202(a)(6), (g)(1) (as noted earlier), (g)(2), and (j) (all of which require EPA to issue standards pursuant to section 202(a)).

over a model year a core element of the standard.[748] The form of the standard mandated by Congress recognized that pre-production certification would need to be based on a projection of production for the upcoming model year, with actual compliance with the required percentages not demonstrated until after the end of the model year.[749] EPA's ABT provisions use this same kind of approach, that also makes the level of a manufacturer's production a core element of the standard. In both forms, compliance is evaluated not only with respect to individual vehicles, but with respect to the fleet as a whole. The difference is that EPA's provisions provide manufacturers with greater flexibility in meeting the performance-based standards, allowing them the ability to achieve the required level of emission reductions even more cost-effectively.[750] That is, Congress' approach required a specific number of vehicles each year to meet more stringent standards, while EPA allows manufacturers to choose how many vehicles each year will meet the more stringent standards, subject to the overall constraint of a fleet average standard that gradually increases in stringency.

Vehicle manufacturers also warrant at the time of sale that each new vehicle is designed to comply with all applicable emission standards and will be free from defects that may cause noncompliance consistent with CAA section 207. Under 40 CFR 1037.120, manufacturers must warrant to the ultimate purchaser, and to subsequent purchasers, that the vehicle is "designed, built, and equipped" to conform at time of sale with all applicable standards, and is free of defects that will cause it to fail to conform in use during the applicable warranty period.[751] Components covered by the warranty include all emission-related components included in the manufacturer's application for a certificate of conformity, which are keyed to the FEL assigned to those vehicles. These provisions comport entirely with section 207 of the Act and are readily determinable at time of sale by reference to the certified FEL limit.

Consistent with section 205, civil penalties are prescribed in 40 CFR Part 1068 subpart B, which prohibits sale or offering into commerce any equipment not covered by a valid certificate of conformity, and authorizes assessment of civil penalties up to $44,539 per vehicle in violation.[752] As explained above, and illustrated in the appended Certificate of Conformity, individual certificates are conditioned on compliance with all regulatory requirements including all those pertaining to compliance demonstrations via averaging. A certificate can be voided "*ab initio*" in the event of a violation of averaging requirements. For example, if a manufacturer fails to meet the required standard using averaging, they can be required to identify the vehicle families or subfamilies that are causing the deficit.[753] The conditions in the certificates mean EPA may declare that the deficit causing vehicles are not covered by the certificate. If EPA exercises that authority, the vehicles causing the deficit would no longer be considered to be covered by the certificate and would be deemed to be introduced into commerce without a valid

[748] *See, e.g.*, CAA section 202(g)(1) (defining "standards which provide that emissions from a percentage of *each manufacturer's sales volume of such vehicles and trucks* shall comply with the levels specified in table G" (emphasis added)).
[749] *See* 56 FR 25724, 25733-34 (June 5, 1991).
[750] In any case, it is often a practical necessity that conformity be determined at end of year for heavy duty vehicles, whether or not they choose the ABT or individual certification path (the individual certification option is found in 1037.241(a)(1)). This is because so many heavy-duty vehicles are built to order, and precise specifications are not known by manufacturers at the model year's commencement.
[751] 40 CFR section 1037.120(a)(1) and (2).
[752] 40 CFR 1068.101(a)(1).
[753] 40 CFR 1037.730(b)(7).

certificate of conformity. This could lead to enforcement action and civil penalties for each of the vehicles not covered by a certificate, consistent with sections 203 and 205 of the Act. Contrary to commenters' assertions, the regulations thus establish a straightforward means of calculating per vehicle violations of the HDV standards if the applicable standard is not achieved on average across the manufacturer's families in each averaging set.[754] In addition, manufacturers can be penalized for prohibited acts like selling uncertified vehicles or failing to honor the emissions warranty, all of which apply under a fleet-average standard in the same way as they do under vehicle-specific standards.

Failure of vehicles to achieve their FEL in-use could lead to a recall under section 207(c)(1) if EPA determines that a substantial number of vehicles fail to achieve their FEL. Commenters' arguments that there is no way to assess if a substantial number of heavy-duty vehicles are non-conforming is incorrect. The certified FEL limit and in-use testing provide a ready means of determining if and how many vehicles fail to meet their applicable standard in-use.

Similarly incorrect is the commenters' argument that the standards do not allow for section 202(m) emission control diagnostic systems that accurately identify emission control-related deterioration that could result in failure of vehicles to comply with emission standards. Once again, every vehicle is certified to an FEL that is immediately determinable, as are means of diagnosing potential deterioration of the vehicle's emission control system relative to this FEL.[755]

Further, commenters reliance on the *NRDC v. Thomas* dicta is misplaced. First, the Court noted that Section 206(a)'s testing and certification provisions refer to vehicles, not to classes of vehicles.[756] As explained above, however, the certification is conditioned not only on compliance with the fleet-average standards, but also on each vehicle complying with its FEL.[757]

Second, the *NRDC* Court noted that in legislative history to the 1970 amendments, Congress indicated that each prototype, rather than the average of prototypes, should meet emission standards.[758] EPA addressed this concern in the preamble to a 1990 rule. Congress's concern was that "we did not have an adequate testing program" to "get to this problem of cleaning up the auto emissions,"[759] and that the testing of a small number of prototypes and averaging of those prototypes did not provide an accurate assessment of vehicle compliance with standards. But EPA's current certification and in-use standards are vehicle-specific and "ensure that each engine meets the [applicable] limit."[760] Averaging as used in the current program does not create any uncertainty as to whether manufacturers are in compliance with the standards because every

[754] *See* 1037.730(b)(7). We note again that the Phase 3 rule contains a temporary flexibility whereby compliance in MYs 2027-2032 can be demonstrated across all of the HDV averaging sets.
[755] Cf. 40 CFR Part 1037.201(l) (requirement for certification application to identify vehicle family's deterioration history) and 1037.241(c) (EPA may require certification applicant to provide analysis "showing that the performance of your emission controls will not deteriorate during the useful life" and potentially requiring applicant to develop deterioration factors for the vehicle and its emission control components).
[756] *NRDC v. Thomas*, 805 F.2d at 425 n.24.
[757] The *NRDC* Court also noted the "counterargument" to its concern, that "the manner of testing deemed appropriate or the content of the standards themselves is within the discretion of the agency." *NRDC v. Thomas*, 805 F.2d at 425 n.24.
[758] *Id.*
[759] *Id.*
[760] 55 Fed. Reg. at 30594/1.

vehicle must achieve its certified emission performance as part of the fleetwide compliance framework.

Response 10.2.1.d.4: Illustrative Certificate of Conformity

	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY **2023 MODEL YEAR** **CERTIFICATE OF CONFORMITY** **WITH THE CLEAN AIR ACT**	**OFFICE OF TRANSPORTATION** **AND AIR QUALITY** **ANN ARBOR, MICHIGAN 48105**

Certificate Issued To: Volvo Group Trucks Technology, Powertrain Engineering, a Division of Mack Trucks (U.S. Manufacturer or Importer) **Certificate Number:** PVPT2TRACS00-019-R03	**Effective Date:** 07/18/2022 **Expiration Date:** 12/31/2023	Byron J. Bunker, Division Director Compliance Division	**Issue Date:** 07/18/2022 **Revision Date:** 10/17/2023

Model Year: 2023 **Vehicle Family:** PVPT2TRACS00 **Vehicle Regulatory Sub-category:** Class 8 low-roof sleeper cab tractors above 33,000 pounds GVWR **Averaging Set:** Heavy Heavy-Duty Vehicles (8)	**CO2 Emission Standard (g CO2/ton-mile):** 72.3 **Highest Projected CO2 Family Emission Limit (g/ton-mile):** 113.2 **Lowest Projected CO2 Family Emission Limit (g/ton-mile):** 55.7

Pursuant to Section 206 of the Clean Air Act (42 U.S.C. section 7525), 40 CFR Part 1037 and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test vehicle which represents the vehicle family, and is subject to the terms and conditions prescribed in those provisions. This certificate of conformity covers only those new motor vehicles which conform in all material respects to the design specifications that applied to those vehicles described in the documentation required by 40 CFR Part 1037 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1037.

This certificate of conformity is conditional upon compliance of said manufacturer with the averaging, banking and trading provisions of 40 CFR Part 1037, Subpart H. Failure to comply with these provisions may render this certificate void *ab initio*.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1068. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1068.

This certificate does not cover vehicles sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

Response 10.2.1.e. The Russello Canon Is Inapplicable

Commenters invoked the Russello and *expressio unius* canons of statutory construction, claiming that various provisions of both the CAA and other statutes indicate that Congress knew how to specify ABT-based standards when it wished, and therefore that the absence of such an explicit delegation in section 202(a)(1) is an indication that no such delegation is intended. We disagree with the relevance of these canons here, which we refer to collectively as the Russello canon. To begin with, the "canon does not apply unless it is fair to suppose that Congress considered the unnamed possibility and meant to say no to it, and that the canon can be overcome by contrary indications that adopting a particular rule or statute was probably not meant to signal any exclusion."[761] As explained above, a more direct and explicit indication of Congressional intent vis-a-vis ABT is available, as Congress ratified EPA's use of ABT as upheld by the D.C. Circuit's decision in *NRDC v. Thomas*, 805 F. 2d 410, 425 (D.C. Cir. 1986).[762] For this reason alone, the Russello canon does not apply.

Moreover, the Russello canon has limited if any utility where wording is not identical or otherwise substantially similar.[763] That is the case with respect to the provisions cited by the

[761] *Marx v. Gen. Revenue Corp*., 133 S. Ct. 1166, 1175 (2013).
[762] *See* 88 FR at 25950.
[763] *See Nat'l Postal Pol'y Council v. Postal Regul. Comm'n*, 17 F.4th 1184, 1191 (D.C. Cir. 2021), cert. denied, 142 S. Ct. 2868 (2022) ("The Mailers also invoke the presumption in *Russello v. United States* — that the inclusion of a phrase in one provision and its absence in another is deliberate, 464 U.S. 16, 23, 104 S.Ct. 296, 78 L.Ed.2d 17 (1983) — to argue that the exception to the price cap for emergencies in § 3622(d)(1)(E) demonstrates that Congress decided not to grant the Commission the authority to override the price cap in § 3622(d)(3). Mailers Br. 20–21. That canon has limited force here, however, because the two provisions use different words and are not otherwise

commenters. Commenters cite the Clean Fuels Vehicle provisions in Part C of Title II for the proposition that Congress knew how to specify an ABT program.[764] This program is found in a separate Part of the statute, uses different language than section 202, and is not otherwise parallel to section 202. Namely, the Part C provisions direct EPA to set standards for clean-fuel vehicles operating on clean alternative fuel including electricity, but only on a targeted regional basis. This was a specific project to advance alternative fuels and technologies,[765] not a limit on EPA's general Section 202(a)(1) authority. Moreover, the credit provisions are highly detailed, and in some cases, mandatory. For example, the credit provisions in section 246(f) are mandatory, specific to certain State Implementation Plan (SIP) revisions, and subject to limits on how the credits can be used, such as "to demonstrate compliance with other requirements applicable under this section in the same nonattainment area."[766] By contrast, section 202(a)(1) does not explicitly mandate or specify a credit program, and it also provides for nationally applicable standards. EPA's decision to implement ABT and fleet-average standards falls within Congress's delegation to the agency to establish the standards. Thus, sections 246 and 249 are quite different from section 202(a)(1), and the Russello canon is inapplicable.

Commenters cited the Reformulated Gasoline and Renewable Fuel Standards provisions of the Act as further examples of Congress knowing how to specify averaging or credit programs when it wished to adopt them.[767] These provisions involve fuels, not emission from motor vehicles, and so are not the same or parallel to section 202(a). Moreover, the credit programs in those provisions are also mandatory.[768] Further, Congress explicitly specified that the RFS program does not limit the agency's authority to promulgate other GHG programs.[769]

EPA notes that the ABT program for section 202(a) standards is not unique in lacking an explicit statutory ABT provision. Over the decades, EPA has also promulgated ABT programs in other similar instances. For instance, EPA has also implemented a highly successful ABT program for fuels standards under section 211(c).[770] Indeed, many fuels companies, such as members of commenters API and AFPM, have historically supported and benefited from these ABT programs. Like the section 202(a) ABT programs, fuels programs containing ABT provisions that are promulgated under section 211(c) also lack an explicit statutory ABT provision. Such absence is also in marked contrast to the section 211(k) ABT program.

More broadly, in light of the history of Federal environmental law, it is not surprising that the later-enacted clean fuel vehicles, reformulated gasoline, and RFS programs have explicit

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parallel. *See City of Columbus v. Ours Garage & Wrecker Serv., Inc.*, 536 U.S. 424, 435–36, 122 S.Ct. 2226, 153 L.Ed.2d 430 (2002).").

[764] Commenters also cite to the Clean Fuel Vehicles program as evidence that Congress knew how to explicitly specify a program for electric vehicles. We respond to these comments in RTC 2.1.

[765] *See* H. REP. NO. 101-490, pt. 1, at 283 (1990), 1990 WL 1222133, at *65-66 (Congress wanted "to encourage a broad range of vehicles," including those using electricity, and break the "chicken and the egg" supply-and-demand problem among automakers, consumers, and fuel producers).

[766] CAA section 246(f)(2)(A).

[767] *See* CAA section 211(k)(7) (credits relating to reformulated gasoline), section 211(o)(5) (credit program for RFS).

[768] *See* CAA section 211(k)(7) (regulations "shall provide" for credits for certain reformulated gasoline), section 211(o)(5) (RFS regulations "shall provide" for credits).

[769] CAA section 211(o)(12).

[770] *See, e.g.*, 65 FR 6698 (Feb. 10, 2010); 79 FR 23416 (Apr. 28, 2014); 66 FR 5002 (Jan. 18, 2001); 72 FR 8428 (Feb. 26, 2007).

provisions relating to credits, while earlier-enacted the sections 211(c) fuels and 202(a) motor vehicle programs do not. Credit programs generally and ABT programs specifically were not widely used in the early days of federal air pollution control, and the lawmakers likely had limited knowledge of such programs.[771] For instance, at the time of the Motor Vehicle Air Pollution Control Act of 1965, there was no ABT program for any federal air pollution regulatory program. Congress, recognizing the need for regulatory flexibility so as to avoid obsolescence, declined to specify the details of how the standards should be implemented, entrusting those technical judgments to the expertise of the administrative agency.

Even further afield is Valero's assertion that the Energy Policy Conservation Act provision directing NHTSA to issue regulations setting "average fuel economy standards for automobiles manufactured by a manufacturer"[772] constrains EPA's section 202(a) authority. EPCA is a different statute from the CAA, and it is also concerned with entirely different purposes. Section 202(a) is concerned with preventing or controlling emissions of air pollutants from motor vehicles which contribute to endangerment, not with vehicular fuel economy.[773] The Russello canon has no applicability here.

Response 10.2.1.f: EPA May Include ZEV and ICE Heavy Duty Vehicles Within a Single Regulatory Class.

Several of the commenters argue that even if section 202(a)(1) authorizes fleet average standards, ICE and non-ICE vehicles' performance cannot be averaged together because they are not of the same "class" as required by section 202(a)(1). There are two versions of this argument: that all members of the class being averaged must emit the pollutant(s) which are contributing to endangerment, or that they have fundamentally different powertrains and so cannot be reasonably grouped together.

EPA disagrees. As discussed in Section I.A of the preamble, section 202(a) requires EPA to prescribe standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles, which in the Administrator's judgment cause, or contribute to, air pollution which endangers public health and welfare. Congress defined "motor vehicles" by their function: "any self-propelled vehicle designed for transporting persons or property on a street or highway."[774] Likewise, with regard to classes, Congress explicitly contemplated functional categories: "the Administrator may base such classes or categories on gross vehicle weight, horsepower, type of fuel used, or other appropriate factors."[775] It is indisputable that ZEVs are

[771] *See* Ellerman, P.L. Joskow & D. Harrison, Jr., Emissions Trading in the U.S.: Experience, Lessons and Considerations for Greenhouse Gases (2003), *available at* https://globalchange.mit.edu/publication/13922 (discussing the history of ABT and other credit programs in US environmental law, summarized on p. 7 tab. 1).
[772]49 U.S.C. § 32902(a).
[773] *See Massachusetts v. EPA,* 549 U.S. 497, 532 (2007) ("that DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public's "health" and "welfare," 42 U.S.C. § 7521(a)(1), a statutory obligation wholly independent of DOT's mandate to promote energy efficiency. See Energy Policy and Conservation Act, § 2(5), 89 Stat. 874, 42 U.S.C. § 6201(5). The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency").
[774] CAA section 216(2).
[775] CAA section 202(a)(3)(A)(ii). This section applies to standards established under section 202(a)(3), not to standards otherwise established under section 202(a)(1). But it nonetheless provides guidance on what kinds of classifications and categorizations Congress thought were appropriate.

"new motor vehicles" as defined by the statute and that they fall into the weight-based "classes" that EPA established with Congress's explicit support.

Under section 202(a), regulation of motor vehicle emissions has two distinct aspects: (1) if the Administrator finds that "any class or classes of new motor vehicles or new motor vehicle engines, … in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare," then (2) "[t]he Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from" such class or classes. The first step of this inquiry is the endangerment finding, while the second step is setting the standards.[776] As the Supreme Court held in *Massachusetts* and the D.C. Circuit reaffirmed in *Coalition for Responsible Regulation*, the Endangerment Finding is a matter of "scientific judgment"—whether air pollution endangers and whether the class of motor vehicles contributes to such pollution.[777] By contrast, the decision on what standards to set is a policy decision subsequent to the endangerment finding based on technical determinations of technology availability, cost of compliance, and lead-time.[778]

In making the GHG Endangerment Finding in 2009, EPA defined the "classes" of motor vehicles and engines for GHG regulation as "Passenger cars, light-duty trucks, motorcycles, buses, and medium and heavy-duty trucks."[779] Heavy-duty ZEVs fall within the class of heavy-duty trucks. In making the Endangerment Finding, EPA satisfied the statutory prerequisite for establishing GHG standards for the entire class of HD vehicles, which includes zero-emitting HD vehicles that do not emit pollutants.[780] That is, the Administrator's judgment as to endangerment applied to the above-stated classes as wholes, with no qualification as to the level of emissions, powertrain, or any other characteristic. The Endangerment Finding was upheld after extensive litigation.[781] EPA did not reopen the 2009 Endangerment Finding in this rulemaking, and comments collaterally challenging it are beyond the scope of this rulemaking. Once EPA made

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[776] See 74 FR 66544 ("the decisions on cause or contribute and endangerment are separate and distinct from the decisions on what emissions standards to set under CAA section 202(a)."); *see also id.* at 66501-02; Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act: EPA's Response to Public Comments, Volume 11: Miscellaneous Legal, Procedural, and Other Comments, 11.3.
[777] *Massachusetts v. EPA*, 549 U.S. 497, 534 (2007); *Coal. for Responsible Regul., Inc. v. EPA*. 684 F.3d 102, 117-19 (D.C. Cir. 2012).
[778] *See Coal. for Responsible Regul., Inc. v. EPA*, 684 F.3d 102, 118 (Policy inquiries "muddle the rather straightforward scientific judgment about whether there may be endangerment by throwing the potential impact of responding to the danger into the initial question. To be sure, the subsection following § 202(a)(1), § 202(a)(2), requires that EPA address limited questions about the cost of compliance with new emission standards and the availability of technology for meeting those standards, but these judgments are not part of the § 202(a)(1) endangerment inquiry. The Supreme Court made clear in Massachusetts v. EPA that … policy concerns were not part of the calculus for the determination of the endangerment finding in the first instance."); *see generally id.* at 117-19.
[779] 74 FR 66496, 66537 (Dec. 15, 2009).
[780] We note that this is not special to GHGs. For example, EPA has also made endangerment findings and established criteria pollutant standards for an entire class or classes of vehicles (e.g., for light-duty vehicles and heavy-duty vehicles), with includes ICE only vehicles, hybrid vehicles, and ZEV vehicles. Of course the nature of compliance demonstration may differ by vehicle. For example, it would be a waste of resources to test BEVs for tailpipe emissions, and thus EPA allows BEVs to certify to certain standards without testing.
[781] *Coal. for Responsible Regul., Inc. v. EPA*, 684 F.3d 102, 117 (D.C. Cir. 2012) ("We ultimately conclude that the Endangerment Finding is consistent with *Massachusetts v. EPA* and the text and structure of the CAA, and is adequately supported by the administrative record.").

the endangerment finding for the class, EPA was required to set emission standards for vehicles in that class to address the contribution to endangerment. In the final rule, as in prior GHG rules, EPA acts consistently with the endangerment finding in promulgating GHG regulations for the class of HD vehicles.

Some commenters nonetheless contend that ZEVs fall outside of EPA's regulatory reach under this provision because they do not cause, or contribute to, air pollution which endangers human health and welfare. That misreads the statutory text. Section 202(a)(1)'s focus on regulating emissions from "class or classes" indicates that Congress was concerned with the air pollution generated by a class of vehicles, as opposed to from individual vehicles. Accordingly, Congress authorized EPA to regulate *classes* of vehicles, and EPA has concluded that the *class* of heavy-duty vehicles as a whole causes or contributes to dangerous pollution. As noted, the *class* of heavy-duty vehicles includes ZEVs, along with ICE and hybrid vehicles. EPA has consistently viewed heavy-duty motor vehicles as a class of motor vehicles for regulatory purposes, including in the HD GHG Phase 1 and Phase 2 rules.

Commenters do not seriously question that HD vehicles as defined by EPA are a "class," which they clearly are. A "class" is a "set, group, collection…containing members having…at least one attribute in common."[782] Heavy duty motor vehicles are a "set" or "group" of vehicles "containing members" having two key attributes in common. They are all motor vehicles as defined in section 216(2) of the Act, and they also share the further common attribute of gross vehicle weight of 8,500 pounds or greater.[783] These HD vehicles, along with certain other vehicles (regulated by EPA under a separate rulemaking), are a subset of the statutory definition of "heavy duty vehicles," which refer to motor vehicles with "a gross vehicle weight … in excess of six thousand pounds."[784] The statute plainly permits such a classification as it often speaks of "classes" of "heavy duty vehicles."[785]

The class of HD vehicles, then, includes all HD vehicles without regard to whether or not they emit or have a specific propulsion system. This is consistent with EPA's historical approach to defining vehicle classes. Congress ratified this historical approach in the 1990 amendments to the CAA. Congress added definitions in section 216 that incorporated into the statute EPA's prior inclusive definitions of "light duty vehicle" and "light duty truck" which "have the meaning provided in regulations promulgated by the Administrator and in effect as of November 15, 1990." Congress then mandated certain standards for light duty vehicles and light duty trucks that incorporated those inclusive definitions,[786] which do not include any distinction based on whether a vehicle emits pollutants or has a certain powertrain. CAA sections 202(g), (h)(1), and (j)(1).

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[782] Webster's II Universal Dictionary.
[783] 88 FR at 25938/1; 40 CFR 86.1803-01.
[784] CAA section 202(b)(3)(C).
[785] *See*, *e.g*., CAA section 202(a)(3)(A)(i).
[786] *See* 40 CFR 86.082-2 ("Light-duty truck means any motor vehicle rated at 8,500 pounds GVWR or less which as a vehicle curb weight of 6,000 pounds or less and which has a basic vehicle frontal area of 45 square feet or less, which is: (1) Designed primarily for purposes of transportation of property or is a derivation of such a vehicle, or (2) Designed primarily for transportation of persons and has a capacity of more than 12 persons, or (3) Available with special features enabling off-street or off-highway operation and use. * * * Light-duty vehicle means a passenger car or passenger car derivative capable of seating 12 passenger) or less."); 46 FR 50464-01, 50476-77 (Oct. 13, 1981).

Commenters fail to seriously grapple with these arguments, but nonetheless claim that the prerequisite for EPA regulation is the agency finding that *individual* regulated vehicles must themselves emit air pollutants. This claim is completely unmoored from the statutory text and purpose, which speaks in terms of "classes" of vehicles that emit pollutants. Section 202(a)(1) does not speak to emissions from individual vehicles at all. For that view to be right, Section 202(a) would have to be rewritten to say the emission of air pollutants "*from any new motor vehicle*."

Furthermore, while an individual vehicle could possibly "contribute" to dangerous air pollution warranting regulation, it would not typically "cause" such pollution. Instead, the more common "cause" would be a group of vehicles aggregated as a class. This confirms that "cause, or contribute to" clause as a whole modifies emissions from a "class or classes" of vehicles, rather than emissions from individual vehicles.[787]

These commenters also misunderstand the broader statutory scheme. Congress directed EPA to apply the standards to vehicles whether they are designed as complete systems or incorporate devices to prevent or control pollution. Thus, Congress understood that the standards may be premised on and lead to technologies that prevent pollution in the first place. It would be perverse to conclude that in a scheme intended to control the emissions of dangerous pollution, Congress would have prohibited EPA from premising its standards on controls that completely prevent pollution, while also permitting the agency to premise them on a technology that reduces 99 percent of pollution. Such a nonsensical reading of the statute would mean that the availability of technology that can reduce 99 percent of pollution could serve as the basis for highly protective standards, while the availability of a technology that completely prevents the pollution could not be relied on to set emission standards at all. Such a reading would also create a perverse safe harbor allowing polluting vehicles to be perpetually produced, resulting in harmful emissions and adverse impacts on public health, even where available technology permits the complete prevention of such emissions and adverse impacts at a reasonable cost. That result cannot be squared with section 202(a)(1)'s purpose to reduce emissions that "cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare,"[788] or with the statutory directive to not only "control" but also "prevent" pollution.

Commenters' suggestion that EPA define the class to exclude ZEVs would also be unreasonable and unworkable. *Ex ante*, EPA does not know which vehicles a manufacturer may produce and, without technological controls including add-on devices and complete systems, *all* of the vehicles have the potential to emit dangerous pollution.[789] Therefore, EPA establishes standards for the entire class of vehicles, based upon its consideration of all available technologies. It is only after the manufacturers have applied those technologies to vehicles in actual production that the pollution is prevented or controlled. To put it differently, even

[787] The rule of last antecedent does not alter that conclusion. That rule is sometimes used to interpret "a list of terms or phrases followed by a limiting clause." *Lockhart v. United States*, 577 U.S. 347, 351 (2016). But Section 202(a)(1) presents no such list, and thus no conundrum of whether the final modifier applies to everything in a preceding list or just the last item.

[788] *See also Coal. for Responsible Regul.*, 684 F. 3d at 122 (explaining that the statutory purpose is to "prevent reasonably anticipated endangerment from maturing into concrete harm").

[789] As noted above, manufacturers in some cases choose to offer different models of the same vehicle with different levels of electrification. And it is the manufacturer who decides whether a given vehicle will be manufactured to produce no emissions, low emissions, or higher emissions controlled by add-on technology.

hypothetically assuming EPA could not set standards for vehicles that manufacturers intend to build as electric vehicles—a proposition which we do not agree with—EPA could still regulate vehicles manufacturers intend *not* to build as electric vehicles and that would emit dangerous pollution in the absence of EPA regulation.[790] When regulating those vehicles, Congress explicitly authorized EPA to premise its standards for those vehicles on a "complete system" technology that prevents pollution entirely, like ZEV technologies.

Commenters' claim that EPA must classify or categorize vehicles by powertrain is also misplaced. For any given class of vehicles, the Administrator may make appropriate subcategorizations in establishing the standards.[791] Section 202(a)(1) does not explicitly delineate how EPA should categorize, indicating that Congress entrusted this subsidiary technical determination to the Administrator's judgment.[792] EPA routinely makes categorizations based on characteristics like vehicle weight and functionality, and establishes different standards for each category where that is warranted, for instance, often establishing less stringent standards for heavier vehicles as compared to lighter vehicles of the same functionality in light of differences in technological feasibility and costs. This rulemaking proposed to generally maintain the pre-existing regulatory categories of vocational vehicles and tractors, as well as further subcategorizations within each of those categories, e.g., by weight (light heavy duty, medium heavy duty, and heavy heavy-duty vocational vehicles) and functionality (rural, urban, and multi-purpose vocational vehicles; day cabs and sleeper cab tractors, plus custom chassis subcategories).

Commenters do not identify anything in the statute that mandates categorization based on whether a vehicle emits or whether it has a certain powertrain. And in fact, Section 202(a)(1) does not require categorization (or classification) on these bases. Moreover, the intention underlying the commenters' preferred categorization is to delay the introduction of effective pollution control technologies like ZEVs, with the result of perpetuating dangerous air pollution. That is not a reasonable way to implement section 202(a)(1).

Although it does not directly apply to section 202(a)(1) standards, Section 202(a)(3)(A)(ii) provides guidance on what kinds of classifications and categorizations Congress thought were appropriate. [793] That section states "[i]n establishing classes or categories of vehicles or engines for purposes of regulations under this paragraph, the Administrator may base such classes or

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[790] In other words, the additional ZEVs EPA projects in the modeled potential compliance pathway exist in the baseline case as pollutant-emitting vehicles with ICE. We further note that it would be odd for EPA to have authority to regulate a given class of motor vehicles—in this case heavy-duty motor vehicles—so long as those vehicles emit air pollution at the tailpipe, but to lose its authority to regulate those very same vehicles should they install emission control devices to limit such pollution or be designed to prevent the endangering pollution in the first place.

[791] We acknowledge that we have not always clearly delineated between the terms "class" versus "category." But the key point here is not the semantics of these two words, but rather a substantive distinction: the "classes" of vehicles that contribute to dangerous pollution for which EPA makes the endangerment finding and are thereby subject to the regulation for the relevant pollutant, and the "categories" or "subcategories" of vehicles within a class for which the agency may in its discretion establish different standards based on the characteristics of those subcategories.

[792] Congress, however, did provide indicia as to what appropriate categorizations could be in section 202(a)(3)(A)(ii), which we discuss further below. This section does not apply directly to this rulemaking but is nonetheless instructive as to potential means of categorizing (as well as classifying) heavy duty vehicles.

[793] Section 202(a)(3)(A)(ii) applies to standards established under section 202(a)(3), not to standards otherwise established under section 202(a)(1). Nonetheless, we think it provides guidance more generally on what classifications and categorizations Congress thought appropriate.

categories on gross vehicle weight, horsepower, type of fuel used, or other appropriate factors." The class of HD vehicles is distinguished from other motor vehicles by its members having a "gross vehicle weight" exceeding 8,500 pounds. The categories within HD vehicles are also distinguished by weight (e.g., light HD versus heavy HD vocational vehicles) as well as by function (e.g., vocational vehicles versus tractors), which the Administrator views as an "other appropriate factor."[794]

Moreover, we note that other parts of the statute do actually *require* distinctions based on powertrain or based on fuel type (which corresponds to powertrain). Even within section 202 itself, Congress specified certain standards applicable only to some "gasoline and diesel-fueled" vehicles.[795] In section 216(1), Congress also limited the definition of a nonroad engine to mean only certain kinds of "internal combustion engine."[796] This treatment shows that when Congress wants to require distinctions related to powertrain, it knew how to do so. The conspicuous absence of any such limitation in section 202(a)(1) suggests that no such limitation should be inferred.

Commenters' suggestion that ZEVs are somehow so fundamentally different from ICE vehicles as to require different classification or categorization is also misplaced. EPA has conducted comprehensive analysis in this rule demonstrating that, during the timeframe for this rule, ZEVs are generally capable of performing the same functions as ICE vehicles of their respective types and established the standards accordingly. Indeed, manufacturers will sometimes produce the same vehicle model with varying levels of electrification.[797] We also determined that ZEVs would not be reasonably available in certain applications—for example, those involving some custom chassis types, or operation in extreme weather conditions or at extreme daily VMT—and we accordingly assumed solely ICE vehicles would continue to be used for those applications.

Relatedly, a commenter claims that because there is no identifiable vehicle configuration that corresponds to the standards, industry as a whole would have to certify at least two fundamentally different types of vehicles to satisfy them. It is not entirely clear what this comment means. HD vehicles are a highly diverse class of vehicles, and different manufacturers produce different subsets of such vehicles, with diverse vehicle configurations. We expect manufacturers to continue to produce the kinds of vehicles they have traditionally produced as

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[794] *See White Stallion Energy Center v. EPA*, 748 F. 3d 1222, 1249 ("[N]othing in the Clean Air Act 'requires' EPA to create a CFB subcategory. Rather, the statute gives EPA substantial discretion in determining whether subcategorization is appropriate. *See also* CAA § 112(d)(1), 42 U.S.C. § 7412(d)(1) (EPA "may distinguish among classes, types, and sizes of sources"); *Nat'l Ass'n of Clean Water Agencies v. EPA*, 734 F.3d 1115, 1159 (D.C.Cir.2013) ("EPA's subcategorization authority under § 112 involves an expert determination, placing a heavy burden on a challenger to overcome deference to EPA's articulated rational connection between the facts found and the choice made."); *NRDC v. EPA*, 489 F. 3d 1364, 1375 (D.C. Cir. 2007) ("Because Congress has vested EPA with subcategorization authority under Section 112(c)(1), and its exercise of that authority involves an expert determination, L–P carries a heavy burden to overcome deference to the agency's articulated rational connection between the facts found and the choices made.").

[795] CAA section 202(a)(3)(B)(ii), (h) tab. H, (i)(1); *see also* CAA section 202(a)(5)(A) ("gasoline vapor recovery"), (g) tab. G ("diesel-fueled LDTs"), (k) ("gasoline-fueled motor vehicles").

[796] CAA section 216(10).

[797] For example, the Freightliner Cascadia and eCascadia are ICE and BEV versions of Freightliner's HD semi truck. Or for example, the Ford F-150 has been offered in ICE and EV versions, while the Hyundai Ioniq and Kia Niro has been offered in HEV, PHEV, and EV versions. Jaguar Land Rover has also indicated that every model will be available with a fully electric version by the end of the decade.

the standards do not limit manufacturers to only producing a single vehicle configuration or applying only a single type of pollution control technology. Moreover, it is up to manufacturers to decide how to comply with EPA's standards, and we expect each manufacturer to choose the compliance pathway that best suits its business.

Commenters suggest that calculating a fleetwide average that includes both ZEVs and other vehicles creates an illogical or false average, but EPA rejects that suggestion. It is entirely consistent with the history of motor vehicle regulation under the CAA for pollution control technologies to be phased in across the fleet, and there is nothing false about the tailpipe emissions compliance figures being averaged together under this rule. After all, ZEVs do indeed produce no tailpipe emissions, so it is accurate to account for them as such. Indeed, it would be more inaccurate to exclude ZEVs in calculating fleetwide compliance. And there is nothing false about regulatory averages that include electric vehicles. Emission standards generally apply to all motor vehicles in the relevant class. Manufacturers count the emissions of every vehicle in their fleet when calculating fleet-average emissions. Electric vehicles are thus treated just like any other vehicle with emission-control technology. For that reason, averaging is technology neutral. The impact a particular technology has on a fleet's performance depends on its effectiveness. And electric vehicles are very effective at reducing greenhouse-gas emissions. But that effectiveness does not mean EPA must categorize electric vehicles separately or that such vehicles are beyond EPA's regulatory authority.

Some commenters latch onto the fact that EPA has historically established separate categories for spark ignition and compression ignition vocational vehicles for purposes of HD GHG regulation.[798] EPA is retaining this categorization scheme in this rule. We expect manufacturers to continue producing both spark and compression ignition ICE vocational vehicles during the timeframe of this rule; that is, manufacturers will likely comply with the Phase 3 standards, as with their Phase 2 predecessors, in whole or in part based on the GHG performance of both types of vocational vehicle engines. Given technological differences, spark and compression ignition ICE emit different amounts of pollutants, including GHGs, and including when using the same pollution control technologies.[799] As such, EPA's standards and categorization scheme appropriately reflect the different feasible emissions performance of these two types of internal combustion engines and vehicles. In principle, this is no different than having different GHG standards for, say, an ICE long-haul tractor and an ICE light HD vocational vehicle: they emit different amounts of pollutants, even when using the same pollution control technologies, and the standards appropriately reflect this difference.

We note the key difference between this scheme and the one that commenters say is compelled. Under Phase 3, vocational vehicles with all engine types must meet GHG standards whose stringency is supported by the feasible emission reductions under the modeled potential compliance pathway, which includes both ZEVs and vehicles with ICE technologies.[800] Under the commenters' approach, EPA is precluded from requiring any emission reductions associated with ZEV technologies that are available at a reasonable cost, and the nation has to forgo large public health and welfare benefits. We do not think such a result is reasonable.

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[798] *See* 40 CFR section 1037.105 (b)(1).

[799] *See, e.g.,* 81 FR at 73562, 73679, 73703 (Phase 2 rule discussions of engine technologies considered in vehicle standard-setting).

[800] The standard can of course be met by any means a manufacturer chooses.

Finally, many of commenters' arguments rest on a false premise that ZEVs cannot emit any air pollutants. But ZEVs can in fact emit GHGs through their HVAC systems.[801] They can also emit GHGs and criteria pollutants when using fuel operated heaters.[802] And of course, ZEVs like any other motor vehicle emit PM through brake and tire wear.[803]

10.2.2 U.S.-Directed Production Volume

Comments by Organizations

Organization: California Air Resources Board (CARB)

I. Definition

1. U.S.-Directed Production Volume

Affected pages: 26019-26020

The NPRM requests comments on changing the definition of U.S.-directed production volume used in calculating credits beginning in the MY 2024. This proposed definition would include vehicles certified to a state's emission standard that is different from U.S. EPA's. [EPA-HQ-OAR-2022-0985-1591-A1, pp.67-68]

The U.S.-directed production volume definition should continue to exclude vehicles certified to a state's emission standard that is different from U.S. EPA's. Because California and a number of Section 177 states have adopted the ACT regulation, the inclusion of these vehicles in the production volume for the Phase 3 rulemaking could be appropriate only if the Phase 3 final rules will produce similar emission reductions— e.g., by encouraging similar ZEV penetration rates as those of the ACT regulation. In addition, California recently adopted the ACF regulation which establishes ZEV purchase requirements greater than required in the ACT regulation and a 100 percent manufacturer ZEV sales requirement in 2036, both of which exceed the stringency of U.S. EPA's NPRM. As such, CARB staff does not support the change in the definition of U.S.-directed production volume. The current definition of U.S.-directed production volume, which excludes vehicles certified to California and Section 177 state standards, should be maintained so that Phase 3 GHG achieves benefits beyond what the standards in California and the Section 177 states will already achieve. [EPA-HQ-OAR-2022-0985-1591-A1, p.68]

Eroding the effective Phase 3 GHG stringency in the U.S. EPA-only regulated states by averaging the California and Section 177 ACT states into the national average would work counter to the CAA purpose of state actions being additive beyond national actions. The flow of the vehicles sold subject to the effectively eroded standards back into California and Section 177 states on the used market and in the course of interstate commerce would result in emission increases and exacerbate our air pollution, public health, and climate challenges. [EPA-HQ-OAR-2022-0985-1591-A1, p.68]

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[801] *See* 40 CFR sections 86.1819-14 (h) and 1037.115 (e) prescribing standards to control those emissions.
[802] *See* RTC section 4.10 responding to comments of CARB and Roush regarding fuel operated heaters in ZEVs.
[803] *See* RIA Chapter 4.1 discussing EPA's modelling of these emissions in calculating emission inventories associated with the Phase 3 rule. EPA has not to date adopted standards for such PM emissions; such standards would present a number of complex and novel issues.

In fact, if the U.S.-directed production volume definition is changed as proposed, CARB staff expects that manufacturers would be able to comply with the proposed Phase 3 2027 standards (preferred alternative) without taking any compliance actions (such as selling HD ZEVs or other lower emitting vehicles) outside California and Section 177 states. This is due to the early credit bank manufacturers can generate due to expected action by California and other Section 177 states. Per data in the DRIA, U.S. EPA expects nationwide vocational ZEV sales to increase from 1.1 percent in 2024 to 2.4 percent in 2026, and nationwide tractor ZEV sales to increase from 0.3 percent in 2024 to 1.0 percent in 2026. Assuming these vehicles are sold as BEVs eligible for a 4.5 ATC multiplier, these ZEV sales would provide manufacturers with a credit bank sufficient to offset a nationwide 25 percent ZEV sales requirement for vocational vehicles and nationwide 9 percent ZEV sales requirement for tractors. Given the 2027 standards for vocational vehicles and tractors are 20 percent and 10 percent respectively, these banked credits would almost completely offset the entire MY 2027 requirements under the NPRM. Given that U.S. EPA's reference case does not include the impacts of the ACF regulation, potential early action by manufacturers in California or other Section 177 states, nor the impacts of Vermont, Colorado, and Maryland or future states adopting the ACT regulation, the actual size of the credit bank will be greater than assumed in the reference case, and CARB staff expects that manufacturers would be able to comply with the proposed Phase 3 2027 standards without making any HD ZEVS or otherwise improving their average, nationwide emissions. This sizable bank will hinder U.S. EPA's overall program and reduce the number of ZEVs other states receive. Overall, maintaining separate programs by continuing to exclude vehicles certified to a state's emission standard that is different from U.S. EPA's in the definition of U.S.-directed production volume is critical to avoid these negative effects. [EPA-HQ-OAR-2022-0985-1591-A1, pp.68-69]

If U.S. EPA does finalize this change in definition, U.S. EPA should not make the change effective until MY 2027 (or later if U.S. EPA does not finalize more stringent standards for MY 2027). U.S. EPA argues that the expanded definition is appropriate because U.S. EPA is considering nationwide production volumes when setting these standards. But U.S. EPA is only doing so beginning with MY 2027. U.S. EPA has not proposed to (re)set its standards that way for MYs 2024 through 2026, and it should not, therefore, make any related definitional change for those years. Indeed, doing so would effectively change those standards without any determination (or basis for one) that those standards should be changed. And the same is true for U.S. EPA's other justification for this change. There cannot be any "potential difficulties surrounding manufacturers' long-term compliance planning" for MYs 2024 through 2026 of U.S. EPA's existing Phase 2 regulation, as those standards have been in place for a decade. Whatever justification U.S. EPA may have offered for this definitional change to accompany its revised standards for MY 2027 or its new standards for MY 2028 and later, there does not appear to be any justification for making this definitional change before any revised or new federal standards take effect. [EPA-HQ-OAR-2022-0985-1591-A1, p.69]

As an additional note, for clarity and consistency, CARB staff suggests that U.S. EPA ensure that the regulatory language concerning U.S.-directed production volume for vehicles generating and using emission credits in 40 CFR 1037.705 is consistent with that for engines in 40 CFR 1036.705(c)(4). It appears U.S. EPA has proposed changing 40 CFR 1036.705(c)(4) for engines but not proposed the adoption of consistent language in 40 CFR 1037.705. [EPA-HQ-OAR-2022-0985-1591-A1, p.69]

Organization: Clean Air Task Force et al.

G. EPA should not adopt the proposed definition of "U.S.-directed production volume" without strengthening its standards, and any change to the definition should take effect no earlier than 2027.

EPA's proposal would include vehicles certified to the ACT in California and other states within the "U.S.-directed production volume" eligible for credits. 88 Fed. Reg. at 26009-10 (proposing new definition of term). EPA proposes this change because "the ZEV production volumes destined for California and other states would correspond to a large portion of the nationwide production on which the proposed EPA standards are based," such that "it would be challenging for vehicle manufacturers to comply with the proposed standards if they could not account for those ZEVs." Id. at 26010. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 78 - 79]

For the reasons set forth above, a standard that includes vehicles produced pursuant to the ACT (both in California and in states that have already adopted ACT) should be much more stringent than the standards that EPA proposes. The proposed change to the definition of "U.S.-directed production volume" should therefore be accompanied by a significantly more stringent final rule—one at least as protective of public health and welfare as the ACT implemented nationwide. Otherwise, there is no reason to conclude that it would be "challenging" for manufacturers to comply without accounting for vehicles in California and states adopting California's standards. Id. [EPA-HQ-OAR-2022-0985-1640-A1, p. 79]

Additionally, EPA offers no basis to implement the definitional change in 2024, well before the proposed standards take effect. Id. at 26009 (proposing that revision take effect in 2024). EPA's Phase 2 standards are not premised on ACT-certified vehicles, and there is no reasonable basis to believe that those standards will be difficult to meet without including ACT vehicles. EPA's desire for "consistent treatment of any production volumes certified to ACT" does not allow it to unmoor its regulatory change from its rationale: the need to match its definition to "the production on which the [Phase 3] standards are based," Id. at 26009-10, which does not apply to EPA's Phase 2 standards. And especially for those years in which EPA's final rule allows credit multipliers, including ACT-certified vehicles will deeply undermine the effectiveness of EPA's standards. Therefore if EPA finalizes its proposed change to the definition of "U.S.-directed production volume," that change should take effect no earlier than 2027. [EPA-HQ-OAR-2022-0985-1640-A1, p. 79]

Organization: Colorado Department of Transportation et al

- EPA proposes changes to the definition of 'U.S. directed production volume' a term that defines the geographic boundaries in which sales count toward manufacturers' compliance with EPA's heavy-duty GHG standards. Under the current Phase 2 regulations, this term excludes 'production volumes that are certified to different state emission standards,' meaning that sales in California and the Section 177 States that have adopted the ACT Rule do not count toward compliance with EPA's Phase 2 standards. Under EPA's proposed redefinition, 'total nationwide production volumes' would count toward compliance with its standards, 'including vehicles certified to state emission standards that are different than EPA's'. If EPA moves forward with a proposal that is less stringent than the ACT regulation, our state would not support this change, which would reduce the emission reduction impact of the rule in states that have not adopted the ACT rule. [EPA-HQ-OAR-2022-0985-1530-A1, pp. 2-3]

Organization: Cummins

11. Cummins proposes improved wording for 40 CFR §1036.705(c)(4).

40 CFR §1036.705(c)(4) should be reworded to align and be more consistent with 40 CFR §1036.801. Cummins proposes the following wording:

"Engines produced by a manufacturer for which the manufacturer has a reasonable assurance that sale was or will be made to ultimate purchasers in a state that has implemented emissions standards that are different than the emissions standards in this part." [EPA-HQ-OAR-2022-0985-1598-A1, p. 10]

Organization: Daimler Truck North America LLC (DTNA)

Inclusion of Nationwide Production Volumes in ABT. DTNA agrees with EPA's proposal to allow vehicles produced and certified to meet ACT sales volume requirements in California and other states to generate credits under the federal ABT program starting in MY 2024. Inclusion of nationwide production volumes—including those vehicles that are certified to state-specific emission standards—in credit calculations is in fact necessary to ensure that the Phase 3 standards, which are based on nationwide adoption rates, are feasible and appropriate. As EPA notes, HD ZEV production volumes destined for California and other states correspond to a large portion of the nationwide production on which EPA's proposed standards are based, and it would be extremely challenging for vehicle manufacturers to comply with the proposed standards if they could not account for those ZEVs.21 Including nationwide production volumes in ABT credit calculations is thus necessary to encourage nationwide HD ZEV proliferation, one of the main objectives of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 16-17]

21 See Proposed Rule, 88 Fed. Reg. at 26,010.

Applicable Engine Production Volume for Calculating ABT Credits.

EPA proposes a new 40 C.F.R. 1036.705(c)(4) to maintain the current exclusion of engines that are certified to state-specific engine standards from the engine production volumes used as the basis for ABT credit calculations under Part 1036.144 This modification is needed in light of EPA's proposal to broaden the definition of 'U.S.-directed production volume' (in both Parts 1036 and 1037) to allow GHG ABT credit calculations to encompass nationwide production volumes, as discussed in Section II.A. of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 75]

144 See Proposed Rule, 88 Fed. Reg. at 26,019.

DTNA requests that EPA take this opportunity to make a needed clarification that engines are excluded from credit calculations based upon the states in which they are sold, rather than the standards to which they were certified. [EPA-HQ-OAR-2022-0985-1555-A1, p. 75]

As EPA is likely aware, it is common practice for manufacturers to seek dual CARB and EPA certifications for their engines, including engines that are not ultimately sold in California or a CAA Section 177 opt-in state, so that they can be sold anywhere in the country. Because engines that are sold outside of California or Section 177 states would not be credit-eligible under these states' credit programs,145 it stands to reason that they should not be excluded from the federal ABT credit program just because of their CARB certification. [EPA-HQ-OAR-2022-0985-1555-A1, p. 75]

145 As such, these engines do not present the 'double-counting' problem that originally motivated EPA to exclude products certified to state-specific emission standards from the production volumes used as the basis for federal ABT credit calculations. In enacting this exclusion, EPA sought to ensure that engines already required to be certified under the California program (for sale there or in other states that require CARB certification) could not generate credits under the federal ABT program. This concern is not presented in the case of engines for which federal certification is required but CARB certification is optional because the engines are produced for sale outside of California/opt-in states. We understand that EPA concurs with this interpretation, as evidenced in its statements in the recently finalized Low-NOx Rule preamble. See 81 Fed. Reg. at 4,395, n. 413 (observing that while the 'final ABT program does not allow manufacturers to generate emissions credits from engines certified to state emission standards that are different than the federal standards,' this does not preclude manufacturers from generating emission credits 'if they produce larger volumes of engines to sell outside of those states that have adopted emission standards that are different than the federal standards') (emphasis added).

The requested clarification to Section 1036.705(c)(4) would make plain in the regulations that an engine with dual certification (i.e., one that is certified to both EPA and CARB emission standards) would not be excluded from a manufacturer's credit calculation where it is sold in a state where only EPA is certification is required. To effectuate this change, the Company proposes the following revision to the proposed new Section 1036.705(c)(4):

(c) Compliance with the requirements of this subpart is determined at the end of the model year by calculating emission credits based on actual production volumes, excluding the following engines:

(4) Engines ~~certified to state emission~~ produced by a manufacturer for sale in a state that has adopted emissions standards that are different than the emission standards in this part. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 75-76]

Organization: Ford Motor Company

EPA has proposed a revision to the definition of "U.S.-directed production volume" as defined in 40 CFR §§ 1036.801 and 1037.801 in order to include vehicles sold in California or Section 177 states that have adopted the Advanced Clean Trucks (ACT) regulation, to take effect in 2024MY. Ford supports this proposed change and 2024MY timing. We agree with EPA that the revised definition is appropriate, and so is EPA's rationale in considering the impact of ACT on this HD GHG regulation. The revised definition will align with EPA's goal of increasing heavy-duty ZEV sales nationwide and will help avoid the need to predict or account for any distortionary impact that ACT may have on non-Section 177 state ZEV sales. We believe it is appropriate for EPA to consider nationwide ZEV sales as a whole in this rule. [EPA-HQ-OAR-2022-0985-1565-A1, p. 7]

At the same time, we also support the proposed revision to 40 CFR § 1036.705(c) to continue separate emission credit averaging, banking, and trading for engines certified to different state emission standards when those state standards are materially different than EPA's standards. As articulated by EPA, such a case will continue to exist between California's (and adopting Section 177 states') Heavy-Duty Omnibus rule and EPA's Clean Trucks Plan HD2027 rule, both of which regulate criteria emissions from heavy-duty engines but at different standards, useful lives, and in-use requirements. Engine emission standards for 2027MY and beyond do not include EVs in their averaging sets, for EPA or California, so the overlap in balancing Section 177 and non-Section 177 state ZEV sales does not exist as it does for EPA's proposed HD GHG rule and ACT. [EPA-HQ-OAR-2022-0985-1565-A1, p. 7-8]

Organization: International Council on Clean Transportation (ICCT)

TREATMENT OF ACT COMPLIANCE TOWARDS COMPLIANCE WITH PHASE 2 This section responds to EPA's request for comment on how to account for ZEV adoption rates that would arise from compliance with the California ACT program in setting the proposed Phase 2 GHG standards. We are concerned that EPA's decision to revise the definition of 'U.S.-directed production volume' will allow manufacturers to comply with the proposed CO2 standards through the sale of zero-emission trucks they are already required to sell under state law. This flexibility dilutes the stringency of the proposed standards, reinforces investments in fleet deployment and charging infrastructure in ACT states at the expense of non-ACT states, and limits the benefits of the rule in non-ACT states. [EPA-HQ-OAR-2022-0985-1553-A1, p. 14]

In our view the simplest solution would be to retain the existing definition of 'U.S.' directed production volumes that has been in effect since the adoption of the Phase 2 standards. This would ensure manufacturers are investing in more efficient and zero-emission vehicles in non-ACT states. This would also ensure utility companies and charging infrastructure providers are investing in non-ACT states. And this would provide greater certainty that the rule would deliver its intended benefits in non-ACT states. [EPA-HQ-OAR-2022-0985-1553-A1, p. 14]

If EPA chooses to adopt its proposed revision to the definition of 'U.S. directed production volume,' we suggest the agency determine the stringency of its standards based on a weighted average of ZEV sales required in ACT states and the additional forecasted ZEV sales in non-ACT states. In this way, EPA is aligning the stringency of its standards with the benefits of ZEV sales required under state laws, and it is reinforcing and securing the additional market potential for ZEV deployments in non-ACT states. [EPA-HQ-OAR-2022-0985-1553-A1, p. 14]

A hypothetical example of a sales-weighted average can be illustrated for Class 7-8 short haul tractors. The EPA proposal assumes a 35% ZEV sales share in MY 2032 in this segment. We assume nine states that have adopted the ACT account for 24% of national Class 7-8 short-haul tractor sales. We also assume the ACT requires 74% of MY 2032 sales of these vehicles to be zero-emission. The weighted national average ZEV sales share for Class 7-8 short-haul tractor trucks is 44.4%. This weighted average would be the basis for setting the stringency of the standard for this vehicle category. [EPA-HQ-OAR-2022-0985-1553-A1, pp. 14-15]

Organization: Manufacturers of Emission Controls Association (MECA)

Averaging, Banking and Trading

U.S. Directed Production

EPA's analysis supporting this proposed rule is based on a 50-state approach which provides greater flexibility to address the complexities and fluid nature of heavy-duty vehicle purchases, licensing and operation. For these reasons, MECA believes that it is appropriate that U.S. directed production should include all 50 states. [EPA-HQ-OAR-2022-0985-1521-A1, p. 9]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Definition of U.S.-Directed Production Volume

EPA asks for comment on its proposal to change the definition of the U.S.-Directed Production Volume in 40 CFR 1037.801 such that it represents the total nationwide production volumes, including vehicles certified to state emission standards that are different than the emission standards of 40 CFR part 1037. We request that EPA retain the definition of U.S.-Directed Production Volume as it currently is defined in 40 CFR 1037.801 so that Phase 3 GHG standards achieve benefits beyond what the standards in California and the Section 177 states achieve. [EPA-HQ-OAR-2022-0985-1562-A1, p. 14]

The current definition excludes vehicles certified to a state emission standard that is different from U.S. EPA's, in this case, vehicles certified to California and Section 177 state standards. The change in definition would allow inclusion of the Section 177 states' and California's MHD ZEV production volumes in the national average. Information in EPA's Draft RIA shows the agency expects nationwide vocational ZEV sales to increase from 1.1 percent in 2024 to 2.4 percent in 2026, and nationwide tractor ZEV sales to increase from 0.3 percent in 2024 to 1.0 percent in 2026. Assuming these vehicles are sold as BEVs eligible for a 4.5 advanced technology credit multiplier, these ZEV sales would provide manufacturers with a credit bank sufficient to offset a nationwide 25 percent ZEV sales requirement for vocational vehicles and nationwide 9 percent ZEV sales requirement for tractors. Given the 2027 standards for vocational vehicles and tractors are 20 percent and 10 percent respectively, these banked credits would almost completely offset the entire 2027 MY requirements under the proposed rule. As stated previously, EPA's reference case does not include the impacts of Vermont, Colorado, or future states adopting the ACT regulation, the ACF regulation, or potential early action by manufacturers. Because of this, the amount of banked ZEV credits will likely be greater than assumed in the reference case. This sizable bank will reduce the number of ZEVs other states receive. Thus, continuing to exclude vehicles certified to a state's emission standard different from EPA's in the definition of the U.S.-Directed Production Volume is critical to avoid these negative effects. [EPA-HQ-OAR-2022-0985-1562-A1, p. 14-15]

Organization: ROUSH CleanTech

We do not agree with EPA's proposed approach to combine all US sales into a single GHG credit pool, even if they are certified to alternate state standards. We recognize that by including California certified vehicles in the EPA credit pool it will give the appearance of higher BEV/FCEV adoption rates than if the EPA pool was federal only, but we do not believe this is a reasonable justification for a combined pool. States which adopt the ACT are forcing manufacturers to sell BEV/FCEV's, and in California and states which adopt the ACF, are forcing fleets to buy them. This behavior would totally distort the credit pool and market for the Phase 3 program, and almost certainly will result in little or no incentive for manufacturers to sell BEV's in federal states as BEV's sold in ACT states would receive valuable ACT credits in addition to valuable EPA GHG credits. We recommend that EPA follow current practice (and past precedent) and continue to maintain a separate credit pool that applies only to federal states and allow the ACT states to maintain their own pools (as they will otherwise have to under the ACT program). [EPA-HQ-OAR-2022-0985-1655-A1, p.3]

Organization: State of California et al. (2)

IV. EPA SHOULD NOT CHANGE THE DEFINITION OF "U.S.-DIRECTED PRODUCTION VOLUME," AND CERTAINLY SHOULD DO SO NO EARLIER THAN MODEL YEAR 2027

EPA has proposed to change its definition of "U.S.-directed production volume."241 This term defines the geographic boundaries in which sales count toward manufacturers' compliance with EPA's heavy-duty GHG standards.242 Under the current Phase 2 regulations, this term excludes "production volumes that are certified to different state emission standards," meaning that sales in California and the Section 177 States that have adopted California's ACT Rule would not currently count toward compliance with EPA's Phase 2 standards. EPA seeks comment on whether it should change this definition so that EPA would count "total nationwide production volumes" toward compliance with its standards, "including vehicles certified to state emission standards that are different than" EPA's.243 [EPA-HQ-OAR-2022-0985-1588-A1, pp. 35-36]

241 40 C.F.R. §§ 1036.801, 1037.801.

242 88 Fed. Reg. at 26,009.

243 Id. at 26,010.

Our States and Cities oppose this change. Congress intended EPA's standards to reduce harmful vehicular emissions, thereby protecting public health and welfare, through new vehicle sales in States that have not adopted California's standards. EPA's standards should be based on an assessment of technological development and applications manufacturers can make in those other States, and compliance should be determined accordingly. Certainly, EPA must consider the vehicles being produced for, and anticipated to be produced for, California and Section 177 States pursuant to those States' standards. That information is directly relevant to questions of technological feasibility and cost-effectiveness. This is so not because those vehicles facilitate compliance with EPA's standards, but because the ability to produce and use cleaner vehicles anywhere is one part of the picture of what may be feasible elsewhere. Thus, simply because EPA is "considering such production volumes in setting the stringency of the Phase 3 standards in this rulemaking," it does not logically follow that EPA should "allow[] inclusion of such production volumes in demonstrating compliance with" EPA's standards.244 [EPA-HQ-OAR-2022-0985-1588-A1, p.36]

244 Id.

Moreover, if EPA follows the path it has proposed here—changing the definition of "U.S.-directed production volume" beginning with MY2024, preserving the multiplier credits through MY2026, and finalizing its preferred alternative standards beginning in MY2027—EPA's standards will not protect the public health and welfare as the CAA requires. First, the timing of EPA's proposed definitional change would allow manufacturers to get credit for any ZEVs they sell to comply with state ACT regulations under EPA's existing Phase 2 standards for MY2024-

2026 which are not changing here. In other words, EPA would make compliance significantly easier (perhaps even effortless) in States outside California and the Section 177 States in MY2024-2026, even though EPA has made no finding that manufacturers face challenges with the federal Phase 2 standards in those years (nor could EPA do so). [EPA-HQ-OAR-2022-0985-1588-A1, p.36]

Second, and even worse, EPA would allow manufacturers to receive between 3.5 and 5.5 times the credit for any ZEVs they sell in ACT States for those three model years (2024-2026).245 So, even by simply meeting their compliance obligations in ACT States, manufacturers will rack up enormous credit banks under EPA's program. Manufacturers could then use banked credits, rather than emissions reductions, to comply in later years, which would slow, rather than advance, progress. [EPA-HQ-OAR-2022-0985-1588-A1, p.36]

245 Our States and Cities support the comments of others (including the California Air Resources Board) in urging EPA to end the multipliers earlier than MY2026.

Third, EPA's preferred alternative for MY2027 and beyond is not projected to provide the emissions benefits or to encourage technology-deployment levels equivalent to ACT. If EPA counts ACT compliance toward those weaker standards, it means the non-ACT States (including some joining this comment) can see technology deployment and public health protections at lower-than-average levels. If EPA sets a nationwide standard that it forecasts might result in 30 percent ZEVs nationally for vocational vehicle sales in MY2029, but ACT requires 40 percent in that same year,246 the actual ZEV sales in the non-ACT States can clearly fall well below the 30 percent nationwide forecast. EPA's approach clouds how much protection EPA anticipates its standards will provide in non-ACT States (where those standards are the only protection) and fails to adequately serve the markets EPA's standards are intended to cover. [EPA-HQ-OAR-2022-0985-1588-A1, p.37]

246 88 Fed. Reg. at 25,933.

If EPA intends to finalize the proposed change to the definition of "U.S.-directed production volume," it should, at a minimum, mitigate these adverse outcomes by:

- Making the definitional change effective no sooner than the model year for which EPA revises its Phase 2 standards or promulgates new ones—i.e., MY2027, if EPA revises those standards through this rulemaking; and
- Finalizing standards that produce protections equivalent to ACT. [EPA-HQ-OAR-2022-0985-1588-A1, p.37]

The first of these requests—delaying the effective date of the definitional change—comports with EPA's rationale for making the change at all. EPA says it is proposing this "revision [as] consistent with our intended approach of considering [national] production volumes in setting the stringency of the Phase 3 standards."247 That rationale ties the revision of the definition to EPA's standard-setting in this rulemaking, meaning the definition should be revised, if at all, when standards are newly set—in other words, in MY2027 (at the earliest), not MY2024. EPA also points to what it describes as "potential difficulties surrounding manufacturers' long-term compliance planning (due to the uncertainty surrounding whether additional states may adopt the California ACT program in the future)."248 EPA does not explain why any such "difficulties" are appropriate for EPA to address in advance, rather than for the State considering adoption of ACT in the future to address pursuant to its state law authority and the authority and requirements established in Section 177. EPA likewise does not explain how additional state adoptions would cause “difficulties” for manufacturer compliance with EPA’s standards if EPA’s standards remained as they are—based on, and complied with through, what can be achieved in non-ACT States. In any event, if EPA’s concern is about long-term planning for EPA’s standards, there is no reason for this change to take effect in MY2024-2026, as EPA’s standards for those years have been in place since 2016 and the current definition of “U.S.-directed production volume” has been in place even longer. [EPA-HQ-OAR-2022-0985-1588-A1, p.37]

247 Id. at 26,010.

248 Id.

The second request—finalizing standards more stringent than the preferred alternative—would ensure that EPA is not overstating the protectiveness of its own standards by effectively taking credit for protectiveness actually provided by States’ adoption of ACT. As shown above, standards that produce benefits and technological-deployment levels at least equivalent to ACT are both feasible and needed nationwide. If EPA finalizes standards that stringent, it would obviate both the lack of transparency and the lack of sufficient public protection that otherwise results from EPA disclosing only nationwide technology levels, all the while aware that those levels need not be achieved in the areas for which EPA itself has regulatory responsibility. [EPA-HQ-OAR-2022-0985-1588-A1, p.38]

In sum, our States and Cities do not see a need for EPA’s proposed definitional change and urge EPA to leave the existing definition in place. In any event, manufacturers should get no credit—and certainly not multiplied credit—for vehicles sold in ACT States in model years for which EPA is making no change to its standards. Any such credits would only undermine the existing Phase 2 standards about which EPA has made no findings of infeasibility. And, if EPA proceeds with its definitional change (in MY2027 or later), it should do so only if it also makes its own standards stringent enough to provide transparent and sufficient benefits to the non-ACT States—i.e., by recognizing that ACT-like levels of technological deployment and protection are feasible nationwide. [EPA-HQ-OAR-2022-0985-1588-A1, p.38]

Organization: Tesla, Inc. (Tesla)

Tesla Supports the Definition Change in ‘U.S. Directed Production Volume

‘As proposed, Tesla supports the agency’s revision of the definition of ‘U.S. directed production volumes’ to ensure nationwide production is included within the Phase 3 program starting in MY 2024.184 Compliance with ACT is based upon, inter alia, credits for ZEV sales in a set geographic market and not nation-wide fleet level emission standards. 185 Given these dramatically different compliance regimes, there is no ‘double counting’ in allowing vehicles sold in ACT states to be included in the national emissions standards. Ensuring inclusion of all nationwide sales in the compliance regime will be consistent with the EPA light-duty regime and provide manufacturers with a consistent context for long-term compliance planning. [EPA-HQ-OAR-2022-0985-1505-A1, p. 25]

184 88 Fed. Reg. at 26019.

185 See 13 CCR 1963 et seq.

Organization: Volvo Group

Definition of U.S.-directed Production Volume

Volvo Group agrees that the agency must codify new language as noted in Section III.A.1 of the NPRM revising the current definition of “U.S.-directed production volume” to include all vehicles produced for sales and delivery in the U.S., regardless of whether the vehicles are certified to federal, or state emissions standards. [EPA-HQ-OAR-2022-0985-1606-A1, p. 22]

EPA Summary and Response:

Summary:

A number of commenters supported all aspects of the proposed revision to the definition of U.S.-directed production volume (DTNA, Ford, MECA, Tesla, Volvo.) Tesla indicated that there would be no double-counting of credits given the significantly different compliance regimes under ACT (a sales mandate), and a federal fleet-average standard. DTNA maintains that since standards are based on a nationwide adoption rate, the revised definition is the only way standards might be ‘feasible and appropriate’. Ford added a cautionary note not to adjust the current approach for the Phase 2 engine standards.

Other commenters opposed the revised definition asserting that, combined with the multipliers available for advanced technology credits in that period, the new definition would erode the Phase 3 standard stringency as to result in no improvements beyond what would occur in the absence of the rule (CARB, CATF et al, Colorado DOT et al, ICCT, NESCAUM, State of California et al). The commenters argue that any emission reductions would be attributable to ZEV sales compelled by ACT and so would occur only in California and the section 177 states. The State of California et al. characterized any such credits as “windfall” since they would occur in the absence of federal regulatory standards. ICCT maintained further that the provision would create a disincentive for utilities, as well as for OEMs, to direct resources for ZEVs to non-ACT states. In addition to ACT, CARB also noted that they recently adopted the ACF regulation requiring fleets to purchase ZEVs at levels beyond what is reflected by the proposed Phase 3 standards and that “eroding the effective Phase 3 GHG stringency” by revising the U.S.-directed production volume definition would also erode the effectiveness of ACT and ACF by allowing vehicles subject to “eroded standards” to flow back into the state through interstate commerce or the used vehicle market.

CARB, ICCT, and NESCAUM quantified their concern of offsetting the Phase 3 standards. CARB and NESCAUM highlighted their concern over the BEV multiplier by projecting BEV sales volumes mandated by ACT in California and the section 177 states, and multiplying by 4.5 from MYs 2024-2026. In their calculation, they show that credits would be available to offset BEV penetration levels of 25% for vocational vehicles, and 9% for tractors (either exceeding or roughly the same as the potential compliance pathways projected at proposal for MY 2027).

Some of the commenters further suggested that these credits could even dilute the stringency of the Phase 2 standards, without justification, by making the revised definition effective in MY 2024 (CARB, CATF et al, Colorado DOT et al., State of California et al). CATF commented that “EPA’s desire for “consistent treatment of any production volumes certified to ACT” does not allow it to unmoor its regulatory change from its rationale: the need to match its definition to “the production on which the [Phase 3] standards are based,” Id. at 26009-10, which does not apply to EPA’s Phase 2 standards.

These commenters consequently urged that if EPA amends the U.S. Directed Production Volume definition as proposed, it either commence the change in MY 2027 rather than MY 2024 or that EPA must make a corresponding adjustment in stringency of the national standard. (CATF et al., ICCT, State of California et al. (2).) CATF et al. commented that the Phase 3 final rule should be as protective as ACT implemented nationwide, or EPA should not “conclude that it would be ‘challenging’ for manufacturers to comply without accounting for vehicles in California and states adopting California’s standards.” ICCT offered a second alternative to avoid diluting standard stringency: “If EPA chooses to adopt its proposed revision to the definition of ‘U.S. directed production volume,’ we suggest the agency determine the stringency of its standards based on a weighted average of ZEV sales required in ACT states and the additional forecasted ZEV sales in non-ACT states. In this way, EPA is aligning the stringency of its standards with the benefits of ZEV sales required under state laws, and it is reinforcing and securing the additional market potential for ZEV deployments in non-ACT states.”

In addition to reflecting these concerns regarding dilution of standard stringency, a number of these commenters challenged EPA’s rationale for the proposed changes. One of these commenters stated that if that rationale is to be consistent with the approach of setting standards considering national sales volumes of ZEVs (referring to 88 FR 26009/2), then the amended definition should commence in MY 2027 (State of California). Roush commented that including ACT-based sales in the national credit pool would give the misleading appearance of higher ZEV adoption rates, but that this was not an adequate justification for the amendment. Roush recommended that EPA “continue to maintain a separate credit pool that applies only to federal states and allow the ACT states to maintain their own pools”.

Several organizations commented with specific suggestions relating to the proposed regulatory language.

CARB suggested that EPA ensure that the regulatory language concerning U.S.-directed production volume for vehicles generating and using emission credits in 40 CFR 1037.705 is consistent with that for engines in 40 CFR 1036.705(c)(4). CARB stated that it appears U.S. EPA has proposed changing 40 CFR 1036.705(c)(4) for engines but not proposed the adoption of consistent language in 40 CFR 1037.705.

Cummins states that 40 CFR 1036.705(c)(4) should be reworded to align with 40 CFR 1036.801 and proposes the following: “Engines produced by a manufacturer for which the manufacturer has a reasonable assurance that sale was or will be made to ultimate purchasers in a state that has implemented emissions standards that are different than the emissions standards in this part.”

DTNA states that EPA’s proposed new 40 CFR 1036.705(c)(4) is needed in light of EPA’s proposal to broaden the definition of ‘U.S.-directed production volume’ (in both Parts 1036 and 1037) to allow GHG ABT credit calculations to encompass nationwide production volumes, as discussed in Section II.A. of these comments. DTNA requests that EPA make a needed clarification that engines are excluded from credit calculations based upon the states in which they are sold, rather than the standards to which they were certified. DTNA stated that since engines that are sold outside of California or Section 177 states would not be credit-eligible under these states' credit programs, they should not be excluded from the federal ABT credit program just because of their CARB certification.

DTNA proposes the following revision to the proposed new Section 1036.705(c)(4):

(c)(4) Engines ~~certified to state emission~~ produced by a manufacturer for sale in a state that has adopted emissions standards that are different than the emission standards in this part.

Ford expressed support for the proposed revision to 40 CFR 1037.705(c) and EPA's approach to continue separate credit ABT from engines certified to different state emission standards. Ford notes that both EPA and California do not include EVs in the MY 2027 and later engine CO_2 standards, so "the overlap in balancing Section 177 and non-Section 177 state ZEV sales does not exist as it does for EPA's proposed HD GHG rule and ACT."

Response:

As described in Section III.A.1 of the final rule preamble, we are finalizing a revised definition such that U.S.-directed production volume represents nationwide production, including any production in states that have adopted different standards. After considering comments, we are also finalizing the proposed effective date of MY 2024. In the final rule preamble, we include responses to comments expressing concerns that the new definition would erode the Phase 3 standard stringency and result in no improvements beyond what would occur in the absence of the rule (CARB, ICCT, NESCAUM). We also address comments urging that any definition change not occur until MY 2027 for concern over diluting the Phase 2 program (CARB, CATF et al, Colorado DOT et al., State of California et al).

We have considered ICCT's suggested alternative approach for setting the stringency of the Phase 3 standards. While we did not determine the stringency of the standards exactly as ICCT suggested, we did update our baseline in the FRM to model ZEV adoption in ACT states and non-ACT states separately as described in preamble Section V and RIA Chapter 4. This updated baseline was used in the analyses for the impacts of the final rule standards; for discussion of EPA's basis for concluding the final standards are feasible and appropriate, see preamble Section II.G. We note that our technology assessment in preamble Section II and RIA Chapter 2 is a national assessment of emission-reducing technologies and, as shown in preamble Section V, RIA Chapter 4, and RTC Section 2.4, we anticipate that the Phase 3 standards will lead to greater adoption of emission-reducing technologies (principally ZEVs) in non-ACT states. In Section III.A.1 of the final rule preamble, we note additional concerns with complexity and uncertainty in commenters' suggestions for different approaches to setting the Phase 3 standards while using the previous definition of U.S-directed production volume.

We disagree with Roush's recommendation that EPA maintain a federal credit pool and ACT states maintain their own pools, to the extent Roush is implying these pools should be maintained without any overlap in production volumes between the two pools. As we stated in final rule preamble III.A.1, even under the previous definition of US-directed production volume, manufacturers should be eligible to generate credits under the federal program for production and sales in excess of those required by ACT in states where ACT is applicable[804], as otherwise

[804] We note that commenter CATF appears to accept a similar principle, since it suggests that federal credits in states which have adopted ACT should be available once ACT requirements are surpassed. See the comment summary in the following Section 10.3.

the federal program could create a disincentive for such excess production and sales in such states. Indeed, as commenter Tesla suggests in a similar context, not recognizing such credits federally could also discourage states from adopting the ACT program. See section 10.3 below. It is also unclear how EPA could appropriately distinguish which credits should be treated as excess and part of compliance with the Phase 3 program, and the complexity involved in such a scheme raises verification concerns. These concerns are compounded given that the national standards reflect national production volumes, and the Roush comment would exclude not only ACT sales, but credit-generating sales as well, compounding the disconnect between federal standard setting and federal compliance.

We note further that, unlike a number of commenters, we do not regard an amended definition as a sharp change of approach. It in fact preserves the status quo that existed from the beginning of the HD GHG program through March 2023. That is, up until California enacted its ACT program and EPA granted a preemption waiver for that program, the regulatory definition of U.S. Directed Production Volume had no practical effect because the federal and California programs were identical. All credits were consequently generated nationwide. The change in definition thus preserves that status quo for the existing Phase 2 program, now that the federal and California programs differ, and carries that approach forward in promulgating the Phase 3 program (with corresponding consideration of the ACT program, as explained in final rule Preamble Sections II and V). Regarding the existing Phase 2 program in particular, we recognize that OEMs have brought existing compliance plans to our attention in public comments on this rule reflecting that status and, given the timing of the divergence of the federal and California programs and the proximity with existing compliance plans, EPA views preserving the status quo, whereby all credits are national, as appropriate.

We therefore proposed and are adopting the new definition of U.S.-directed production volume, in part, to avoid the risk that manufacturers may not be able to account for vehicle sales to Section 177 states in their credit calculations under a definition that excludes production volumes meeting different standards. See Section III.A.1 of the final rule preamble for additional reasons that further motivated our decision to revise the definition.

As described in Section III.C.2 of this final rule preamble, we proposed a new 40 CFR 1036.705(c)(4) as the location where we exclude engines certified to different state emission standards from being used to calculate emission credits in the HD engine program. After considering the comments from Cummins and DTNA, and noting that we never intended to discourage manufacturers from certifying a complete engine family to California-level standards, we are further revising the proposed provision to exclude engines if they are certified to different state standards and intended for sale in a state that adopted those different emission standards..[805] In comment, CARB suggested EPA use consistent regulatory language for vehicles and engines in 40 CFR 1037.705 and 1036.705, respectively. We decline CARB's request, noting that the vehicle and engine ABT programs intentionally differ under Phase 3 and we did not reopen the substance of the engine provisions in this rulemaking. The recently promulgated NOx standards for HD engines were developed excluding production volumes certified to different state NOx

[805] We are finalizing as proposed revisions that replace several instances of "U.S.-directed production volume" with a more general "production volume" where the text clearly is connected to ABT or add a more specific reference to the production volume specified in 40 CFR 1036.705(c). See revisions in 40 CFR 1036.150(d) and (k), 1036.725(b), and 1036.730(b).

standards and we are not revising the CO_2 standards for HD engines in the Phase 3 rule, and we also did not reopen any of these engine standards in this rulemaking. Thus, the final regulatory text retains the existing approach of excluding HD engine production volumes certified to different state standards for the credit calculations of 40 CFR 1036.705 to maintain the substance of the existing regulatory provisions. We note that we appreciate Ford's support of EPA continuing to exclude HD engines certified to different state standards from engine ABT calculations, and for recognizing that there is not the same need to account for the ACT regulation with respect to engines in the Phase 3 program.

10.3 ABT as a Compliance Flexibility

10.3.1 Credit Multipliers

Comments by Organizations

Organization: Advanced Engine Systems Institute (AESI)

AESI favors the termination of multipliers for PHEV and BEVs. These technologies are sufficiently incentivized, and the continued use of these multipliers may delay deployment of zero emission trucks. Multiplier incentives should continue for hydrogen fuel cell vehicles, which remain in the early deployment stage of that technology. EPA should also consider appropriate incentives for hydrogen combustion trucks; this would accelerate hydrogen infrastructure capacity and the deployment of fuel cell powered trucks. [EPA-HQ-OAR-2022-0985-1600-A1, p. 2]

Organization: American Council for an Energy-Efficient Economy (ACEEE)

EPA should ensure that credits from Phase 2 do not undermine the Phase 3 standards

Manufacturers' credits carried over from the Phase 2 program could substantially affect the efficacy of Phase 3. The proposal states: "In considering feasibility of the proposed standards, EPA also considers the impact of available compliance flexibilities on manufacturers' compliance options" (FR 26002). Yet EPA has not offered any projection of the credit balances to be carried over from Phase 2 to Phase 3, much less indicated how these credits might affect the levels of electrification achieved or the potential for backsliding on ICEV emissions under the proposed standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 17]

This concern is heightened by the proposal to leave in place the advanced technology multipliers for BEVs through 2026 (FR 26013). As discussed in ACEEE's comments on the 2022 heavy-duty NPRM, these very high multipliers together with sales mandates at the state level and market forces will generate sufficient credits to allow stagnation of average truck emissions levels in the early years of Phase 3, exactly when momentum must build toward rapid decarbonization of the commercial fleet.32 [EPA-HQ-OAR-2022-0985-1560-A1, p. 10]

32 https://www.aceee.org/sites/default/files/pdfs/aceee_hd_phase_2_ghg_comments.pdf

As an example of the ability of carryover credits to undermine the standards, consider the effects of maintaining the advanced technology multipliers in MY 2024-2026. Based on EPA's estimates of ZEV penetration in MY 2024-2026 in the DRIA (Tables 4-6), carryover of advanced technology multiplier credits would more than nullify EPA's proposed increase in stringency in the MY 2027 standards, which therefore would no longer serve to prompt the industry to start meaningful production of BEVs by MY 2027.33 [EPA-HQ-OAR-2022-0985-1560-A1, p. 17]

33 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

Organization: American Trucking Associations (ATA)

Drawing upon past experiences, fleets are concerned that manufacturers will limit diesel product availability to ensure they can comply with their GHG 3 target, which requires a certain percentage of ZEVs to be sold as part of the OEM's fleet mix. Under the GHG 2 regulation, fleets were obligated to purchase aero packages, specific tire configurations, and start-stop technology to ensure compliance with the EPA's technology package. This resulted in a restricted range of options when fleets placed vehicle orders. EPA's elimination of the Advanced Technology Credit for MY 2027, which provides a steeper incline for manufacturers to hit their new GHG 2027 proposed targets with ZEVs, will likely limit fleet technology choices. [EPA-HQ-OAR-2022-0985-1535-A1, p. 9]

Organization: California Air Resources Board (CARB)

E. Credits

1. Advanced Technology Credit (ATC) Multipliers for CO2 Emissions

Affected pages: 25934 and 26010-26013

The NPRM requests comment on the proposed elimination of the ATC multipliers for PHEVs and BEVs in MY 2027, one year earlier than provided in the existing Phase 2 GHG regulation. U.S. EPA is proposing to retain the existing ATC multiplier for FCEVs due to this technology still being in the early stage of development. [EPA-HQ-OAR-2022-0985-1591-A1, p.52]

During the development of federal Phase 2 GHG regulation in 2015, CARB staff advocated for larger credit multipliers compared to Phase 1 to encourage early development of technologies that were not yet commercially available, and to provide incentives to manufacturers who would like to produce HD ZEVs. U.S. EPA agreed and included ATC multipliers in the final Phase 2 GHG regulation. Federal Phase 2 GHG regulation offers credit multipliers for three types of advanced technologies: PHEVs with a multiplier of 3.5, BEVs with a multiplier of 4.5, and FCEVs with a multiplier of 5.5. While CARB staff appreciates that U.S. EPA took CARB's 2015 comments seriously and added the ATC multipliers, with the commercialization of HD ZEVs, CARB staff now believes the time has come to phase out these multipliers. [EPA-HQ-OAR-2022-0985-1591-A1, p.52]

CARB submitted more up-to-date comments in this regard to the U.S. EPA's March 2022 NPRM ''Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards"(HD2027 NPRM).185 CARB staff is now urging U.S. EPA to reduce and phase out the magnitude of the ATC multipliers over time as recommended in their third proposed HD2027 NPRM approach. Furthermore, CARB staff recommends the elimination of ATC multipliers for HD ZEVs that are certified under CARB's ACT regulation. CARB staff continues to urge U.S. EPA to reduce the magnitude of the ATC multipliers in MYs 2024 through 2026, as described in

U.S. EPA's third proposed HD2027 NPRM approach.186 [EPA-HQ-OAR-2022-0985-1591-A1, p.52]

185 Comment submitted by California Air Resources Board (CARB) Posted by the U.S. Environmental Protection Agency on May 15, 2022. https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1186

186 Fed. Reg. 17606-17607. March 28, 2022.

In addition to supporting U.S. EPA's proposal to eliminate ATC multipliers for PHEVs and BEVs for the MY 2027, CARB staff would also like to recommend elimination of ATC multipliers for FCEVs due to the HD ZEV sales mandate in California and Section 177 states.187 As a result of these states' sales mandates, there is no need for ATC multipliers for any HD ZEVs including FCEVs, and removing the multipliers would avoid the double counting of benefits from complying with a regulation while using the ATC multiplier. [EPA-HQ-OAR-2022-0985-1591-A1, pp.52-53]

187 States that have Adopted California's ACT regulation under Section 177 of the Federal CAA

Organization: China WTO/TBT National Notification & Enquiry Center

4. It is suggested to clarify the basis for terminating the credit coefficient of electric vehicles on page 9 of Regulation 88 Federal Register (FR) 25926. [EPA-HQ-OAR-2022-0985-1658-A2, p.4]

88 Federal Register (FR) 25926 regulation proposes on page 9 to terminate the credit rating for electric vehicles one year in advance, while retaining the FCEV credit rating. It is recommended to treat all models equally and either terminate them all or postpone the cancellation for one year simultaneously. The current modifications are not conducive to encouraging relevant enterprises to continuously invest in and improve new technology research and development. [EPA-HQ-OAR-2022-0985-1658-A2, p.4]

Organization: Clean Air Task Force et al.

F. EPA Should Eliminate or Restrict the Availability of Advanced Credit Multipliers in 2025.

We support EPA's proposal to phase out advanced technology multipliers, which provide additional credits for PHEVs, BEVs, and FCEVs. 88 Fed. Reg. at 26010-13. We further request that EPA consider phasing those multipliers out in 2025 rather than 2026, or otherwise restricting their availability and use (e.g., by only providing them for long-haul sleeper cabs and other vehicles for which those technologies currently remain genuinely advanced, or eliminating them for vehicles necessary to satisfy ACT standards in California and states that have adopted those standards). [EPA-HQ-OAR-2022-0985-1640-A1, p. 76]

EPA adopted the credit multipliers as part of the Phase 2 program, "to create a meaningful incentive for those manufacturers considering developing and applying [the] qualifying advanced technologies into their vehicles." 88 Fed. Reg. 26010. They were based on a 2016 "cost analysis that compared the costs of these advanced technologies to the costs of other GHG-reducing technologies," and set at a level that, according to then-available data, "would make these advanced technologies more competitive" and "allow manufacturers to more easily generate a viable business case to develop these advanced technologies and bring them to market." Id. at

26,010-11. EPA recognized when it adopted them that the multipliers were appropriate only for "very advanced technology," and that "because they are so large" they should not "continue indefinitely." Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles–Phase 2, 81 Fed. Reg. 73478, 73497-98 (Oct. 25, 2016). [EPA-HQ-OAR-2022-0985-1640-A1, pp. 76 - 77]

EPA's current proposal recognizes that the circumstances that justified the multipliers have changed dramatically since the Phase 2 program was finalized. 88 Fed. Reg. at 26012 ("[W]e did not expect the level of innovation since observed, the IRA or BIL incentives, or that California would adopt the ACT rule at the same time these advanced technology multipliers were in effect."). Consequently "the multiplier credits could allow for backsliding of emission reductions expected from combustion vehicles for some manufacturers in the near term." Id. (describing "the generation of excess credits which could delay the introduction of technology in the near or mid-term"). EPA's modeling and standard-setting does not account for the use of those credits, 88 Fed. Reg. 26012, and EPA has proposed altering the ABT program (by redefining "U.S.-directed production volume") from MY 2024 onwards to make production volumes certified to ACT standards eligible for credits, id. at 26009. Those provisions, taken together, effectively and substantially dilute the nominal stringency of EPA's proposed standards—the effects of which are already overstated by virtue of EPA's underestimate of ZEV penetration in its baseline scenario. See Section III.B, above. [EPA-HQ-OAR-2022-0985-1640-A1, p. 77]

In response, EPA proposes to phase out the credit multipliers for BEVs and PHEVs one year early, in MY 2026. Id. That one-year change fails to respond adequately to the speed with which BEVs and PHEVs are reaching cost parity and entering the heavy-duty market. The ACT rule, and its adoption by other section 177 states, will result in significant BEV manufacture in 2025. Those programs require between 7 and 11 percent of heavy-duty vehicles (depending on class) certified and offered for sale to be ZEVs and have been adopted in California and seven other states. As EPA acknowledges, the multipliers generated in those states threaten to "create a large bank of credits with the potential to delay the real world benefits of [EPA's] proposed program." 88 Fed. Reg. at 26012. [EPA-HQ-OAR-2022-0985-1640-A1, p. 77]

The market analyses cited in EPA's proposal suggest that rapid technological development together with state rules and the IRA will render BEVs in many sectors cost-competitive and widely available before 2026. ERM determined that a variety of Class 5 and 6 ZEVs would reach purchase price parity with combustion vehicles by 2025, with many Class 8 vehicles at parity by 2026.347 ERM's analysis projects average Class 4-8 ZEV sales in 2025 between 8.8 percent (44,110 vehicles) and 20 percent (102,700 vehicles).348 ICCT's projections similarly indicate steep growth in BEV sales in the heavy-duty sector before 2025, especially buses and class 4 and 5 vehicles, with some sectors nearing 30 percent BEV penetration in 2025.349 Those projections sharply contrast with the projections that served as the basis for EPA's adoption of the multipliers. See Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium-and Heavy-Duty Engines and Vehicles – Phase 2; Regulatory Impact Analysis 2-194 (August 2016) (concluding that "fully electric vocational vehicles" will not "be widely commercially available" before 2027). They suggest that allowing BEVs and PHEVs to accrue credits through the proposed multipliers would significantly and unnecessarily reduce the effectiveness of EPA's standards. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 77 - 78]

347 Robo & Seamonds, Technical Memo, at 4.

348 Id. at 9-11. ERM's analysis excludes PHEVs. Id. at 2.

349 Slowik et al., at 14-15, 24 (projecting that in some heavy-duty sectors ZEV shares near 30 percent, dominated by BEV).

The countervailing reason EPA offers for retaining the multipliers is an ostensible need to "continue to incentivize the development of BEVs," and concern regarding "impact on current manufacturer product plans." 88 Fed. Reg. at 26012. The IRA, however, provides more than adequate new incentives to secure any product plans that were premised on the availability of multipliers. The IRA provides substantial tax credits for battery manufacturers, and additional credits for heavy-duty vehicles. DRIA p.18-19 (Section 1.3.2.2). Indeed, the overall effect of the IRA is to eliminate "incremental cost (with the tax credit) of a BEV compared to a [combustion] vehicle," aside from supply equipment (which is itself subject to additional incentives under the IRA). Id. at 19-21. Manufacturers can, consequently, be safely expected to continue and expand their BEV-related product plans even without credits generated by the multipliers; the benefits those credits would have provided are more than offset by the addition of the IRA's tax credits. [EPA-HQ-OAR-2022-0985-1640-A1, p. 78]

By MY 2025, consequently, there will be little need for advanced technology multipliers, while retention of the multipliers risks major reductions in the real-world benefits of the standards in subsequent years. We therefore urge EPA to further reduce the availability and use of credit multipliers for BEVs and PHEVs. It should consider, for example: phasing out multipliers for BEVs and PHEVs in MY 2025; preventing vehicles certified in California and other states that have adopted ACT from receiving the credit multipliers ("Approach 1," described at 88 Fed. Reg. at 26011) unless they exceed the ACT sales requirements in those states; imposing a two-year limit on the use of any credits generated through advanced technology multipliers; allowing credits only for certain vehicles (e.g., long-haul sleeper cabs, see id. at 26013 (inviting comment on differentiating between weight classes)); or reducing the multipliers available for BEVs and PHEVs (e.g., from 4.5 and 3.5 to 2.5 and 1.5, respectively) in 2025. At a minimum, EPA should account for the use of the credits generated by the multipliers in setting its standards; their effects are likely to be too significant for EPA to reasonably ignore. [EPA-HQ-OAR-2022-0985-1640-A1, p. 78]

Organization: Clean Fuels Development Coalition et al.

Adding insult to regulatory injury, EPA has decided to remove its flexibilities all in one go. The agency previously doled out unlawful credit "multipliers" to electric vehicle manufacturers and that practice continues today under the rules currently in force. 88 Fed. Reg. 25,972 ("instead of including ZEV technologies in the technology packages for setting the Phase 2 standards, we provided advanced technology credit multipliers to help incentivize the development of ZEV technologies."). In other words, EPA's Phase II heavy-duty standards unilaterally created a regulatory cross subsidy program for electric vehicles by giving them double-credit for meeting the standards. This program results in higher prices for gasoline and diesel vehicles because manufacturers must generate or purchase the credits that EPA has created to meet standards. EPA has no authority to create such a subsidy program. It gets to set standards; it has no power to set standards beyond where it thinks they should be and then agree to relax those standards if a manufacturer gives money to the cause of electrification. "Pay our friends if you want more favorable standards" is, to put it mildly, not consistent with the rule of law. Nor is there any logical stopping point to which "friends" might be eligible for such cross-subsidies. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 11 - 12]

The proposal does not acknowledge this lack of authority to create these subsidy programs, but, thankfully, it does propose to end the multiplier program. EPA must do so for both this rule and with respect to the rule currently in place— ideally through an interim final rule addressing that specific issue. [EPA-HQ-OAR-2022-0985-1585-A1, p. 12]

Organization: Daimler Truck North America LLC (DTNA)

EPA should not eliminate the Advanced Technology Credit multiplier for BEVs starting in MY 2026.

As discussed in Section I.B.2 of these comments, regulatory stability and adequate lead-time are key considerations in establishing and implementing new vehicle emission standards. These considerations are embedded in CAA Section 202 because they are necessary for manufacturers to be able to adequately plan their product portfolios, make wise investment decisions in new technology, and develop and validate successful, robust products. This is especially true as new regulatory requirements for certification and useful life have driven more onerous testing requirements and longer validation periods. [EPA-HQ-OAR-2022-0985-1555-A1, p. 74]

DTNA has supported EPA's GHG Phase 2 rules both during the original rulemaking process and during implementation. That support was conditioned on the totality of the Phase 2 program that EPA proposed, including compliance provisions like the Advanced Technology Credit multipliers. During the previous administration, DTNA, and the commercial vehicle industry as a whole, continued to support EPA's GHG Phase 2 rule—again, based upon belief in the importance of regulatory stability and that Agency rulemakings should be respected and not subject to a see-saw effect based on political considerations. [EPA-HQ-OAR-2022-0985-1555-A1, p. 74]

The purpose of Advanced Technology Credit multiplier is to incentivize manufacturers to develop commercial ZEVs to facilitate compliance with EPA's increasingly stringent emission standards. Now that many manufacturers have relied upon the availability of credit multipliers to plan their compliance strategies, exactly as EPA intended, the Agency is considering eliminating them out of concern that the incentives they provided to develop clean technologies may have led to the introduction of more ZEVs than EPA intended. [EPA-HQ-OAR-2022-0985-1555-A1, p. 74]

DTNA has invested considerable time in developing a product portfolio to meet GHG Phase 2 standards under the rules as originally promulgated, which include Advanced Technology Credit multipliers. The Company does not support removing these credits, especially now that we have defended preservation of the Phase 2 program and built compliance plans in reliance on the rules as written. [EPA-HQ-OAR-2022-0985-1555-A1, p. 74]

This is especially true for the alternate approaches EPA discusses in the Proposed Rule, which would phase out the Advanced Technology Credit multipliers even earlier—potentially as early as MY 2024. Changing these rules now would undermine manufacturer reliance interests on the availability of these credits in planning their compliance strategies, as well as the regulatory stability on which capital-intensive long lead-cycle businesses like DTNA depend. [EPA-HQ-OAR-2022-0985-1555-A1, p. 74]

EPA Request for Comment, Request #7: We are proposing in this action to eliminate the advanced technology vehicle credit multipliers for BEVs and PHEVs for MY 2027, one year before these credit multipliers were set to end under the existing HD GHG Phase 2 program. We propose retaining the existing FCEV credit multipliers, because the HD market for this technology continues to be in the early stage of development. We request comment on this approach.

DTNA Response: DTNA does not support the elimination of advanced technology vehicle credit multipliers for BEVs and PHEVs for MY 2027. The availability of these credit multipliers are an integral part of the Phase 2 greenhouse gas (GHG) regulatory program, and manufacturers have relied upon them to build their product and compliance strategies. DTNA addresses this issue in Section III.B.1 of these comments.[EPA-HQ-OAR-2022-0985-1555-A1, p. 159]

EPA Request for Comment, Request #65: We request comment on our proposed MY 2026 phaseout date or whether we should consider other approaches to account for ACT or incentive programs.

- DTNA Response: DTNA discusses this issue in detail in Section III.B.1. of these comments. EPA should not eliminate the Advanced Technology Credit multiplier for BEVs starting in MY 2026, as this would undermine manufacturer reliance interests on the availability of these credits in planning their compliance strategies, as well as the regulatory stability on which capital-intensive long lead-cycle businesses depend. [EPA-HQ-OAR-2022-0985-1555-A1, p. 170]

Organization: Eaton

While no ZEV penetration was assumed in Phase 2, the reality is that the market demands and provides ZEV solutions. Furthermore, the financial incentives of the bipartisan Inflation Reduction Act and many state programs like California HVIP, do provide additional support to these technologies. In fact, the most likely barrier to ZEV adoption is the lack of charging and Hydrogen infrastructure that is not within the purview of this NPRM. In the current situation, ZEV and PHEV multipliers are no longer a driving force for new technology, and with increasing ZEV adoption, they risk distorting the market and thus reduce the technology-neutral character of the regulations. We support the EPA position in sun-setting multipliers as outlined in the recent low NOx rule and recommend the same approach for Phase 3. [EPA-HQ-OAR-2022-0985-1556-A1, p. 6]

Organization: Environmental Defense Fund (EDF)

b) EPA should adopt a protective framework that helps to minimize any potentially adverse climate and health impacts associated with hydrogen usage.

Under the proposal's current framework, hydrogen powered vehicles are incentivized both through credit multipliers and their treatment as having zero-emissions for compliance with the standards. These incentives are misguided given that, as shown above, hydrogen powered vehicles' emissions impacts are worse than diesel vehicles using current, dominant forms of hydrogen production and, in many certain scenarios, using projected future grid electricity. We encourage EPA to strengthen its standards by removing blanket incentives and adopting protections that do not credit or incentivize hydrogen fueled vehicles as having zero-emissions when that is not the case. Instead, EPA should tailor its standards to encourage use of low-GHG hydrogen.218 We offer a few two specific suggestions related to these issues below. [EPA-HQ-OAR-2022-0985-1644-A1, 83]

218 In their assessment of low-GHG hydrogen, EPA should be consistent with standards set in the IRA production tax credit for clean hydrogen as well as other EPA standards such as the recently proposed Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants.

Removing credit multipliers. EPA should remove credit multipliers for hydrogen fueled vehicles — which, as proposed, provide greater incentives for the production of FCEVs than for lower-emitting BEVs. EPA proposes to retain its existing Advanced Technology Credit Multipliers for FCEVs (which are higher than the multipliers for BEVs) through 2027, even though it will remove these same incentives for BEVs in 2026.219 Given that the emissions benefits of hydrogen powered vehicles vary widely — and are, in all cases, worse than that of BEVs — these incentives are counterproductive. EPA should phase out these credit multipliers for FCEVs by 2026, just as they have for BEVs. If EPA is going to maintain these incentives, it should do so only for manufacturers that can demonstrate their vehicles are producing real world emissions benefits by certifying they are running on green hydrogen.220 As the above analysis demonstrates, EPA must not allow any credits for vehicles fueled with hydrogen produced using SMR or grid electrolysis – both of which produce emissions outcomes worse than diesel vehicles in the 2027 timeframe. [EPA-HQ-OAR-2022-0985-1644-A1, 83-84]

219 88 Fed. Reg. 26012.

220 In passing the IRA, Congress recently recognized the importance of an approach to hydrogen powered vehicles that incentivizes clean hydrogen production through its tax credits for clean hydrogen production, which increase with lower lifecycle emissions. 26 U.S.C. §45V.

Apply a Utility / Correction Factor to Vehicles Fueled with Hydrogen. We also urge EPA to account for the wide variation in hydrogen fueled vehicles' emissions benefits in measuring their emissions for compliance with the standards. EPA proposes to count hydrogen powered vehicles as having zero emissions, similar to how it has treated BEVs in the past. However, EPA's prior justifications for treating BEVs this way do not apply to hydrogen powered vehicles.221 Not only do hydrogen powered vehicles not provide clear emissions benefits absent further controls on where the hydrogen they operate on comes from, but due to potential leakage of hydrogen from the vehicles and criteria pollutant emissions from H2ICEVs, they do have vehicle and tailpipe emissions that must be accounted for. Additionally, EPA has previously noted the existence of other emissions reduction programs or controls related to upstream emissions as justifying its focus on tailpipe emissions.222 However, emissions from hydrogen production are currently unregulated, making it especially important that EPA adopt an approach that considers and reflects how hydrogen fueled vehicles are powered and operated. [EPA-HQ-OAR-2022-0985-1644-A1, 84-85]

221 EPA's decision to treat BEVs as having zero-emissions was based on a careful consideration of the emissions benefits associated with BEVs because the original purpose of this approach was to "recognize the benefits of . . . dedicated alternative-fueled vehicles." 76 Fed. Reg. 57123. Because of the emissions issues associated with hydrogen powered vehicles, including the fact that they likely do have tailpipe emission through hydrogen leakage, this same justification cannot justify their parallel treatment.

Additionally, EPA has previously considered it important to its focus on tailpipe emissions that the upstream emissions are regulated by other rules.

222 76 Fed. Reg. 51705 (Aug. 27, 2012) ("There is no good reason to consider [the lifecycle emission of different types of fuels] here, especially where there already is a separate fuel based program, the RFS program, that is directly aimed at achieving the result POP Diesel seeks--a fuel program that achieves a reduction in lifecycle GHG emissions associated with the diesel fuel used by motor vehicles, through a mandate to use certain renewable diesel fuels.).

In this regard, EPA should not treat hydrogen fueled vehicles like BEVs but instead similarly to how the agency treats PHEVs,223 where EPA recognizes that sometimes PHEVs operate on battery power with real emissions benefits and other times the vehicle is powered by its ICE engine with emissions profiles more similar to fossil-powered vehicles. 224 For hydrogen fueled vehicles, EPA could adopt an approach to calculating their GHG emissions that includes a conservative low- GHG utility factor representing emissions attributable to hydrogen fueled vehicles assuming those vehicles are fueled using average, current forms of hydrogen production. For instance, a current factor would need to reflect the fact that most hydrogen is produced using SMR and does not result in real-world emission benefits when compared to diesel vehicles.225 [EPA-HQ-OAR-2022-0985-1644-A1, 85]

223 See 40 CFR § 600.116-12.

224 88 Fed. Reg. 29253 (May 5, 2023) ("Because the tailpipe CO2 produced from PHEVs varies significantly between [charge depleting] and [charge sustaining] operation, both the charge depleting range and the utility factor curves play an important role in determining the magnitude of CO2 that is calculated for compliance.").

225 This utility factor should also differ for H2ICEs, and FCEVS, which have differing emissions benefits.

EPA could, of course, update this factor over time as the relative mix of hydrogen production sources changes. Moreover, as with the credit multipliers, EPA should incentivize manufacturers who can demonstrate their hydrogen fueled vehicles are driving actual emissions benefits. It can do so by allowing manufacturers to adjust the low-GHG utility factor applied to their vehicles where they can show they are resulting in real world emissions benefits through emissions testing or certifying the vehicles run exclusively on low-GHG hydrogen. [EPA-HQ-OAR-2022-0985-1644-A1, 85]

We emphasize the importance of EPA adopting these protections and guardrails now, given the potential near term proliferation of hydrogen fuels and the absence of regulatory structures to ensure any hydrogen produced is done so in a way that minimize climate and health harming pollution. At the same time, we urge EPA to adopt future leakage standards related hydrogen fueled vehicles and explore and pursue all other regulatory authorities to reduce and eliminate harmful pollution associated with hydrogen production and use. [EPA-HQ-OAR-2022-0985-1644-A1, 86]

Organization: Fermata Energy

EPA should add in the final regulation a small multiplier credit for vehicles that have on-board AC bidirectional chargers or are integrated with multiple DC off-board chargers. [EPA-HQ-OAR-2022-0985-1662-A2, p.8]

The promise of bidirectional charging (AC or DC) to address air pollution, GHG emissions, and challenges to the electric grid is very significant with BEVs and PHEVS in medium- and heavy-duty vehicles. While we understand the desire by the EPA to simplify the regulation and reduce the use of bonus multiplier credits, we believe a small bonus credit in this regulation is justified and needed to unlock this technology because of the large emissions reduction benefits and other grid services enabled by bidirectional charging as described in Section II above. The EPA has a long history of providing multiplier credits to emerging technology and we strongly encourage the EPA to adopt in the final regulation a modest multiplier credit for class 2b-8 vehicles that appropriately phases out over time. This approach will not only will help enable the emerging V2G industry, but will also help consumers achieve lower operating costs,16 reduce GHG and traditional pollutants from fossil fueled power plants by shifting electricity use to renewable energy in the cleanest hours of the day, and reduce the need for high-emitting peaker plants. V2G also provides a zero-emission, lower cost alternative to high-emitting portable back-up generators, and saves utility ratepayers money with a low-cost resource compared to battery stationary storage. [EPA-HQ-OAR-2022-0985-1662-A2, p.8]

16 See footnote 11

Organization: International Council on Clean Transportation (ICCT)

ICCT supports the proposal to eliminate advanced technology credit multipliers. Historically, these multipliers were appropriate to provide manufacturers an incentive to invest in the research and development of battery electric and fuel-cell electric vehicles that had yet to be commercialized. Since the adoption of the Phase 2 standards, these technologies have entered the commercial market on a broad scale and, beginning in model year 2024, nine states will require manufacturers to sell them. We do not think multipliers have any further role to play in this rule. [EPA-HQ-OAR-2022-0985-1553-A1, p. 5]

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

We are also concerned that the proposal plans to end the HD GHG Phase II credit multipliers for BEVs and PHEVs. Electrification is still in its infancy in the medium- and heavy-duty sectors. Credit multipliers are an important tool to provide industry with a pathway to compliance while rewarding the introduction of advanced technologies. There is no one-size-fits-all approach to improved efficiency and each manufacturer faces a unique set of challenges due to differences in fleet make-up. Overcompliance and credit multipliers give the industry the ability to deploy cleaner vehicles in segments and applications where it is technically and economically feasible, while continuing to meet customer demands. Where credits are phased down, EPA should consider options for the credit system that incentive domestic manufacturing on advanced technology vehicles and guard against manufacturers importing their way to compliance, particularly where vehicles, batteries, and other key components are built without robust environmental regulations. [EPA-HQ-OAR-2022-0985-1596-A1, p. 5]

Organization: Manufacturers of Emission Controls Association (MECA)

Analyses by ICCT and researchers at Carnegie Mellon have shown that extended use of super credits in the light-duty sector has resulted in the unintended consequence of increased emissions from the non-ZEV fleet as it is allowed to emit more under a fleet average regulatory structure that includes averaging, banking and trading provisions [17, 18]. [EPA-HQ-OAR-2022-0985-1521-A1, p. 9]

> [17]. A. Jenn, I. L. Azevedo and J. J. Michalek, “Alternative-fuel-vehicle policy interactions increase U.S. greenhouse gas emissions,” Transportation Research Part A: Policy and Practice, vol. 124, pp. 396-407, 2019.
>
> [18]. R. Minjares and J. Hannon, “Adapting US heavy-duty vehicle emission standards to support a zero-emission commercial truck and bus fleet,” 2022.

Given the considerable incentives created by the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL) and other federal and state programs supporting the production, sale and operation of heavy-duty zero tailpipe emitting vehicles, MECA agrees that Advanced Technology Multipliers for PHEVs, BEVs and FCEVs are no longer needed beyond MY 2027. Similar to the light-duty sector, an over-incentivized credit scheme for heavy-duty ZEVs is likely to result in market distortions that will reduce the broader deployment of electric and other advanced efficient powertrains and thus decrease the benefits anticipated by the standards. [EPA-HQ-OAR-2022-0985-1521-A1, p. 10]

MECA also supports the need for the inclusion of lifecycle analysis under the Phase 3 program to determine appropriate levels of crediting for zero emissions vehicles. To date, the assigning of zero CO2 emissions results in an arbitrarily large number of credits which impedes the adoption of all advanced CO2 reduction technologies. For this reason, MECA supports the accelerated retirement of advanced technology multiplier credits generated under the Phase 2 program by reducing their five-year lifetime. [EPA-HQ-OAR-2022-0985-1521-A1, p. 10]

Organization: MEMA

Advanced Technology Multipliers

Considering advanced technology multipliers, the agency has proposed to retain the technology multiplier for FCEV “because it has been slower to develop in the HD market.” [EPA-HQ-OAR-2022-0985-1570-A1, p. 14]

MEMA urges that the same consideration be made for H2ICE technology and that it be included along with FCEV in the credit multiplier calculation. [EPA-HQ-OAR-2022-0985-1570-A1, p. 15]

Organization: National Association of Clean Air Agencies (NACAA)

Eliminate Advanced Technology Multipliers After MY 2026

In its Phase 2 heavy-duty GHG rule, adopted in 2016, EPA provided Advanced Technology Multipliers through MY 2027 for battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEVs) to incentivize development and sales of these technologies. Since that time, the feasibility, availability and cost-competitiveness of the technologies EPA intended to incubate have far outpaced EPA’s expectations. Accordingly, the agency proposes to eliminate the Advanced Technology Multipliers for BEVs and PHEVs after MY 2026 and to retain the 5.5 multiplier for FCEVs through MY 2027. NACAA supports EPA’s proposal to end the BEV and PHEV Advanced Technology Multipliers with MY 2026 and, further, recommends that the agency also end the multiplier for FCEVs with MY 2026. Given the multiple commercialized heavy-duty fuel cell vehicles an Advanced Technology Multiplier beyond MY 2026 is not necessary and retaining one through MY 2027 could result in the significant generation of credits and an erosion of the CO2 emission standards. [EPA-HQ-OAR-2022-0985-1499-A1, p. 9]

Organization: National Parks Conservation Association (NPCA)

Lastly, NPCA wishes to express support for EPA's proposal to phase out advanced technology multipliers for various hybrid or ZEV models, and request that EPA expedite such a phase out to occur in 2025 instead of the proposed 2026 date. [EPA-HQ-OAR-2022-0985-1613-A1, p. 4]

Organization: Navistar, Inc.

Navistar is opposed to EPA's proposal to eliminate the credit multipliers under the Phase 2 program for MY 2027. In the proposed rule, EPA seeks to end credit multipliers for vehicles incorporating battery-electric technologies (BEVs) one year earlier than provided in the existing heavy-duty vehicle GHG Phase 2 program (i.e., no credit multipliers for BEVs in MY 2027 and later). Changes to the Phase 2 credit multiplier are unwarranted. As discussed above, multipliers are still very much necessary for the development and integration of new and higher-cost technologies into existing and new markets. Navistar has relied on the certainty of the GHG standards in engineering and manufacturing ZEV trucks. A transition of the trucking industry to ZEVs requires regulatory consistency and certainty, and well-designed incentives. EPA's proposal to change the Phase 2 GHG standards at this time undermine these important considerations. [EPA-HQ-OAR-2022-0985-1527-A1, p. 6]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Advanced Technology Multipliers

We agree with EPA's proposal to remove the BEV advanced technology multiplier in MY 2026. The multiplier, if left in place, could result in significant production of credits and a dilution of the stringency of the GHG standards. We encourage EPA to remove the FCEV multiplier in 2026 as well. [EPA-HQ-OAR-2022-0985-1562-A1, p. 14]

Organization: Odyne Systems LLC

Extend or do not change the date for the PHEV credit multiplier rather than reduce it.

The EPA is considering reducing the credit multiplier timeframe for PHEVs and BEVs to 2027 rather than 2028. Odyne recommends extending the time frame or keeping it the same because, while there is much discussion about PHEVs and BEVs, very few are built. Credit multipliers will provide needed incentives for manufacturers to quickly sell PHEVs and BEVs and benefit from their investments. [EPA-HQ-OAR-2022-0985-1623-A1, p. 4]

Organization: PACCAR, Inc.

A. EPA Should Reconsider Its Proposed Credit Multiplier Changes

EPA's proposed changes to the battery electric and hybrid credit multipliers undermine the regulatory certainty on which OEMs have reasonably relied. EPA's HD GHG Phase 2 rulemaking included MY2027 advanced technology credit multipliers and successfully led OEMs to develop zero emissions powertrains earlier than they likely would have without the credit multipliers. Since then, OEMs have designed their product portfolios and compliance plans accordingly, including by increasing ZEVs because of the credit multipliers. The NPRM proposes to eliminate the battery electric and hybrid credit multipliers for MY2027 with less than four years lead-time for manufacturers to adjust their compliance plans. PACCAR therefore respectfully requests that EPA not eliminate the battery electric and hybrid credit multipliers for MY2027. [EPA-HQ-OAR-2022-0985-1607-A1, p. 9]

PACCAR also urges EPA to revise § 1037.150(p) to extend the fuel cell multiplier through at least MY2030. Doing so would incentivize further fuel cell technology investment, which remains immature. [EPA-HQ-OAR-2022-0985-1607-A1, p. 9]

EPA should also modify the advanced technology credit to add a hydrogen internal compression engine (ICE) credit multiplier through MY2030, which would incentivize hydrogen ICE technology investment. Increased use of hydrogen ICE powertrains would spur hydrogen refueling infrastructure development, which would benefit hydrogen ICE and fuel cell trucks because both vehicles rely on the same refueling infrastructure. The current lack of hydrogen refueling infrastructure is a significant impediment to both hydrogen ICE and fuel cell electric vehicle adoption and the credit multipliers would encourage growth. [EPA-HQ-OAR-2022-0985-1607-A1, p. 9]

Organization: Southern Environmental Law Center (SELC)

We therefore support EPA's proposal for stronger GHG emission standards for model year 2027 heavy-duty vehicles and the discontinuance of credit multipliers for BEVs and PHEVs after model year 2026. Any compliance flexibilities included in the standards must not unnecessarily dilute the stringency of the standards. BEVs and PHEVs are no longer "new advanced technologies" that need to be incentivized—especially considering the level of innovation and deployment of ZEV technology that has occurred since the Phase 2 rulemaking. As EPA notes, "the multiplier credits could allow for backsliding of emissions reductions expected from [internal combustion engine] vehicles for some manufacturers in the near term . . . as sales of advanced technology vehicles which can generate the incentive credit continue to increase."48 Getting ZEVs on the road should be a priority, but efforts to incentivize their deployment cannot erode improvements in internal combustion engine vehicles. [EPA-HQ-OAR-2022-0985-1554-A1, p. 6]

48 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 26012 (Apr. 27, 2023).

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

EPA should add a small bonus credit (multiplier) for vehicles that have on-board AC bidirectional chargers or are integrated with multiple DC off-board chargers, as this will bring overall cost savings, help the grid and send a strong signal to accelerate this needed technology. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

EPA should consider providing small bonus credits (multipliers) in 2027 to 2030 for several advanced technologies including PHEVs with a long all-electric range and not just for fuel cell EVs as these technologies need extra lead time to develop given offerings for the heavy-duty market. As we describe below, having multiple technologies helps in reaching many hard-to-reach customer segments. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

2) EPA should consider adding a small bonus for vehicles that have on-board AC bidirectional chargers or are integrated with multiple DC off-board chargers. Alternatively, at minimum, EPA should conduct an analysis on how EPA can advance bi-directional charging in the future. Justification: The promise of bi-directional charging (AC or DC) to address air pollution, GHG and electric grid issues is very significant with BEVs and PHEVS in light-, medium- and heavy-duty vehicles, or off-road equipment. For example, a recent May 2022 presentation by the World Resources Institute using Bloomberg NEF and Energy Information Administration data found the power capacity in 2030 for EVs to be 10 to 20 times more than the 2030 power capacity of stationary storage.6 While these numbers are for light-duty EVs, electrified trucks can also contribute and some fleets (e.g., school buses, municipal trucks, trucks in one-shift operations) are expected to be early adopters. EPA can and should play a role in helping to unlock this potential.

a. For example, the internal combustion engine in a PHEV has a much lower emission signature than a stand-alone, backup generator.

b. Bidirectional charging, like battery stationary energy storage, can reduce GHG and traditional pollutants from fossil fueled power plants by shifting electricity use to renewable energy in the cleanest hours of the day and reducing the need for high-emitting plants (such as traditional peaker power plants).

c. Bidirectional charging can also provide many types of grid services including ancillary services, providing resource adequacy, and helping with the evening transition from renewables to other generation resources. Because the batteries are already paid for by the truck owners, utilities can gain a low-cost resource compared to battery stationary storage.

d. The potential value is significant and can contribute to lower operating costs for BEVs and PHEVs.7 [EPA-HQ-OAR-2022-0985-1647-A2, p. 5]

6 See slide 5 at https://www.slideshare.net/emmaline742/building-resiliency-with-v2g-in-residential-homes-bycamron-gorguinpour

7 California Energy Commission, March 2019, Distribution System Constrained Vehicle-to-Grid Services for Improved Grid Stability and Reliability, Figure 42

While we understand the desire by EPA to simplify the regulation and reduce the use of bonus multiplier credits, we believe a small bonus credit in this regulation is justified and needed to unlock this technology because of the large emission reduction benefits and other benefits enabled by bidirectional charging. [EPA-HQ-OAR-2022-0985-1647-A2, p. 6]

8) However, the above incentive is not enough. Regarding EPA's question of whether to provide a longer period of credit multipliers (bonus credits) for fuel cell EVs, our coalition recommends a modest multiplier be provided in the final rule not just for FCEVs but also for PHEVs with a long all-electric range and for MY 2027 to 2030. These technologies need extra lead time to develop given offerings for the heavy-duty market, and it is in EPA's interest to have multiple technologies that provide customer choice and help EPA in reaching many hard-to- reach customer segments. [EPA-HQ-OAR-2022-0985-1647-A2, p. 7]

Organization: Tesla, Inc. (Tesla)

Tesla Supports Elimination and Rapid Phasedown of All GHG Credit Multipliers

Even though it is a scaling heavy-duty BEV manufacturer, Tesla supports eliminating advanced technology multipliers to ensure overall program integrity and supports firmly establishing a one-for-one credit ratio that is a more rational and transparent compliance mechanism and creates actual BEV vehicle deployment, thereby enabling deeper emission reduction targets. [EPA-HQ-OAR-2022-0985-1505-A1, p. 24]

Tesla also agrees with the agency that providing credit multipliers can unnecessarily dampen actual deployment of BEVs and lead to backsliding of emission reductions.178 This is true regardless of the technology to which a multiplier may be attached and is not applicable just to BEVs. Accordingly, Tesla supports an elimination on credit multipliers for all heavy-duty ZEVs and encourages EPA to tailor Approach 3 to reflect a rapid phasedown of multiplier credits, including eliminating the credit multipliers after MY 2026.[EPA-HQ-OAR-2022-0985-1505-A1, p. 24]

178 88 Fed. Reg. at 26012.

Furthermore, each of the other proposed options for reforming the existing credit multipliers presented by EPA all have substantial weaknesses. Approach 1 would provide multipliers only to those BEV sales in non-ACT states.179 This creates a disincentive for states to adopt ACT and will reduce adoption of a regulatory framework that would yield greater GHG reductions from the heavy-duty sector. [EPA-HQ-OAR-2022-0985-1505-A1, p. 24]

179 88 Fed. Reg. at26011-12.

Similarly, Approach 2 allowing for the use of multipliers and then capping the credit use, is equally flawed. Under this architecture, manufacturers will likely deploy ZEVs to maximize generation of multiplier credits up to the cap limit but move no further.180 In the E.U, a similar 'Super Credit' multiplier exists for light-duty vehicles which emit <50g CO_2/km, which can be earned from 2020-2022 inclusive. In the first year of the Super Credit eligibility, eight out of ten manufacturers reached the cap.181 This was achieved by aggressive sales practices (pricing and pre-registrations) to capture the maximum value of the credits up to the cap, and then halting further sales once the cap was reached. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 24-25]

180 Id.

181 ICCT, CO2 emissions from new passenger cars in Europe: Car manufacturers' performance in 2020 (August 2021) at 4, Table 1. available at https://theicct.org/sites/default/files/publications/eu-co2-pvs-performance-2020-aug21_0.pdf

Finally, as a general matter of policy development, in setting an emissions performance standard the regulation should be agnostic with respect to what technology is used to meet, and ideally outperform, the standard. Allowing the continuation of credit multipliers for FCEVs in the proposed regulation's crediting provisions will promote the inefficient investment into a technology with little near-term ability to address the critical GHG emissions problem. As one recent study concluded, hydrogen fuel cell trucks are unlikely to be commercially viable and the urgency of the climate crises should compel a focus on BEV deployment.182 EPA should ensure this focus and eliminate the credit multipliers for all ZEVs. [EPA-HQ-OAR-2022-0985-1505-A1, p. 25]

182 Plotz, Nature Electronics, Hydrogen technology is unlikely to play a major role in sustainable road transport (Jan. 31, 2022) available at https://www.nature.com/articles/s41928-021-00706-6

Organization: Truck and Engine Manufacturers Association (EMA)

FCEV Credit Multiplier – The Phase 2 regulation provides credit multipliers for vehicles incorporating BEV and FCEV technologies. For Phase 3, EPA proposes to eliminate the credit multiplier for BEVs because the technology is now in production for most OEMs, so the extra incentive is no longer critical to bring the technology to market more quickly. EPA is proposing to maintain the credit multiplier for FCEVs. EMA supports EPA's proposal to continue to provide incentives for fuel-cell technology vehicles to encourage the quicker development and deployment of this still-nascent zero-emission technology. [EPA-HQ-OAR-2022-0985-2668-A1, p. 49]

Organization: Truck Renting and Leasing Association (TRALA)

Carbon Offset Credit Periods Should be Extended

TRALA recommends OEM multiplier credits for BEV sales remain in effect through 2030 for Classes 2-7 and for Class 8 vehicles through 2035. If ZEV technologies accelerate at the levels envisioned by the agency, multiplier credits will not be utilized or needed by OEMs. But if lack of capable infrastructure delays mainstream adoption of ZEV technologies, credit multipliers will offer a needed path for OEMs to maintain compliance while also incentivizing further private investment in infrastructure. With respect to Class 8 vehicles, FCEVs will likely continue to lag years behind their BEV counterparts, so applying the FCEV multiplier to hydrogen ICE vehicles (H2-ICE) will enable ready H2-ICE technology to develop infrastructure necessary to deploy FCEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 22]

Organization: Volvo Group

Expiring BEV and Plug-in Hybrid Electric Vehicle (PHEV) Advanced Technology credit multiplier in 2026

The Volvo Group is still concerned that the conditions and enablers within the market will not be available at levels allowing any finalized standards to be achieved across all averaging sets. Thus, we suggest the agency set specific MY2026 total industry EV sales penetration thresholds within an averaging set as a criterion for reducing or removing the multiplier at the end of the 2026 Model Year. For example, the EPA could set a threshold ratio comparing actual model year 2026 EV sales percentages within an averaging set to the MY 2027 adoption rate used to set stringency. If the decided ratio were met, the multiplier would expire as proposed. [EPA-HQ-OAR-2022-0985-1606-A1, p. 22]

The agency could also set a range for this ratio. If the minimum level were met, the multiplier would be reduced, ramping down until meeting the maximum threshold, where it would expire as proposed. A method such as this would help to minimize potential risk in the early years of the transition, while also minimizing, or potentially eliminating concern over credit windfalls, as any credit multiplier would be dependent on the market readiness for EVs within a specific averaging set, and not applied to all equally. [EPA-HQ-OAR-2022-0985-1606-A1, p. 22]

Organization: Zero Emission Transportation Association (ZETA)

ZETA supports the proposed accelerated phaseout of HDEV credit multipliers by MY 2027. HDEV technology has progressed rapidly since the Phase 2 GHG emissions standards finalized in 2016. HDEVs will soon penetrate the market to a much greater degree than was previously anticipated. EPA has recognized that multipliers present a tradeoff between driving emissions reductions and incentivizing new technology. Based on the technology available today, multipliers are no longer required to incentivize HDEV technology investments, and a more stringent GHG standard would most effectively drive HDEV adoption and, in turn, emissions reductions. While we believe it is appropriate to phase out credit multipliers for HDEVs, we recognize that other zero-emission technologies, such as hydrogen fuel cell vehicles, are in a different stage of development and deployment. While we are not recommending phasing out credit multipliers for these technologies, we request EPA articulate clear guidelines for when it would be appropriate to do so. [EPA-HQ-OAR-2022-0985-2429-A1, p. 16]

EPA Summary and Response:

Summary:

Commenters' support for EPA's proposed approach for phasing out advanced technology credit multipliers ("multipliers") varied. As noted in this summary, some commenters supported EPA's proposal to phase out PHEV and BEV multipliers after MY 2026 and retain the FCEV multiplier through MY 2027. Others commented that EPA should retain the multipliers through MY 2027 as finalized in the Phase 2 program. Some commenters requested EPA eliminate some or all multipliers before 2026, while others recommended EPA extend the availability of some or all multipliers beyond MY 2027. A few commenters offered other suggestions for credit multipliers.

Commenters supporting EPA's proposed phase out of multipliers

AESI commented in support for eliminating PHEV and BEV multipliers and continuing fuel cell multipliers. Additionally, AESI recommended EPA consider incentives for H2 combustion to accelerate H2 infrastructure capacity which they suggest would further benefit fuel cell trucks.

ACEEE commented that multipliers had the potential to "more than nullify EPA's proposed increase in stringency", which could reduce industry's motivation to produce BEVs. ACEEE expressed concern that credits might potentially lead to backsliding on internal combustion engine vehicles, with emphasis that that advanced technology multipliers could lead to "stagnation of average truck emission levels in the early years of Phase 3".

Eaton supported sunsetting the BEV and PHEV multipliers as proposed, noting that the multipliers are no longer the driving force in light of market demands and financial incentives of the IRA.

MECA supported EPA's proposed phase-out of the BEV and PHEV multipliers, noting available incentives, including the BIL and IRA, and state programs to support production in lieu of multipliers and the risk of market distortions, reduced deployment of advanced technology, and decreased benefits of the standards if multipliers continue to be available. MECA also recommended EPA reduce the five-year lifetime of advanced technology multiplier credits and suggests the agency should include a lifecycle analysis "to determine appropriate levels of crediting for zero emissions vehicles".

ICCT expressed support for "the proposal to eliminate adv tech multipliers".

SELC supported the proposal to end BEV and PHEV credit multipliers in MY 2026, noting that it "should be a priority" to incentivize those vehicles, but that multipliers can "erode improvements" in ICE-based vehicles, suggesting a concern with potential dilution of the Phase 2 standards.

ZETA supported the proposed phase-out of multipliers for HDEVs (i.e., heavy-duty electric vehicles). ZETA indicated that they are "not recommending phasing out credit multipliers" for FCEV, but requested that EPA present clear guidelines for phasing them out.

<u>Commenters requesting EPA phase out multipliers earlier than proposed</u>

A number of commenters urged earlier phase out of the multipliers because the BIL and IRA are now providing all the incentive for adoption needed. Certain of these commenters also noted that the ACT program likewise provides sufficient incentive. (CATF, Eaton, MECA.)

NACAA and NESCAUM and OTC supported the proposal to phase out the BEV and PHEV multipliers and recommended EPA also phase out the FCEV multiplier in MY 2026 as well.

EDF recommended removing credit multipliers for all hydrogen-fueled vehicles (including FCEVs) or, at minimum, phasing out the FCEV multipliers with BEVs by MY 2026. EDF referred to the upstream emissions associated with hydrogen production as justification for removing the FCEV multipliers, which they suggest is "worse than diesel vehicles" in some cases.

Specific to hydrogen, EDF pointed out that EPA's original reasons in phases 1 and 2 for not accounting for upstream emissions – that upstream emissions are regulated (under stationary source standards, or, for biofuels, under the RFS program), and that not-yet commercialized technologies need regulatory encouragement – either do not apply for hydrogen since hydrogen emissions are not regulated or have been overtaken by events such as the introduction of HD BEVs. EDF thus sees no need for the credit multiplier for hydrogen-fueled vehicles of any type. EDF further recommends that EPA apply a correction factor or utility factor to any vehicle fueled with hydrogen, so a manufacturer's compliance accounts for the unregulated emissions from hydrogen production, pointing to a similar approach in the current rules for PHEVs. EDF suggests those factors could be adjusted over time if a manufacturer can demonstrate lower emissions through testing. Lastly, EDF encouraged EPA to adopt leakage standards for hydrogen-fueled vehicles and to work with other agencies to address pollution from hydrogen production.

CARB recommended EPA adopt the third approach that was proposed in the HD2027 NPRM for advanced technology credit multiplier. Specifically, they would like EPA to incrementally reduce the magnitude of all of the advanced technology credit multipliers over the period of MYs 2024 through 2026. CARB also requested that EPA remove multipliers for any HD ZEVs certified to CARB's ACT regulation, including those sold in California or Section 177 states, suggesting that retaining the multiplier would be double-counting of benefits.

Similar to CARB, Tesla supported eliminating multipliers according to Approach 3 from EPA's HD2027 NPRM. Tesla noted that the HD2027 Approach 1 (limit BEV multipliers to non-ACT states) disincentivizes ACT adoption and the HD2027 Approach 2 (cap use of multipliers) would give manufacturers little incentive to produce beyond the cap limit. Finally, Tesla requested that EPA eliminate the FCEV and BEV multipliers in the same model year to ensure the regulation is agnostic to technology.

NPCA supported the proposal to phase our advanced technology multipliers and requested that EPA "expedite" it to occur in 2025.

CATF et al. also recommended EPA accelerate the phase out multipliers for all BEV, PHEV, and FCEV by 2025 or restrict their availability. CATF et al suggested the market and IRA will lead to BEVs being widely available by MY 2026 and keeping the multipliers could risk reducing the benefits of the standards. They maintain that ICCT's analysis and EPA's own analysis show that substantial percentages of HDVs are likely candidates for early BEV adoption. Therefore, allowing these credits with the 4.5 multiplier creates a large bank of credits which may be windfalls if generated in California or section 177 states. Thus, EPA's original justification for the credit multipliers – to encourage nascent, promising technology not yet in commercial use – has been superseded.

CATF et al. suggested phasing out by MY 2025 would prevent manufacturers from getting credit multipliers for vehicles certified to ACT. Some example restrictions CATF et al. suggested include: eliminating them for vehicles that would be used to meet the ACT standards in California or other states that adopted ACT; impose a 2-year limit on using credits generated with multipliers; limiting the multipliers to long-haul sleeper cabs or other vehicles categories where those technologies are still "genuinely advanced"; or reducing the value of the multipliers in 2025. CATF et al. further suggested that EPA should account for credit multipliers in setting the standards noting the proposed change to the definition of U.S.-directed production volume.

Commenters requesting EPA retain Phase 2 multipliers or extend their availability

Odyne Systems requested EPA extend or keep the same timeframe for PHEV or BEV credit multipliers, because very few are built.

EMA expressed support for the proposal to retain the FCEV multiplier through MY 2027.

DTNA requested EPA retain the multipliers as finalized in Phase 2, noting their continued support for Phase 2 program and manufacturers' reliance on those multipliers in implementing their compliance strategies for which the company "invested considerable time in developing".

UAW expressed concern over phasing-out the BEV and PHEV multipliers, noting that multipliers are “an important tool” for compliance that manufacturers can use to introduce advance technologies in vehicle segments and applications “where it is technically and economically feasible, while continuing to meet customer demands”. UAW requested that EPA “guard against” the potential for vehicles and components to be imported from areas “without robust environmental regulations”.

Navistar opposed the proposal to phase out the BEV and PHEV multipliers noting manufacturers’ reliance on these multipliers in devising their multi-year compliance strategy for the Phase 2 rule, and manufacturers’ continued need for regulatory consistency and certainty.

PACCAR requested EPA reconsider phasing out the BEV and PHEV multipliers, indicating that OEMs built credit multipliers into their product portfolios and compliance plans. PACCAR also requested EPA extend the FCEV multiplier through at least MY 2030, suggesting fuel cell technology is still “immature”. PACCAR also requested EPA add a multiplier for H2ICE through MY 2030 as well to “spur hydrogen refueling infrastructure development”.

Strong PHEV requested the current multiplier for FCEV and a new multiplier for PHEVs with “a long all-electric range” be extended to MY 2030.

TRALA requested EPA extend the BEV multiplier through 2030 for Classes 2-7 and through 2035 for Class 8, noting credit multipliers will help if infrastructure lags. TRALA also requested the FCEV credit multiplier apply for H2ICE.

Other comments relating to multipliers

ATA cautioned that phasing out the advanced technology multiplier in MY 2027 will make it more challenging for manufacturers to meet the standards and “likely limit fleet technology choices” because the rule “requires a certain percentage of ZEVs to be sold”. ATA pointed to past fleet experiences under the Phase 2 program where the association stated that “fleets were obligated” to purchase technology packages with their new vehicles so manufacturers could comply with EPA’s regulation.

China/WTO recommended treating BEVs, PHEVs, and FCEVs the same, ending the “credit rating” (i.e., multipliers) at the same time.

Clean Fuels Development Coalition et al. commented that EPA must end current multiplier program. Furthermore, they argue EPA had no authority to create multipliers in the first place and that EPA does not have the authority to set standards “beyond where it thinks they should be” and then “relax those standards of a manufacturer gives money to the cause of electrification”. They suggest multipliers are essentially a ZEV subsidy program and manufacturers would charge more for gas/diesel vehicles because they have to buy emission credits from EPA’s “friends”.

Fermata Energy and Strong PHEV recommended EPA add a multiplier option for vehicles with onboard AC bidirectional chargers or multiple DC off-board chargers. Strong PHEV recommended EPA conduct an analysis on bidirectional charging for the future.

Volvo expressed concern about meeting the proposed standards across all averaging sets and suggested EPA set specific EV sales penetration thresholds for MY 2026 to use as criteria for evaluating the need to discontinue multipliers on an individual averaging set-basis.

Response:

As described in section III of the Preamble to this rule, we are not taking final action on the proposal to revise the Phase 2 rule to provide for an earlier phase out (one year early) of multipliers for PHEVs and BEVs. As such, manufacturers may continue to generate credits that include credit multipliers for PHEV, BEV, and FCEV technologies through MY 2027 as was adopted in Phase 2. Retaining the existing Phase 2 ABT provisions on credit multipliers should address potential concerns or uncertainties raised by manufacturers regarding their compliance plans relying on the credits generated under the existing Phase 2 credit multiplier provisions.

Also described in section III of the Preamble to this rule, we disagree with those commenters that assert manufacturers will necessarily comply with the Phase 3 standards by virtue of complying with ACT. These comments assume a given volume of Phase 2 credits will be generated and carried over into Phase 3, and thus presuppose manufacturers' compliance strategies with both the federal performance-based Phase 2 and 3 standards and the California ACT program. However, after balancing the concerns raised in comments and related uncertainties we identified, we are finalizing a provision that will limit when manufacturers may use credits generated from credit multipliers in MY 2027 through 2029 and eliminate the availability of those multiplier credits for use in MY 2030 and later.

In response to PACCAR's comment on lead time, we note that we did consider timing for production plans in developing both the standards and the credit provisions of the Phase 3 final rule; however, the four-year lead time referred to in PACCAR's comment does not apply (see section II.F.2 of the final rule preamble).

We acknowledge comments requesting that EPA also phase out the FCEV credit multiplier before MY 2027. CARB indicated the FCEV credits would be double-counted due to the ACT sales mandates. As discussed in section 10.2.1 of this response to comment document and section III.A.1 of the final rule preamble, our revised definition of U.S.-directed production volume, effective in MY 2024, will ensure credits from all vehicles are not double-counted as a result of ACT or other state programs.

In response to EDF's request that EPA provide restrictions on which type of H2-powered vehicles qualify for incentives, we refer to sections 9.3 of this RTC document for more discussion of our consideration of H2 technology. Furthermore, EDF's suggestion to adopt a utility factor for hydrogen-fueled vehicles, analogous to that applied for PHEVs, is less impactful for a standard based on tailpipe emissions. CO_2 tailpipe emissions of GHGs are zero and near-zero for FCEVs and H2ICE vehicles regardless of the hydrogen source, whereas the utility factor for PHEVs reflects the drastically different pollutant emissions when the vehicle operates on battery or on internal combustion engine. EDF's suggestion would only make sense if the vehicle emission standards were based on some type of lifecycle approach. We explain in section 17.2 of this document the many reasons that we decline to implement CAA Title II in that manner. EDF also requested a hydrogen leakage standard for vehicles powered by hydrogen. We did not propose any such requirement and do not have sufficient data on hydrogen leakage to do so.

In response to Tesla's comment that FCEV are "unlikely to be commercially viable," we refer to our discussions of fuel cell technology in Section II.D of the final rule preamble and Chapter 2.5 of the final RIA for this rule. In response to EDF and MECA suggesting that EPA base standards on some type of lifecycle analysis rather than on tailpipe, we refer to section 17.2 of this response to comment document where we discuss our reasons for not doing so.

To address the concern of reduced Phase 3 stringency raised in comments (ACEEE, CATF et al., EDF, MECA, SELC), we are finalizing provisions to limit the potential use of this flexibility, as mentioned earlier in this response, which will allow use of multiplier credits to address Phase 2 compliance and use in specified circumstances to smooth the transition in the Phase 3 program's initial model years only. We are also phasing out the multiplier portion of any advanced technology credits that remain after MY 2029. In Section III of the Preamble to this rule, we describe these provisions we are finalizing to minimize the impact on the projected stringency of Phase 3.

We appreciate ATA's comment sharing the experience of their member fleets that manufacturers have previously restricted the range of options available to fleets as part of their compliance plans. However, we note that none of EPA's GHG programs *require* manufacturers to sell a certain percentage of any technology, as claimed in ATA's comment. As reiterated here and throughout the final rule preamble, EPA's Phase 3 standards are supported by multiple potential compliance pathways and manufacturers have a range of other options for meeting the standards.

Volvo's comment reflects a similar misapprehension. Volvo suggests tying multipliers to ZEV adoption rates, such that "EPA could set a threshold ratio comparing actual model year 2026 EV sales percentages within an averaging set to the MY 2027 adoption rate used to set stringency." But the standard is performance-based, and there are many ways to achieve the standards other than the potential compliance pathway which EPA costed. So, deviation from that EPA's potential pathway in practice is not an alarm bell, but rather an indication that an OEM has chosen to comply in a different matter. That choice should not trigger some type of automatic consequence, including an automatic adjustment to multiplier level, or retention of multipliers.

Clean Fuels Development Coalition et al. maintains that advanced technology multipliers are "a regulatory cross subsidy program for electric vehicles" and that "EPA has no authority to create such a subsidy program." In the same vein, CFDC et al. states that EPA "gets to set standards; it has no power to set standards beyond where it thinks they should be and then agree to relax those standards if a manufacturer gives money to the cause of electrification." First, the advanced technology multipliers at issue are part of the existing regulations that were established in Phase 2 and we did not generally reopen those provisions in this rulemaking; rather, we specifically only proposed to revise the sunset date one year earlier. Second, the commenter significantly mischaracterizes EPA's previous action. As EPA stated in first adopting the advanced technology multipliers and as repeated in the Phase 3 proposal in language quoted by the commenter, the advanced technology multipliers are not reflected in the stringency of the standard. They are a compliance flexibility. See 88 FR at 25972/2 ("instead of including ZEV technologies in the technology packages for setting the Phase 2 standards, we provided advanced technology credit multipliers to help incentivize the development of ZEV technologies."). Thus, the commenter's rhetoric notwithstanding, EPA did not set standards "beyond what it thinks they should be" and then selectively relax the standards. The advanced multiplier provision is a compliance flexibility, not part of the basis that supports the feasibility of the Phase 2 standards. As to commenter's argument that EPA did not have the authority to create such a flexibility in the Phase 2 final rule, it was within EPA's authority as well as reasonable for EPA to develop a mechanism which modestly encourages utilization of these advanced but nascent technologies that had the potential to lead to large reductions in GHG emissions in determining compliance with emission standards.

The commenter's assertion that "[t]his program results in higher prices for gasoline and diesel vehicles because manufacturers must generate or purchase the credits that EPA has created to meet standards" is difficult to understand. The premise appears to be that the Phase 2 standards can only be met be OEMs producing vehicles which get the benefit of the credit multipliers, or by buying credits from manufacturers who do. This is simply not the case. First, the Phase 2 standards were premised on a mix of improvements to ICE engine efficiency and vehicle improvements, not on adoption of zero emission or plug-in hybrid technologies. Second, in practice, although there has been some penetration of these technologies into the HD fleet, that penetration is minimal, meaning that of the hundreds of thousands of successful certifications under Phase 2, the overwhelming majority reflect the types of improvements on which EPA predicated the Phase 2 standards. A choice to comply by buying credits is just that, a choice, and nothing forced upon a manufacturer by the rule.

In this Phase 3 final rule, we are acting to limit the impact of the existing credit multiplier incentives while balancing concerns of timing regarding near-term OEM production plans for compliance. See Section III.A.2 of the final rule preamble for a description of our considerations. Furthermore, we note that credits from both advanced technologies and other vehicles are generated relative to established standards and not relative to credits generated from other vehicles. Nor does our cost analysis, which shows that the standards' costs are reasonable, consider credit purchase. Consequently, overcompliance using one set of vehicle technologies does not negate another vehicle's ability to meet the standard. Finally, as with the Phase 2 standards, in this Phase 3 final rule, EPA did not rely upon potential credits generated through the advanced technology credit multiplier flexibility when developing the stringency of the Phase 3 standards; rather, the Phase 3 standards are supported by potential compliance pathway(s) as described in Section II of the final rule preamble and can be met using a range of technologies without utilizing such credits resulting from the multipliers.

We are not finalizing new multipliers to apply for technologies other than PHEV, BEV, and FCEV. As noted in Section III.A.2 of the final rule preamble, the proposal regarding Phase 2's credit multipliers was limited to evaluating approaches to phase out their availability for use. We did not propose or request comment on extending credit multipliers to apply for other technologies and comments requesting new multipliers are out of scope for this final rule.

AESI recommended EPA provide an incentive for H2 combustion trucks. Others (MEMA, PACCAR, TRALA) suggested that a multiplier for H2 ICE technologies would further incentivize hydrogen-based vehicle technologies and encourage hydrogen infrastructure investment and development. We are not finalizing an additional multiplier for credits generated from H2 ICE technology, but we are finalizing our proposed approach to deem CO_2 emissions to be zero from H2 ICE vehicles powered by neat hydrogen, which reduces some of the testing required to certify these vehicles.[806]

[806] We also note that, in Section III.C.2 of the preamble to this final rule, we describe additional relief from CO_2 testing that we are finalizing for engines, by exempting H2 ICE fueled with neat hydrogen from CO_2 testing by deeming their CO_2 emissions as 3 grams CO_2/ton-mile.

Fermata Energy and Strong PHEV suggested "vehicle to grid" (V2G) bidirectional chargers can address air pollution, GHG emissions, and electric grid challenges, but provided no data to show a reduction in *tailpipe* CO_2 from the technology. As described in section 17.1 of this RTC document, we are not taking a lifecycle approach to setting standards in this rule and without a clear reduction in tailpipe emissions, we would have no basis for considering whether a compliance flexibility predicated on use of this technology is warranted. At this time, while we retain our approach of only considering tailpipe emissions from heavy-duty vehicles, we do not expect to initiate any analyses relating to bidirectional charging, as requested by Strong PHEV.

10.3.2 Averaging Set

Comments by Organizations

Organization: Allergy & Asthma Network et al.

EPA Should Ensure Real-World Benefits

As in many of our organizations' previous comments to EPA on other proposals to reduce emissions from the heavy-duty vehicles sector, we note that the potential for banking, averaging and trading can allow for gaming of the system that reduces real-world emissions cleanup. We urge EPA to ensure that engine families are not allowed to generate excess emissions above the final limits by balancing benefits of zero-emission or hybrid vehicles against them. [EPA-HQ-OAR-2022-0985-1532-A1, p. 4]

Organization: American Council for an Energy-Efficient Economy (ACEEE)

EPA also raises the possibility of allowing advanced technology credits to be used across averaging sets (FR 26013), even though the ZEV adoption targets in the proposal are tailored to the opportunities and constraints for electrification for each specific vehicle type. As EPA and NHTSA observed in the Preamble to the final Phase 2 rule, "combined with the very large multipliers being adopted, there could be too large a risk of market distortions if we allowed the use of these credits across averaging sets" (Phase 2 FR 73498). That risk remains. [EPA-HQ-OAR-2022-0985-1560-A1, p. 17]

Advanced technology credits should remain applicable within averaging sets only. [EPA-HQ-OAR-2022-0985-1560-A1, p. 17]

Organization: California Air Resources Board (CARB)

2. Other Potential HD CO2 Emission Credit Flexibilities

Affected page: 26013

The NPRM requests comments on allowing ATCs to be transferred across averaging sets and on setting restrictions on such credit usage. CARB regulations do not support the use of credit transfer across averaging sets. CARB staff specifically required class 7 and 8 tractor deficits under ACT to be settled using class 7 and 8 tractor ZEV credits to assure sufficient production of HD ZEV semi tractors to reduce emissions and meet pressing needs around ports, railyards, freight facilities, and other directly community impacting truck activities. U.S. EPA should consider whether the credit structure finalized would allow manufacturers to effectively ignore entire categories of vehicles. As discussed further in the EJ-related comments in Part I. Section H. below, CARB staff encourages U.S. EPA to adopt sector specific ZEV sales requirements for the heaviest tractor class to ensure progress in environmental justice communities. [EPA-HQ-OAR-2022-0985-1591-A1, p.54]

5. Weight Class Modifiers (WCM)

Affected page: 26013

In response to U.S. EPA's request for comment, CARB staff does not believe the inclusion of WCM is necessary for the Phase 3 standards. The WCM values were designed based on the structure of the ACT regulation which bases credit balances on vehicles and was designed to allow manufacturers significant flexibility given the diversity of vehicle operations from class 2b to 8. The WCMs are designed to give manufacturers flexibility to focus sales on specific segments while maintaining emission benefits. Given that U.S. EPA's NPRM uses an emissions basis for calculating credits rather than vehicles, and is structured more narrowly, the inclusion of WCMs in U.S. EPA's NPRM would not provide any additional benefit. [EPA-HQ-OAR-2022-0985-1591-A1, p.58]

Organization: Clean Air Task Force et al.

EPA should also not adopt any of the proposed additional flexibilities in the use of advanced technology credits. Id. at 26013 (inviting comments on use of credits across averaging sets). Those flexibilities promise to unnecessarily exacerbate the above-described distortions. [EPA-HQ-OAR-2022-0985-1640-A1, p. 78]

Organization: Daimler Truck North America LLC (DTNA)

Manufacturers should be allowed to transfer credits generated by ZEVs among all available vehicle categories.

The flexibility to transfer ZEV credits among available vehicles categories would enable manufacturers to determine the classes and vehicle categories that they believe are best suited to ZEV adoption. Under this approach, manufacturers could focus their ZEV product and market development efforts on certain vehicle categories, using credits to offset CO2 emissions from vehicle categories that are less suitable for ZEV adoption. EPA could effectuate such flexibility by amending its regulations to provide that the averaging set limitations in 40 CFR 1037.740 do not apply to ABT credits generated by ZEVs. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 74-75]

This compliance flexibility should be allowed without a credit discount and should apply to all credits generated by ZEVs (including BEV, H2-FCEV, and H2-ICE) throughout the life of the GHG Phase 3 program. This flexibility should also apply to credits which are traded between manufacturers to enable a vibrant credit market and to incentivize manufacturers large and small to develop ZEVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 75]

EPA Request for Comment, Request #66: We request comment on the potential need for additional flexibilities to assist manufacturers in the implementation of Phase 3. Specifically, we request comment on providing the flexibility for manufacturers to use advanced technology credits across averaging sets, subject to a cap.

- DTNA Response: EPA should allow manufacturers to transfer credits generated by ZEVs among all available vehicle classes, as discussed in Section III. B. 1 of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 171]

EPA Request for Comment, Request #67: During this proposed Phase 3 standards transition, we are considering whether additional flexibilities in the Phase 3 program emissions credit ABT program design may be warranted, similar to the Phase 1 provision which allowed credits generated from advanced technologies to be transferred across averaging sets. We request comment on including a similar flexibility for the Phase 3 program.

- DTNA Response: See DTNA Response to Request # 66, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 171]

Organization: Ford Motor Company

To achieve the 2032 goals EPA has proposed and Ford supports, the final regulation must include two key elements. First, as EPA outlined and requested comment on, EPA must allow manufacturers to trade credits generated by heavy-duty ZEVs across averaging sets, including from class 2b and class 3 ZEVs to light-heavy-duty and medium-heavy-duty vocational vehicles. If the EPA limits a manufacturer's ability to make such trades, credit trading caps should be in the range of multiple megatons. This will be a necessary flexibility because decarbonizing heavy-duty transportation will be stepwise – manufacturers will introduce ZEVs more quickly in vehicle segments where ZEVs are able to more quickly meet customer needs, with remaining segments switching to zero emission technologies as charging infrastructure and consumer enthusiasm for ZEVs improves. [EPA-HQ-OAR-2022-0985-1565-A1, p. 2-3]

GHG Credit Flexibilities

EPA has requested comment on several possible mechanisms by which manufacturers might generate GHG credits based on ZEVs and transfer those credits across averaging sets. First, EPA suggested a provision similar to that used in the Phase 1 heavy-duty GHG standards, which "would allow vehicle CO_2 credits generated by PHEVs, BEVs, and FCEVs to be used across vehicle averaging sets or possibly across engine averaging sets as specified in 40 CFR part 1036," as an interim measure to begin in 2027MY and to end after 2032MY (88 Fed. Reg. at 26,013). Ford strongly supports this proposed credit trading provision. [EPA-HQ-OAR-2022-0985-1565-A1, p. 6]

Ford and other heavy-duty vehicle manufacturers often produce a relatively smaller number of engines and powertrains in the heavy-duty space (40 CFR Part 1036 and 1037 certification) as compared to the light-duty space (40 CFR Part 86 certification). This will make transitioning to heavy-duty ZEVs more of a stepwise process compared to the light-duty fleet, where multiple vehicles, platforms, engines, and powertrains all contribute to the same averaging set, and changing one platform or powertrain to a ZEV replacement can accomplish relatively smooth year-over-year fleet ZEV percentage increase. In the heavy-duty space, a manufacturer may, for example, devote available engineering resources to developing and launching a light heavy-duty ZEV and not have resources to develop and launch a medium heavy-duty ZEV until two years later. If a manufacturer generates positive CO_2 credits and complies with vocational vehicle fleet electrification targets (overall, cumulative across all averaging sets), then it is reasonable to allow that manufacturer to transfer credits from averaging sets with early ZEV adoption to averaging sets that will add ZEV options later during the program. [EPA-HQ-OAR-2022-0985-1565-A1, p. 6]

Regarding heavy-duty engines certified under 40 CFR Part 1036, Ford also supports the ability for manufacturers to generate CO_2 credits from heavy-duty ZEVs and transfer those credits to heavy-duty engine averaging sets. Current regulations do not include ZEVs in these averaging sets, leaving relatively less flexibility to comply than for heavy-duty vocational vehicle averaging sets but also providing no particular incentive to adopt ZEVs. Allowing transfer of ZEV-generated CO_2 credits would provide manufacturers increased flexibility in their compliance plans and also provide environmental benefits by encouraging overcompliance with vocational vehicle GHG standards and ZEV sales percentages. Overall, credit transfers into heavy-duty engine averaging sets would help keep heavy-duty engine and heavy-duty vocational vehicle GHG compliance more closely aligned and not at risk of diverging to the point that robust compliance in one space is not at all reflected in the other. [EPA-HQ-OAR-2022-0985-1565-A1, p. 6-7]

EPA has also requested comment on appropriate restrictions on number of credits that could be transferred from one averaging set to another. In the Phase 1 heavy-duty GHG program, the advanced credits that could be brought into any service class in any model year were capped at 60,000 Mg. This credit cap is far too low for larger, higher-volume manufacturers like Ford to provide useful flexibility. As an example, suppose a manufacturer sells 150,000 light heavy-duty vehicles per year. If these vehicles were all certified at the existing Phase 2 2027MY light heavy-duty multipurpose compression-ignition standard of 330 g CO_2/ton-mile, the manufacturer would generate a 4.68 Mt CO_2 (4,680,000 Mg CO_2) deficit against the proposed 2027MY light heavy-duty multipurpose compression-ignition standard of 257 g CO_2/ton-mi: [EPA-HQ-OAR-2022-0985-1565-A1, p. 7]

((257g CO_2/ton - mile)-(330 g CO_2/ton-mile)) x (2.85 tons payload) x (150,000 units) x (150,000 mile UL) x 10^{-6}= 4,681,125 Mg CO_2

Large year-over-year stringency increases have the potential to create credit deficits in the megaton CO_2 range for manufacturers with sufficient volume, especially in the first year of the program transitioning from the 2026MY standards to the proposed 2027MY standards when manufacturers would have previously been planning to the phase 2 2027MY standards. Accordingly, Ford proposes not less than a five megaton (5,000,000 Mg) CO_2 credit transfer cap into any averaging set in any model year. This cap would allow a useful amount of flexibility given the rate of change of the standards and possible manufacturer fleet volumes for these vehicle classes. [EPA-HQ-OAR-2022-0985-1565-A1, p. 7]

Organization: Manufacturers of Emission Controls Association (MECA)

Furthermore, the Phase 2 regulation did not allow for the transfer of credits across averaging sets, and we believe this provision should be extended into the Phase 3 final rule. This is particularly important as the increasing number of electric trucks sold will afford EPA an opportunity to assess durability, FUL and LCA for different vehicle classes and averaging sets. [EPA-HQ-OAR-2022-0985-1521-A1, p. 10]

For similar reasons, MECA does not support the use of weight class modifiers which we believe can have the same effect of reducing or delaying the broader deployment of advanced

GHG reducing technologies across all commercial vehicle sectors. [EPA-HQ-OAR-2022-0985-1521-A1, p. 10]

Organization: National Association of Clean Air Agencies (NACAA)

End the Phase 2 Credit Exchange Between Vocational Vehicles and Tractors

The averaging, banking and trading program under EPA's current Phase 2 heavy-duty GHG program allows CO2 emission credits to be exchanged between vocational vehicles and tractors within a weight class. With the final Phase 3 rule, EPA should end the Phase 2 credit exchange program to ensure that manufacturers produce heavy-duty ZEVs across the range of vehicle configurations they produce. [EPA-HQ-OAR-2022-0985-1499-A1, p. 9]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Averaging Banking and Trading (ABT)

EPA requests comment on the consideration of the use of credits across averaging sets and specifically requests comment on consideration of a program similar to ARB's ACT credit program. EPA proposed to allow the transfer of CO2 credits between class 4-6 vocational vehicles and class 7 and 8 tractors. In the ACT regulation, tractor ZEV sales cannot be offset by sales of class 4-6 vehicles. In the final rule, we encourage EPA to disallow the transfer of credits across classes 4-6 to class 7 and 8 tractors. We encourage EPA to only allow ZEV tractor sales credits to be used to offset tractor sales deficits. As stated earlier, tractor emissions make up the lion's share of heavy-duty vehicle emissions and fuel consumption. Allowing the use of credits across averaging sets could reduce the effectiveness of the regulation. [EPA-HQ-OAR-2022-0985-1562-A1, p. 14]

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

EPA in finalizing the regulation, should make sure that averaging, banking and trading provisions are open to all propulsion technologies including PHEVs, BEVs and FCEVs (technology neutral and performance based) and provide increased flexibility to trade the CO2 reduction benefits of PHEVs, BEVs and FCEVs between different sizes and types of vehicles until at least MY 2032. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

7) Our coalition is supportive of continuing averaging, banking and trading provisions as long as it is technology neutral, and performance based and does not favor engine-based technology. Regarding EPA's question on flexibility in the averaging, banking, and trading system, we support including the ability to trade the CO2 reduction benefits of PHEVs, BEVs and FCEVs between different sizes and types of vehicles until at least MY 2032. We believe this is a modest way to help encourage the most advanced clean technologies in this regulation. [EPA-HQ-OAR-2022-0985-1647-A2, p. 7]

Organization: Tesla, Inc. (Tesla)

No Trading Should Be Allowed Across Averaging Sets

The final rules should not allow crediting trading across averaging sets.183 As the agency suggests, allowing such trading will distort the marketplace, decrease the predictability and integrity of the rule's benefits, and may unnecessarily result in focusing on electrification of only certain heavy-duty segments. Given the difference in carbon emission impacts between the averaging sets, credits generated from lower weight class ZEVs should not be allowed to offset heavier weight class vehicle credits deficits. In short, EPA should maintain a credit trading policy that ensures manufacturers seek GHG reductions and electrification in all heavy-duty segments. [EPA-HQ-OAR-2022-0985-1505-A1, p. 25]

183 88 Fed. Reg. at 26013.

Organization: Volvo Group

Flexibilities

Full credit fungibility across vehicle averaging sets

In NPRM Section III.A.3 "Other Potential HD CO2 Emission Credit Flexibilities" the agency requested "comment on the potential need for additional flexibilities to assist manufacturers in the implementation of Phase 3." [EPA-HQ-OAR-2022-0985-1606-A1, p. 20]

First and foremost, Volvo Group no longer sees the need to restrict vehicle credits to use within an averaging set. Since the Phase 1 program development began in 2009, and continuing through the development of the Phase 2 program finalized in late 2016, the Volvo Group has been the sole voice of opposition among the major vehicle OEMs to movement of vehicle credits across averaging sets. Since Volvo Group did not have a significant North American offer outside of the Heavy-Heavy Duty (HHD) vehicle averaging set during this time, we opposed this flexibility due to the unlevel playing field and resultant competitive disadvantage it would create. With the 2020 launch of the well-received Mack MD Class 6/7 medium duty trucks, Volvo Group no longer sees a competitive disadvantage to movement of credits across vehicle weight classes, nor does it see a competitive advantage provided to any one OEM by expanding credit fungibility. An expanded allowance would, however, allow manufacturers to focus development resources and budgets on the most cost-effective improvements for customers, further easing the transition to ZEV technologies. Thus, Volvo Group requests the agency finalize an allowance for full credit fungibility across vehicle sub-categories without restriction. Since credits in each averaging set are calculated in Mg of CO2 reduction, and already account for the payload and useful life mileage within the averaging set in which they were earned, Volvo Group sees no reason that these credits should be subjected to discounting, or any other method of reduction in value of transferred credits. [EPA-HQ-OAR-2022-0985-1606-A1, p. 20-21]

Vehicle Advanced Technology (AT) credit fungibility to engine averaging sets

The agency also went on to further specifically "request comment on providing the flexibility for manufacturers to use advanced technology credits across averaging sets, subject to a cap" (emphasis is the agency's own). Volvo Group sees no reason why one-way movement of any vehicle credit, regardless of the technology from which it is derived, should not be allowed to offset engine deficits. Nor do we see the need for a cap on the number of credits that could be moved from the vehicle averaging sets into the engine averaging sets. Since, as noted previously in these comments, the benefits of the current Phase 2 regulation and the proposed Phase 3 rule are derived solely from complete vehicle improvements that incorporate the actual fuel map of the installed engine, the greenhouse gas reductions from the regulation are not decreased by offsetting engine deficits with vehicle credits. Additionally, a cap does nothing to increase the calculated benefit of the regulation but is rather an arbitrary and capricious method of driving additional engine improvements above and beyond the engine efficiency reductions manufacturers will need to claw back due to the discussed impacts of the EPA's model year 2027 NOx reductions finalized in the Clean Trucks Plan NOx regulation. Since, the expected engine level of improvements from the model year 2024 to the model year 2027 compression ignition engine standards range only from ~0.5% to ~0.9% (see table below for specific values and averaging sets), the expected improvements are negligible compared to the actual benefit derived from a Phase 3 regulation predicated on any level of zero-emission vehicle penetrations. Lastly, in a scheme where only one-way movement of vehicle credits into engine averaging sets is allowed, any amount of credits moved from the vehicle to engine averaging sets are effectively retired, reducing the OEMs available credit balance to be carried forward. (Refer to Table 2 on page 21 of docket number EPA-HQ-OAR-2022-0985-1606-A1). [EPA-HQ-OAR-2022-0985-1606-A1, p. 21]

As such, Volvo Group urges the agency to finalize an allowance for unrestricted one-way movement of any category or class of vehicle credits into engine averaging sets throughout the Phase 3 regulatory period from model year 2027 through 2032 with no cap on the number of credits that can be moved. [EPA-HQ-OAR-2022-0985-1606-A1, p. 21]

Providing a Weight Class Modifier on Credits to Incentivize Adoption in Heavier Weight Classes

Volvo Group agrees that this approach would be valuable to incentivize development of EVs in heavier weight categories. [EPA-HQ-OAR-2022-0985-1606-A1, p. 22]

EPA Summary and Response:

Summary:

EPA requested comment on providing a flexibility for manufacturers to use advanced technology credits across averaging sets, with the potential for caps or other limitations, as an interim allowance from model years 2027 through 2032 (see 88 FR at 26013). Commenters expressing support for using credits across averaging sets generally noted that the flexibility would help manufacturers implement advanced technologies in the vehicle segments with the greatest demand or cost effectiveness, and some of those commenters suggested EPA expand the flexibility beyond the examples provided in the requests for comment. Commenters opposed to allowing credit transfers across averaging sets generally expressed concern over market distortions and reduced effectiveness of the rule.

Among the commenters supporting credit transfers across averaging sets, DTNA requested that all credits generated by ZEVs, including BEV, H2-FCEV, and H2-ICE, should be available to all vehicle categories, indicating that it would allow manufacturers to "determine the classes and vehicle categories that they believe are best suited to ZEV adoption" and offset CO_2 emissions from other categories they determine are less suitable for ZEVs. DTNA further suggested that these ZEV credits should not be discounted and the allowance should apply for all credits generated by ZEVs "throughout the life of the GHG Phase 3 program".

Ford requested that EPA allow credit transfers across averaging sets, including "Class 2b and 3 ZEVs to light-heavy-duty and medium-heavy-duty vocational vehicles", indicating that a stepwise approach will be needed for the heavy-duty sector and manufacturers would benefit from introducing ZEVs to vehicle categories where ZEVs would "more quickly meet customer needs". Specifically, they emphasized that a manufacturer may have more engineering resources dedicated to light-duty ZEV development and medium-duty ZEVs may have a two year delay. Ford also requested the ability to generate CO2 credits from heavy-duty ZEVs that could be used in heavy-duty *engine* averaging sets to maintain consistent compliance between engine and vocational vehicles. Regarding a credit trading cap, Ford, suggested a cap should be "in the range of multiple megatons" as opposed to the 60,000 Mg value indicated by EPA. Ford suggested that manufacturers with large production volumes can have megaton credit deficits and suggests "not less than a five megaton (5,000,000 Mg) CO2 credit transfer cap into any averaging set in any model year".

Strong PHEV Coalition suggested ABT should be open to PHEVs, BEVs, and FCEVs and that those vehicles should have the flexibility to trade credits "between different sizes and types of vehicles until at least MY 2032".

Volvo noted their previous opposition to transferring credits across averaging sets, citing a competitive disadvantage during the Phase 1 and Phase 2 programs. Since then, Volvo has released a Class 6/7 truck and no longer sees a competitive disadvantage to that potential credit allowance. Volvo suggested the expanded credit fungibility would allow manufacturers to "focus development resources and budgets on the most cost-effective improvements for customers, further easing the transition to ZEV technologies". Volvo requested no restrictions (e.g., discounting) on the credit transfers, because the payload and useful life mileage in the credit calculation account for differences between averaging sets. Like Ford, Volvo also requested one-way transfer of vehicle credits to offset engine deficits, but unlike Ford, maintained that there should not be a cap, stating "a cap does nothing to increase the calculated benefit of the regulation but is rather an arbitrary and capricious method of driving additional engine improvements above and beyond the engine efficiency reductions manufacturers will need to claw back" due to the recent EPA heavy-duty NOx regulation. Volvo noted that the relatively small change in engine standards from MY 2024 to 2027 would have a "negligible" improvement compared to Phase 3 and that any manufacturer who opted to use this one-way credit would then lose the ability to apply those credits to a vehicle.

Other commenters cautioned against allowing credit transfers across averaging sets. ACEEE commented that "advanced technology credits should remain applicable within averaging sets only". ACEEE expressed concern over the risk of market distortions if EPA were to allow credits, especially those generated with multipliers, to be used across averaging sets.

Allergy & Asthma Network et al. noted the potential for "gaming" through use of ABT, and specifically urged EPA not to allow engine families "to generate excess emissions above the final limits by balancing benefits of zero-emission or hybrid vehicles against them".

CARB noted that the ACT program specifically requires tractor deficits to be settled using tractor ZEV credits to "assure sufficient production of HD ZEV semi tractors" and CARB suggested EPA should consider whether manufacturers could "effectively ignore entire categories of vehicles" when evaluating possible credit approaches to finalize. CARB encouraged EPA to adopted ZEV sales requirements specifically for the Heavy HDV tractors indicating that it would "ensure progress" in EJ communities.

CATF cautioned that allowing use of credits across averaging sets would "exacerbate" the concerns they expressed in section 10.3.1 of this response to comment document over credit multipliers distorting the stringency of the Phase 3 program.

MECA supported extending the Phase 2 restriction on transferring credits across averaging sets into Phase 3, noting that EPA could better assess the durability, FUL, and LCA for vehicles within the averaging sets.

Tesla did not support allowing credit trading across averaging sets, indicating that the allowance would "distort the marketplace, decrease the predictability and integrity of the rule's benefits, and may unnecessarily result in focusing on electrification of only certain heavy-duty segments".

Several commenters requested that EPA further limit the current averaging sets to reduce the risk that ZEV vocational vehicles could reduce incentive for manufacturers to produce ZEV tractors.

NACAA requested EPA revise the current ABT program to disallow credits exchanges between vocational vehicles and tractors within the same weight class. NACAA suggested that continuing the current approach would not "ensure that manufacturers produce heavy-duty ZEVs across the range of vehicle configurations".

NESCAUM and OTC noted that CARB's ACT regulation disallows transferring credits between vocational vehicles and tractors. NESCAUM and OTC commented that EPA should also disallow transferring credits between Class 4-6 vehicles and Class 7 and 8 tractors and only allow credits from ZEV tractor sales to offset tractor deficits. They noted that tractor emissions "make up the lion's share of heavy-duty vehicle emissions" and transferring credits across averaging sets "could reduce the effectiveness of the regulation".

Regarding EPA's request for comment on weight class multipliers, CARB and MECA recommended EPA not apply weight class modifiers. CARB indicated that the weight class multipliers they applied in their ACT rule were specific to that rule and should not apply to a federal program. Volvo stated that weight class modifiers would "incentivize development of EVs in heavier weight categories".

Response:

We are retaining our current GVWR-based averaging set definitions and the flexibility that allows credits to be averaged, banked, or traded within an averaging set. After considering comments and further evaluation of the example flexibilities included as requests for comment in the proposal, the final provision, available as an interim, transitional flexibility during model years 2027 through 2032, will allow manufacturers to use credits generated from heavy-duty vehicles across averaging sets. In Section III.A.3 of the final rule preamble, we describe how the allowance applies for heavy-duty vehicles under 40 CFR 1037 and heavy-duty vehicles under 40 CFR part 86, subpart S. While some commenters expressed general support for our request for comment on allowing one-way transfer of CO_2 credits from heavy-duty vehicle averaging sets to heavy-duty engine averaging sets, we are not finalizing that option in this final rule. We expect we would need to apply restrictions on the engine averaging sets where vehicle credits can be applied to limit potential disproportionate adverse emission impact on certain engine categories and also set FEL caps to avoid backsliding on the engine standards. At this time, we believe the complexity of this flexibility would limit its use relative to the other flexibilities we are finalizing in this rule.[807]

ACEEE commented that the risk of market distortions is greater considering the availability of credits generated with multipliers. In response, as described in preamble Section III and our response in RTC section 10.3.1, we note that we are separately taking steps to reduce the impact of credits from multipliers by restricting their use toward Phase 3 compliance and removing any remaining multipliers in model year 2030.

We disagree with Volvo's statement that a cap is a "rather an arbitrary and capricious method" of achieving more emissions reductions from engines. Rather, caps are important in cases where credits have the potential to lead to a disproportionate negative emissions impact on one or more vehicle or engine categories. As noted previously, we are not finalizing the option for manufacturers to use heavy-duty vehicle credits in heavy-duty engine averaging sets, in part to avoid the potential for disproportionate negative emissions impact on one or more engine categories. However, we are not including a cap on credits transferred between heavy-duty vehicle averaging sets in the final interim flexibility. A cap would be justified in cases where vehicles with zero or near-zero tailpipe CO_2 emissions are able to offset a significant number of vehicles in any given averaging set under this flexibility. Our assessment of the effect of those vehicles does not indicate a such an offset.

We requested comment on the possibility of allowing credits generated by Class 2b and 3 PHEV, BEV, and FCEV pickup trucks and vans[808] to transfer to the heavy-duty vehicle averaging sets (see 88 FR at 26013). Ford commented in support of that potential allowance, indicating there is a two-year delay in adapting light-duty vehicle technology for the heavy-duty vehicle market. After considering comments, we are extending our model year 2027 through 2032 allowance for transferring credits across averaging sets to include credits from Class 2b and 3 PHEV, BEV, and FCEV pickup trucks and vans. Specifically, we are finalizing an interim allowance for one-way credit transfers from averaging sets for heavy-duty vehicles certified to 40 CFR part 86, subpart S, to averaging sets for heavy-duty vehicles certified to 40 CFR part 1037. We are limiting this aspect of the flexibility to transferring credits generated during MYs 2027-2029 from to 40 CFR part 86, subpart S, to 40 CFR part 1037 in recognition that there is greater availability of PHEV, BEV, and FCEV in pickup trucks and vans and less need to offer a flexibility for vehicles in that market. We note that it would take multiple pickup trucks or vans to offset any single heavy-duty vehicle, and any credits transferred under this flexibility would no longer be available for the part 86 ABT program to aid in manufacturers meeting the requirements for those vehicles.

We did not propose and are not revising the current ABT provisions to disallow credit exchanges between vocational vehicles and tractors within a given averaging set, as requested by NACAA and NESCAUM/OTC. NACAA correctly pointed out that EPA's current rules for heavy-duty vehicle averaging sets allows credits to be exchanged between all vehicles within an

[807] See also revised 40 CFR 86.1819-14, new 40 CFR 1036.150(bb), and new 40 CFR 1037.150(z) that specify how manufacturers can exchange credits across averaging sets in 40 CFR parts 86, 1036, and 1037 during model years 2027 through 2032.
[808] These vehicles are certified to 40 CFR part 86, subpart S.

averaging set. As defined in 40 CRR 1037.740, averaging sets mirror the vehicle weight classes, which are largely based on vehicles' GVWR (see 40 CFR 1037.140 and the definition of "class" in 40 CFR 1037.801). As such, the Medium HDV and Heavy HDV classes, and their corresponding averaging sets, may contain both vocational vehicles and tractors if they have a similar GVWR. As CARB noted in their comment, they designed the ACT regulation to limit how credits can be used to offset tractor deficits. We understand the concerns from CARB, NACAA, and NESCAUM/OTC that manufacturers may generate Phase 3 credits from certain vehicles within a weight class in order to avoid producing ZEV for others. We note that the possibility of offsetting some applications is inherent in the design of the ABT provisions, which allows manufacturers to decide which vehicle applications to apply technologies for their specific company's product line. The structure of the ABT program, including the current GVWR-based averaging sets, have been in place since Phase 1 (see 76 FR 27239) and, as noted in section 10.2 of this RTC document, we are not reopening issues relating to the structure of the ABT program. We are repeating these points here to respond to this comment, not to indicate any reconsideration of this established position.

We further note, in response to NACAA and NESCAUM/OTC, that subcategory-specific emission standards continue to apply for heavy-duty vehicles and that emission credits generated within a given averaging sets must balance to zero (or a zero balance is achieved in the following three model years). Consequently, vehicle families across each averaging set are meeting their emission targets, with the associated environmental and health benefits, *on average* and individual vehicles are certified as well to the FEL for that vehicle family or subfamily. See section 10.2 of this RTC document. We do not have data to suggest a clear advantage of separate averaging sets for vocational vehicles and tractors, since manufacturers may produce more ZEV tractors, but they may also opt to produce fewer ZEV vocational vehicles in the vocational averaging set.

11 Battery Durability and Warranty

11.1 Battery Durability

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

3. EPA's Approach Fails to Address Important Issues That Will Affect Consumers' Best Interest.

EPA's proposal may impose additional costs of economic risk to small business owners who will be asked to depend upon increasingly expensive, lesser-proven HDVs for their livelihood. HD engine standards and the standards for MY 2021 and later light-HD engines apply over a useful life of 15 years or 150,000 miles, whichever comes first. 150,000 miles is well below the period of use for a comparable ICE powertrain. In the Proposed Rule, EPA asserts that it "concurs with the emerging consensus that battery durability is an important issue. The ability of a zero-emission vehicle to achieve the expected emission reductions during its lifetime depends in part on the ability of the battery to maintain sufficient driving range, capacity, power, and general operability for a period of use comparable to that expected of a comparable ICEVs. Durable and reliable electrified vehicles are therefore critical to ensuring that projected emissions reductions are achieved by this proposed program."93 EPA further states that it "proposed a specific durability testing requirement in the Proposed Rule and received comment on that proposal, including comment stating that the requirements could result in increases in the battery capacity beyond what was needed to meet the job of the customer. Due to these concerns and because we are still evaluating the range of durability metrics that could be used for quantifying HD BEV performance, EPA is not proposing specific durability testing requirements in this rule."94 EPA should consider inclusion of durability requirements in this proposal as 150,000 miles is well below the period of use for a comparable ICE powertrain and will impact consumers as there is not enough data regarding these technologies due to their very small market penetration. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 25 - 26]

93 Proposed Rule at 26,014–15.

94 Id. at 26,015.

EV batteries are high-cycle batteries and are made to function for approximately 10 years for a light-duty vehicle, and a shorter time for medium- and heavy-duty vehicles. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

EV batteries lose approximately 3 percent of their charging capacity and associated range per year of operation. These percentages likely are higher for higher mileage utilization for typical heavy-duty vehicles. EPA has not made any effort to account for battery degradation, and associated reductions in charging efficiency, charging capacity, customer impacts and accelerated battery replacement and costs. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

Many 'spent' EV batteries still have 70-80 percent of their capacity left, which is more than enough to be repurposed into other uses such as energy storage and other lower-cycle applications.108 This will extend the time that batteries and raw materials remain in use and therefore increase the demand for virgin critical minerals. [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

108 Engel, H., Hertzke, P., & Siccardo, G. (2019, April). Second-life EV batteries: The newest value pool in Energy Storage. McKinsey Center for Future Mobility. https://www.mckinsey.com/~/media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/Second%20life%20EV%20batteries%20The%20newest%20value%20pool%20in%20energy%20storage/Second-life-EV-batteries-The-newest-value-pool-in-energy-storage.pdf

Organization: California Air Resources Board (CARB)

c. Battery durability monitor

Affected pages: 26016, 26127, and 26124 (1037.115(f))

In response to U.S. EPA's request for comment, CARB staff suggests that requirements for entire system monitoring to be added instead of requirements for battery monitoring only. The requirements could include monitoring of the energy storage system, the thermal management system, the regenerative braking system, the charging system, the motor/generator, and fuel-cell stack, if present. [EPA-HQ-OAR-2022-0985-1591-A1, p.37]

CARB staff suggests requiring manufacturers to provide a description of a method for monitoring and calculating the battery state of health. CARB staff suggests that manufacturers of BEVs should provide the rated energy capacity for their batteries and the SAE J1798 procedure should be followed for testing the battery rated energy capacity. "Battery durability subfamily" needs to be defined. [EPA-HQ-OAR-2022-0985-1591-A1, p.37]

California's Zero Emission Powertrain (ZEP) Test Procedure sets requirements for battery monitoring. CARB staff suggests that NPRM could be aligned with the ZEP procedure.114 [EPA-HQ-OAR-2022-0985-1591-A1, p.37]

114 California Standards and Test Procedures for New 2021 and Subsequent Model Heavy-Duty Zero-Emission Powertrains, June 27, 2019. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/zepcert/froattc.pdf

Organization: Clean Air Task Force et al.

V. EPA Should Adopt the Proposed Warranty and Durability Requirements.

A. EPA should adopt the proposed durability provisions but should also require state-of-certified-range monitors.

We urge EPA to adopt the proposed durability and warranty requirements. 88 Fed. Reg. at 26013-16. As EPA explains, the calculation of emission credits for ZEVs is based on attributed mileage over their useful life. 88 Fed. Reg. at 26013. In addition to helping ensure that ZEVs will in fact achieve the projected emission reductions throughout their useful lives, the warranty and durability requirements will enhance consumer confidence in ZEVs and promote their faster adoption among purchasers, leading to greater air quality benefits. [EPA-HQ-OAR-2022-0985-1640-A1, p. 81]

EPA's authority to adopt the proposed durability requirements is grounded in section 206 of the Clean Air Act, which (read in conjunction with section 203) provides that before introducing a new motor vehicle into commerce, a manufacturer must obtain an EPA "certificate of conformity" indicating that the vehicle complies with applicable emission standards promulgated under section 202. 42 U.S.C. § 7525(a)(1); 42 U.S.C. § 7522(a)(1). Section 202(a)(1), in turn, requires vehicles to achieve compliance with standards throughout their "useful life," "whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control such pollution." 42 U.S.C. § 7521(a)(1). Section 206 also provides that EPA may condition the certificate of conformity "upon such terms…as [it] may prescribe." 42 U.S.C. § 7525(a)(1). The statute thus confers broad authority on EPA to ensure that ZEVs (like any other motor vehicle) in fact achieve the level of emission reductions attributed to them for purposes of compliance calculations throughout their useful lives. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 81 - 82]

As part of the durability requirements, we urge EPA to require heavy-duty BEVs and PHEVs to have a state-of-certified-range (SOCR)355 monitor that can be accessed by consumers. 88 Fed. Reg. at 26015. Compared to usable battery energy (the metric EPA has proposed), SOCR monitors provide important information on range and battery performance that drivers and consumers can easily understand. Requiring manufacturers to provide SOCR monitors, in addition to the other battery durability measures EPA has proposed, would also enhance consumer confidence in used heavy-duty ZEVs. [EPA-HQ-OAR-2022-0985-1640-A1, p. 82]

355 SOCR is "the measured or on-board electric range at a specific point in its lifetime, expressed as a percentage of the certified range." UN Global Technical Regulation No. 22 (In-vehicle Battery Durability for Electrified Vehicles), ECE/TRANS/180/Add.22, at II.3.10., Apr. 14, 2022, https://unece.org/sites/default/files/2023-01/ECE_TRANS_180a22e.pdf; see also 88 Fed. Reg. at 26015 (referring to Global Technical Regulation No. 22).

Finally, while EPA proposes that the new battery durability monitoring requirements take effect "beginning with MY 2027," the proposed regulatory text (40 C.F.R. § 1037.115(f)) states that they "apply starting in model year 2030." Compare 88 Fed. Reg. at 26014, with id. at 26124. In the final rule, EPA should update the regulatory text to clarify that the requirements apply starting in MY 2027. [EPA-HQ-OAR-2022-0985-1640-A1, p. 82]

Organization: Cummins Inc.

V. Battery Durability Requirements

12. An on-board state-of-certified-energy (SOCE) monitor accuracy requirement is needed.

Cummins supports having a customer facing SOCE monitor that includes an accuracy requirement. We propose aligning this requirement with the proposed accuracy requirements in EPA's Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles proposal which states that in-use vehicles must display SOCE values that are accurate within 5 percent of measured values as calculated in GTR No. 22. [EPA-HQ-OAR-2022-0985-1598-A1, p. 10]

13. Cummins supports common sense battery durability requirements.

Cummins supports common sense battery durability requirements to ensure a level playing field across all zero emissions vehicle manufacturers and to ensure vehicle owners receive robust new technology which will spur broader adoption. Battery durability is important to the future of battery electric vehicles (BEV). Many fleets are purchasing BEV for the first time and directly comparing them to the existing ICE vehicles in their fleets. If fleets experience a sub-par product that does not meet their expectations, they will hesitate to continue to invest in this product which could result in ICE vehicles remaining in their fleets for longer periods of time. Heavy-duty durability requirements must deviate from the proposed Light-Duty and Medium-Duty Rule and protect for miles, years, and weight, with a focus on the throughput of the battery with regards to the machine. Cummins commits to working with EPA and other stakeholders to develop recommended durability requirements. [EPA-HQ-OAR-2022-0985-1598-A1, p. 10]

14. A test procedure for determining Useable Battery Energy (UBE) is needed for BEV.

Having a standard test procedure for determining UBE in BEV is needed to ensure a level playing field for battery durability. Just as there is a proposed test procedure for hybrids, a standard test procedure should be developed for HD BEVs. Cummins commits to working with EPA to develop a standard test procedure for determining UBE that is appropriate for heavy-duty BEV. [EPA-HQ-OAR-2022-0985-1598-A1, p. 10]

Organization: Daimler Truck North America LLC (DTNA)

DTNA supports the proposed battery durability monitoring and ZEV warranty requirements but requests revisions to proposed Section 1037.115(f) to clarify the Agency's intent. [EPA-HQ-OAR-2022-0985-1555-A1, p. 66]

DTNA agrees with EPA that customer adoption of new vehicle technologies, especially ZEVs, relies on certainty that the products can do the jobs that customers need them to do over a predictable period of time. DTNA is focused on providing our customers with durable products that have predictable maintenance and repair costs. To this end, we spend considerable development and validation resources to test vehicles for hundreds of thousands of miles before production, working hand-in-hand with customers to ensure they have the best possible experience with our products. Manufacturers are well-motivated by market forces to develop robust, durable, and maintainable products, thus EPA regulations are not needed to ensure quality. Simply put, manufacturers must develop economical, reliable, and durable products, or customers will not buy them. [EPA-HQ-OAR-2022-0985-1555-A1, p. 66]

Nonetheless, DTNA requests that EPA revise the language proposed for 40 C.F.R. 1037.115(f) to specify the State-of-Certified-Energy (SOCE) monitoring requirements that will apply rather than incorporating a general reference to the 'monitoring requirements' GTR No. 22, which could be imprecise and open to interpretation. The regulatory language proposed for Section 1037.115(f) states that 'Monitoring requirements related to State of Certified Range (SOCR)', 'Accuracy requirements for SOCE in GTR No. 22,' and 'Minimum Performance requirements for battery durability' from GTR No. 22 'do not apply,' but the Agency does not specify exactly which clauses of GTR No. 22 are intended to apply. EPA also does not clearly state that the requirements for 'In-Use Verification' in GTR No. 22 do not apply. [EPA-HQ-OAR-2022-0985-1555-A1, p. 67]

DTNA recommends that EPA clarify its intent by incorporating and modifying the language from GTR No. 22 that the Agency intends to adopt. Specifically, the Company recommends that Section 1037.115(f) read as follows:

(f) State-of-Certified-Energy (SOCE) monitors.

(1) The requirements of this section apply starting in model year 2030.

(2) The manufacturer shall install an SOCE monitor that operates during the life of the vehicle. The SOCE monitor shall maintain an estimate of the state of certified energy (on-board SOCE).

The manufacturer shall determine the algorithms by which on-board SOCE is determined for the vehicles they produce. The manufacturer shall update the on-board SOCE with sufficient frequency as to maintain the necessary degree of accuracy during all normal vehicle operation. The on-board SOCE shall have a resolution of 1 part in 100 and be reported as the nearest whole number from 0 to 100.

(3) The manufacturer shall make available the most recently determined values of the on-board SOCR and on-board SOCE via the OBD port or otherwise make the SOCE available to the operator.

(4) For battery electric vehicles, use good engineering judgment to develop a test procedure for determining useable battery energy (UBE).

(5) For plug-in hybrid electric vehicles, determine UBE as described in 40 C.F.R. 1036.545 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 67-68] The warranty and battery durability monitoring requirements in the Proposed Rule strike an adequate balance between ensuring this baseline level of product performance and not adding undue burden and expense to ZEVs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 67]

EPA should not set additional product requirements for ZEVs that could increase cost or limit manufacturers' ability to provide customers with adequate choice in the market. [EPA-HQ-OAR-2022-0985-1555-A1, p. 68]

While DTNA supports EPA's proposed durability monitoring and warranty requirements, as discussed above, the Company does not support additional ZEV requirements that could add costs and disincentivize ZEV adoption. Related to this key point, DTNA offers the following responses to EPA's requests for comment on potential additional requirements related to battery health. [EPA-HQ-OAR-2022-0985-1555-A1, p. 68]

EPA should not set durability standards, including a minimum State-of-Certified-Energy (SOCE) or State-of-Certified-Range (SOCR).

The ZEV market is still developing, and factors will emerge bearing on battery and fuel cell durability that cannot be adequately considered during this rulemaking. For example, high-speed charging (megawatt charging or more) will almost certainly become a market necessity, which will enable further penetration of ZEVs but will likely have an effect on battery life that manufacturers cannot predict at the time of certification. Similarly, the state of hydrogen infrastructure and the quality and purity of the supplied hydrogen could affect fuel cells in ways that are not well understood today. [EPA-HQ-OAR-2022-0985-1555-A1, p. 68]

Additionally, widespread adoption of Vehicle-to-Grid operations or for auxiliary power draws in the form of so-called Electric Power Takeoff (ePTO) applications are not well understood and could impact battery durability. Both of these technologies could draw as much or more power from the vehicle as driving and must be accounted for in any standard regulating the lifetime operation of the vehicle. [EPA-HQ-OAR-2022-0985-1555-A1, p. 68]

Manufacturers can develop ZEVs to meet any reasonable useful life or durability periods that EPA requires, but it is important to recognize the impact that these requirements would have on vehicle costs and adoption rates. In the Low-NOx Proposed Rule, where EPA last considered promulgating ZEV durability requirements, the Agency proposed to require ZEVs to meet durability timeframes of the longest-lived, highest mileage diesels in order to generate NOx emission credits. As EPA acknowledged in the Low-NOx Proposed Rule, compliance with these requirements would necessarily require manufacturers to make choices that add to vehicle costs and/or diminish functionality:

- '[M]anufacturers could choose to design the battery or fuel cell in their product to have a larger capacity at the start of the vehicle life and limit the extent to which the initial capacity is available for use […] Alternatively, a manufacturer could choose to include battery or fuel cell maintenance or replacement as part of critical emission-scheduled maintenance.'138 [EPA-HQ-OAR-2022-0985-1555-A1, pp. 68-69]

138 See Low-NOx Proposed Rule, 87 Fed. Reg. at 17,559

In other words, a sufficiently long durability or range requirement would require manufacturers to: (1) install a larger battery or fuel cell; (2) limit the capability of the vehicle by restricting its available energy; and/or (3) replace the battery or fuel cell during its useful life. Each of these actions would necessarily add significant cost or reduce the effectiveness of the vehicle at a given cost point, ultimately reducing vehicle versatility and negatively impacting ZEV adoption rates. To avoid this result, manufacturers should be free to develop the products that customers need, and market forces should determine the adequate mix of durability, cost, warranty, and other operational considerations. [EPA-HQ-OAR-2022-0985-1555-A1, p. 69]

Lastly, if EPA were to adopt durability requirements premised upon use of a SOCE or SOCR monitor, these requirements would increase vehicle costs and create regulatory burdens that would put ZEVs at a competitive disadvantage relative to their ICE vehicle counterparts. Such requirements would amount to an 'OBD monitor for range,' which existing conventional vehicles are not required to have. OEMs receive certification based on the GHG emissions performance of their conventional vehicles for the regulatory useful life of the vehicle but are not required to provide a means for monitoring vehicle range over time. For ZEVs, degradation of energy capacity or range is, to some degree, expected and in any case will not cause a ZEV to emit any pollutant. DTNA supports providing SOCE information to the customer but, for the reasons stated herein, would not support durability requirements based on SOCE or SOCR. [EPA-HQ-OAR-2022-0985-1555-A1, p. 69]

EPA should not set any requirements related to a Certified Range, including an initial Certified Range value, or a monitor or other requirement for SOCR. DTNA understands that EPA is considering whether or not it should require vehicles to have a SOCR, including an initial certification for range, a health monitor in terms of certified range, or potentially a durability requirement related to certified range. A range requirement would be incompatible with the unique product and operational realities of commercial vehicles, would not be feasible due to technical considerations, and would not be protective of the environment. [EPA-HQ-OAR-2022-0985-1555-A1, p. 69]

Commercial vehicle ranges are extremely variable and are based to a great degree on the load the vehicle is carrying; its operational characteristics, including terrain and drive profile, and whether it is conducting auxiliary work operations that require a large accessory load; and the specifics of the vehicle equipment. While this is also true for light-duty vehicles to some extent, the variability in range for commercial vehicles is much greater for a given battery capacity, making any certified range value effectively meaningless. Before proposing any requirements regarding certified range, EPA should study this issue to understand the wide variability of ranges in a properly-operating commercial ZEV. [EPA-HQ-OAR-2022-0985-1555-A1, p. 69]

In addition to the considerations above, DTNA believes commercial vehicles have such wide-ranging equipment types that it would be highly impractical to certify a range (or variety of ranges) for a vehicle family. Under existing regulations, there can be a wide range of vehicles within a given family. These vehicles may have widely varying powertrain types and capacities, aerodynamics, transmissions, drive axle ratios, and more, all of which can have dramatic impacts on range. While ZEV vehicle types are limited today, future families including ZEVs are likely to have similarly wide-ranging configurations, and it is quite possible that a vehicle family with one zero-emission powertrain configuration could cover hundreds or thousands of different vehicle specifications, each with widely varying ranges. Moreover, it would be practically impossible for a vehicle manufacturer to determine and certify the range for each configuration. [EPA-HQ-OAR-2022-0985-1555-A1, p. 70]

DTNA supports EPA's proposal to allow BEV manufacturers to develop their own procedures for determining Certified Energy at the time of certification and for SOCE on each vehicle. [EPA-HQ-OAR-2022-0985-1555-A1, p. 70]

Manufacturers are best positioned to determine the appropriate method for calculating the SOCE at the time of certification and for developing appropriate algorithms for onboard SOCE. EPA has previously proposed specific test procedures, such as the proposed Multicycle Test (MCT) in the Low-NOx Proposed Rule. Such proposals are needlessly prescriptive and do not adequately consider the wide range of vehicle applications and impracticality of testing such configurations, as detailed in DTNA's comments on the Low-NOx Proposed Rule.139 [EPA-HQ-OAR-2022-0985-1555-A1, p. 70]

139 See Comments of DTNA North America LLC, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards; Proposed Rule (May 13, 2022) at 121-123, https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1168.

Ultimately, the purpose of a battery health test is to measure how much capacity is available in the battery pack. EPA requests comment on whether a vehicle-level test is appropriate for these purposes. It is unclear why components besides the battery should be part of the test. While the drive motor, accessories, control strategies, etc. might change the rate at which power is consumed from the battery, they have no effect on the total amount of energy stored in the battery pack. With many vehicle configurations that could affect the outcome of the test, any vehicle-level test will need to be repeated many times—one for each configuration that affects the test—with no significant additional information to be gained about the capacity of the battery pack. [EPA-HQ-OAR-2022-0985-1555-A1, p. 70]

DTNA supports EPA's proposal to let manufacturers determine the most appropriate test procedures, but if the Agency believes a prescribed test is necessary, it should consider a test that measures battery energy directly using a standardized charge-discharge cycle to determine battery capacity. Such a test reduces the number of configurations a manufacturer must test and provides detailed information about the capacity of the battery in a useable, repeatable manner. The industry already uses such a test for this purpose—the 'Static Capacity Test (Constant Current Method)' set forth in Society of Automotive Engineers (SAE) J1798, 'Recommended Practice for Performance Rating of Electric Vehicle Battery Modules,' which is incorporated by reference in CARB's standards and test procedures for HD zero-emission powertrains.140 [EPA-HQ-OAR-2022-0985-1555-A1, p. 70]

> 140 See CARB, 'California Standards and Test Procedures for New 2021 and Subsequent Model Heavy-Duty Zero Emission Powertrains' (June 27, 2019) at C-11, https://ww2.arb.ca.gov/sites/default/files/2020-05/ADA__California%20Standards%20And%20Test%20Procedures%20For%20New%202021%20And%20Subsequent%20Model%20Heavy-Duty%20Zero-Emission%20Powertrains.pdf.

Any battery health test procedure, for BEVs or for FCEVs, must be developed in concert with truck, battery, and fuel cell manufacturers to adequately capture the wide range of applications and equipment, technology types, and degradation modes of these vehicles, as well as recognize the practical constraints on executing these tests. This is especially important if EPA, in the future, proposes to require a battery durability or in-use verification aspect of their regulation. Such procedures must be developed with manufacturers and account for the challenges of testing in commercial vehicles. [EPA-HQ-OAR-2022-0985-1555-A1, p. 71]

EPA Request for Comment, Request #68: EPA requests comment both on this rule's proposed approach and on an alternative approach of EPA defining a test procedure to determine UBE, such as the test procedure EPA proposed in the HD2027 NPRM, CARB zero-emission powertrain certification, and the test procedures being considered by the UN ECE EVE IWG.

- DTNA Response: DTNA supports EPA's proposal to allow manufacturers to determine UBE, but would not support EPA setting a specific test procedure to determine UBE. If a regulatory test procedure for demonstrating UBE is deemed necessary, however, EPA should adopt battery-only test for UBE, like that incorporated into CARB's zero-emission powertrain certification standards and procedures, rather than any test performed at the chassis or vehicle level. UBE certification at the vehicle or chassis level would be impractical for the HD market, due to the wide variety of vehicles and applications in this sector, and the irrelevance of chassis components to battery energy. DTNA discusses these issues in detail in Section III.A. of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 171]

EPA Request for Comment, Request #69: While we are not proposing to require that heavy-duty BEVs and PHEVs implement a state-of-certified-range (SOCR) monitor, we are requesting comment on whether we should require the SOCR monitor defined in GTR No. 22.

- DTNA Response: EPA should not finalize any requirements regarding SOCR, due in part, to the wide variety of vehicles and applications in the HD market that would make certification impractical, and because electric vehicle range does not affect the CO2 emissions of the vehicles. DTNA discusses these issues in Section III.A. of these comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 171]

Organization: Fermata Energy

III. Recommendations regarding V2G in EPA rules and EPA's Proposed Battery Durability Monitoring and Warranty Requirements for Heavy Duty Electric Vehicles

Any eventual battery durability requirements set by EPA should account for frequent bidirectional charging (e.g. such as vehicle-to-grid) activities [EPA-HQ-OAR-2022-0985-1662-A2, p.6]

We recognize that the EPA is not setting a battery durability requirement at this time, and is instead proposing to require battery state of health and durability monitoring. The EPA specifically mentioned the need for larger batteries that may not be used as a reason for proposing monitoring. However, the EPA made no mention of the need for vehicle-to-grid technology in heavy duty BEVs and PHEVs in the proposed rule. [EPA-HQ-OAR-2022-0985-1662-A2, p.6]

Battery degradation is an inherently complex topic; battery chemistry, temperature, use cases, the EV duty cycle, and other factors all impact battery degradation. Some V2X activities, especially those utilizing bidirectional charging capabilities, will require additional battery cycling that will impact long-term battery durability. While the exact level of cycling will depend on the specific V2X use case and could vary based on customer behavior, it is reasonable to expect that in the future most EVs could experience some incremental level of degradation due to V2X activities. [EPA-HQ-OAR-2022-0985-1662-A2, p.6]

Given the extensive public and private benefits that V2X can offer, as detailed above, it is paramount that any battery durability requirements EPA establishes for EVs not inadvertently foreclose V2X, and especially V2G opportunities. Setting overly-stringent durability requirements that limit V2X activities – whether intentionally or not – conflicts with EPA's larger mission of reducing emissions and accelerating EV adoption. [EPA-HQ-OAR-2022-0985-1662-A2, p.6]

Furthermore, we note there are ongoing efforts by the Informal Working Group on Electric Vehicles and the Environment under the United Nations Economic Commission for Europe (UN ECE) to develop minimum performance requirements for EV batteries that include V2X considerations. This Working Group is chaired by the US Environmental Protection Agency (EPA) and includes the European Commission, individual European and Asian countries, as well as industry stakeholders from around the world. In order to account for VGI activities, the Working Group is also considering a "virtual km" mechanism, in which the energy discharged by the EV battery in bidirectional mode is converted to a km-equivalent via a predetermined formula.14 The total mileage used for confirming the compliance with the performance requirements would consist of the sum of the km driven and the virtual km. While Fermata Energy is not necessarily endorsing this specific approach or methodology, we believe that the EPA should seriously consider an agreed upon method to account for V2G battery degradation such as the UN Global Technical Regulation "virtual miles" before adopting a final regulation with durability or warranty requirements. [EPA-HQ-OAR-2022-0985-1662-A2, p.7]

14 For example, see the following presentation on V2X virtual mileage at the 50th EVE IWG meeting: https://wiki.unece.org/download/attachments/128420289/Input%20on%20V2X%20virtual%20mileage.pptx?api=v2

In the absence of an agreed upon method to account for V2G battery degradation, OEMs may choose to reach battery warranty agreements with V2X services providers to approve specific equipment for use with their bidirectionally-enabled vehicles. In September 2022, Nissan approved the Fermata Energy bidirectional charger as the first bidirectional charging system for use with its all-electric LEAF vehicle in the US.15 While these sorts of battery warranty approvals are a very important development for the bidirectional charging industry, OEM approval processes can be slow. It may take years for other OEMs to negotiate these sorts of agreements with V2X charger manufacturers and service providers. An agreed-upon methodology for accounting for V2G battery degradation would be the more expedient approach to ensuring battery durability, instead of relying on OEM to EVSE agreements, which could take years. [EPA-HQ-OAR-2022-0985-1662-A2, pp.7-8]

15 https://usa.nissannews.com/en-US/releases/release-5078281d19ed36853371357c4a1a8244-nissan-approves-first-bi-directional-charger-for-use-with-nissan-leaf-in-the-us

Organization: International Council on Clean Transportation (ICCT)

ICCT supports the proposal to establish durability monitoring and warranty requirements for batteries. The battery is the most significant new cost component of a zero-emission vehicle. The used vehicle market will rely to a significant extent on access to objective information on the state of health of the battery to inform residual value calculations. Durability monitoring and warranty requirements will provide greater certainty to fleet customers that their batteries are reliable. These requirements will create a level playing field for the industry to meet minimum reporting and warranty expectations. [EPA-HQ-OAR-2022-0985-1553-A1, p. 5]

Organization: Manufacturers of Emission Controls Association (MECA)

Battery State of Health (SOH) Monitors as per UNECE GTR No. 22b & Labeling

MECA supports the inclusion of SOH monitors and usable battery energy (UBE) measurement requirements as per UN ECE GTR No. 22b that include vehicle miles traveled and power take-off (PTO) equivalent miles traveled. This information will serve to generate durability data to support future EPA programs, as well as industry and consumer needs. The UN-ECE is expected to finalize GTR No.22b in the next year and once completed EPA should assess and align with this global regulation. MECA believes that mandated battery labeling requirements will facilitate in-use vehicle service and end-of-life vehicle recycling. Towards this goal, EPA should align battery labeling requirements with those required under California’s ACC II light-duty regulation. [EPA-HQ-OAR-2022-0985-1521-A1, p. 11]

Organization: Tesla, Inc. (Tesla)

The Proposed Battery State of Health Monitor/State of Certified Energy Provisions for Monitoring Battery Durability Are Reasonable

Building consumer assurance is a key factor towards achieving significantly higher levels of BEV penetration, especially in the heavy-duty markets. Tesla agrees with EPA that consumers should have access to information regarding the state of battery health (SOH), especially those considering the purchase of a used BEV or when filing a warranty claim. As further noted, durability monitoring can ensure emission reduction benefits are met and provide integrity to credit trading. [EPA-HQ-OAR-2022-0985-1505-A1, p. 25]

Tesla has favored a SOH monitor based upon battery capacity because it is directly proportional to vehicle range, depends on the least test conditions, can easily be run with an onboard diagnostic procedure, and can be verified with simple measurement equipment. Nonetheless, Tesla recognizes and participated in proceedings developing the UN GTR 22 and agrees with EPA's adoption of the GTR 22 and a SOH monitor communicating the battery's state of certified energy (SOCE) based upon usable battery energy (UBE).186 [EPA-HQ-OAR-2022-0985-1505-A1, p. 25]

186 88 Fed. Reg. at 26015.

In the heavy-duty NOX NPRM Tesla provided detailed responses to many aspects of the proposed test procedures.187 Given the diversity of heavy-duty platforms, requiring a one size fits all SOCE test procedure will lead to inaccurate and distorted results. Therefore, Tesla supports the agency's proposal to allow BEV manufacturers to develop their own SOCE test procedures.188 The agency is correct that a customer-accessible SOH monitor needs to be accurate, transparent, verifiable and, importantly, easy for a consumer to understand. As such, customers will be best served by allowing manufacturers to develop test procedures that are adapted to their unique vehicle design. Tesla supports the agency's decision to not implement a durability requirement.189 Imposing specific durability testing requirements on BEVs provides no emissions reduction benefit. BEVs do not emit tailpipe (or evaporative) criteria pollutants and changes in battery durability and retained range do not alter this fact. Unlike emission controls in ICE vehicles, BEVs are also not vulnerable to defeat devices and tampering.190 Requiring durability standards can cause greater tailpipe emissions by harming the rate of BEV uptake through imposition of substantial new costs and designs with reserved battery capacity. Tesla respectfully submits that any speculative benefit from consumer assurance provisions such as durability requirements must be balanced against increase up-front costs on BEVs, which are likely to slow consumer uptake and thereby increase emissions. Moreover, as the DOE has documented, BEV range continues to accelerate as the technology is deployed.191 As BEV range increases, the loss of incremental battery capacity over time (due to expected degradation) will matter less to consumers. Similarly, the agency should allow manufacturers to address range monitoring as each sees fit to do, and Tesla does not support imposition of a state of certified range (SOCR) monitor.192 [EPA-HQ-OAR-2022-0985-1505-A1, p. 26]

187 Tesla, Comments on EPA's Clean Air Act Waiver for California's Omnibus Low NOX Regulation, Advanced Clean Trucks, Zero Emission Airport Shuttle, and Zero-Emission Power Train Certification Regulations (Aug. 2, 2022) available at https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0331-0060

188 88 Fed. Reg. at 260115.

189 Id.

190 See e.g. Transport Topics, Three Companies Charged With Emission Device Tampering (may 11, 2023) available at https://www.ttnews.com/articles/emissions-devicetampering?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202023-05-12%20Transport%20Dive%20%5Bissue:50451%5D&utm_term=Transport%20Dive

191 U.S. DOE, FOTW #1290, May 15, 2023: In Model Year 2022, the Longest-Range EV Reached 520 Miles on a Single Charge (May 15, 2023) available at https://www.energy.gov/eere/vehicles/articles/fotw-1290-may-15-2023-model-year-2022-longest-range-ev-reached-520-miles

192 88 Fed. Reg. at 26015.

Organization: Truck and Engine Manufacturers Association (EMA)

ii. Authority to adopt requirements for ZEV powertrain components

In the NPRM, EPA claims it has the authority to adopt durability, useful life, and warranty requirements for the various components of ZEV powertrains, including batteries, fuel cells, and electric motors. More specifically, EPA is proposing to set specific mileage and years-based warranty requirements for BEV and FCEV batteries, as well as certain other associated electric powertrain components (e.g., fuel-cell stack, electric motors, and inverters). The proposed warranty periods would be five years or 50,000 miles for light heavy-duty ZEVs, and five years or 100,000 miles for medium-duty and heavy-duty ZEVs. EPA also is proposing to adopt new battery durability monitoring requirements for HD BEVs and plug-in hybrid electric vehicles (PHEVs) beginning with the 2027 model year. EPA is further proposing to mandate that OEMs provide a customer-facing battery state-of-health (SOH) monitor for all heavy-duty BEVs and PHEVs. The SOH monitor would need to monitor and communicate the vehicle's state of certified energy (SOCE), including the state of the usable battery energy (UBE) expressed as a percentage of the original UBE when the BEV was new. [EPA-HQ-OAR-2022-0985-2668-A1, p. 17]

Notwithstanding its claims, EPA does not have the delegated authority under the CAA to adopt the proposed requirements for ZEV batteries and associated electric powertrain components, which have no capability of producing emissions of any air pollutants. EPA's authority to adopt warranty, durability and useful life requirements for motor vehicles is delineated in CAA sections 202(d), and 207(a) and (b). Those provisions constrain EPA's authority to ensuring vehicles' and engines' compliance for prescribed periods of time with "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines." (CAA section 202(a)(1); 42, U.S.C. §7521(a)(i).) [EPA-HQ-OAR-2022-0985-2668-A1, pp. 17 - 18]

For example, CAA section 202(d) states that EPA "shall prescribe regulations, under which the useful life of vehicles and engines shall be determined for the purpose of subsection (a)(1) of section 7541 [CAA section 202(a)(1)]." As noted, that statutory purpose is to authorize EPA to establish standards to limit "the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines." The CAA defines "air pollutant" to mean "any air pollution agent or combination of such agents...substance or matter which is emitted into or otherwise enters the ambient air." (CAA, section 302(g); 42 U.S.C. §7602(g).) The CAA further defines "emission standard" to mean a requirement "which limits the quantity, rate or concentration of emissions of air pollutants on a continuous basis." (42 U.S.C. §7602(k).) Thus, EPA's authority to prescribe useful life requirements under CAA section 202(d) is directly tied to the purpose of extending the time span of emission standards that limit the rate, quantity or concentration of emissions of air pollutants from new motor vehicles or new motor vehicle engines. Since ZEV powertrains, including ZEV batteries, do not and cannot emit any air pollutants in any quantity into the ambient air (and so, in effect, are outside of the practical scope of emission standards), EPA does not have the authority to set emissions-related useful life requirements for BEV and FCEV powertrains or their various non-emitting components. [EPA-HQ-OAR-2022-0985-2668-A1, p. 18]

Similarly with respect to the proposed warranty and durability requirements, EPA's authority to adopt those types of requirements is set forth in CAA section 207. In particular, CAA section 207(a)(1) makes it clear that the scope of authorized warranties is to ensure that vehicles and engines "are designed, built and equipped so as to conform at the time of sale with the applicable regulations [i.e. emission standards] established under section 7521 [section 202(a)(1)]." (42 U.S.C. §7541(1).) Here again, ZEV powertrains and associated components do not and cannot emit any air pollutants, and so are not among the types of combustion sources that can be subject to emission standards. Consequently, they are not among the types of mobile sources that can be covered by the emissions-related warranties authorized under the CAA. [EPA-HQ-OAR-2022-0985-2668-A1, p. 18]

While it is certainly true that EPA has the authority to set lower emission standards as advancements in technology allow, even down to zero, the scope of EPA's related authority to establish emissions warranty and durability periods is fundamentally different. More specifically, EPA does not retain the authority to establish "emissions-related" warranty and durability requirements for mobile source powertrains that are inherently incapable of generating any emissions of any air pollutants, including when those ZEV powertrains deteriorate, malfunction, or completely breakdown. [EPA-HQ-OAR-2022-0985-2668-A1, p. 18]

It is axiomatic that ZEV powertrains do not have the capacity to emit air pollutants. That holds true when those powertrains are new, when they are deteriorated, and even when they cease working altogether. Thus, ascribing "emissions-related" warranty and durability requirements to those ZEV powertrains and their components is, in effect, a non sequitur. [EPA-HQ-OAR-2022-0985-2668-A1, p. 18]

EPA's authority to prescribe emissions-related warranty and durability regulations is premised on the concept that mobile sources subject to the regulations need to rely on emissions-reducing components, such as exhaust aftertreatment systems, that can deteriorate over time in a manner that can increase emissions in-use to levels above the applicable underlying emission standards. EPA clearly has the authority to guard against those adverse results by adopting emissions-related warranty and useful life provisions that promote both the manufacture of more durable emissions-related components, and the prompt repair of malfunctioning emissions-related components. [EPA-HQ-OAR-2022-0985-2668-A1, p. 19]

But none of the above pertains to ZEV powertrain components that are inherently incapable of generating any air pollutants whatsoever. As a consequence, EPA's authority to adopt emissions-related warranties and durability periods also does not apply. It is the same reason that EPA is not authorized to adopt emissions-related warranty and durability regulations for steering wheels, brake pedals, windshields, or even current-technology car and truck batteries. [EPA-HQ-OAR-2022-0985-2668-A1, p. 19]

In the end, EPA's proposed warranties and durability requirements for ZEV batteries and other ZEV powertrain components amount to attempted forays into the regulatory realm of consumer protection – an attempt to ensure that ZEV powertrains meet consumer expectations and needs for range and reliability. EPA's jurisdiction does not extend that far. [EPA-HQ-OAR-2022-0985-2668-A1, p. 19]

In sum, the useful life, warranty and durability requirements EPA is authorized to adopt under the CAA are all directly tied to ensuring compliance over time with the air pollutant emission standards that EPA sets for new motor vehicles and new motor vehicle engines. Since ZEV powertrains and their associated components do not and cannot emit any air pollutants, and so are not within the scope of any specific emission standards, they are, by definition, also not within the scope of EPA's regulatory authority as it pertains to useful life, warranty and durability requirements. Consequently, those types of proposals must not be included in any final Phase 3 rule. [EPA-HQ-OAR-2022-0985-2668-A1, p. 19]

Battery Durability Monitor – Notwithstanding our comments above on EPA's lack of delegated authority under the CAA to adopt the proposed battery durability monitor requirements, we offer several provisional comments on those proposed provisions. [EPA-HQ-OAR-2022-0985-2668-A1, p. 54]

The NPRM includes proposed regulatory language for the battery durability requirements in 40 C.F.R. § 1037.115(f), stating that "[t]he requirements of this section apply starting in model year 2030. See, 88 Fed. Reg. 26124 (emphasis added). We agree that the proposed effective date of MY 2030 would be earliest reasonable timing within which to implement battery durability monitors. Developing battery durability monitors will require significant and time-consuming development work by manufacturers. It will take time and resources for manufacturers to design the monitor systems, develop test procedures for measuring battery energy, and to ensure that the procedures accurately and repeatably measure the battery energy. That task is made significantly more challenging by the large number of battery configurations that manufacturers must develop to meet the needs of the highly diverse commercial vehicle market. Additionally, manufactures must redesign many unique vehicle dashboards to incorporate the required state-of-energy displays; and changing dashboards requires notoriously long lead-times due to the necessary tooling changes, and their complex interactions with multiple vehicle systems. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 54 - 55]

The preamble contains an apparent typographical where it states that "EPA is proposing new battery durability monitoring for HD BEVs and PHEVs … beginning with MY 2027." See, Id. at 26014 (emphasis added). That early implementation is not consistent with the proposed regulatory language, and, more importantly, is not feasible. [EPA-HQ-OAR-2022-0985-2668-A1, p. 55]

The NPRM would require that manufacturers "use good engineering judgement to develop a test procedure for determining useable battery energy (UBE)." See, Id. at 26124. There is no doubt that manufacturers are in the best position to develop the most effective and efficient test procedures for measuring UBE. Measuring UBE for the many different battery configurations needed for the commercial vehicle market may necessitate bench-testing to avoid the costs and complexity associated with vehicle-level testing. One effective method for conducing that bench-testing is the SAE International standard J1798_200807 – Recommended Practice for Performance Rating of Eclectic Vehicle Battery Models, which is incorporated by reference in CARB's Heavy-Duty Zero-Emission Powertrain Certification Requirements. See, 13 CCR § 1956.8, D. [EPA-HQ-OAR-2022-0985-2668-A1, p. 55]

The NPRM also includes in the battery durability monitor requirements in 40 C.F.R. § 1037.115(f) several references to the United Nations Economic Commission for Europe (UNECE) Global Technical Regulation (GTR) No. 22 on In-Vehicle Battery Durability for Electrified Vehicles:

Battery durability monitor. Battery electric vehicles and plug-in hybrid electric vehicles must meet monitoring requirements related to batteries serving as a Rechargeable Energy Storage System from GTR No. 22 (incorporated by reference, see § 1037.810). The requirements of this section apply starting in model year 2030. The following clarifications and adjustments to GTR No. 22 apply for vehicles subject to this section:

(1) Install a customer-accessible display that monitors, estimates, and communicates the vehicle's State of Certified Energy (SOCE) include information in the application for certification as described in § 1037.205. Monitoring requirements related to State of Certified Range (SOCR) do not apply.

(2) Accuracy requirements for SOCE in GTR No. 22 do not apply. Minimum Performance Requirements for battery durability also do not apply. (See, 88 Fed. Reg. 26124 (emphasis added).) [EPA-HQ-OAR-2022-0985-2668-A1, p. 55]

The proposed battery durability monitor requirements in 40 C.F.R. § 1037.115(f) that reference GTR No. 22 are imprecise and unclear. GTR No. 22 is a comprehensive standard with numerous detailed requirements. While the proposed regulatory language identifies several sections of GTR No. 22 that do not apply, the language does not specify which clauses of GTR No. 22 do apply. Additionally, the UNECE is currently developing revisions to GTR No. 22, and will soon approve an amended version. A general reference to a GTR, which may soon be out-of-date, is not appropriate or implementable. Instead, we recommend that § 1037.115(f) include the following straightforward and implementable requirements:

- The manufacturer shall install a State of Certified Engine (SOCE) monitor that operates during the life of the vehicle. The SOCE monitor shall maintain an estimate of the state of certified energy (on-board SOCE).
- The manufacturer shall determine the algorithms by which on-board SOCE is determined for the vehicles they produce. The manufacturer shall update the on-board SOCE with sufficient frequency as to maintain the necessary degree of accuracy during all normal vehicle operation.
- The on-board SOCE shall have a resolution of 1 part in 100 and be reported as the nearest whole number from 0 to 100.
- The manufacturer shall make available the most recently determined values of the on-board SOCR and on-board SOCE via the OBD port or otherwise make the SOCE available to the operator.
- For BEVs, use good engineering judgment to develop a test procedure for determining UBE.
- For PHEVs, determine UBE as described in 40 C.F.R. § 1036.545. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 55 - 56]

Organization: Zero Emission Transportation Association (ZETA)

iv. Range and durability

In the LDV segment, a recent study found that a majority of EVs retain at least 90 percent of their original range capacity left even after driving more than 100,000 miles—a testament to battery durability.122 While HDVs operate under different duty cycles and applications, there is good reason to believe advances in LDV battery technologies and durabilities will extend into other vehicle classes. CATL—recently announced a new "condensed" battery with 500 Wh/kg. CATL expects to start mass production of the model in 2023,123 and such an increase in battery capacity will benefit HDEVs in an outsized way. Bloomberg recently reported that the average range for a U.S. EV in the U.S. has quadrupled since 2011. In 2022, it stood at 291 miles and today is a third higher than the global average.124 Policies such as EPA's emissions standards are critical to helping maintain the U.S.'s position as a global leader. [EPA-HQ-OAR-2022-0985-2429-A1, p. 29. This comment can also be found in section 4 of this comment summary.]

122 "New Study: How Long Do Electric Car Batteries Last?" Recurrent Auto, (March 27, 2023) https://www.recurrentauto.com/research/how-long-do-ev-batteries-last

123 "World's largest battery maker announces major breakthrough in energy density," TheDriven, (April 21, 2023) https://thedriven.io/2023/04/21/worlds-largest-battery-maker-announces-major-breakthrough-in-battery-density

124 "US Electric Cars Set Record With Almost 300-Mile Average Range," Bloomberg, (March 9, 2023) https://www.bloomberg.com/news/articles/2023-03-09/average-range-for-us-electric-cars-reached-a-record-291-miles#xj4y7vzkg

EPA Summary and Response:

Summary:

Multiple commenters including the American Fuel and Petrochemical Manufacturers, Allergy & Asthma Network et al., ICCT, CARB, MECA, … commented that EPA should finalize durability requirements for ZEV, to ensure ZEV durability is comparable to the comparable HD ICE powertrain.

CARB commented that EPA should finalize entire system monitoring requirements instead of requirements just for the battery. CARB suggested that SAE J1798 should be used for determining battery energy capacity and stated that EPA should include battery durability subfamily definitions. CARB further maintained that EPA should adopt California's Zero Emission Powertrain (ZEP) Test Procedure for the battery monitor.

Clean Air Task Force et al. commented that EPA should finalize the proposed durability requirements and make them effective for MY2027 and later vehicles. They also commented that EPA should require state-of-certified-range monitors.

Cummins commented that they support common sense battery durability requirements to ensure a level playing field across all zero emissions vehicle manufacturers and to ensure that vehicle owners receive robust new technology which will spur broader adoption. Cummins commented that having a standard test procedure for determining usable battery energy (UBE) is needed to ensure a level playing field.

DTNA supports the proposed battery durability monitoring requirements, but also stated that EPA should not set durability standards. DTNA doesn't support a state-of-health (SOH) monitor based on state-of-certified range (SOCR). DTNA supports allowing manufacturers to define the test procedure for determining UBE. DTNA commented that EPA should allow manufacturers to develop their own test procedure for determining UBE, and that if EPA must define a test procedure, it should align with CARB's zero-emission powertrain certification standards and procedures. DTNA commented that EPA should include all the durability monitoring requirements in 40 CFR 1037, rather than reference the GTR No. 22. DTNA commented that impacts from vehicle-to-grid and electric power takeoff applications are not well understood and could impact battery durability. DTNA also commented that it is not clear why components other than the battery should be included in the test.

EMA agreed with the proposal (including proposed regulatory text) stating that battery durability requirements commence in MY 2030. In their view, MY 2030 would be the earliest reasonable timing within which to implement battery durability monitors. In this regard, EMA notes an inconsistency between the proposed regulatory text (giving MY 2030 as the commence date) and the Preamble, which gave MY 2027 as the starting date.

EMA supports the NPRM requiring that manufacturers "use good engineering judgement to develop a test procedure for determining useable battery energy (UBE)."

EMA comments that battery electric vehicles and plug-in hybrid electric vehicles must meet monitoring requirements related to batteries serving as a Rechargeable Energy Storage System from GTR No. 22. The requirements of this section apply starting in model year 2030. EMA requests that the following clarifications and adjustments to GTR No. 22 be made for vehicles subject to this section:

(1) Install a customer-accessible display that monitors, estimates, and communicates the vehicle's State of Certified Energy (SOCE) include information in the application for certification as described in 40 CFR 1037.205. Monitoring requirements related to State of Certified Range (SOCR) do not apply.

(2) Accuracy requirements for SOCE in GTR No. 22 do not apply. Minimum Performance Requirements for battery durability also do not apply.

EMA comments that the proposed battery durability monitor requirements in proposed 40 C.F.R. § 1037.115(f) that reference GTR No. 22 are imprecise and unclear. GTR No. 22 is a comprehensive standard with numerous detailed requirements. While the proposed regulatory language identifies several sections of GTR No. 22 that do not apply, the language does not specify which clauses of GTR No. 22 do apply. They recommend that § 1037.115(f) include the following language, which they characterize as providing straightforward and implementable requirements:

The manufacturer shall install a State of Certified Engine (SOCE) monitor that operates during the life of the vehicle. The SOCE monitor shall maintain an estimate of the state of certified energy (on-board SOCE).

The manufacturer shall determine the algorithms by which on-board SOCE is determined for the vehicles they produce. The manufacturer shall update the on-board SOCE with sufficient frequency as to maintain the necessary degree of accuracy during all normal vehicle operation.

The on-board SOCE shall have a resolution of 1 part in 100 and be reported as the nearest whole number from 0 to 100.

The manufacturer shall make available the most recently determined values of the on-board SOCR and on-board SOCE via the OBD port or otherwise make the SOCE available to the operator.

For BEVs, use good engineering judgment to develop a test procedure for determining UBE.

For PHEVs, determine UBE as described in 40 C.F.R. § 1036.545.

EMA and Volvo commented that EPA doesn't have the legal authority to require a battery durability monitor for ZEVs, the argument being that CAA section 202(d), 207 (a), and 207 (b) do not apply to vehicles with no tailpipe emissions. They make the same argument with respect to warranty and useful life requirements for ZEV powertrains and related components. EMA agrees that EPA may issue emission standards, including standards of zero, for new motor vehicles. However, EMA asserts that, thereafter " EPA does not retain the authority to establish "emissions-related" warranty and durability requirements for mobile source powertrains that are inherently incapable of generating any emissions of any air pollutants, including when those ZEV powertrains deteriorate, malfunction, or completely breakdown." EMA states that this is because "[i]t is axiomatic that ZEV powertrains do not have the capacity to emit air pollutants." EMA likens warranty and durability requirements issued under such circumstances to issuing warranty and durability standards for floor mats or steering wheels. We address these arguments together in the response following these summaries.

MECA commented that they support inclusion of SOH monitors and usable battery energy (UBE) measurement requirements that include vehicle miles traveled and power take-off (PTO) equivalent miles traveled. MECA also commented that EPA should require battery labeling requirements.

Fermata Energy commented that EPA should not set durability requirements that would discourage the use of V2X. The durability monitoring requirements and minimum performance requirements should consider V2X.

Tesla supported the proposed durability monitoring requirements, including the proposal to not define the test procedure for determining UBE.

Response Concerning Legal Authority:

EPA does not accept the argument that it lacks legal authority to adopt durability, warranty, and useful life requirements for ZEV powertrains and components. EPA's response is set out in full in Preamble Section III.B. As explained there, we reject EMA's suggestion that EPA does not have authority to set durability or warranty requirements because ZEV batteries are not emission-related for several reasons. First, EMA argues that because ZEVs do not themselves emit, they and their powertrain components are "not within the scope of any specific emission standards," and therefore they cannot be subject to "emissions-related" durability and warranty requirements. But EPA does have the authority to set standards for ZEVs as they are part of the "class" of regulated vehicles. Congress authorized EPA to regulate *classes* of vehicles, and EPA has concluded that emission of air pollutants from the *class* of heavy-duty vehicles as a whole causes, or contributes to, air pollution emissions which endangers public health and welfare. See Preamble Section I.C and RTC Section 10.2.1.f. Thus, the class of new motor vehicles for which EPA must establish emission standards are those whose emissions contribute to endangerment, CAA section 202(a)(1), namely "Passenger cars, light-duty trucks, motorcycles, buses, and medium and heavy-duty trucks."[809] The *class* of heavy-duty vehicles includes heavy-duty electric vehicles.

In addition, all vehicles, including ZEVs, are subject to an applicable Family Emission Limit (FEL) throughout their useful life to demonstrate compliance with EPA's GHG emissions standards.[810] EMA is thus incorrect in suggesting that useful life, warranty, and durability standards are unimplementable for ZEV powertrains and components. EPA accounts for durability at certification by requiring, as part of the compliance demonstration for meeting GHG emission standards, a demonstration that emission controls will not deteriorate during useful life, a battery in a hybrid electric vehicle being the given example. 40 CFR 1037.241(c); see generally RTC section 10.2.1.d . Durability of a BEV battery is covered by this same provision and principle Vehicle manufacturers also warrant at the time of sale that each new vehicle is designed to comply with all applicable emission standards and will be free from defects that may cause noncompliance. CAA section 207. Thus, under 40 CFR 1037.120, manufacturers must warrant to the ultimate purchaser, and to subsequent purchasers, that the vehicle is "designed, built, and equipped" to conform at time of sale with all applicable standards, and is free of defects that will cause it to fail to conform in use during the applicable warranty period. 40 CFR section 1037.120(a)(1) and (2). Components covered by the warranty include all emission-related components included in the manufacturer's application for a certificate of conformity, which are keyed to the FEL assigned to those vehicles. These provisions comport entirely with section 207 of the Act and are readily determinable at time of sale by reference to the certified FEL limit. See generally Preamble Section III.B and RTC 10.2.1.d.3.

EMA argues secondly that a component only counts as emission-related if its failure would allow the vehicle to continue operating, but with higher emissions. But nothing in the statute imposes such a limitation. Moreover, while it is true that the failure of a battery would cause the vehicle to stop operating, the same is true for some other vehicle components that have also historically been subject to durability requirements. For instance, EPA has set durability requirements for diesel engines (see 40 CFR 86.1823-08(c)), failure of which could cause the vehicle to stop operating. Similarly, Congress explicitly provided that electronic control modules (ECMs) (described in the statute as "electronic emissions control units") are "specified major emissions control component[s]" for warranty purposes per section 207(i)(2); failure of ECMs can also cause the vehicle to stop operating, and not necessarily increase the emissions of the vehicle.

EMA is similarly incorrect in asserting that by applying durability and warranty requirements to vehicular components which do not emit, EPA is engaging impermissibly in a type of consumer protection. In fact, such provisions are routine. The Phase 2 rule, for example, includes "emission-related warranty requirements" for a series of ICE vehicle components which themselves do not emit but whose performance is necessary to assure that a vehicle complies with the standards throughout its useful life, among them vehicle speed limiters, tire pressure monitoring systems, idle-reduction systems, aerodynamic components, and hybrid system

[809] 74 FR 66496, 66537 (Dec. 15, 2009).
[810] See Preamble section I.C and Response to Comments Section 10.2.1 for further description of EPA's authority to set standards under section 202(a) using an averaging form, and to include ZEVs and PHEVs within a fleet average-based standard. For a more detailed description of the ABT process for HDVs, see section III.A above and section 10.2.1.d of the Response to Comments. EPA replies to the commenter's assertions regarding authority to establish standards for a vehicle's useful life as part of that same response to comments as well as in Preamble section III.B. .

components. 40 CFR section 1037.120(c). ZEV powertrains and components are exactly comparable: they are, in the words of the regulation, all “emission-related components,” id., and in the words of the statute, “devices to prevent or control pollution.” CAA section 202(a)(1).

EPA's authority to set and enforce durability requirements for emission-related components like batteries is an integral part of its title II authority. Durability requirements ensure that vehicle manufacturers and the vehicles they produce will continue to comply with emissions standards set under 202(a) over the course of those vehicles' useful lives. EPA has separate authority to set warranty requirements for batteries in ZEVs and PHEVs. CAA section 207(a)(1). Providing a warranty for emission-related components like batteries precisely accomplishes the Congressional purpose of assuring purchasers that vehicles will conform to applicable emission standards at time of sale and in use. For standards to be meaningfully applicable across a vehicle’s useful life, EPA’s assessment of compliance with such standards necessarily includes an evaluation of the performance of the emissions control systems, which for BEVs, FCEVs, and PHEVs includes the battery system both when the vehicle is new and across its useful life. This is particularly true given the averaging form of standards that EPA uses for GHG emissions (and which EMA continues to support), and with which most manufacturers choose for demonstrating compliance. For EPA to determine the level at which to set fleet average standards, the Agency needs to have confidence that the emissions reductions—and thus credits generated —by each ZEV and PHEV introduced into the fleet are reflective of the real world. This is particularly important because one of the elements of the credit generating formula is useful life of the vehicle in miles travelled. See 40 CFR 1037.705(a). Although the standards exist independently from durability, ensuring that ZEVs contain durable batteries is thus linked to the integrity of the averaging process: assuring that vehicles will perform in fact for the useful life mileage reflected in any credits they may generate. Put another way, durable batteries are a factor ensuring the real-world performance of the averaging form of the standard: that the standard is met per vehicle, and on average, per fleet throughout the vehicles’ useful life. The battery warranty provisions finalized in this rulemaking in turn allow for confidence that the batteries installed by vehicle manufacturers are durable and thus support the standard.

See Section III.B of the preamble for a complete response.

Responses to Remaining Comments

We do not agree with CARB’s comment that EPA should adopt an entire system monitoring requirement as Part of the Phase 3 rule (and CARB appears to advocate that such a program commence in the initial model year of the program as well). We didn’t propose such a requirement, and such a requirement would merit full public process including an opportunity for comment. In addition, CARB didn’t provide sufficient detail on what an “entire system monitoring requirement” would be, so we lack the necessary detail to finalize an entire system monitoring requirement at this time. Regarding the comment from CARB that SAE J1798 should be required for determining usable battery energy (UBE), we don’t agree. See Preamble Section III.B for details on why we are finalizing as proposed that manufacturers will seek approval for the procedure to determine UBE, and the criteria manufacturers would have to consider in making that determination. In addition, we disagree that now is the right time to finalize a subfamily definition, as we are still learning what parameters are important for dividing ZEV families. For example, we have not determined whether a ZEV family be divided into subfamilies if the ZEV family includes multiple battery families, or whether ZEV only be divided into subfamilies if the ZEV family includes multiple battery chemistries. We believe that these decisions are best made once there is more real-world data on these ZEV.

We disagree with the comment from Clean Air Task Force that the durability monitoring requirement should start with MY 2027, as this would only provide manufacturers a few years to develop and get approval for the test procedure to determine UBE. The final rule provides necessary lead time, with this requirement commencing in MY 2030.

We disagree with the comment from Cummins that the Phase 3 rule should include a standard test procedure for determining UBE. As discussed in Section III.B of the preamble, the final rule instead provides for individual approvals of UBE test procedures, based on criteria set in the regulations.

We agree with the comments that now is not the right time to finalize durability standards for ZEV. As we discussed in Section III.B of the preamble, we are instead finalizing durability monitoring requirements for ZEV. We also agree with DTNA's comment that all the durability monitoring requirements should be included in 40 CFR 1037 and, consistent with DTNA's comment that confusion might result from incorporating GTR No. 22 by reference without further specification as to what parts apply, have not included a reference to GTR No. 22 for any of the durability monitoring requirements. DTNA requested clarification or definitions as to which components would be included in a test procedure, but this comment is moot since, as noted, the final rule provides for individual applications for test procedures to determine UBE. Determination of which components are included consequently will be determined case-by-case as part of that application process.

Regarding the comments from DTNA, Fermata, and MECA that the durability requirements should consider impacts on the use of V2X or the use of PTO, we are finalizing a durability *monitoring* requirement, without setting minimum performance requirement of maintaining a certain SOCE value for a defined period of time. Because of this, the finalized requirements do not directly impact V2X or PTO considerations. If the use of V2X or PTO had significant impacts on the durability of the battery, the monitor should detect those impacts. The finalized requirements leave it to the user to decide how to respond. However, in a future action, EPA may decide to set minimum performance requirements for SOCE and if so, EPA may consider how the use of V2X and PTO will impact the durability of the battery.

Regarding EMA's comment on the implementation date of the durability monitoring requirements, we have clarified that the requirements start with MY 2030, as consistently stated throughout this rule and in the regulatory text.

Regarding the comments on the proposed revisions to 40 CFR 1037.115(f), we have considered them along with the other comments on this section in the text of the final regulation. As noted above, we agree that the rule text should contain all the requirements instead of incorporating by reference the requirements in GTR No. 22. We agree with the comments that the SOCR monitor and the Minimum Performance Requirements should not be required at this time. As discussed further in the Section III.B of the preamble, we are however finalizing accuracy requirements for the SOCE monitor.

Regarding MECA's comments on finalizing requirements for battery labeling, we disagree that this is the right time to do so. We believe that requirements like this would be better considered when there are more HD ZEV in the market to make an informed decision on what labeling information would be needed, such that we don't add requirements that result in unnecessary barriers to the development of the technology.

11.2 Warranty

Comments by Organizations

Organization: Allergy & Asthma Network et al.

We also continue to urge EPA to reflect the full useful life of heavy-duty vehicles in their testing and warranty requirements. Warranty provisions must match the full useful life of the vehicle, and we encourage EPA to consider this as one million miles. [EPA-HQ-OAR-2022-0985-1532-A1, p. 4]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

Clear guidance on repackaging, certification, standardization, and warranty liability of spent EV batteries would be needed to overcome safety and regulatory challenges reuse poses at scale.109 [EPA-HQ-OAR-2022-0985-1659-A2, p. 29]

109 IEA Report 2022.

Organization: American Thoracic Society (ATS)

ATS encourages EPA to ensure required reductions are achieved in the real world. Reductions in vehicle tailpipe emissions has largely been a success story, with the automobile industry ushering in significant technology advances to reduce overall emissions. Unfortunately, we have seen many cases of car and heavy-duty truck companies trying to 'beat' emissions standards through deceit and evasion rather than 'meeting' standards through innovation. The ATS encourages EPA to ensure that it has appropriate post purchase surveillance capacity to ensure promised emissions reductions are achieved in real world use. [EPA-HQ-OAR-2022-0985-1517-A1, p. 4]

ATS recommends that EPA requires heavy-duty manufacturers to warranty the functionality of vehicle tailpipe GHG and criteria pollutant control technology through the expected useful lifetime of the heavy-duty vehicle. Allowing industry to warranty emissions control systems for a short time will likely encourage cheating and likely prevent achieving the anticipated emissions reductions. [EPA-HQ-OAR-2022-0985-1517-A1, p. 4]

Organization: California Air Resources Board (CARB)

2. Warranty Requirements

a. BEV and FCEV Component Warranty

Affected Page: 26016

The NPRM is proposing that manufacturers identify HD BEV and FCEV batteries and associated electric powertrain components as components covered under the emission-related warranty in the vehicle's application for certification. These components would be covered under the existing regulations' emissions warranty periods of five years or 50,000 miles (whichever is greater) for light HDVs or five years or 100,000 miles (whichever is greater) for medium HDVs and heavy HDVs. [EPA-HQ-OAR-2022-0985-1591-A1, p.56]

CARB staff recommends that U.S. EPA consider providing additional guidance for manufacturers to determine which components would be covered under warranty, how failures would be defined, and what types of failures would be covered under warranty. Without further guidance, manufacturers may not properly identify all components that should be covered under warranty. Perhaps certain components and systems (inverters, motors, thermal management systems, etc.) can be required to be included as parts identified to be covered under warranty for all vehicles. This would give potential purchasers confidence that common major components would be covered under warranty. [EPA-HQ-OAR-2022-0985-1591-A1, p.56]

Additionally, providing specific parameters for when the failure of a battery or other component used with HD BEVs or FCEVs should be covered under warranty would be valuable for potential purchasers. For example, the battery warranty does not specify what amount of deterioration would be considered a failure that would be covered under warranty. This could lead to manufacturers having different levels of what they consider a failure causing confusion and uncertainty amongst potential purchasers. [EPA-HQ-OAR-2022-0985-1591-A1, p.56]

Not having certainty of the level of deterioration that would be covered could be problematic for potential purchasers as battery repairs/replacements would be very costly. Also, if a battery deteriorates too much, it could render a vehicle useless as it may no longer be able to perform the tasks that it was designed for due to the limited amount of usable energy it could store. If the warranty specifically stated how much the state of health of a battery could deteriorate over the warranty period, and there were clearer guidelines that could better inform potential purchasers about what types of failures would be covered under warranty, it could lead to increased consumer confidence and support for HD ZEV adoption. [EPA-HQ-OAR-2022-0985-1591-A1, p.57]

Organization: Clean Air Task Force et al.

V. EPA Should Adopt the Proposed Warranty and Durability Requirements.

B. EPA should adopt the proposed warranty requirements.

We support the proposed warranty provisions, which fall well within EPA's authority under the Clean Air Act. Section 207 provides that manufacturers of motor vehicles must warrant that the vehicle is "free from defects in materials and workmanship which cause such vehicle . . . to fail to conform with applicable regulations" for the warranty period specified by EPA through regulation. 42 U.S.C. § 7541(a)(1). Using this authority, EPA has historically required manufacturers to provide warranties for a broad array of "emission-related" vehicle components, including tires, tire pressure monitoring systems, speed limiters, and aerodynamic performance devices, 40 C.F.R. § 1037.120(c), all of which play a role in reducing vehicle emissions. BEV and FCEV batteries, fuel-cell stacks, electric motors, and inverters are no different—they are "emission-related" components because they enable the elimination of tailpipe emissions from motor vehicles. We agree with EPA's rationale for applying warranty requirements to BEV and FCEV batteries and associated emission-related electric powertrain components, 88 Fed. Reg. at

26016-17, and we urge EPA to finalize this aspect of the proposal. [EPA-HQ-OAR-2022-0985-1640-A1, p. 82]

Organization: Daimler Truck North America LLC (DTNA)

While DTNA recognizes the benefit of an emissions warranty for conventional vehicles, these benefits are not the same for ZEVs. Emissions-related warranties for conventional vehicles help ensure that customers are motivated to repair failures of emissions control equipment throughout the vehicle's life. Since a manufacturer must account for potential warranty outlays and pass that cost to the customer at the time of initial purchase, customers have 'already paid for' the eventual repairs to their emissions control systems and do not face a substantial disbenefit (the added cost of the repair) when considering whether or not to repair the system. If the customer elects not to repair emissions control equipment that is under warranty, the vehicle continues to operate while potentially emitting higher levels of controlled pollutants. [EPA-HQ-OAR-2022-0985-1555-A1, p. 66]

The same logic does not apply for ZEVs, as they do not have failure modes that can cause increased emission levels of controlled pollutants. The only failures that EPA aims to warrant against for a ZEV are failures that have direct operational impacts on the customer, which is motivation enough to drive a repair. DTNA believes that ZEV warranty coverage and length should be an area of competition between OEMs, where manufacturers seek to best optimize for their customers' demands and thereby drive the highest ZEV penetration rates possible. [EPA-HQ-OAR-2022-0985-1555-A1, p. 66]

DTNA supports well-informed and carefully crafted regulations, which can serve as a check to make sure that all manufacturers entering the commercial ZEV market provide a baseline level of assurance for product durability, protecting against market distortion by manufacturers offering low-cost, low-quality products that they will not stand behind. However, overly onerous product requirements can serve to increase product cost, drive additional manufacturer burden, and reduce the number of choices manufacturers are able to provide to customers, thereby slowing ZEV adoption rates and undermining EPA's aims in this rulemaking. [EPA-HQ-OAR-2022-0985-1555-A1, p. 67]

EPA's proposed ZEV warranty requirement and the current useful life mileages, which are based on the existing GHG Phase 2 values, represent an adequate compromise such that manufacturers will not be required to offer costly warranties that customers may not want. [EPA-HQ-OAR-2022-0985-1555-A1, p. 69]

EPA should make a number of clarifications to its warranty proposal regarding covered components and failures.

EPA proposes to require manufacturers to identify BEV and FCEV batteries and 'associated electric powertrain components' in their certification applications as components covered under the existing emission-related warranty.141 To eliminate any confusion over this requirement, EPA should specify the 'associated components' that must be covered by warranty. While it is clear in the Proposed Rule that high-voltage battery and fuel cell stacks must be covered, the ambiguous phrase 'associated electric powertrain components' used in the preamble and the proposed use of the phrase 'other components' in 40 CFR 1037.120(c) could include any combination of components, from motors and inverters to power distribution modules, cabling, control surfaces, cooling systems, and more. To increase regulatory certainty, and to ensure that manufacturers are on a level playing field with respect to warranty costs, EPA should revise 40 CFR 1037.120(c) to specify which ZEV components are covered by the emission-related warranty. DTNA recommends that EPA clarify that only the high-voltage battery or fuel-cell stack should be covered by the emissions warranty. Alternately, EPA could consider the list of components defined by CARB's definition of 'Zero Emissions Powertrain.' [EPA-HQ-OAR-2022-0985-1555-A1, p. 71]

141 Proposed Rule, 88 Fed. Reg. at 26,016.

EPA should also clarify its warranty requirement to specify that a covered failure is one that results in a complete lack of motive capability. Mere degradation of the battery and/or associated ZEV powertrain components, which could result in a reduction of range but not a complete lack of motive capability, should not be considered a warrantable failure under the emission-related warranty requirements. ZEV range degradation does not impact the vehicle's emissions of CO2 or other criteria pollutants. It would be impossible for EPA to determine an adequate reduction in range that could be described as a failure in all circumstances, and that could not rightly be described as a properly operating vehicle in other contexts. For example, if an OEM were to sell one configuration with an estimated range of 250 miles, which, over its life, experienced degradation that reduced its nominal range to 125 miles, this could be described as a 'failure' in some contexts. However, that same OEM would be able to sell a similar vehicle with a smaller vehicle which started life with a nominal range of 125 miles. That vehicle would not be considered 'failed' at the start of its life, and in fact, both vehicles would qualify for the same amount of CO2 credit under EPA's rules—since they both emit zero CO2 over their useful lives. Such comparisons illustrate why EPA should clarify that an emissions-related warranty only covers component failures that result in a complete lack of motive capability. Manufacturers are free to warrant the range of the vehicle over a period of time as the market demands and the technology supports. [EPA-HQ-OAR-2022-0985-1555-A1, p. 71]

Lastly, DTNA disagrees with EPA's proposed revision to 40 C.F.R. 1037.120(c) to remove the sentence stating that the emission-related warranty does not need to cover components whose failure would not increase a vehicle's emissions of any regulated pollutant. This could be read to extend the emissions-related warranty for ZEVs to include components that have no effect on GHG emissions, including aerodynamics, tires, and other components. While it is true that such a component, if failed, may slightly reduce the range of the ZEV, such failure would not increase vehicle emissions, and a vehicle without such failures, but even shorter range, could be sold as new and generate the same amount of CO2 credit. Additionally, EPA adds 'to the extent such emission-related components are included in your application for certification.' It is not clear why a manufacturer would include these components in its application for certification; these components are not required to be included specifically, and a manufacturer gains no emissions credit by including them as emissions-reduction technology. A ZEV with no aerodynamic fairings is still a ZEV and generates the same amount of CO2 credit as a vehicle with significant aerodynamic technology. By potentially requiring these components to be covered by emission-control warranty, EPA disincentivizes their use, and treats some ZEVs as 'better' than others using inconsistent logic. [EPA-HQ-OAR-2022-0985-1555-A1, p. 72]

To refine its warranty proposal, DTNA recommends that EPA (1) specifically enumerate the ZEV components that must be covered by warranty and (2) clarify that only failures resulting in a complete lack of operation of the vehicle must be covered by the emission control warranty. [EPA-HQ-OAR-2022-0985-1555-A1, p. 72]

Organization: Dana Incorporated

Vehicle Basic and ePowertrain Warranty

EPA is proposing that manufacturers identify ePowertrain components as components covered under their vehicles' emissions-related warranty. Warranty requirements in the heavy-vehicle class 6 through 8 segments are wide-ranging, complex, and highly dependent on vehicle application. In addition to vehicle basic warranties, it is common for component providers to offer additional coverage on engines, motors, invertors, e-axles, and drive axles. The variation and complexity in the vehicle duty-cycle merits a tailored warranty plan. Given this dynamic, EPA should consider ePowertrain warranties for BEVs for linehaul applications that extend to a 5-year duration and should be valid for minimum of 300,000 miles. For class 6, 7 and 8 vocational (or non-linehaul applications), the ePowertrain warranty term should be reduced to 3 years / 100,000 miles to better represent the warranties currently applied in the heavy-vehicle segment. [EPA-HQ-OAR-2022-0985-1610-A1, p. 3]

Organization: Fermata Energy

Final battery warranty requirements should include a thorough understanding of the impact on V2G in heavy duty vehicles so as to not discourage V2G. [EPA-HQ-OAR-2022-0985-1662-A2, p.6]

EPA is proposing a battery warranty of 5 years or 50,000 miles for Light HDV and 5 years or 100,000 miles for Medium HDV and Heavy HDV. However, we do not see any consideration of frequent use of V2G in this proposal. V2G technology is emerging in heavy-duty vehicles, such as school buses and other use cases such as fleets with only an eight-hour work day and sixteen hours to be connected to a charger. The concern is that overly restrictive warranty or durability requirements by EPA could place arbitrary restrictions on V2X activities. Fermata Energy appreciates EPA's intent to ensure consumer protection and customer satisfaction with EV ownership through robust standards and to meet the useful life requirements in the Clean Air Act. However, overly stringent requirements that constrain battery cycling could also constrain the novel set of value propositions that V2X offers and that would otherwise spur EV adoption (e.g., home backup power, payment for grid services, etc.). Overly stringent battery durability requirements could drive OEMs to limit the range, performance, and/or state of charge of EV batteries, or take other measures to provide for sufficient degradation margin in later years. As such, Fermata Energy believes that EPA should consider an approach to durability requirements that balances competing factors and specifically consider the GHG benefits of V2G as a storage technology which unlocks and enables a faster, more cost-effective transition to renewable energy. [EPA-HQ-OAR-2022-0985-1662-A2, pp.6-7]

Organization: Manufacturers of Emission Controls Association (MECA)

Durability and Warranty Requirements

MECA believes that durability and warranty requirements instill confidence in the reliability of all technologies to fleet and truck owners. Therefore, based on their given weight class and application, diverse heavy-duty powertrains should be required to meet similar durability and warranty requirements. MECA recognizes that EPA's currently proposed warranty periods of 50,000 miles / 5 years for light-heavy-duty and 100,000 miles / 5 years for medium and heavy-heavy duty zero emissions vehicles reflect the low market penetration and lack of experience with this new technology. However, EPA should set a phase-in schedule to collect real-world data from electric trucks with the goal to align the durability, warranty and full useful life of the heavy-duty zero emission vehicles to more closely match the recently adopted durability and warranty requirements outlined under the EPA Heavy-Duty Engine and Vehicle Standards for MY 2027 and beyond which are shown in Table 1 below. [EPA-HQ-OAR-2022-0985-1521-A1, pp. 10 - 11.] [See Docket Number EPA-HQ-OAR-2022-0985-1521-A1, page 11 for Table 1.]

MECA believes that equivalent warranty periods and durability for zero emissions vehicles are essential to ensure confidence in the technology for truck and fleet owners as well as ensure longer term emissions reductions. [EPA-HQ-OAR-2022-0985-1521-A1, p. 11]

Organization: MEMA

Warranty Provisions Must Not Harm Aftermarket or Preclude Choice in Repair

MEMA urges the EPA to clarify that warranty repairs can be completed at dealer or authorized repair locations, at independent aftermarket repair locations, or at the fleet owner's own shops. The repair and maintenance of in-service vehicles is critical to ensuring that they operate as designed and continue to meet safety and emissions standards. A properly operating vehicle is critical for consumers who rely on light-duty passenger vehicles for daily transportation. This importance is increased when considering the regular repair, maintenance, and service of heavy-duty commercial vehicles. For these commercial vehicles, vehicle downtime costs the vehicle owner's business money, leads to shipment delays, and negatively impacts supply chains. In many locations throughout the country, the nearest dealer or authorized repair facility is, at best inconvenient or, at worst, hundreds of miles away. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 13 - 14]

MEMA urges EPA to clarify and specify the specific vehicle parts intended to be covered by the proposed warranty, namely the vehicle high-voltage battery and propulsion motors. Heavy-duty vehicles include thousands of individual parts and components. Many of these parts are regularly replaced because they experience wear over time. As currently written in the NPRM, the boundaries of which parts are covered by the warranty, and which are not covered are unclear. This uncertainty could lead to vehicle owner misunderstandings, unintended legal exposure for OEMs and technology providers, and significantly increased new vehicle costs that counter the goal of targeted market adoption. [EPA-HQ-OAR-2022-0985-1570-A1, p. 14]

Taken further, MEMA urges EPA to not require warranty coverage on parts that have a shorter life and are a routinely replaced due to wear, or are adjacent to the warrantied parts through physical, electrical, or software connections but not the targeted component; such as sensors, filters, monitoring systems, cooling systems, HVAC, braking systems, control systems, inverters, converters, charging systems, structural systems, other drivetrain components, electrical motors not part of the forward propulsion system, and filters. We urge EPA to work with industry stakeholders, including suppliers, to develop a list of wear and non-applicable parts and components with these criteria in mind. [EPA-HQ-OAR-2022-0985-1570-A1, p. 14]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Battery warranty

EPA's proposal includes battery durability monitoring requirements applicable to heavy-duty battery electric vehicles. The proposal, however, appears to lack similar provisions applicable to heavy-duty FCEVs. We encourage EPA to establish warranty provisions for heavy-duty FCEVs. [EPA-HQ-OAR-2022-0985-1562-A1, p. 14]

Organization: ROUSH CleanTech

We are concerned with the proposed revision to 40CFR1037.120(c) ("The emission-related warranty also covers other added emission-related components to the extent they are included in your application for certification, and any other components whose failure would increase a vehicle's CO2 emissions.") We believe the "any other components" language is needlessly broad, and would likely incorporate non-emissions components such as wheel bearings, parking brakes, brake pads, etc. into the GHG warranty because they have failure modes that can cause drag. We hope this was not the intent of the authors, but if so then we suggest that this concept should receive significantly more review and discussion in industry. Moreover, we believe that the proposed "any other component" clause will result in a warranty increase that is meant only for ICE vehicles, since the same failing component on a BEV/FCEV does not increase CO2 emissions under EPA's definition, even though it would unquestionably result in a reduction in vehicle efficiency and harm the environment. We recommend that EPA remove the bolded portion from the proposed rule, since that is more elegant than somehow incorporating regulations that consider the CO2 emissions associated with energy production. [EPA-HQ-OAR-2022-0985-1655-A1, p.4]

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

Regarding battery warranties and battery durability, we are concerned that bi-directional charging was not considered and request a more reasonable proposal in the final rule that assumes frequent bi-directional charging and does not unintentionally discourage vehicle-to-grid technology. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

5) Regarding battery warranties, we are concerned that bi-directional charging was not considered and request a more reasonable proposal in the final rule that assumes frequent bidirectional charging. As described in our recommendation 2 above, vehicle-to-grid and vehicle to building provide substantial benefits to society and to consumers. Therefore, EPA in its final rulemaking should carefully avoid unintentionally discouraging the development of this market with warranty requirements for PHEVs (and BEVs) that are too stringent. We understand that there are many factors to consider including consumer protection, useful life requirements in the Clean Air Act, but the benefits to consumers, utility ratepayers and the environmental benefits of V2G and vehicle to building should also be considered. Regarding battery durability, we appreciate that EPA proposes only monitoring requirements and request EPA, in developing any durability requirements, to thoughtfully consider V2G and not discourage its development. [EPA-HQ-OAR-2022-0985-1647-A2, pp. 6 - 7]

Organization: Tesla, Inc. (Tesla)

Warranty Provisions Are Consistent with the Industry

Tesla supports the agency clarifying that the application of the existing warranty provisions found at 40 C.F.R. 1037.120 includes BEV components.193 Since deployment of the Semi, Tesla has provided warranties to purchasers that are consistent with (and even exceed) the proposed requirements. [EPA-HQ-OAR-2022-0985-1505-A1, p. 26]

193 88 Fed. Reg. at 26015-16.

Organization: Truck and Engine Manufacturers Association (EMA)

Emission-Related Warranty Requirements – Notwithstanding our comments above on EPA's lack of delegated authority under the CAA to adopt the proposed emission-related warranty requirements, we offer several provisional comments on those proposed provisions. [EPA-HQ-OAR-2022-0985-2668-A1, p. 56]

The NPRM includes a proposed revisions to 40 C.F.R. § 1037.120(c) to add the following bolded language to identify the components required to be covered under an emission-related warranty:

Components covered. The emission-related warranty covers … fuel cell stacks, and RESS [rechargeable energy storage system] and other components used with hybrid systems, battery electric vehicles, and fuel cell electric vehicles to the extent such emission-related components are included in your application for certification. See, 88 Fed. Reg. 26125 (emphasis added). [EPA-HQ-OAR-2022-0985-2668-A1, p. 56]

The NPRM does not provide any clear direction on what is included in the phrase "other components," or even if includes anything beyond fuel cell stacks, RESS (i.e., battery systems), and "emission-related components that are included in [the manufacturer's] application for certification." EPA should clarify that the emission-related warranty provisions only apply to RESS and fuel cell stacks, and possibly other components in the manufacturer's certification application. [EPA-HQ-OAR-2022-0985-2668-A1, p. 56]

Traditional emission-related warranty requirements serve the useful purpose of motivating a trucking company to keep the emissions control systems functioning properly throughout each vehicle's useful life. Since a failure of a traditional emissions-related component may not negatively affect the ability of a commercial vehicle to perform its intended function, the fleet owner may not otherwise be motivated to remedy the failure. In the commercial vehicle market, other warranties are negotiated between the buyer and seller, and each one represents the result of a calculated shifting of financial risk between upfront expenditures and ongoing maintenance costs. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 56 - 57]

Warranting the RESS and fuel cell stacks for the terms proposed in the NPRM may be appropriate while EPA and the industry gather data on how HDOH batteries and fuel calls age in the field. Adding other components to those warranties will only serve to add unnecessary upfront cost to the acquisition price of a ZEV, since manufacturers must add to the price of the vehicle the expected costs through the life of the warranty. Those additional warranty requirements also could interfere with the traditional negotiations between commercial vehicle buyers and the selling manufacturers and/or dealer, forcing higher upfront costs on trucking fleets that may be able to manage maintenance costs more efficiently. [EPA-HQ-OAR-2022-0985-2668-A1, p. 57]

In addition to clarifying that the proposed emission-related warranty provisions only apply to RESS and fuel cell stacks, EPA should clarify that the warranties only cover failures that result in a lack of motive capability. Mere degradation of the RESS or fuel cell, which may result in reduced range but not a complete lack of motive capability, should not be considered a warrantable failure. It would be impossible to determine an adequate reduction in range that could be a "failure" in all circumstances, especially considering the diversity of operations and vehicle configurations in the commercial vehicle industry. [EPA-HQ-OAR-2022-0985-2668-A1, p. 57]

Considering the broad variety of operations and vehicle configurations in the commercial vehicle industry, warranty periods in terms of miles and years may not capture all the RESS loads of an HDOH vehicle. Accordingly, we recommend that EPA add a third parameter for the warranty terms that accounts for total energy throughput. EPA should allow manufacturers to account for truck refrigeration units, sleeper-cab heating and air conditioning, power take-offs, and other auxiliary loads on the RESS. One way to account for those loads is by determining the "virtual distance" the vehicle travels, such as by using the following formula developed by the UNECE working group that is developing the amendments to GTR No. 22: [EPA-HQ-OAR-2022-0985-2668-A1, p. 57] [See the Formula on page 57 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Using the above formula, the warranty miles would be equal to the actual vehicle odometer miles plus the virtual distance. Using such a calculation would increase transparency to the customer, further enable auxiliary load technologies, and avoid requiring warranties that are not appropriate for how the vehicle operates. [EPA-HQ-OAR-2022-0985-2668-A1, p. 57]

Organization: Valero Energy Corporation

EPA goes on to explain that "typical battery warranties being offered by HD BEV manufacturers range between 8 and 15 years today. A BEV battery replacement may be practically necessary over the life of a vehicle if the battery deteriorates to a point where the vehicle range no longer meets the vehicle's operational needs. We believe that proper vehicle and battery maintenance and management can extend battery life."43 [EPA-HQ-OAR-2022-0985-1566-A2, p. 9]

43 DRIA at 185.

EPA cites no authority for the basis of this opinion, and fails to acknowledge that battery degradation is not necessarily a matter of improper maintenance and management – weather, vehicle use (duty cycles), charging behavior, battery chemistry, and even bi-directional charging are known to influence battery life.44 [EPA-HQ-OAR-2022-0985-1566-A2, p. 9]

44 Further, for purposes of EPA's analysis, it should not matter whether or not the battery or fuel cell stack replacement were to occur under warranty. Coverage under a warranty does not make the replacement free – it is still a cost that must be accounted for.

Organization: Volvo Group

We do not believe that EPA has the authority to mandate useful life and warranty requirements for zero-emission vehicles, since there is no situation in which the failure of any system on a ZEV would cause that ZEV to produce increased emissions. [EPA-HQ-OAR-2022-0985-1606-A1, p. 3]

Organization: Zero Emission Transportation Association (ZETA)

ZETA's member companies stand by the durability of their products and many of them have their own warranties. While we support EPA's proposed warranty requirements, we note that designating the electric battery and powertrain as "emissions control equipment" under the Clean Air Act could subject these components to additional regulatory requirements and rules. Specifically, we are concerned about the uncertainty in how EPA's anti-tampering rules may apply to these components and request EPA clarification on how enforcement would be applied. [EPA-HQ-OAR-2022-0985-2429-A1, p. 16]

EPA Summary and Response:

Summary:

ATS recommends that EPA finalize warranty requirements through the useful life of the vehicle to ensure emission reduction in the real world and discourage cheating.

CARB commented that EPA should provide additional guidance on which components and what types of failures are covered under the warranty, and in addition how the failures would be defined. CARB commented that this should be done so that manufacturers properly identify all components and to give potential purchasers confidence that major components would be covered under warranty.

DTNA supports the proposed ZEV warranty requirements and commented that EPA's proposed ZEV warranty requirement represents an adequate compromise such that manufacturers will not be required to offer costly warranties that customers may not want. DTNA requests that EPA specify which ZEV components are covered by the emission-related warrant, and that EPA should clarify its warranty requirement to specify that a covered failure is one that results in a complete lack of motive capability. DTNA disagrees with EPA's proposed revision to 40 CFR 1037.120(c) to remove the sentence stating that the emission-related warranty does not need to cover components whose failure would not increase a vehicle's emissions of any regulated pollutant and adds 'to the extent such emission-related components are included in your application for certification.' This could be read to extend the emissions-related warranty for ZEVs to include components that have no effect on a ZEV's GHG emissions (zero, by definition), including aerodynamics, tires, and other components. DTNA recommends that EPA (1) specifically enumerate the ZEV components that must be covered by warranty and (2) clarify that only failures resulting in a complete lack of operation of the vehicle must be covered by the ZEV emission control warranty. DTNA commented that EPA should leave ZEV warranty to the market.

Dana commented that EPA should finalize longer warranty periods than proposed.

EMA commented that the NPRM includes a proposed revisions to 40 CFR 1037.120(c) to add the following language to identify the components required to be covered under an emission-related warranty: “Components covered. The emission-related warranty covers … fuel cell stacks, and RESS [rechargeable energy storage system] and other components used with hybrid systems, battery electric vehicles, and fuel cell electric vehicles to the extent such emission-related components are included in your application for certification.” EMA comments that EPA should clarify that the emission-related warranty provisions only apply to RESS and fuel cell stacks, and possibly other components in the manufacturer’s certification application. EMA comments that including RESS and fuel cell stacks for the terms proposed in the NPRM may be appropriate while EPA and the industry gather data on how HDOH batteries and fuel calls age in the field, but adding other components to those warranties will only serve to add unnecessary upfront cost to the acquisition price of a ZEV.

EMA comments that EPA should clarify that the warranties only cover failures that result in a lack of motive capability and not a reduction in range as it would be impossible to determine an adequate reduction in range that could be considered a failure.

EMA recommends that EPA add a third parameter for the warranty terms that accounts for total energy throughput. EPA should allow manufacturers to account for truck refrigeration units, sleeper-cab heating and air conditioning, power take-offs, and other auxiliary loads on the RESS. This could be done by determining the “virtual distance” the vehicle travels, such as by using a formula developed by the UNECE working group that is developing the amendments to GTR No. 22: [See the Formula on page 57 of docket number EPA-HQ-OAR-2022-0985-2668-A1.] Using this formula, the warranty miles would be equal to the actual vehicle odometer miles plus the virtual distance.

EMA and Volvo commented that EPA doesn’t have the authority to require emissions warranty for ZEV. Fermata Energy and Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition commented that EPA should finalize warranty periods that consider V2G and V2X.

MEMA commented that EPA specify which vehicle parts are covered by the warranty. MEMA urges EPA to not require warranty coverage on parts that have a shorter life and are a routinely replaced. MEMA commented that EPA should clarify that warranty repairs can be completed by authorized repair locations, at independent aftermarket repair locations, or at the fleet owner’s own shops.

MECA commented that EPA should phase in Warranty requirements for ZEV with the goal to align with the MY 2027 and later warranty requirements finalized in the EPA Heavy-Duty Engine and Vehicle Standards rule.

NESCAUM and OTC commented that EPA should establish warranty provisions for FCEVs.

ROUSH CleanTech is concerned with the proposed revision to 40 CFR 1037.120(c) They believe the “any other components” language is needlessly broad, and would likely incorporate non-emissions components such as wheel bearings, parking brakes, brake pads, etc., into the GHG warranty because they have failure modes that can cause drag. They recommend that EPA remove the portion of the text that incorporates regulation that consider the CO2 emissions associated with energy production.

Valero Energy commented replacement of the battery and/or fuel must be accounted for even if they are covered by warranty.

ZETA support proposed warranty requirement but is concerned about the uncertainty in how EPA's anti-tampering rules may apply to these components and request EPA clarification on how enforcement would be applied.

Response:

In response to the comments on the length of the warranty requirements, as discussed in Section III.B of the preamble, we believe that aligning the warranty requirements for ZEV with the existing warranty requirements in 40 CFR 1037 for conventional vehicles is an appropriate suggestion which we are adopting.

Regarding the comments from CARB, DTNA, EMA, and MEMA on which components and what failures are subject to the warranty requirements, see our response in Section III.B of the preamble.

Regarding the comment from EMA on adding a total energy throughput term, we are not finalizing this since we are not defining a specific percentage of new UBE that must be maintained during the warranty period.

Regarding the comments from EMA and Volvo on EPA lacking the authority to set warranty requirements for ZEV, see our response in Section 11.1 of the response to comments document and in Section III.B of the preamble.

In response to Fermata Energy and Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition comment that EPA should finalize warranty periods that consider V2G and V2X, we are not finalizing requirements that are defining a specific percentage of new UBE that must be maintained during the warranty period. Due to this and since the final warranty periods are consistent with warranties already being provided by ZEV manufacturers, there are not any specific changes to the warranty requirements due to considerations of V2G or V2X.

In regard to MEMA's comment that EPA should clarify that warranty repairs can be completed by authorized repair locations, at independent aftermarket repair locations, or at the fleet owner's own shops, MEMA's concern is addressed in existing 40 CFR 1037.125(f).

In response to NESCAUM and OTC comments that EPA should establish warranty provisions for FCEVs, the final requirements apply to all ZEV including FCEV. See Section III.B of the preamble on what FCEV components are subject to the warranty requirements.

Roush's comment regarding the scope of the "any other components" clause in proposed (and now final) section 1037.120(c) is fully addressed in the Section III.C of the preamble. Regarding Valero Energy's comment in accounting for the replacement of the battery and/or fuel, our analysis shows that the battery and fuel cell can be designed to last at 10 years and for the vehicles where we determined a battery replacement may be needed, we have accounted for the costs in the BCA. See RIA Chapter 2.4.1.1.4, RIA Chapter 3.4.6.5, and RTC Section 3.8.3.

In response to ZETA's comment on clarifying the implications of designating the electric battery and powertrain as "emissions control equipment," and how anti-tampering requirements would apply, more information is needed to provide a complete response. The anti-tampering requirements are generally in place to prevent modifications to engines and vehicles that would increase emissions. ZEV have zero tailpipe emissions, so unless the changes to the ZEV decrease the operational life of the vehicle, the emissions of the vehicle wouldn't go up. With this said, more information/specifics are needed to respond to this comment.

12 Program Costs

12.1 Vehicle costs

Comments by Organizations

Organization: Clean Fuels Development Coalition et al.

And, as will be discussed later in this comment, the proposal's listed costs grossly underestimate the rule's true costs. The proper metric is aggregate cost because the major-questions doctrine asks about the rule's significance to the "national economy." West Virginia v. EPA, 142 S. Ct. at 2609 (2022). These aggregate costs include: [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

Direct compliance costs: Not only the increased vehicle costs, but also the costs to build out factories, and the cross-subsidies from every diesel truck purchaser to every battery electric truck purchaser in the country. [EPA-HQ-OAR-2022-0985-1585-A1, p. 5]

EPA Summary and Response:

Summary:
The Clean Fuels Development Coalition commented that we are underestimating costs of the rule in that we are only accounting for direct compliance costs.

Response:
In our analysis, for compliance costs we accounted for both direct and indirect costs for manufacturers (the regulated entities under the final rule's Phase 3 standards). Indirect manufacturing costs accounts for costs associated with producing the unit of output that are not direct manufacturing costs such as research and development (R&D), warranty, corporate operations (such as salaries, pensions, health care costs, dealer support, and marketing) and profits. This methodology is meant to address all compliance costs associated. See RIA Chapters 3.2.1 (direct costs for manufacturers) and 3.2.2 (indirect costs to manufacturers). As detailed in Sections II and IV of the preamble and Chapters 2 and 3 of the RIA, in addition to compliance costs for manufacturers, our cost analyses also appropriately assessed purchaser costs and social costs of the final rule. See, for example, RIA Chapters 3.4 (purchaser costs) and 3.5 (social costs). See also RTC Sections 2 and 3 for responses to comments on major questions doctrine and additional responses on costs.

12.2 RPE

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Second, EPA's estimates of indirect costs are further flawed. They are calculated by multiplying the direct costs (already defective for the reasons stated) by so-called "retail price equivalent" ("RPE") multipliers. Draft RIA at 279. The multipliers EPA uses that are substantially out of date and inappropriate for complex electric vehicles. EPA's multipliers are derived from a 2010 report relying on 2008 data that did not even involve electric vehicles. See id. at 279 n.8 (citing Alex Rogozhin et al., Heavy Duty Truck Retail Price Equivalent and Indirect Cost Multipliers, Draft Report, RTI Int'l, at 3-2, 5-1 (July 2010) ("Heavy Duty Truck RPE")). The report's most aggressive technological scenario accounted for only "hybrid-electric powertrains." Heavy Duty Truck RPE at 5-1. And EPA did not even apply the multipliers associated with that scenario—it instead applied the multipliers from the "industry average" scenario, id. at 3-9; see Draft RIA at 279, resulting in a significant underestimate of indirect costs. [EPA-HQ-OAR-2022-0985-1660-A1, p. 54]

Organization: Daimler Truck North America LLC (DTNA)

Based upon currently available data, it appears that EPA significantly under-projects the incremental cost of ZEVs due to a stack-up of discrepancies in direct manufacturing costs and indirect manufacturing costs. For example, EPA's derived Retail Price Equivalent Factors derived from SEC filings60 may not accurately capture manufacturers' indirect Research and Development (R&D) expenditures, which will be required for ongoing ZEV product development. Never before have manufacturers invested in so many propulsion technologies simultaneously, including new diesel technologies for CARB24 and EPA27 NOx standards, BEVs, FCEVs, and hydrogen combustion technologies. In the HD TRUCS model, EPA projects battery density and fuel cell efficiency to increase throughout the Phase 3 program, indicative of additional R&D investments. EPA is also projecting increased customer adoption by MY 2032, citing technology improvements. However, DTNA is observing slow uptake of these products and increased uncertainty in macroeconomic conditions that may impact the trucking industry and recovery of R&D costs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 33]

60 See id. at 279.

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #74: We request data to inform RPE factors for the heavy-duty industry.

- DTNA Response: See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172] [Refer to section 2 of this comment summary]

<u>EPA Summary and Response:</u>

<u>Summary:</u>

Both AmFree and DTNA maintain that EPA's estimate of manufacturers' indirect costs, using Retail Price Equivalent (RPE) multipliers, are underestimated. AmFree maintains that the source of EPA's estimate is a 2010 study which is out-of-date in that it does not consider any indirect costs associated with fully electrified powertrains, and considers hybrid powertrains only. Further, AmFree claims that EPA did not even use the multipliers associated with that degree of electrification, and instead used an averaged multiplier. DTNA also maintains that EPA's multipliers reflect out of date information, in that companies are now engaged in "unprecedented" research and development (R&D) associated with different types of powertrains not reflected in the companies' SEC filings which form the basis for EPA's RPE estimate.

Response:

AmFree and DTNA commented on the retail price equivalent (RPE) markup factor used to estimate indirect costs. Both argued that the factor used by EPA was improperly low and based on dated information given that it was derived in an era when battery electric heavy-duty vehicles did not exist. AmFree further argued that EPA had failed to consider the most aggressive technology scenario considered in the RPE source study –hybridization – and instead considered only the "industry average" scenario. This latter argument suggests a misunderstanding or mischaracterization of the RPE source study. The study was meant to estimate indirect cost impacts of lower complexity versus higher complexity technologies, not necessarily higher technology. In other words, a battery electric powertrain may be higher technology, in that it is newer relative to internal combustion technologies to which it might be compared, but it may not necessarily be more complex. In fact, battery electric powertrains tend to have far fewer parts and could be considered less complex. But that approach, termed indirect cost multipliers (ICMs) to differentiate them from the RPE, is not even relevant in this situation because EPA is not using the ICM approach. Somewhat ironically, the RTI (2010) RPE source study (cited fully in DRIA p. 309 reference 8) argued that, in the short-term, a higher complexity technology, which AmFree argues electrification represents, would have ICM markups of 1.52, which is higher than the 1.42 RPE markup used in the NPRM, and long-term ICM markups of 1.31, lower than the NPRM's 1.42 RPE markup.

The real point of the RPE source study was that some elements of the RPE should not be considered as a rule's compliance costs for manufacturers . For example, part of the RPE is meant to reflect costs associated with running and maintaining production facilities. If EPA requires an emission reduction that results in widget 1 being replaced by widget 2 at a cost of $100 per widget but there is no impact on the cost of running and maintaining the production facility, why should those facility-related indirect costs change at all? Under the RPE approach, any direct cost incurred by an entity is assumed to share in the burden of covering indirect costs, and indirect costs simply scale in concert with direct costs. The intent behind the ICM markup approach developed by EPA was to more appropriately weigh a single technology (e.g., cooled exhaust gas recirculation), that might be added to an engine or vehicle, against another technology (e.g., direct injection) when determining compliance pathways. If one technology reasonably incurred lower indirect costs than another, it might represent a more attractive compliance pathway. However, the analysis behind the proposal and final rule does not weigh single technologies against one another and instead weighs entirely different powertrains against one another. Whichever powertrain is considered, it would be expected to carry its full weight in recovering costs which makes the RPE approach more appropriate. In the NPRM, we did not adopt the ICM approach and did not adopt the ICM's use of near-term vs. long-term indirect costs and have instead reasonably chosen to rely on RPE markups themselves. While it is true that the source study dates from 2010, we note that commenter did not submit information upon which to base any changes.

Regarding the accuracy of SEC filings capturing R&D expenditures, we assume that the commenter is speaking of recent expenditures relative to the expenditures at the time of the RPE report being completed. We maintain that it is appropriate to use an approach based on indirect costs historically scaling with direct costs, and we apply that through the RPE approach. This historical trend was discussed at length in the 2020 light-duty CAFE and GHG rulemaking (see 87 FR at 25770 to 25773 (May 2, 2022)). While it is perhaps true that a higher percentage of R&D budgets are being directed toward BEV and FCEV development than toward ICE development, or that the electrification share of R&D expenditures are increasing as the ICE share decreases, we estimate that the R&D budgets of industry members are, on average, scaling with direct costs and revenues in a manner consistent with historical trends. To assess this estimate, we looked at recent financial statements for Cummins, PACCAR and Tesla, three of the prominent regulated entities subject to this rule and for which financial data is readily available (see table below). We looked at their income statements and found the ratios of R&D to total revenues (our proxy for direct plus indirect costs), the ratios of R&D to the cost of revenues, and the ratios of total revenues to cost of revenues to be very consistent for the past three years. While R&D is in fact increasing year-over-year, as argued by commenters, the ratio of R&D to revenues and cost of revenues is relatively constant. We acknowledge this is a simplifiedlook and includes only three companies; however, it is not meant to replace our 2010 RPE study. The point we are making with these data is simply that financials within companies tend to scale in relatively consistent ways. Absent better, more recent, or additional data from commenters, we conclude that our approach remains reasonable and we continue with this approach.

Income Statement data from Yahoo! Finance, accessed January 19, 2024

Income Statement	12 months ending	Cummins (stock symbol CMI)	PACCAR (stock symbol PCAR)	Tesla (stock symbol TSLA)
Total Revenues (thousands of dollars)	12/31/2022	28,074,000	28,819,800	81,462,000
	12/31/2021	24,021,000	23,522,300	53,823,000
	12/31/2020	19,811,000	18,728,500	31,536,000
Cost of Revenues (thousands of dollars)	12/31/2022	21,355,000	23,593,200	60,609,000
	12/31/2021	18,326,000	19,614,900	40,217,000
	12/31/2020	14,917,000	15,264,800	24,906,000
R&D (thousands of dollars)	12/31/2022	1,278,000	341,200	3,075,000
	12/31/2021	1,090,000	324,100	2,593,000
	12/31/2020	906,000	273,900	1,491,000
R&D to Total Revenues	12/31/2022	4.6%	1.2%	3.8%
	12/31/2021	4.5%	1.4%	4.8%

	12/31/2020	4.6%	1.5%	4.7%
R&D to Cost of Revenues	12/31/2022	6.0%	1.4%	5.1%
	12/31/2021	5.9%	1.7%	6.4%
	12/31/2020	6.1%	1.8%	6.0%
Total Revenues to Cost of Revenues	12/31/2022	1.31	1.22	1.34
	12/31/2021	1.31	1.20	1.34
	12/31/2020	1.33	1.23	1.27

12.3 Learning curve

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

e. EPA's Estimate Of The Cost Of Compliance Is Defective

EPA's estimate of the cost to manufacturers of complying with the proposed standards also has significant flaws. First, as to direct manufacturing costs, EPA applied a "learning curve" to the cost of manufacturing new electric vehicles that predicts that costs will dramatically decrease over time. Draft RIA at 277–78. And, in particular, it chose to apply a "steeper learning algorithm" for zero-emission technologies. Id. at 277. That algorithm assumes that by 2033, manufacturing costs will be about 75 percent of what they will be in 2027, and that by 2055, costs will be about 54 percent of the 2027 amount. Id. at 278. But EPA appears to have pulled the figures for this learning curve out of thin air—it nowhere identifies how they were calculated or why they are reasonable. Id. at 277–78. Given that this learning curve has a direct and significant effect on EPA's direct-costs calculation, as well as its indirect-costs estimate, any final rule must explain how it was generated and why it is appropriate under the circumstances.

Organization: Daimler Truck North America LLC (DTNA)

Learning Curve Reductions in Unit Production Costs

The learning curve that EPA factors into its unit production cost estimates may not be accurate for BEV or FCEV products. EPA states the learning curve represents a 'learning by doing' approach for manufacturers, including simplified machining and assembly operations, use of lower cost materials, and a reduction in the complexity and number of parts over time.59 DTNA agrees that production efficiencies typically improve over time, leading to some direct manufacturing cost savings, but BEVs and FCEVs already use fewer mechanical parts compared to conventional vehicles, and it is possible they will not experience as sharp of a learning curve. The HD ZEV market cannot take advantage of synergies with the passenger car market, due to the more extreme use cases and longer lifetimes of components required for HDVs. Further, a number of components will need to undergo additional refinement to achieve EPA's projected efficiencies and will not be able to take advantage of economies of scale. [EPA-HQ-OAR-2022-0985-1555-A1, p. 33]

59 See DRIA a 277.

Finally, a larger fraction of ZEV production costs come from raw materials as compared to conventional vehicle manufacturing, suggesting that production efficiencies over time are likely to lead to fewer cost reductions compared to the conventional vehicle space. Further, HD ZEV production costs will be impacted by raw material pricing, which is subject to significant market volatility, as DTNA experienced in 2022 due to a surge in lithium prices, which increased battery costs that were in turn passed on to consumers in the form of increased product prices. To account for these considerations, EPA should adjust the ZEV learning curve assumptions in the HD TRUCS tool as new data becomes available. [EPA-HQ-OAR-2022-0985-1555-A1, p. 33]

EPA Request for Comment, Request #20: We request comment on our approach, including other data we should consider in our assessment of energy consumption.

- DTNA Response: EPA should consider all available data including that which can be provided by manufacturers in confidential settings; however, given that the HD ZEV market is currently in a nascent state, any data available today is necessarily limited. EPA should thus re-evaluate its assumptions on this issue on a regular basis, using the best available data. See Section II.C.2 of DTNA's comments. [EPA-HQ-OAR-2022-0985-1555-A1, p. 161]

EPA Request for Comment, Request #73: We request comment on [EPA's] approach [to estimate the extent to which learning effects will reduce incremental costs of ZEV technologies], including methods for accounting for the projected future ICE costs.

- DTNA Response: [See DTNA Response to Request # 20, above. [EPA-HQ-OAR-2022-0985-1555-A1, p. 172] [Refer to section 2 of this comment summary]

Organization: Energy Innovation

D. Factors Affecting Learning Curves for HDV Electrification

We appreciate the EPA's attention to learning curves in the proposed rule, for they affect the rate of deployment of newer technologies, which leads to learning-by-doing advances in performance and production, and economies of scale, which lower the cost of production. Learning curves affect how quickly BEVs can outcompete ICE vehicles on purchase price, which is a primary factor in market adoption and consumer acceptance. From our research, we have identified the following factors that warrant further consideration by the EPA as it develops the final rule. Combined, these factors suggest faster learning curves compared to levels modeled:

7. Novel battery chemistries
8. Faster-than-expected moderation of pandemic-induced supply chain disruption
9. Battery pack economies of scale
10. Tendency of battery outlooks to underestimate future learning curves [EPA-HQ-OAR-2022-0985-1604-A1, pp. 12 - 13]

1. Novel battery chemistries

Novel battery chemistries nearing commercial availability will open new avenues for innovation, and their effects will not be limited to technological change. Novel battery chemistries will also have economic benefits by spreading EV battery demand across a greater array of raw inputs. More diverse mineral input supplies will disperse demand instead of concentrating it, reducing supply-side price pressure. New battery chemistries will also increase competition between battery technologies, reducing producer profit margins and improving consumer economics. [EPA-HQ-OAR-2022-0985-1604-A1, p. 13.] [See Figure 7, Demand for Colbalt, on page 13 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

Evidence of how new battery technologies can quickly disrupt markets has recently been provided by cobalt-free lithium-ion-phosphate batteries, growing to 40 percent of global battery market demand in the first half of 2023.22 BloombergNEF analysis finds that global demand for cobalt would be 52 percent higher if lithium-ionphosphate batteries had not grown as they have.23 [EPA-HQ-OAR-2022-0985-1604-A1, p. 13]

22 Heejin Kim, “Korea’s Battery Makers Embrace LFP Cells as China Strides Ahead,” Bloomberg, May 15, 2023, https://www.bloomberg.com/news/articles/2023-05-15/korea-s-battery-makers-embrace-lfp-cells-as-china-strides-ahead#xj4y7vzkg.

23 “Race to Net Zero: The Pressures of the Battery Boom in Five Charts” (BloombergNEF, July 21, 2022), https://about.bnef.com/blog/raceto-net-zero-the-pressures-of-the-battery-boom-in-five-charts/.

Two new battery chemistries entering commercial use this year in EV battery packs are sodium-ion batteries24 and lithium-sulfur batteries.25 BloombergNEF estimates sodium-ion uptake, substituting for lithium-based chemistries, could lower lithium demand by 40 percent in 2035.26 Lastly, one of China’s major battery makers announced it boosted the energy density of lithium-ion-phosphate batteries by adding manganese, producing a battery able to travel 621 miles (1,000 km) on a single charge.27 [EPA-HQ-OAR-2022-0985-1604-A1, p. 14.] [See Figure 8, Impact of Sodium-Ion Battery Update on Lithium Demand, on page 14 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

24 Casey Crownhart, “How Sodium Could Change the Game for Batteries,” MIT Technology Review (blog), May 11, 2023, https://www.technologyreview.com/2023/05/11/1072865/how-sodium-could-change-the-game-for-batteries/.

25 Kate McAlpine, “1,000-Cycle Lithium-Sulfur Battery Could Quintuple Electric Vehicle Ranges,” Michigan News, University of Michigan Vice President for Communications (blog), January 12, 2022, https://news.umich.edu/1000-cycle-lithium-sulfur-battery-could-quintupleelectric-vehicle-ranges/.

26 Colin McKerracher, “EV Sales Are Soaring And Oil Use Is About to Peak: Hyperdrive,” Bloomberg, June 8, 2023, https://www.bloomberg.com/news/articles/2023-06-08/ev-sales-are-soaring-and-oil-use-is-about-to-peakhyperdrive?srnd=premium#xj4y7vzkg.

27 Annie Lee, “China’s EV Battery Sector Is Preparing a New Breakthrough,” Bloomberg, June 5, 2023, https://www.bloomberg.com/news/articles/2023-06-05/china-s-ev-battery-sector-is-preparing-another-technologybreakthrough#xj4y7vzkg.

2. Faster-than-expected moderation of pandemic-induced supply chain disruption

Key mineral inputs to battery production have dropped in price over the last six months more quickly than had been anticipated. Lithium prices have also fallen, dropping by half from a November 2022 peak.28 The downward trend in cobalt has been even more severe, partly because of the reduction in global cobalt demand due to lithium-ion phosphate batteries' growing market share. In June, the cobalt price had dropped to $14 per pound, down 65 percent from its 2022 peak.29 [EPA-HQ-OAR-2022-0985-1604-A1, p. 14]

28 Annie Lee, "Lithium Prices in China Halve in Just Four Months," Bloomberg, March 21, 2023, https://www.bloomberg.com/news/articles/2023-03-21/china-lithium-prices-halve-since-november-as-supply-woes-ease#xj4y7vzkg.

29 Lee.

Trends in cobalt and lithium prices are part of a broader trend in moderation of supply-chain pressures on EV batteries. Goldman Sachs Group Inc. is forecasting "softness for battery metals including cobalt, lithium and nickel in the second half of 2023 amid an oversupply."30 [EPA-HQ-OAR-2022-0985-1604-A1, p. 14]

30 "Cobalt Price Has Fallen Nearly 30% This Year," Mining.Com (blog), June 12, 2023, https://www.mining.com/cobalt-price-has-fallennearly-30-this-year/.

Another factor creating downward price pressure in the near term is record inventories. On May 11, 2023, Bloomberg reported that "[b]attery inventory is at an all-time high."31 [EPA-HQ-OAR-2022-0985-1604-A1, p. 14.] [See Figure 9, Global Cobalt Metal Price, on page 15 of docket number EPA-HQ-OAR-2022-0985-1604-A1.]

31 Shall Ren, "Banks Are Roaring Back in Xi's New China," Bloomberg, May 23, 2023.

3. Battery pack economies of scale

As battery size increases, the added cost of the pack needed to contain battery cells falls, reducing cost ($/kWh), keeping other factors constant. The larger the battery size, the more the costs associated with the packaging and management system can be distributed among more cells. These fixed costs remain largely the same whether the battery is small or large, so increasing the size of the battery allows for a lower cost per cell. A larger battery pack generally allows for more efficient design and packaging of the battery cells. For example, in a larger pack, cells can be arranged more closely together, reducing the amount of wasted space and materials. This again reduces the ratio of battery pack to cell. [EPA-HQ-OAR-2022-0985-1604-A1, p. 15]

A recent study by ICCT shows that larger batteries offer lower costs.32 Comparing the 2030 cost outlook for a car battery providing 300 miles vs. 150 miles of range, the larger battery costs $68 per kWh vs. $79 per kWh, offering a 14 percent advantage. [EPA-HQ-OAR-2022-0985-1604-A1, p. 15]

32 Peter Slowik et al., "Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022-2035 Time Frame," International Council on Clean Transportation, October 2022, https://theicct.org/wp-content/uploads/2022/10/ev-cost-benefits-2035-oct22.pdf. Table 5 at 10.

As the EPA notes in the proposed rule, design aspects of commercial vehicle battery packs can create challenges. It is particularly important to recognize pack-level scale economies will be an advantage for battery packs for commercial vehicles compared to personal passenger vehicles. [EPA-HQ-OAR-2022-0985-1604-A1, p. 15]

4. Tendency of battery outlooks to underestimate future learning curves

Historic forecasts of battery prices have largely underestimated the impact of future learning curve effects. Recent, open-source, peer-reviewed research by the Institute for New Economic

Thinking (INET) at Oxford University33 shows the persistent underestimation of future innovation for batteries and develops an empirical forecasting approach that performs better.34 [EPA-HQ-OAR-2022-0985-1604-A1, p. 15]

33 “Institute for New Economic Thinking, University of Oxford,” n.d., https://www.inet.ox.ac.uk.

34 Rupert Way et al., “Empirically Grounded Technology Forecasts and the Energy Transition,” Joule 6, no. 9 (September 21, 2022): 2057–82, https://doi.org/10.1016/j.joule.2022.08.009 and https://www.cell.com/joule/fulltext/S2542-4351(22)00410-X.

Figure 10 is reproduced from the INET article to help illustrate this point. The figure denotes historical prices for lithium-ion (Li-ion) consumer battery cell prices and Li-ion EV battery packs with black and red data points, respectively, while red line segments trace historical forecasts for the most optimistic scenarios by leading energy-economy modelers such as the International Energy Agency. [EPA-HQ-OAR-2022-0985-1604-A1, pp. 15 - 16]

The figure’s graphing of historical data alongside past forecasts of battery cell and EV battery pack prices reveals the persistent gap between actual and forecasted innovation for batteries. [EPA-HQ-OAR-2022-0985-1604-A1, p. 16]

Even the most optimistic projections for each past forecast lowball future learning curves, since empirical price reductions trace a steeper trajectory, with cost dropping faster, compared to the forecast’s shallower slope. The result is even more compelling considering the comparison to the most optimistic of each battery forecast sampled. [EPA-HQ-OAR-2022-0985-1604-A1, p. 16]

These four factors impacting learning curves will very likely affect the BEV market over the next decade, which should inform the EPA’s analysis and its final proposed rule for HDVs. [EPA-HQ-OAR-2022-0985-1604-A1, p. 16.] [See Figure 10, Technology Forecasts and Energy Transition, on page 16 of docket number EPA-HQ-OAR-2022-0985-1604-A1, p. 16]

Organization: POET

The Trinity report also identified the following additional overly optimistic assumptions:

- ‘Application of an aggressive ‘learning curve’ for HD ZEV powertrains (Table 3-2 of the DRIA) which lowers the main element of HD ZEV cost by about 25% over the period from 2027 to 2032 and by 46% by 2055 while assuming no virtually no reductions (2% by 2032 and 8% by 2055) in the cost of conventional powertrains. These cost reductions are claimed despite that fact that substantial learning related to the production of batteries, fuel cells, and other ZEV componentry has already occurred in the light-duty sector and further learning curve benefits are expected to be much smaller than those forecast by U.S. EPA.’72 [EPA-HQ-OAR-2022-0985-1528-A1, pp. 17-18]

72 Id.

Organization: Truck and Engine Manufacturers Association (EMA)

The HD TRUCS tool also assumes aggregate cost reductions for each year of the Phase 3 regulation, model years 2027 through 2032. Those assumed cost reductions are premised on the experience that suppliers and OEMs can gain year-over-year from manufacturing ZEV components and vehicles, starting with the year that the technology is introduced into production. Those experience-based reductions are reflected in a "learning curve," which is documented in EPA's draft RIA. The learning curve yields a year-by-year reduction in costs, starting with a higher percentage reduction for the 2027 to 2028 model year, and then lower percent cost reductions for each subsequent year of learning. EPA has developed one learning curve for BEVs and FCEVs, and another for ICEs. The ICE curve reflects lower percent changes each year compared to the BEV/FCEV curve, since ICE technologies have been in production for many years. [EPA-HQ-OAR-2022-0985-2668-A1, p. 21]

Learning Curve – The Draft RIA documents EPA's approach to accounting for anticipated improvements in cost as a result of manufacturing experience. It is reflected in HD TRUCS through the "learning curve" concept. Table 3-2 of the Draft RIA (reproduced below) contains the values of the learning curve that EPA used in HD TRUCS. The Table shows the learning curve values for 2027 through 2051, with unique values for BEV and FCEV powertrains versus ICE-powered vehicles. The greater the difference between years, the greater the reduction that is applied. [EPA-HQ-OAR-2022-0985-2668-A1, p. 26]

For its version of HD TRUCS, EPA begins to apply the learning curve impacts on costs starting in 2027. Presumably, that correlates with EPA's expectation of the introduction of new technologies, based on the values in the BEV/FCEV portion of the table. For the first step, between 2027 and 2028, the EPA learning curve applies a 7.9% cost reduction factor. For the second step, between 2028 and 2029, EPA uses a 6% reduction, followed by reductions of 4.8%, 4.0% and 3.4% out to 2032. ICE powertrains have a much gentler slope of learning-curve cost reductions between 2027 and 2032, starting at 1% for the first two years, as can be seen in the table below. [EPA-HQ-OAR-2022-0985-2668-A1, p. 26] [See Table 3-2 on page 27 of docket number EPA-HQ-OAR-2022-0985-2668-A1]

EMA agrees with EPA that cost reductions can and do come down over time. The major point of difference, however, relates to when the learning curve should be deemed to start. EMA believes that the learning curve, should start when the ZEV technology initially goes into production, not when a given technology-forcing regulation might take effect. In that regard, the steep portion of the learning curve, when the greatest reductions can occur, is happening now for BEVs (not four years hence), since the actual start of production of BEV technologies began in 2022. It is incorrect and inappropriate, therefore, for EPA to assign 2027 as the start of the learning curve and the start of significant cost reductions for OEMs when, in actuality, those reductions are already included in today's projections of 2027 BEV costs. Accordingly, the values in the NPRM table are only reasonable if the starting year of the learning curve discounts is pulled back to 2022. [EPA-HQ-OAR-2022-0985-2668-A1, p.27]

In sum, it is more appropriate to start the learning curve cost discounts for BEV technologies in 2022, and then to use EPA's table to calculate the reductions that will occur in 2028 through 2032 based on the later-year values in the table. Applying those adjustments, the first years of the learning curve table become the Early Learning Year, as shown in the table below. It should be noted that the Learning Scalars are identical between the NPRM learning table and the Early Learning Years table below. [EPA-HQ-OAR-2022-0985-2668-A1, p.27] [See the Learning Curve table on page 28 of docket number EPA-HQ-OAR-2022-0985-2668-A1]

Specifically then, for the regulatory years of 2027-2032, EMA recommends that the following Learning Scalars along with the associated percentage cost reductions should be used in the final revised HD TRUCS tool: [EPA-HQ-OAR-2022-0985-2668-A1, p.28] [See the Proposed Learning Curve table on page 28 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Learning Curve Start Year – As discussed above, EMA has changed the learning-curve start year for BEVs from 2027 to 2022 in this run. The revised values for the learning curve inputs are show in the table below. The ensuing table shows the revised projected ZEV adoption rates for 2027 and 2032 that result from using the revised learning curve inputs. [EPA-HQ-OAR-2022-0985-2668-A1, p. 35.] pSee the Proposed Learning Curve Table on page 35 of docket number EPA-HQ-OAR-2022-0985-2668-A1.]

Organization: Valero Energy Corporation

9. EPA provides no basis or explanation for the learning curves applied to BEV, FCEV, and ICE powertrains.

EPA assumes that the costs for EV batteries, fuel cell stacks, hydrogen fuel tanks, on-board chargers, power electronics, final drive, and fuel cell stack tractors will be reduced each year of the rulemaking period, according to a "learning curve" defined in Table 3-2 of the Draft RIA. EPA provides no basis, reference, or explanation for the learning scalar factors. EPA also fails to acknowledge the impact of variable commodity prices on the cost to produce these components. [EPA-HQ-OAR-2022-0985-1566-A2, p. 18]

In Table 3-2, EPA also defines a learning curve to ICEVs, similarly with no basis, reference, or explanation. However, in the HD TRUCS model, EPA fails to apply the learning-based cost reductions that it defines in Table 3-2 to ICEVs, just one more intentional or unintentional tipping of the scales towards ZEVs. [EPA-HQ-OAR-2022-0985-1566-A2, p. 18]

EPA Summary and Response:

Summary:

Commenters agreed that some degree of savings reflecting learning was appropriate. Commenters asserted different positions regarding the amount to allocate to learning and the time when a learning curve should be assessed. DTNA agrees that learning will result in improved production efficiencies and lower costs of production; however, DTNA asserted that this learning might not have the same rates as ICE since BEVs have fewer moving parts. DTNA also asserted that the use case of HDVs – more extreme operating conditions and longer lifetimes – means that learning synergies with the passenger vehicle market will not occur. Both DTNA and Valero questioned the appropriateness of the learning scalar factors EPA used at proposal in light of the effect of critical commodity prices on component costs, which costs are independent of learning. AmFree et al. and Valero commented that EPA does not identify how learning factors were calculated or justify why they are reasonable. Valero commented that HD TRUCS did not apply learning to ICE vehicles.

Energy Innovation suggests that faster learning curves may be appropriate for BEVs due to novel battery chemistries that can disrupt markets and increase competition; faster-than-expected moderation of pandemic-induced supply chain disruption; battery pack economies of scale; and the tendency of battery outlooks to underestimate future learning curves.

EMA did not disagree with the rate of learning over time included in the NPRM; however, they asserted learning should start in 2022 rather than 2027 (the date included in the NPRM) because OEMs began producing HD BEVs in 2022. EMA explained that this would mean at the start of the rule, the learning would be in the "flatter part" of the curve. POET separately asserted that EPA's NPRM learning curve was overly optimistic/aggressive because of experience from LDVs in the production of batteries and other ZEV components (thus similarly implying that learning began earlier and should not commence in 2027).

Response:

Regarding comments related to battery costs, we respond to those in Section 3.4.1 of this document. Regarding critical materials and prices, we respond to such comments in Section 17.2 of this document. EPA agrees that we should use the best available data for learning curves and we have done so. Also, as discussed in Section II of the preamble, we are committing to monitor the industry's compliance with the standards.

Cost reduction via learning-by-doing is a well established phenomenon having been studied for over 50 years with some of the earliest works dating to World War II.[811] Therefore, we know that learning-by-doing occurs and will continue to occur in the HD industry given the level of competition and the ingenuity of its employees and, we suspect, regardless of the number of parts in a given system. Some commenters referred to our learning-by-doing as a means of addressing economies of scale. This is not a correct representation since our learning-by-doing is exactly that, learning-by-doing and is not meant to reflect cost changes associated with economies of scale.

Regarding comments that learning in the light-duty sector may not translate to the heavy-duty sector, we do not agree with assertions that such learning transfer would not occur. The learning we are estimating is primarily at the cell level and not so much at the pack level. While packs may differ, cells should be similar.

We note that several of the commenters concur with the general point that learning-by-doing occurs and will continue to occur in the HD industry (and that EMA concurs with EPA's NPRM learning curve, but disagrees at what point in the learning we will be at in 2027 and later). One key point is estimating at what speed that learning will occur. Traditionally, cost-reductions on the order of 80 percent to 90 percent are expected to occur with each doubling of cumulative production. In other words, if a widget costs $100 to make in year one with production of 100 units, then the cost could be expected to reduce to $80 to $90 by the time 200 units have been produced.[812]

Due to modeling constraints and the difficulty in applying learning effects as a function of sales within a model that adjusts sales based on learning effects, we have traditionally applied learning impacts using static learning factors applied to a given cost estimate as a means of reflecting learning-by-doing effects on future costs. [813] Further, we have traditionally applied

[811] See "Cost Reduction through Learning in Manufacturing Industries and in the Manufacture of Mobile Sources, Final Report and Peer Review Report," EPA-420-R-16-018.
[812] *ibid*.
[813] See the 2010 light-duty greenhouse gas rule (75 FR 25324, May 7, 2010); the 2012 light-duty greenhouse gas rule (77 FR 62624, October 15, 2012); the 2011 heavy-duty greenhouse gas rule (76 FR 57106, September 15,

those static learning factors across regulatory scenarios even though, as in the NPRM, a higher sales penetration of BEV and FCEV—i.e., advanced—technology in the action scenarios would arguably result in more rapid learning relative to the no-action scenario where less penetration of those technologies is projected. Because the learning effects are static, the next key point becomes a matter of estimating where on the learning curve a technology is considered to be. In other words, is a technology on the early steeper portion of the learning curve or on the later, flatter portion of the learning curve. In the NPRM, we estimated that ICE technology was on the flatter portion of the curve, given that most ICE technologies have been in production for many years, and that advanced technologies like BEV and FCEV technologies were on the steeper portion. We continue with that approach in the FRM analysis, although we have shifted the learning effects for advanced technology in a manner consistent with some of the comments. More specifically, we apply the same learning curve in the final rule for BEVs and FCEVs but on a portion of the curve that is less steep (flatter) in MY 2027 and later than we used in the NPRM.

We note that beyond suggesting that a learning curve commence coincident with HD BEV production, commenters did not provide any different learning factors and did not assert that learning impacts should be fully removed. Commenters also did not question that the learning factors applied to electrification technologies appropriately includes more learning year-over-year than the learning factors applied to ICE vehicle technologies. We reiterate that such an approach is warranted given that ICE vehicle technologies have been implemented for over 100 years while the newer technologies (e.g., HD BEV technology) is relatively new and is undergoing rapid development around the world. Lastly, we note that, while our learning factors for BEV and FCEV technologies were more aggressive than those for ICE vehicle technologies, in the proposal they resulted in only a 26 percent cost reduction by model year 2033, a full 7 years from MY 2027. In the final analysis, the cost reduction between MY 2027 and MY 2033 is just 22 percent from learning. Such a set of learning factors does not seem overly aggressive given the pace of change in the BEV and FCEV vehicle space.

EPA acknowledges the uncertainties with forecasting the rate of learning. It is possible that manufacturers will learn more quickly than we anticipate, causing costs to be lower than we projected; for example, as noted above, a higher sales penetration of BEV and FCEV technology in the action scenarios would arguably result in more rapid learning relative to the no-action scenario where less penetration of those technologies is projected, and in turn more rapid learning than EPA accounted for. It is also possible that manufacturers will learn more slowly than anticipated, for instance, in the event DTNA is correct that BEV learning is slower due to BEVs having fewer parts. Considering all these uncertainties, the historical data on learning in the HD and motor vehicle markets over time, as well as the significant forces driving increased producing of HD BEV and FCEV and thus their learning in the future, EPA's technical judgment is that the learning factors we have applied are reasonable.

Regarding the comments from Energy Innovation, while we acknowledge the points raised, these do not pertain to the concept of learning-by-doing which our learning factors are meant to capture. Novel battery chemistries that might have lower costs would represent a new technology, not cost reductions via learning-by-doing to our estimated technologies. Similarly,

2011); the 2016 heavy-duty greenhouse gas rule (81 FR 73478, October 25, 2016); the 2014 light-duty Tier 3 rule (79 FR 23414, April 28, 2014); the heavy-duty NOx rule (88 FR 4296, January 24, 2023).

supply chain issues returning to historical norms is not an effect meant to be captured via our learning-by-doing cost reduction estimates.

For the FRM, we are applying ICEV learning both in HD TRUCS as well the cost calculations in RIA 3 and preamble Section IV.

13 Emission Impacts

Comments by Organizations

Organization: American Council for an Energy-Efficient Economy (ACEEE)

We note that, in contrast to the energy efficiency ratios implied by Table 2 showing that the H2-FCEV truck uses 57% more energy per mile than the BEV, EPA adopts an assumption that a H2-FCEV uses only 25% more energy than a BEV (DRIA p.313). ACEEE looked at the sources referenced in the DRIA, which include the GREET and MOVES models, and was unable to find the basis for this claim. In fact, the MOVES document cited by the DRIA states the following:

In addition, heavy-duty fuel cell vehicles (FCEVs) have a lower efficiency ratio than their BEV counterparts. However, an identical EER is implicitly applied to both BEVs and FCEVSs in MOVES, since BEV and FCEV vehicles have been aggregated within the electricity fuel type by the time the EERs are applied. To account for this, the energy consumption rates for FCEVs in EmissionRate are scaled up by a ratio of 1.6, based on values in GREET 202164 as explained in Appendix D…27 (emphasis added). [EPA-HQ-OAR-2022-0985-1560-A1, p. 13.]]This comment can also be found in section 7 of this comment summary.]

Appendix D states (p.51):

The 1.6 multiplier for the FCEV emission rates was derived from the relative miles per gallon diesel equivalent estimated in GREET 2021. While the GREET model anticipates that the relative miles per gallon will vary with vehicle class, as show in Table D-5, we currently expect most FCEVs will be used in long-haul applications. Thus, we selected the values for Combination Long-Haul Vans to represent all heavy-duty FCEVs. Consistent with GREET and with the MOVES adjustment report, the listed value for EVs was also decreased by 15 percent to account for battery and charging losses that are not relevant for FCEVs. This results in a ratio of 1.61 which we rounded to 1.6. [EPA-HQ-OAR-2022-0985-1560-A1, p. 13.]

Hence the cited MOVES document does not appear to support the DRIA claim that an FCEV uses only 25% more energy to operate than a BEV, but instead supports the values shown in Table 2 above. [EPA-HQ-OAR-2022-0985-1560-A1, p. 13.]

EPA notes that most hydrogen is produced today via steam methane reforming (SMR) but cites provisions in IIJA and IRA promoting green hydrogen production in support of its “simplifying assumption”, for purposes of the rule impacts analysis, that any hydrogen used to fuel heavy-duty FCEVs will be produced through grid electrolysis (FR 26042, footnote 664). Based on this assumption, EPA calculates declining carbon intensity of hydrogen fuel as a result of anticipated grid decarbonization. However, it is not clear that the hydrogen for use as a transportation fuel will generally be produced through grid electrolysis in the coming years or will have carbon emissions similar to hydrogen from grid electrolysis. [EPA-HQ-OAR-2022-0985-1560-A1, p. 14.]

EPA points to incentives for clean hydrogen production in IIJA and IRA, as well as “new transportation and other demand drivers and potential future regulation” (DRIA p.321) to support this assumption. However, potential dramatic increases in the coming years in the volume of both clean hydrogen and hydrogen produced through electrolysis are insufficient to ensure that hydrogen production through SMR will decline or that hydrogen used to fuel heavy-duty vehicles will become cleaner in tandem with grid decarbonization. This is especially true given the many uses to which a growing hydrogen supply could be put. [EPA-HQ-OAR-2022-0985-1560-A1, p. 14.]

It should be noted that EPA's analysis of the upstream impacts of BEVs, as well as those of hydrogen-fueled vehicles, relies on assumptions regarding the decarbonization of the electricity (FR 26044). However, those assumptions, unlike the hydrogen assumptions, are based on a quantitative analysis of IIJA and IRA incentives, resulting in a much more convincing case for low-carbon electricity generation. [EPA-HQ-OAR-2022-0985-1560-A1, p. 14.]

EPA should not incentivize hydrogen-fueled vehicles without strong evidence that hydrogen fuel for transportation will be clean in the foreseeable future. For H2-ICEVs in particular, for which intrinsic efficiency advantages are modest, actual GHG benefits may be negative, and potential future benefits are based largely on changes to the fuel rather than to the vehicle, the zero-upstream incentive is inappropriate. It would offer manufacturers the same compliance benefit for an H2-ICEV as for a BEV or FCEV but require only relatively small changes to the engine, as described At FR 25960. The fact that H2-ICEVs produce NOx makes conferring ZEV benefits on them all the more inappropriate. Low-carbon hydrogen-fueled vehicles are best incentivized through performance-based standards. [EPA-HQ-OAR-2022-0985-1560-A1, pp. 14 - 15.]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

B. EPA's Analysis Of Net Emissions Is Flawed

EPA estimates that the proposed rule will result in a net reduction of emissions from 2027 to 2055. See 88 Fed. Reg. at 26,045. That estimate is dubious. EPA's modeling omits critical sources of emissions and rests on several significant, unwarranted assumptions. [EPA-HQ-OAR-2022-0985-1660-A1, p. 54]

Downstream Emissions. EPA's projection of reduced net emissions from the proposed rule rests primarily on a predicted reduction in "downstream" emissions— i.e., emissions generated by operating motor vehicles. 88 Fed. Reg. at 26,039, 26,045. But in estimating the proposed rule's effect on downstream emissions, the agency omits the particulate emissions caused by brake and tire wear. Id. at 26,039; Draft RIA at 328 n.A, 342. That omission has no analytical justification, departs from prior agency practice, and improperly skews the calculation in favor of electric vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, p. 54]

Particulate emissions from brake and tire wear fit comfortably within the downstream category, which includes anything "emitted directly by a vehicle." Draft RIA at 310. The draft regulatory impact analysis at times acknowledges this fact—for instance, EPA includes "particulate emissions from brake wear and tire wear" within a list of examples of downstream sources of pollution. Id. But the agency does not account for these emissions when modeling the proposed standards' ultimate emissions impact. EPA instead simply states—with no further explanation—that "primary exhaust PM2.5 [particulate matter] does not include brake wear and tire wear"; EPA includes a footnote mentioning that, if it did factor those sources into the analysis, the estimated reductions would be lower. Id. at 328 n.A; see also id. at 342. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 54 - 55]

The agency's decision to ignore brake and tire wear is not only inconsistent with its own definition of downstream emissions but also marks a change from settled agency practice. In earlier GHG rules for heavy-duty vehicles, EPA considered brake and tire emissions when analyzing the impact of the proposed standards. See Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 76 Fed. Reg. 57,106, 57,301 n.a (Sept. 15, 2011) ("HD GHG I") ("PM2.5 from tire wear and brake wear is included."); Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2, 81 Fed. Reg. 73,478, 73,578 n.b (Oct. 25, 2016) ("HD GHG II") ("The impacts shown include all PM2.5 impacts from the rule including impacts from increased tire wear and brake wear that results from the slight increase in VMT projected as a result of this rule."). And in one of those rules, EPA even decided to adopt "[f]urther PM [c]ontrols" after concluding that the standards would increase particulate emissions by 464 tons in 2040 and 534 tons in 2050. HD GHG II, 81 Fed. Reg. at 73,579. The agency has not acknowledged its change in position here, let alone explained "why the new approach" of ignoring emissions from brake and tire wear "better comports with . . . the provisions that Congress enacted." Am. Fed'n of Gov't Emps. v. FLRA, 25 F.4th 1, 12 (D.C. Cir. 2022). That is reason enough to conclude that "the [agency] has not, in fact, engaged in reasoned decision-making." Id. (internal quotation marks and brackets omitted). [EPA-HQ-OAR-2022-0985-1660-A1, p. 55]

Nor could EPA contend that this omission is insignificant. The draft regulatory impact analysis describes brake and tire wear as "a significant source of particulate emissions" and estimates that, if they were included, the expected reduction in particulate emissions would decrease by half or more in every year the agency considered. Draft RIA at 328 & n.A (emphasis added). For model year 2035, particulate-emissions reductions would fall from 6 percent to 3 percent. Id. By model year 2045, they would decline from 30 percent to 10 percent. Id. And by 2055, they would plummet from 39 percent to 13 percent. Id. [EPA-HQ-OAR-2022-0985-1660-A1, p. 55]

This substantial decrease is not surprising. Emissions from tire wear, for example, rise as vehicles (1) get heavier and (2) apply higher torques at lower speeds—two traits prominent in electric vehicles, especially relative to internal-combustion-engine vehicles. See e.g., Raheb Mirzanamadi & Mats Gustafsson, Users' Experience of Tyre Wear on Electric Vehicles, Swedish Nat'l Road & Transp. Rsch. Inst., at 10 (June 2022) ("[E]lectric vehicles . . . have higher acceleration and are heavier than equivalent internal combustion engine vehicles . . . which can lead to higher non-exhaust emissions from tyre and road wear as well as higher resuspension of road dust."); Ye Liu et al., Exhaust and Non-Exhaust Emissions from Conventional and Electric Vehicles: A Comparison of Monetary Impact Values, J. Cleaner Prod., Vol. 331 (Jan. 2022) ("[I]t can be observed that compared [to] ICEVs, EVs emit more non-exhaust PM2.5 and PM10 emissions. Such an increase in non-exhaust emissions is associated with the equivalent EVs possessing heavier weight relative to [ICEVs]."); Gunda Obereigner at al., Active Limitation of Tire Wear and Emissions for Electrified Vehicles, SAE Techn. Paper (Apr. 6, 2021) ("[A]s electrified vehicles weigh more and typically exhibit higher torques at low speeds, their non-exhaust emissions tend to be higher than for comparable conventional vehicles, especially those generated by tires."). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 55 - 56]

At various other points in the proposed rule, the agency asserts without explanation that the per-mile rate of brake wear is "expected to be lower" for electric vehicles "due to regenerative braking systems." 88 Fed. Reg. at 25,987; see also id. at 26,035; Draft RIA at 185, 194. EPA cites nothing to support that expectation. But even if true, that has nothing to do with tire wear—an independent source of particulate emissions and, by some accounts, "the most important one." OECD, Non-Exhaust Particulate Emissions from Road Transport (Dec. 7, 2020); see also Kris Vanherle et al., Transport Non-Exhaust PM-Emissions, European Envt'l Agency (Mar. 2021) ("[R]egardless of the potential of regenerative braking to reduce brake wear, on motorways, EVs have higher PM emissions compared to ICEVs due to higher tyre wear associated with higher weight."). Other studies note that regenerative braking is one of "the most commonly answered reasons" for accelerated tire wear, further demonstrating that the existence of regenerative braking does not justify EPA's omission. Mirzanamadi, Users' Experience of Tyre Wear, supra, at 11, 51. [EPA-HQ-OAR-2022-0985-1660-A1, p. 56]

The proposed rule, requiring a widespread shift to electric vehicles, would therefore affect particulate emissions much differently than prior rules that focused solely on adaptations for internal-combustion-engine vehicles. Indeed, according to a recent study, particulate emissions from tire wear are "around 1,850 times greater" than those that come from a tailpipe. Emission Analytics, Graining Traction, Losing Tread Pollution from Tire Wear Now 1,850 Times Worse than Exhaust Emissions (May 10, 2022). And the Organisation for Economic Cooperation and Development reports that "[w]ear and tear from brakes, tyres and road surfaces will soon overtake car exhaust fumes as the leading source of fine particles released into the air by road traffic, . . . and heavy electric vehicles with long-distance batteries could compound the problem even as they slash emissions from engine exhaust." Measures Needed to Curb Particulate Matter Emitted by Wear of Car Parts and Road Surfaces, OECD (July 12, 2020). By excluding this category of emissions from its analysis, EPA elides one of the key ways its proposal will cause more harm than good. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 56 - 57]

Upstream Emissions. In addition to overstating reductions in downstream emissions, the proposed rule fails to account properly for increases in "upstream" emissions—those that "are not emitted by the vehicle itself but can still be attributed to its operation." Draft RIA at 310. In evaluating this category, EPA improperly cabins its analysis to only those emissions caused by electric-generating units ("EGUs") and refineries—i.e., emissions generated to provide power to operate vehicles. See 88 Fed. Reg. at 26,039–40; Draft RIA at 310. This marks another unexplained shift in agency policy. And even when examining this limited set of upstream sources, the agency makes unfounded assumptions and methodological choices that are (once again) skewed in favor of the proposed rule. [EPA-HQ-OAR-2022-0985-1660-A1, p. 57]

First, the emissions associated with powering a vehicle—whether by electricity from an EGU or fuel from a refinery—are far from the only ones reasonably "attributed" to its operation. Draft RIA at 310. Depending on the vehicle, there are also emissions associated with producing, recycling, and disposing of batteries; operating charging infrastructure; and extracting, refining, transporting, and storing petroleum fuels. These emissions can be substantial and, when considered together, may undermine EPA's assumption that swapping internal- combustion-engine vehicles for electric ones will necessarily result in an environmental good. [EPA-HQ-OAR-2022-0985-1660-A1, p. 57]

The International Energy Agency's discussion of emissions from mining illustrates this point. According to the IEA, "the production and processing of energy transition minerals are energy-intensive" and involve "relatively high emission[s]." Role of Critical Minerals at 15, 130; see also Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, Am. Transp. Rsch. Inst., https://tinyurl.com/3ktjd85v ("Mining and processing produce considerable CO2 and pollution issues."). For this reason, producing an electric vehicle is a more carbon- intensive process than producing a conventional one. Role of Critical Minerals at 194. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 57 - 58]

EPA never explains why emissions from EGUs and refineries are the only ones relevant to the analysis. Nor does it acknowledge that its current position departs from earlier GHG rulemakings, where it did consider additional upstream sources. See HD GHG I, 76 Fed. Reg. at 57,301 ("To project these impacts, EPA estimated the impact of reduced petroleum volumes on the extraction and transportation of crude oil as well as the production and distribution of finished gasoline and diesel."); HD GHG II, 81 Fed. Reg. at 73,852 ("To project these impacts, Model B estimated the impact of reduced petroleum volumes on the extraction and transportation of crude oil as well as the production and distribution of finished gasoline and diesel."). EPA has an obligation to explain why a more cabined view of upstream emissions is appropriate here. See Am. Fed'n of Gov't Emps, 25 F.4th at 12. [EPA-HQ-OAR-2022-0985-1660-A1, p. 58]

Second, EPA's assessment of EGU emissions is flawed. EPA assumes that the amount of emissions associated with increased demand for electricity will "decrease[] over time because of projected changes in the future power generation mix, including cleaner combustion technologies and increases in renewables." 88 Fed. Reg. at 25,935. That expectation is entirely speculative and, in large part, based on the availability of three tax credits that Congress recently approved as part of the IRA to incentivize manufacturing, production, and investment in low-carbon initiatives. See id. at 25,935 n.63, 26,040 n.654, 26,044; Draft RIA at 321 n.vi, 325, 345, 347, 349. The agency does not explain the applicability of these tax credits or provide any data or evidence showing, or even suggesting, that they will have such a material impact on the power-generation mix. See Appalachian Power Co. v. EPA, 249 F.3d 1032, 1053 (D.C. Cir. 2001) (per curiam) (explaining that "model assumptions must have a 'rational relationship' to the real world"). Before modeling EGU emissions based on them, EPA must make an earnest effort to assess the number of EGUs that will receive the credits and whether the savings will be enough to incentivize such a major shift in their operations. If the agency is unable or unwilling to provide that analysis, it must project EGU emissions based on the power-generation mix that is now available. And if EPA concludes that the power-generation mix will change even without the widespread availability of the IRA tax credits, it must explain the basis for that belief. [EPA-HQ-OAR-2022-0985-1660-A1, p. 58]

In addition, whether the power-generation mix stays the same or changes in the way EPA speculates, it is necessary to assess whether EGUs will use the same sources to power their base loads and the peak loads that will inevitably occur if the proposed rule is adopted. According to a recent study, changes in the electricity sector have caused EGUs to increasingly rely on coal to meet demand that exceeds their typical capacity. See Stephen P. Holland et al., Why Marginal CO2 Emissions Are Not Decreasing for US Electricity: Estimates and Implications for Climate Policy, Nat'l Acad. of Scis., at 1 (2022) ("More recently, however, changes in the electricity sector have pushed coal, which has the greatest CO2 intensity, to more frequently be used as the marginal fuel for generation, thereby increasing marginal emissions."). Providing electricity to meet peak loads can therefore have a disproportionately high impact on emissions, which cannot be adequately captured by looking at "average emissions" (i.e., carbon intensity) across the electricity sector. Id. Instead, "estimates of marginal emissions . . . are needed to accurately evaluate the impacts of policies or behaviors that cause changes in the demand or supply of electricity." Id. at 2. [EPA-HQ-OAR-2022-0985-1660-A1, p. 59]

The authors of the study demonstrated the importance of this point in the context of electric vehicles. They analyzed the Biden Administration's goal to make half of new vehicle purchases electric by 2030 and concluded that, when taking marginal emissions into account, "the increase in electricity sector CO2 emissions . . . would undo more than half of the reductions from reducing the number of gasoline-fueled, light-duty vehicles." Holland et al., Why marginal CO2 emissions are not decreasing, supra, at 2. By contrast, if they had instead looked only at average emissions, "the emissions reductions would [have been] overestimated by somewhere between 27% and 114%." Id. [EPA-HQ-OAR-2022-0985-1660-A1, p. 59]

EPA does not explain whether or how it takes marginal emissions into account when estimating EGU emissions. Neither the notice of proposed rulemaking nor the draft regulatory impact analysis discusses this concept, and stakeholders were denied an opportunity to study the agency's complicated modeling given the exceedingly short window for public comment. Given the importance of this issue, EPA should clearly explain whether it considered marginal emissions as the study discussed above advises, and if not, the basis for its alternative approach.8 [EPA-HQ-OAR-2022-0985-1660-A1, p. 59]

8 EPA's underestimation of EGU emissions also affects its evaluation of fuel-cell vehicles. Although the vast majority of hydrogen used for fuel-cell vehicles is made through "steam methane reforming," "largely as part of petroleum refining and ammonia production," the agency makes the "simplifying assumption" that "all hydrogen used for FCEVs is produced via grid electrolysis of water and can therefore be entirely represented as additional demand to EGUs." 88 Fed. Reg. at 26,042 & n.664; Draft RIA at 321–22. Even assuming that "simplifying assumption" is warranted, EPA must accurately predict EGU emissions to measure the effect of shifting from internal-combustion-engine to fuel-cell vehicles. For the reasons described above, it has not done so.

Finally, EPA may be substantially overestimating the decrease in refinery emissions. The agency "assumed refinery activity decreases with decreased demand for liquid fuel from heavy-duty vehicles." 88 Fed. Reg. at 26,040. But at the same time, EPA "recognize[d] that there is significant uncertainty in the impact reduced fuel demand has on refinery emissions." Draft RIA at 327. "If refineries do not decrease production in response to lower domestic demand" and "increase exports instead," then the agency "would project no emission reductions from refineries" rather than the ones they include in their analysis. Id. (emphasis added); see also id. at 345, 350. EPA must explain the basis for its assumption that refineries will decrease production before it factors these sizeable reductions into the calculation. See Int'l Harvester Co., 478 F.2d at 645 (explaining that EPA must "support its methodology as reliable" with more than "speculation"). [EPA-HQ-OAR-2022-0985-1660-A1, p. 60]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

1. EPA Cannot Adequately Substantiate the Need for Regulatory Action

The structure of the Clean Air Act and its regulatory provisions for standard setting also are premised on EPA identifying sources of emissions that cause or contribute to non-attainment with the National Ambient Air Quality Standards ("NAAQS"). However, EPA makes no attempt to outline a baseline scenario whereby all stationary and mobile sources in the country achieve current EPA standards. Such a baseline is necessary because it is the only means by which the agency and the public can compare the marginal costs and benefits of further tightening emission standards and deploying different technologies and alternatives. EPA's failure to conduct either a baseline or marginal analysis (while also failing to account for billions of dollars in costs) is inconsistent with the structure of the Clean Air Act, and good regulatory practice, and makes it impossible to conduct an alternatives analysis, as required under Executive Order 12866 (Regulatory Planning and Review) and OMB Circular A-4; as such, the proposed rule, if finalized, is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1659-A2, p. 24]

In addition to the above, EPA did not fully consider that the higher purchase price of new ZEVs will keep older, more polluting trucks on the road longer whereas new and heavier ZEVs will increase particulate matter ("PM") emissions through increased brake, tire, and road wear. Data from EPA's 2020 National Emissions Inventory97 shows that direct PM2.5 emissions from roadways can be due to roadway dust vs. on-road mobile vehicle engine emissions. Roadway dust emissions which include particles from tire wear are correlated with vehicle weight, so increases in fleet average vehicle weight would be expected to increase roadway dust PM2.5 emissions.98 In addition, a study by the American Transportation Research Institute found that the weight of a BEV Class 8 Sleeper Cab tractor is nearly double that of a comparable ICEV, weighing 32,016 pounds (lbs) versus 18,216 lbs.99 Therefore, converting ICEs to ZEVs under the proposed regulation would significantly increase the average vehicle weight on U.S. roadways, which in turn would increase the entrained road dust emissions. There also exist overall truck weight restrictions, which could require a greater number of ZEVs to move the same tonnage of cargo, thus increasing vehicle miles traveled and potentially PM emissions. EPA also ignores the GHG emissions associated with manufacturing more, less dense, remotely located intermittent generation sources and battery back-up, plus the need for more natural gas peaking capacity and massive transmission, substation, and transformer investment to integrate these technologies into the power grid. Those emissions are significant and may offset or eliminate the benefits that EPA calculates. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 26 - 27]

97 EPA, "2020 National Emissions Inventory (NEI) Data," available at https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data.

98 EPA, Emissions Factor Documentation for AP-42 (Dec. 31, 2003) available at https://www3.epa.gov/ttn/chief/old/ap42/ch13/s021/final/c13s0201.pdf.

99 AMERICAN TRANSPORTATION RESEARCH INSTITUTE, "Understanding the CO2 Impacts of Zero-Emission Trucks" (May 2022) available at https://truckingresearch.org/wp-content/uploads/2022/05/ATRI-Understanding-CO2-Impacts-of-Zero-Emission-Trucks-May-2022.pdf.

Organization: American Petroleum Institute (API)

1. Decrease in non-GHG refinery emissions

We question the agency's projections of refinery emissions decreases due to reduced fuel demand (Draft RIA, Table 4/18). The analysis assumes that there will be less domestic fuel demand due to a marked uptick in the use of HD ZEVs. However, as we have noted throughout these comments, there is significant concern that the market may not reach the levels of HD ZEV penetration suggested by the proposal. If fleets continue to use ICEVs in significant numbers, which could reasonably be expected based on various factors (e.g., the life of HD vehicles, costs of purchasing new vehicles, etc.), even with an increased use in biofuels, there will continue to be a demand for conventional fuels. There could also be increased demand for refined products in other countries that the U.S. could supply. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 13 - 14]

Furthermore, EPA's analysis assumes that lower domestic fuel demand, due to increased usage of HD ZEVs, will result in reduced refinery throughput. However, this assumption may not hold true as the U.S. has emerged as a major player in the global market for refined products, actively exporting significant quantities. While the EPA assumes that a gallon of reduced domestic demand would reduce net crude and product imports by 0.864 (Draft RIA Section 6.5), their assumption fails to consider the possibility that refinery throughput could remain steady while the U.S. simultaneously increases its exportation of refined products. [EPA-HQ-OAR-2022-0985-1617-A1, p. 14]

EPA justifies its assumption that imports will fall 86.4 percent by comparing the AEO 2022 Reference case with the AEO 2022 Low Economic Growth case. This comparison is not suitable for drawing these conclusions because in the Low Economic Growth case, U.S. refined product exports are lower compared to the Reference Case, suggesting a decline in global demand for refined products. Regardless of the assumption's merits, the EPA doesn't explicitly state, in its regulatory impact analysis, that the reduced global demand for refined products is, in part, an assumption based on the forecasts EPA uses for its analysis and not attributable to its regulation. [EPA-HQ-OAR-2022-0985-1617-A1, p. 14]

Organization: Clean Air Task Force

A. EPA underestimated the net benefits of the proposed rule by undercounting refinery emissions.

EPA attempts to account for the climate benefits and the criteria pollutant health benefits of the proposed rule in its quantitative cost-benefit analysis. See 88 Fed. Reg. 26074-26078. For both of these analyses, EPA includes emissions from onroad heavy-duty vehicles (i.e., tailpipe emissions) and upstream emissions from electric generating units (EGUs) that produce the fuel (e.g., electricity, hydrogen) that powers ZEVs. However, EPA does not include in this analysis upstream emissions from refineries that produce the fuel (i.e., gasoline or diesel) that powers combustion vehicles. In order to calculate the full net benefits of the proposed rule, and to provide parallel treatment of fuel production for ZEVs and combustion vehicles, EPA should account for refinery emissions in its cost-benefit analysis. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 79 - 80]

EPA defines upstream emissions sources as "those that occur before tailpipe emissions from vehicles, such as from electricity generation for charging BEVs, the production of hydrogen used to fuel FCEVs, and emissions generated during petroleum-based fuel production and distribution." 88 Fed. Reg. at 26039-26040. However, while EPA quantified emissions changes associated with upstream EGUs, it did not quantify emissions changes associated with producing or extracting crude or transporting crude or refined fuels. See 88 Fed. Reg. at 26044. Instead, EPA provided a limited analysis of refinery emissions in only "one analysis year (2055) and only certain non-GHG pollutants (NOx, PM2.5, VOC, and SO2)." DRIA at 344. [EPA-HQ-OAR-2022-0985-1640-A1, p. 80]

This disparate treatment of upstream emissions sources underestimates the benefits of the proposed rule. Indeed, EPA acknowledges that its methodology "likely underestimates the net emissions reductions that may result from the proposal." 88 Fed. Reg. at 26044. In the limited analysis that EPA did conduct for 2055, refinery criteria emissions decreases are of a similar order of magnitude to EGU emissions increases, the latter of which are included in the net benefit calculations. In the case of SO2, including reductions in refinery emissions resulting from the standards in net emissions calculations would shift the impact of the proposed standards from a net increase in emissions to a net decrease in emissions. [EPA-HQ-OAR-2022-0985-1640-A1, p. 80]

EPA recognizes that were it to "estimate impacts on refinery GHG emissions, [EPA would] expect that the decrease in liquid fuel consumption associated with this rule would lead to a reduction in those emissions." 88 Fed. Reg. at 25935 n.62. Refinery emissions can increase the lifecycle GHG emissions of petroleum-based fuels over downstream tailpipe emissions significantly, depending on the source and type of oil. For example, accounting for refinery (midstream) emissions from oil produced from South Belridge in California's San Joaquin Valley would increase total emissions by 20 percent compared to just accounting for combustion (downstream) emissions.350 [EPA-HQ-OAR-2022-0985-1640-A1, p. 80]

350 Carnegie Endowment for Int'l Peace, Profiling Emissions in the Supply Chain, Oil-Climate Index, http://oci.carnegieendowment.org/#supply-chain (last visited June 9, 2023).

In finalizing the standards, EPA should ensure that it has a complete accounting of these upstream refinery emissions to properly measure the net benefits of the options under consideration. Failing to do so would undercount the benefits associated with more stringent standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 80]

Organization: Clean Fuels Development Coalition et al.

And, as will be discussed later in this comment, the proposal's listed costs grossly underestimate the rule's true costs. The proper metric is aggregate cost because the major-questions doctrine asks about the rule's significance to the "national economy." West Virginia v. EPA, 142 S. Ct. at 2609 (2022). These aggregate costs include: [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

Air quality effects: This includes the air quality and health impacts from significant increases in tire wear from heavy-duty vehicles, as well as the increases in CO2 emissions that will result from manufacturing more electric generation infrastructure, transmission, distribution, charging equipment, the manufacturing of batteries, etc.5 Most egregious is the omission of the cost of increased brake and tire wear, which the proposal describes as "a significant source of particulate emissions" and estimates that, if they were included, the expected reduction in particulate emissions would decrease by half or more in every year the agency considered. DRIA at 328. These added emissions are so high that they offset most of the benefits from eliminating tailpipe emissions. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 5 - 6]

5 As will be discussed later in the comment, EPA's current assessment of emissions impacts, listed in Table ES-5, are "downstream" only, meaning the "emissions processes … that come directly from a vehicle, such as tailpipe exhaust, crankcase exhaust, evaporative emissions, and refueling emissions." 88 Fed. Reg. 25,935. This unreasonably ignores all the "upstream" emissions the rule would produce and does so only by footnote. This appears to be intentionally misleading.

D. The proposed rule misstates emissions benefits because it neglects upstream electric generating unit emissions, among others.

In addition to underestimating costs, the proposal also overstates benefits. The most egregious of these comes from the way EPA accounts for upstream emissions for electric generating units. To realize substantial reductions in GHG emissions—and thus benefits from said emissions—the rule relies on the decrease in emissions from petroleum-fueled heavy-duty vehicles replaced by electric heavy-duty vehicles. But these vehicles are themselves still responsible for emissions from the electricity that powers them. Current electricity GHG emissions factors are approximately 442,000 U.S. Tons of CO2 / Terawatt-Hour. How much carbon dioxide is produced per kilowatt-hour of U.S. electricity generation, Energy Information Administration, https://www.eia.gov/tools/faqs/faq.php?id=74&t=11. The proposal estimates that this will fall to 136,686 U.S. Tons of CO2 / Terawatt-Hour in 2035 and 30,130 U.S. Tons of CO2 / Terawatt-Hour in 2050. DRIA at 325. [EPA-HQ-OAR-2022-0985-1585-A1, p. 34]

This is unrealistic. Emissions reduction on the U.S. electric grid have thus far come primarily from natural gas replacing coal. To continue to lower CO2 emissions in this manner would require an almost complete conversion to low carbon sources. But barriers to wind, solar, and nuclear adoption will not enable these changes. Furthermore, researchers estimate that the 350 million EVs required to decarbonize the fleet in 2050 could use as much as half of US national electricity demand. Thea Riofrancos et al., Achieving Zero Emissions with More Mobility and Less Mining, U.C. Davis Climate + Community Project (Jan. 2023), https://subscriber.politicopro.com/eenews/f/eenews/?id=00000185-e562-de44-a7bfed7751a00000. [EPA-HQ-OAR-2022-0985-1585-A1, p. 34]

These costs also ignore that realizing these reductions requires the installation of new solar and wind generation, which itself has a cost. Without additional wind and solar generation, upstream emissions from electricity generating units will not decrease as much as EPA expects, diminishing those benefits. In addition to the direct costs of this generation, the proposal also ignores the greenhouse gas emission associated with manufacturing more, less dense, remotely located intermittent generation sources, and the battery back-up; transmission, substation, and transformer investment to integrate these technologies into the power grid; and natural gas peaking capacity necessary to sustain their intermittency. These emissions are significant and must be accounted for in the calculation of any benefits of the proposed rule. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 34 - 35]

Organization: Cummins Inc.

We also appreciate EPA's assumption that emissions generated from creating hydrogen are the same as grid emissions. [EPA-HQ-OAR-2022-0985-1598-A1, p. 9]

Organization: Delek US Holdings, Inc.

EPA compounds this flaw by making unsupported assumptions regarding total emissions impacts of its proposal. While it claims that the overall analysis for combined downstream and upstream emissions "likely underestimates the net emissions reductions that may result" from the Proposed Rule, EPA failed to offer a data-based substantiation. The Proposed Rule did not quantify emissions changes associated with producing or extracting crude or manufacturing refined fuels.18 It failed to assess emissions from battery manufacturing or electricity production. EPA should provide a more comprehensive analysis to comply with its directive under the Clean Air Act and better assess the resulting impact of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1561-A1, p. 5]

18 Proposed Rule at 26,044. Although EPA stated it "expects the increased adoption of HD ZEVs to increase emissions from EGUs and decrease emissions from refineries," EPA quantified only the criteria pollutant emission reductions it anticipated from Refineries for the year 2055. Proposed Rule at 25,936, 26,042–44 (Table V–9).

The Proposed Rule predicts net emissions reductions but does not adequately evaluate local ambient air quality impacts from increased power generation spurred by the mass adoption of electric vehicles. Although EPA modeled changes to power generation anticipated by the Proposed Rule as part of its upstream analysis, EPA does not consider the potential degradation of air quality in areas in the direct vicinity of existing or new power plants, especially as the need for baseload generation at times when the sun is not shining and the wind is not blowing rises exponentially with rapid electrification.38 [EPA-HQ-OAR-2022-0985-1561-A1, p. 8]

38 Proposed Rule at 25,983.

Organization: Environmental Defense Fund (EDF)

VI. EPA should ensure rigorous accenting and protective safeguards are in place related to the production and use of hydrogen

a) EPA should ensure its assessment of hydrogen is rigorous, comprehensive, and fully accounts for potential adverse climate and health impacts associated with hydrogen production and use

i. The method of hydrogen production impacts whether hydrogen fueled vehicles decrease the vehicle's associated emissions when compared to diesel vehicles or increases them.

In the proposal, EPA assumes all of the hydrogen used to fuel FCEVs will be produced through grid electrolysis. Currently, 95% of hydrogen is produced from natural gas in a process called steam methane reformation (SMR).206 SMR emits CO2 as a byproduct of the hydrogen production resulting in a carbon intensity of between 8 and 12 kg of CO2/kg H2. Hydrogen produced using electricity from the current U.S. average grid has a carbon intensity of 21 kg of CO2/kg H2.207 [EPA-HQ-OAR-2022-0985-1644-A1, 78]

206 DRIA page 80

207 Thomas Koch Blank and Patrick Molly. Hydrogen Decarbonization Impact for Industry: Near-term challenges and long-term potential. 2020. RMI, https://rmi.org/wp-content/uploads/2020/01/hydrogen_insight_brief.pdf (Attachment BB)

EDF assessed the emissions associated with vehicles using different sources of hydrogen, calculating the difference in CO2 emissions of BEVs, FCEVs, and H2ICE vehicles, and conventional diesel ICE vehicles with the carbon intensities of the fuels along with the powertrain efficiencies taken into consideration. We used the vehicle efficiencies from ICCT's report on decarbonizing tractors. The efficiencies used in that study are similar to those assumed by EPA in HD TRUCS with the exception that ICCT also includes H2 ICE vehicles allowing for an equal comparison.208 We included the combustion emissions from diesel, the production emissions from electricity and SMR hydrogen, and the electricity production emissions for grid electrolysis hydrogen. We included hydrogen produced using the current grid, EPA's modeled incremental 2035 grid, and linearly extrapolated to calculate the grid emissions in 2027.209 210 The results of this analysis are plotted below in Figure 12, which importantly does not include any additional upstream emissions (i.e. methane emissions from natural gas production). [EPA-HQ-OAR-2022-0985-1644-A1, 79] [See Figure 12 on p. 80 of Docket Number EPA-HQ-OAR-2022-0985-1644-A1]

208 Hussein Basma et al. Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States. 2023. ICCT, https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/

209 Frequently Asked Questions: How much carbon dioxide is produced per kilowatt-hour of U.S. electricity generation? 2022. U.S. Energy Information Administration, https://www.eia.gov/tools/faqs/faq.php?id=74&t=11

210 Section 4.3.3.2 EGU Emissions Modeling Methodology from Draft RIA

Regardless of the grid, the emissions from the electricity needed to power BEVs is lower than the combustion emissions from a diesel vehicle. Using the current grid, BEVs represent a decrease of roughly a third and by 2035, they reduce emissions by almost 80%. This analysis shows that the emission reductions from FCEVs and H2ICE vehicles are highly dependent on the production method of the hydrogen and increase emissions relative to diesel vehicles when the hydrogen is produced by SMR, the current grid, and even the projected 2027 grid. Additionally, assuming EPA's 2035 grid mix, the emission benefits of BEVs are roughly twice those of FCEVs and four times those of H2ICE vehicles. [EPA-HQ-OAR-2022-0985-1644-A1, 80]

Moreover, FCEVs and ICE vehicles are much less efficient than BEVs. Additionally, 40% of the energy from the electricity used to make hydrogen using electrolysis is lost in the process. When the inefficiencies of both processes are combined, it takes 2.6 times as much electricity to power a FCEV as a BEV. When considerations like compression and transportation of the hydrogen are included, three to four times more energy is needed for hydrogen road transportation.211When considerations like compression and transportation of the hydrogen are included, three to four times more energy is needed for hydrogen road transportation compared to battery electric vehicles.212 213 [EPA-HQ-OAR-2022-0985-1644-A1, 80-81]

211 Eriko Shrestha and Tianyi Sun. Rule #1 of deploying hydrogen: Electrify first. 2023. EDF Blog Energy Exchange, https://blogs.edf.org/energyexchange/2023/01/30/rule-1-of-deploying-hydrogen-electrify-first/ EDF Blog Energy Exchange, https://blogs.edf.org/energyexchange/2023/01/30/rule-1-of-deploying-hydrogen-electrify-first/ (Attachment GG)

212 Eriko Shrestha and Tianyi Sun. Rule #1 of deploying hydrogen: Electrify first. 2023. EDF Blog Energy Exchange, https://blogs.edf.org/energyexchange/2023/01/30/rule-1-of-deploying-hydrogen-electrify-first/

213 Hydrogen vehicles fueled with low-GHG hydrogen would provide substantial climate benefits relative to diesel vehicles. They would also require substantially more low carbon electricity than a BEV.

Unless hydrogen fueled vehicles use low-GHG hydrogen, they do not substantially reduce climate emissions. While switching to BEVs reduces emissions relative to diesel vehicles using today's grid, the same cannot be said for FCEVs or H2ICE vehicles using hydrogen produced from SMR or grid electrolysis – both of which increase emissions relative to diesel vehicles. Indeed, even in 2030, emissions associated with grid electrolysis hydrogen fueled vehicles are higher than diesel vehicles. [EPA-HQ-OAR-2022-0985-1644-A1, 81]

ii. EPA should consider the impacts of hydrogen leakage given recent science demonstrating climate impacts.

While EPA accounts for the EGU emissions associated with hydrogen production from grid electrolysis in the assessments of costs and benefits, the impact of hydrogen leakage is not accounted for in the proposal. A recent but growing body of evidence clearly shows that hydrogen gas in the atmosphere causes global warming and EPA must consider these impacts when setting standards. [EPA-HQ-OAR-2022-0985-1644-A1, p. 81]

Hydrogen is a short-lived, indirect GHG that causes warming by increasing the concentration of other GHGs in the atmosphere. It is a small and slippery molecule that can easily escape from all parts of the value chain. Recent studies have found hydrogen's warming power is over 30 times larger than CO2 pound for pound over the 20 year period after it is emitted, and about 10 times larger over 100 years – values that are 2-6 times higher than previously thought.214 EDF research shows that if the hydrogen emissions rate is high across the value chain, it can severely undermine the intended benefits of clean hydrogen.215 [EPA-HQ-OAR-2022-0985-1644-A1, p. 81-82]

214 Ocko, Ilissa and Hamburg, Steve (2022). "Climate consequences of hydrogen leakage." Atmospheric Chemistry and Physics. Vol. 22, Issue 14. https://acp.copernicus.org/articles/22/9349/2022/ (Attachment CC); See also Warwick et al., (2022). "Atmospheric Implications of Increased Hydrogen Use". Department for Business, Energy & Industrial Strategy. https://www.gov.uk/government/publications/atmospheric-implications-of-increased-hydrogen-use (Attachment DD).

215 Id.

Currently, estimates of hydrogen leakage rates range considerably, due to a lack of empirical data on leakage from specific infrastructure such as electrolyzers, pipelines, and storage. Hydrogen emissions associated with production include both unintended leakage and intentional purging/venting (which can be controlled by incorporating technology that recombines purged and vented hydrogen back into the production process). Overall, estimates of emissions associated with electrolytic hydrogen production currently range from 0.1% to 9.2%. Blue hydrogen production is estimated to have less than 1.5% hydrogen emissions, since waste gas is likely to be flared or used for process heat. Hydrogen also has the potential to leak from various delivery segments of the value chain, including compression, liquefaction, storage, and transportation via pipelines or trucks. Overall, current estimates of leakage rates for the full hydrogen value chain, including production, processing, storage and delivery, range up to 20%.216 [EPA-HQ-OAR-2022-0985-1644-A1, p. 82]

216 Estimates include Cooper et al., (2022). "Hydrogen emissions from the hydrogen value chain-emissions profile and impact to global warming". Science of the Total Environment. Vol. 830. https://linkinghub.elsevier.com/retrieve/pii/S004896972201717X; Frazer-Nash Consultancy (2022). "Fugitive Hydrogen Emissions in a Future Hydrogen Economy". https://www.gov.uk/government/publications/fugitive-hydrogen-emissions-in-a-future-hydrogen-economy; Arrigoni, A. and Bravo Diaz, L. (2022). "Hydrogen emissions from a hydrogen economy and their potential global warming impact". Publications Office of the European Union, Luxembourg. doi:10.2760/065589, JRC130362; and Schultz et al., (2003). "Air Pollution and Climate-Forcing Impacts of a Global Hydrogen Economy". Science, Vol. 302. https://www.science.org/doi/10.1126/science.1089527

Studies on hydrogen leakage often rely on natural gas supply chain leakage as a proxy, and there is a high degree of uncertainty in existing methane emission estimates. Moreover, the patterns of hydrogen leakage can be different from that of methane, with fluid dynamics theory suggesting that hydrogen can leak 1.3 to 3 times faster than methane, and experimental studies suggest different leak rates for different leak regimes.217 However, development of appropriate sensor technologies is currently underway which would enable such measurement. [EPA-HQ-OAR-2022-0985-1644-A1, p. 82-83]

217 Ibid.

No estimates currently exist of the potential for leakage that would result from FCEVs or H2ICE vehicles fueling or the potential leakage that could result from vehicles while they are in use. Given the nature of hydrogen (small and as a result leak prone) and the necessary widespread infrastructure needed to enable vehicle refueling, the potential for leakage is a large source of concern for EDF. Accordingly, we urge EPA to consider the impact of hydrogen leakage in impacting the greenhouse gas emissions profile of H2 ICE vehicles and fuel cell vehicles. [EPA-HQ-OAR-2022-0985-1644-A1, p. 83]

b) EPA significantly underestimated upstream emissions from the production, transportation and distribution of gasoline and diesel fuel

EPA underestimates upstream emissions from the production, transportation and distribution of gasoline and diesel fuel. Using more reasonable assumptions to characterize these emissions would increase the benefits of EPA's heavy-duty standards. In particular, there are several areas we encourage EPA to more fully consider, to provide a more comprehensive assessment of the final rule's benefits. [EPA-HQ-OAR-2022-0985-1644-A1, p. 91]

1) Production of raw materials used in the production of gasoline and diesel fuel. EPA has not, but should, consider upstream emissions impacts associated with changing crude oil production and in doing so, should consider differences in pollution profiles associated with specific types and source of crude oil no longer being used by U.S. refineries as well as emissions associated with other potential refinery inputs (for instance natural gas or natural gas liquids.) These emissions are included in GREET and we encourage EPA to likewise include them in its analysis. [EPA-HQ-OAR-2022-0985-1644-A1, p. 91]

2) Transportation of gasoline and diesel fuel to the refinery. EPA likewise did not consider emissions associated with transportation of gasoline and diesel fuels to refineries. GREET addresses the emissions from transporting the other raw materials used by refineries, such as natural gas and natural gas liquids and EPA should include their reduction (including both greenhouse gases and other air pollutants) in its benefit analyses of the Final Rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 91]

3) Refinery Emissions. EPA does consider refinery emissions but consideration appears limited to 2055 and is not reflected in the agency's cost-benefit analysis. We encourage EPA to remedy both of these issues, extending the analysis and ensuring the pollution reduction benefits are part of EPA's cost-benefit analysis. EDF estimated the health benefits of reductions in upstream fossil fuel emissions using EPA's projections of the reduction in gasoline and diesel fuel use for this proposal.241 We applied the upstream emission factors that EPA used in its recent light-duty GHG rule for MYs 2023-2026 to these emission reductions.242 EDF then applied the benefit per ton estimates for a 3% discount rate for refinery emissions for the year 2040 to these emission reductions.243 [EPA-HQ-OAR-2022-0985-1644-A1, p. 91-92]

241 Table 6-2 of the Draft RIA

242 Row 29 of the UE_Gasoline and Row 29 of the UE_Diesel worksheets of the "parameters_FW-OEMs_YearShift.xlsx" file used to estimate emission impacts of the final standards. Changes in CNG use (in terms of gasoline equivalent gallons) were added to those of gasoline.

243 Table 14, Technical Support Document, Estimating the Benefit per Ton of Reducing Directly-Emitted PM2.5, PM2.5 Precursors and Ozone Precursors from 21 Sectors, U.S. Environmental Protection Agency Office of Air and Radiation Office of Air Quality Planning and Standards Research Triangle Park, NC 27711, April 2023

This "benefit per ton" analysis was the most recent we could readily find. It only presents a point estimate for each pollutant, while past studies, including EPA's analysis of emissions from vehicles and electricity generating units in this Proposal typically present a range. We found a net present value in 2027 (discounted at 3% per year) for upstream fossil fuel health benefits of $29 billion. Comparing these point estimates of the benefits per ton of refinery emissions to those developed by EPA in 2018 implies that they represent a mid-point of the typical range.244 This $29 billion estimate of the health benefits of reduced upstream fossil fuel emissions exceeds the mid-point of EPA's total estimate of health benefits of the proposal of $15-$29 billion.245 Though this estimate is approximate, it underscores the magnitude of these benefits and the importance of EPA considering them in its final rule. [EPA-HQ-OAR-2022-0985-1644-A1, p. 92]

244 Technical Support Document, Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors U.S. Environmental Protection Agency Office of Air and Radiation, Office of Air Quality Planning and Standards Research Triangle Park, NC 27711, February 2018

245 Table 7-18 of the Draft RIA.

4) Finished fuel distribution and production and transportation of ethanol to retail fuel stations. EPA likewise failed to consider these impacts and doing so is possible using existing tools, including GREET. [EPA-HQ-OAR-2022-0985-1644-A1, p. 92]

5) Emissions from the production and transportation of ethanol used in U.S. gasoline should also be considered. EPA makes no mention of these emissions. [EPA-HQ-OAR-2022-0985-1644-A1, p. 92]

In each of these areas, EPA has either failed to consider or underestimated emissions associated with production and distribution of gasoline and diesel fuel. A more comprehensive assessment of these impacts would only further strengthen the benefits of final heavy-duty vehicle standards. [EPA-HQ-OAR-2022-0985-1644-A1, p. 93]

Organization: MCS Referral & Resources

Comment 1

In Tables V-6 and IX-9 (reprinted below), the estimated reductions are not credible because they are based on not credible estimates of total emissions before reductions. [EPA-HQ-OAR-2022-0985-1629-A1, p. 1]

The tables show downstream HDE reductions in both criteria and toxic air pollutants under EPA's proposal and an alternative, expressed in tons and as a % of estimated emissions before any reductions for 2035, 2045 and 2055. [EPA-HQ-OAR-2022-0985-1629-A1, p. 1] [[See Docket Number EPA-HQ-OAR-2022-0985-1629-A1, page 1, for referenced tables]]

From these tables (and from the data on reductions in downstream carbon dioxide given in Tables V-4 and IX-7), I calculated the estimates used by EPA of the total emissions for CO2 and several of the criteria pollutants before downstream reductions in 2035, 2045, and 2055. The total emissions BEFORE reductions should be the same under both proposals. [EPA-HQ-OAR-2022-0985-1629-A1, p. 2]

As shown in DD Table 1 below, they are within 5% of each other in all cases except the PM estimates for 2035, which are inexplicably 11.9% higher for the EPA proposal than the alternative. [EPA-HQ-OAR-2022-0985-1629-A1, p. 2]

Critically, all these downstream pollutant estimates (pre-reduction) also should rise or fall together in 2045 and 2055, relative to the prior decade, given that they are all coming from the same group of non-electric vehicles. But as shown in the columns at right labeled % Change…, this is not the case. [EPA-HQ-OAR-2022-0985-1629-A1, p. 2]

Implausibly and inconsistently, the pre-reduction pollutant estimates for CO2, CO, PM, and NOx all showed no change or declined from 2035 to 2045 (as shown in red below), while only NOx also declined from 2045-55. The most extreme declines are seen in the pre-reduction emissions for PM in 2045, which EPA is estimating will decrease by 49% from 2035 to 2045 in its favored proposal, and by 43% in the alternative, while CO emissions declined less than 3% and CO2 emissions less than 4%. This is not credible. [EPA-HQ-OAR-2022-0985-1629-A1, p. 2]

Over 2 decades (from 2035-55), EPA's pre-reduction emissions of both NOx and PM2.5 declined by exactly 1/3 or more, while both CO2 and CO increased. These also are not plausible or consistent estimates. [EPA-HQ-OAR-2022-0985-1629-A1, p. 2]

We recommend that EPA recalculate all the rows in these tables using estimates for downstream emissions (pre-reductions) that are the same in both its favored proposal and the alternative. [EPA-HQ-OAR-2022-0985-1629-A1, p. 2] [[See Docket Number EPA-HQ-OAR-2022-0985-1629-A1, page 2, for referenced tables]]

Carbon monoxide should be included in all tables that estimate GHG emissions because it is a greenhouse gas. According to the IPCC, the indirect Global Warming Potential for CO over 20 years is 2.8 to 10, which is in addition to CO's direct GWG potential of approximately 1.3. See: https://archive.ipcc.ch/ipccreports/tar/wg1/249.htm#tab69 [EPA-HQ-OAR-2022-0985-1629-A1, p. 2]

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Rows should be added for estimates of CO contributions to GHG emissions in Tables IX-7, 8, 12,13,16, and 17. [EPA-HQ-OAR-2022-0985-1629-A1, p. 5]

Organization: POET

Current hydrogen production also leads to significant upstream emissions because it is produced via steam methane reforming ('SMR') using fossil fuels as process energy.36 EPA hopes to rely on hydrogen produced via electrolysis using renewable grid electricity.37 Yet today, hydrogen produced using grid electricity, renewable or otherwise, accounts for less than 1 percent of all hydrogen produced.38 Most hydrogen—about 95 percent—is produced using SMR without carbon capture.39 The IRA and BIL incentives are meant to address this by pushing hydrogen production toward electrolysis using renewable energy or SMR with carbon capture, but that shift is in its infancy and assumptions about the rapid conversion of hydrogen production to zero-carbon sources seem highly optimistic. The IRS, for instance, has yet to release critical guidance on how it will implement the production tax credit for low-carbon hydrogen.40 Yet EPA essentially assumes that carbon-intensive hydrogen is equivalent to hydrogen produced via electrolysis using renewable or nuclear energy in terms of emissions.41 That assumption is deeply flawed, as shown by the graph below: [EPA-HQ-OAR-2022-0985-1528-A1, pp. 11-12] [Refer to Figure 1-12, DOE Comparison of Domestic Hydrogen Production Pathways, on p. 12 of docket number EPA-HQ-OAR-2022-0985-1528-A1]

36 See U.S. Dep't of Energy, Hydrogen Production: Natural Gas Reforming, available at https://www.energy.gov/eere/fuelcells/hydrogen-production-natural-gas-reforming (last visited June 16, 2023) ('95% of the hydrogen produced in the United States is made by natural gas reforming in large central plants.').

37 See Attachment A at 8-10.

38 Id. at 8.

39 Id.

40 See IRS, Notice 2022-58, Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production (Nov. 3, 2022), available at https://www.irs.gov/pub/irs-drop/n-22-58.pdf.

41 Attachment A at 9.

Review of U.S. EPA's Assessment of Reductions in GHG Emissions Due to HD ZEVs

At a high level, the U.S. EPA's assessment of the reductions in GHG emissions due to the deployment of HD ZEVs, presented in Chapter 4 of the DRIA, is straightforward. The agency uses its MOVES emissions inventory model to estimate GHG emissions from conventional HD vehicles and then subtracts the GHG emissions associated with the electricity used to power BEVs and the hydrogen used to power FCEVs. In estimating GHG emissions associated with electricity and hydrogen production for use in HD vehicles, U.S. EPA assumes that all BEVs will be charged using grid electricity and that all FCEVs will be fueled with hydrogen produced by electrolysis using grid electricity (DRIA Chapter 4.3.3.1.). Unfortunately, while the basic approach used in the assessment is straightforward there are a number of concerns resulting from the way it was implemented by U.S. EPA. [EPA-HQ-OAR-2022-0985-1528-A1, p. 29]

The first concern is associated with the emission factors used for electricity generation for future years that reflect U.S. EPA's assumptions of the impact of the IRA. These are presented in Table 4-8 of the DRIA. Focusing on the CO2 emission factors, the 136,686 ton per Terawatt value for 2035 is 72% lower than the 2021 value published by EIA7 for gas fired generation and 88% lower than that for coal generation. The 2050 emission factor assumed to apply by U.S. EPA is 94 and 97% lower than the EIA 2021 gas and coal emission factor, respectively. For comparison, a summary published by EIA8 suggests that the IRA will reduce electric sector CO2 emissions by about 50% in 2035 relative to 2021 with that value remaining relatively constant thereafter. Obviously, the assumption of optimistically low electricity generation emission rates by U.S. EPA leads to higher estimates for the CO2 reductions predicted to result from the Proposed Rule. [EPA-HQ-OAR-2022-0985-1528-A1, p. 29]

7
https://www.eia.gov/tools/faqs/faq.php?id=74&t=11#:~:text=In%202021%2C%20total%20annual%20U.S.%20electricity%20net%20generation,billion%20short%20tons%20%E2%80%94of%20carbon%20dioxide%20%28CO%202%29.

8 https://www.eia.gov/outlooks/aeo/IIF_IRA/

A related concern is U.S. EPA's assumption that the hydrogen used by HD FCEVs and H2-ICE vehicles will be generated from very low carbon grid electricity rather than steam methane reforming or higher carbon grid electricity. The import of this issue can be seen from Figure 1-12 of the DRIA which is reproduced below. The current carbon intensity of hydrogen produced from several different pathways are shown by the green bars. As shown, electrolysis to produce hydrogen from grid electricity is currently a high carbon intensity pathway accounting for less than 1% of hydrogen production. Reforming of natural gas without carbon capture and sequestration which accounts for about 95% of production is also a high carbon intensity pathway. However, instead of making the reasonable assumption that the carbon intensity of a substantial amount of the hydrogen used to fuel HD FCEVs will be at these levels, U.S. EPA is essentially assuming that the carbon intensity will be at the same level as that shown for production from electrolysis using electricity from renewable or nuclear generation sources. Again, if U.S. EPA's optimistic assumptions are not realized in practice, effective GHG emissions from HD FCEVs will be much higher than forecast and the GHG reductions from the Proposed Rule will be similarly reduced. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 29-30] [Refer to Figure 1-12 (DOE), Comparison of Domestic Hydrogen Production Pathways, on p. 30 of docket number EPA-HQ-OAR-0222-0985-1528-A1]

Another concern with U.S. EPA's estimates of the GHG emission reductions associated with the Proposed Rule is the agency's inconsistent treatment of the methane (CH4) and nitrous oxide (N2O). These compounds are potent GHGs as shown by their 100 year global warming potential relative to CO2 in Table 4-11 of the DRIA. Also shown in Table 4-11 are the estimated reductions of these pollutants from HD vehicles from the proposed rule. However, despite the fact that electricity generation from combustion sources also results in emissions of methane and nitrous oxide, U.S. EPA fails to quantify or even mention the fact that there will be offsetting increases in emissions of these pollutants due to increased demand for electricity in Chapter 4 of the DRIA. For example, no emission factors for these compounds are presented in Table 4-8 and they are not included in any of the comparisons of increased emissions from electricity generation versus decreased emissions from HD vehicles shown in Chapter 4. This failure to properly address the overall impact of the Proposed Rule on methane and nitrous oxide emissions overstates the actual GHG emissions reduction which are shown in Table 4-15 of the DRIA. [EPA-HQ-OAR-2022-0985-1528-A1, p. 30]

The U.S. EPA Emission Inventory analysis in Chapter 4 also overstates the GHG reductions associated with the Proposed Rule by failing to account for the fact that conventional vehicles operate on fuels that are a mixture of fossil and low-carbon renewable fuels – including ethanol, renewable diesel fuel and biodiesel fuel. Based on data from EIA,9 the average ethanol content of gasoline sold in the U.S. is expected to increase from about 10% to 12% between now and 2050 while the average content of the combination of renewable and biodiesel is expected to increase from about 7% to 10% over the same range. Although the actual impact of proper accounting for renewable fuels on CO2 emissions from the Proposed Rule will be slightly smaller than the percentages listed above, they should clearly be accounted for by U.S. EPA. It is also important to note that use of ethanol and other renewable fuels capable of reducing GHG emissions from both new and in-use HD vehicles could be increased through incentives like those that have been provided to electricity and hydrogen through the IRA and the structure of the Proposed Rule. In addition, the magnitude of GHG reductions due to the use of ethanol and other renewable fuels could be increased by greater use of carbon capture and storage during their production, which would further lower their carbon intensity. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 30-31]

9 https://www.eia.gov/outlooks/aeo/data/browser/#/?id=11-AEO2023&cases=ref2023&sourcekey=0

Taken together, all of the concerns discussed above suggest that GHG emission benefits of the Proposed Rule are likely to be substantially less than claimed by U.S. EPA. [EPA-HQ-OAR-2022-0985-1528-A1, p. 31]

EPA Summary and Response:

Summary:

EPA received several comments regarding emission inventories and emissions impacts of the rule, with most comments containing criticism or recommendations regarding the modeling methodologies and tools EPA used. Many commenters argued that EPA's analysis overstated the rule's emission impacts, while others argued that EPA's analysis understated the emission impacts of the rule. For the most part, these arguments related specifically to EPA's upstream emissions modeling, including emissions sources such as electricity power generation, hydrogen production, and the refining of fossil fuels for gasoline and diesel fuel.

Response:

EPA has grouped comments and their responses by subject matter. The subject matter sections include: emissions from brake wear, tire wear, and road dust; IPM and power sector modeling; refinery emissions modeling; upstream emission sources EPA estimated; hydrogen production for fuel cell electric vehicles; suggested improvements in analysis; and points needing clarification. Remaining comments and their responses are grouped together in the final section labeled "Other comments."

Emissions from brake wear, tire wear, and road dust

EPA received comments stating that even though ZEVs have zero tailpipe emissions, other emission sources from their operation are important to consider. The comments stated that the biggest source of particulate emissions from their operation come from the wearing of tires, brakes, and the fugitive emissions of road dust while driving, collectively referred to here as non-exhaust emissions. Several commenters provided comment on EPA's modeling of these emissions.

> *AmFree et al.: But in estimating the proposed rule's effect on downstream emissions, the agency omits the particulate emissions caused by brake and tire wear.*

Later in the comment, AmFree et al. repeats:

> *AmFree et al.: The agency has not acknowledged its change in position here, let alone explained "why the new approach" of ignoring emissions from brake and tire wear "better comports with . . . the provisions that Congress enacted."*

AmFree et al.: EPA instead simply states—with no further explanation—that "primary exhaust PM2.5 does not include brake wear and tire wear"; EPA includes a footnote mentioning that, if it did factor those sources into the analysis, the estimated reductions would be lower. That omission has no analytical justification, departs from prior agency practice, and improperly skews the calculation in favor of electric vehicles.

This is incorrect. EPA did model emissions from brake and tire wear for all vehicles, including ZEVs, in the proposed rulemaking. However, for the reasons described below, we assumed HD ZEVs emit brake and tire wear emissions at the same level as their ICE counterparts. The assumption of equal brake and tire wear in MOVES is the reason that emissions from these sources are only mentioned in a footnote to DRIA Table 4-12, which states in full:

"Note that primary exhaust PM2.5 does not include brake wear and tire wear which are a significant source of particulate emissions. After accounting for brake wear and tire wear, the total primary PM2.5 emission reductions would be 3 percent in 2035, 10 percent in 2045, and 13 percent in 2055." DRIA p. 328 note A to Table 4-12.

This footnote may have resulted in confusion because it refers to a reduction in the relative impact (i.e., percentage) when considering all sources of PM together instead of just exhaust. The estimated reductions in particulate matter, in absolute tons, are not impacted whether we consider total PM or just exhaust PM. Therefore, the emission estimates are not skewed. To minimize confusion, in the final rulemaking we present the impact on total particulate matter emissions.

AmFree et al., AFPM, and Clean Fuels Development Coalition et al. then describe the expected relationship between tire wear emissions and characteristics of HD ZEVs. Particulate emissions from tire wear are generated from friction at the interface of a tire and the road. The commenters stated that rates of tire wear are positively correlated with vehicle torque, acceleration, and mass because these factors cause the tires to exert a greater force against the road. The commenters also stated that HD ZEVs tend to be heavier than comparable ICE vehicles and have greater torque and acceleration across a motor's RPM range, so it is reasonable to expect EVs to have higher rates of particulate emissions from tire wear.

AmFree et al.: Emissions from tire wear, for example, rise as vehicles (1) get heavier and (2) apply higher torques at lower speeds—two traits prominent in electric vehicles, especially relative to internal-combustion-engine vehicles.

AFPM: new and heavier ZEVs will increase particulate matter ("PM") emissions through increased brake, tire, and road wear. Roadway dust emissions which include particles from tire wear are correlated with vehicle weight, so increases in fleet average vehicle weight would be expected to increase roadway dust PM2.5 emissions.

AFPM: converting ICEs to ZEVs under the proposed regulation would significantly increase the average vehicle weight on U.S. roadways, which in turn would increase the entrained road dust emissions.

Clean Fuels Development Coalition et al.: Most egregious is the omission of the cost of increased brake and tire wear, which the proposal describes as "a significant source of particulate emissions" and estimates that, if they were included, the expected reduction *in particulate emissions would decrease by half or more in every year the agency considered. These added emissions are so high that they offset most of the benefits from eliminating tailpipe emissions.*

The comments cite several sources between them. One source is a 2022 survey of BEV drivers by the Swedish National Road and Transport Research Institute (Mirzanamadi and Gustafsson, 2022).[814] This report surveyed more than 300 EV operators and found that "[t]he results showed that approximately 33% of private users and 12.5% of professional users experienced faster tyre wear in their EVs/HEVs/PHEVs, compared with tyre wear in ICEVs. Generally, for all electric vehicle types, most professional users experience similar tyre wear as for ICEVs." This study's evidence is, at best, suggestive of increased tire wear emissions, given that fewer than half of the drivers surveyed experienced increased tire wear in the real world.

Another source cited is a study published in 2022 by Ye Liu et al.[815] which estimates the relative brake and tire wear emissions of ZEVs based on mathematical modeling. In it, they demonstrate that, relative to comparable ICE vehicles, we may expect ZEVs to have increased particulate emissions from tire wear and road dust, by roughly 10% and 15%, respectively (see Table 3 in the study).

Three more sources cited by the commenters (a 2020 OECD report,[816] a 2022 report by the private company Emission Analytics,[817] and an SAE technical paper by Obereigner et al.[818]) discuss ZEV tire wear and road dust suspension relative to ICE vehicles but do not make the direct comparison between the technologies as characterized by the commenters. In discussing ZEV versus ICE non-exhaust emissions, the OECD report cited specifically acknowledges the uncertainty in the balance of ZEV and ICE non-exhaust emissions, saying, "There is no scientific consensus as to what the net effect is." The Emission Analytics report suggests that ZEVs may have greater tire wear emissions but does not directly claim this. And the cited SAE technical paper specifically discusses engineering approaches which could be used to ensure that ZEVs do not have greater tire wear PM emissions than comparable ICE vehicles.

Overall, the sources cited by the commenters do not fully support the claim that "new and heavier ZEVs will increase particulate matter emissions." We discuss further below how we considered whether it may be reasonable to project an increase in particulate emissions from tire

[814] Mirzanamadi, Raheb and Gustafsson, Mats. "Users' experiences of tyre wear on electric vehicles". Swedish National Road and Transport Research Institute (VTI) 2022. Available online: http://vti.diva-portal.org/smash/get/diva2:1658879/FULLTEXT01

[815] Liu, Ye et al. "Exhaust and non-exhaust emissions from conventional and electric vehicles: A comparison of monetary impact values." Journal of Cleaner Production. Volume 331. January 10, 2022. Available online: https://doi.org/10.1016/j.jclepro.2021.129965

[816] Fulvio Amato, Alexandros Dimitropoulos, Katherine Farrow, and Walid Oueslati. Non-exhaust Particulate Emissions from Road Transport: An Ignored Environmental Policy Challenge. OECD. December 7,2020. Available online: https://www.oecd-ilibrary.org/sites/4a4dc6ca-en/index.html?itemId=/content/publication/4a4dc6ca-en

[817] Emissions Analytics. "Gaining traction, losing tread Pollution from tire wear now 1,850 times worse than exhaust emissions". Newsletter. May 10, 2022. Available online: https://www.emissionsanalytics.com/news/gaining-traction-losing-tread

[818] Obereigner, G., Shorten, R., Meier, F., Jones, S. et al., "Active Limitation of Tire Wear and Emissions for Electrified Vehicles," SAE Technical Paper 2021-01-0328, 2021. Available online: https://doi.org/10.4271/2021-01-0328.

wear and road dust from ZEVs relative to comparable ICE vehicles, but at this time our assessment is that this relationship is uncertain and subject to change as EV engineering evolves.

AmFree et al. did not mention brake wear as a source of particulate emissions from HD ZEVs in addition to tire wear, and AFPM made only a passing mention. Unlike tire wear, it is reasonable to expect HD ZEVs to have lower brake wear emissions than comparable ICE vehicles. Most ZEVs are equipped with regenerative braking systems. Particulate emissions from brakes are generated by the force of friction used to dissipate vehicle energy at the brake surface. Heavier vehicles require more energy to be dissipated, and therefore brake wear emissions when using friction brakes will be higher. However, when a vehicle is using regenerative brakes, some of the kinetic energy from slowing the vehicle is directed towards recharging the battery instead of relying on friction brakes for deceleration. Thus, there is less material wear via friction and emissions from friction brakes and regenerative braking systems reduce particulate emissions.[819] This effect is discussed by all the non-exhaust emission studies cited by the commenters. In fact, the modeling study by Liu et al., cited by AmFree et al., found in a literature review that regenerative braking decreases brake wear emissions from ZEVs by 68 percent. In their modeling, the reduced brake wear emissions often exceed the increased tire wear and road dust emissions such that ZEVs have lower non-exhaust emission impacts, when monetized, than comparable diesel vehicles. This can be calculated using Table 6 of the paper.

EPA investigated the possibility of updating our modeling assumptions on brake wear and tire wear emissions from electric vehicles. Updating these non-exhaust PM emission rates specific to HD ZEVs would require having detailed emissions data in which brake wear and tire wear emissions can be calculated in various operating conditions. None of the sources cited by commenters support this level of detailed analysis, nor could EPA find any sources of data or studies that allow this level of detailed analysis. Many sources attempt to compare non-exhaust PM emissions from ZEVs directly to ICE vehicles, but they are often modeling studies like Liu et al. or studies done under conditions that may not be representative of real-world operation.

EPA also could not find a single study which evaluated either brake wear or tire wear of heavy-duty ZEVs specifically. All sources we found, including those cited by commenters, focus on light-duty ZEVs because they already have higher volumes of adoption. Even if studies or data focused on light-duty vehicles were at the necessary level of detail, using them to extrapolate to heavy-duty vehicles would be unreasonable because of the large number of confounding factors. The most significant factor is the fact that many heavy-duty vehicles have more axles, and therefore a greater number of non-traction tires, and many HDVs pull trailers. The impact of greater torque from the driving axle on the wear of these non-traction axle tires is not clear, nor is the impact of regenerative braking on the brake wear from these additional axles. An additional confounding factor is the fact that estimating brake and tire wear of ZEVs in a high-torque setting is not straightforward because it depends, in part, on the engineering of the vehicle's motor, brake systems, and tires. This is discussed as part of the SAE technical paper cited by AmFree et al., for example. Finally, the relationship between propulsion technology (an EV versus an ICE vehicle) and vehicle weight is less clear for heavy-duty vehicles than for light-duty vehicles because many heavy-duty vehicles are designed to pull large payloads. If heavy-duty ZEVs have comparable weight to ICE vehicles when considering a vehicle's payload, then

[819] U.S. Department of Energy. "How Regenerative Brakes Work". Energy Saver. Available online: https://www.energy.gov/energysaver/how-regenerative-brakes-work.

it would be unreasonable to expect greater rates of non-exhaust PM emissions due to differences in weight.

Overall, EPA is receptive and appreciates the comments from stakeholders regarding the modeling of tire wear, brake wear, and road dust emissions. We accounted for both brake and tire wear emissions in the proposal and do so in the final rulemaking. To estimate increased tire wear emissions from HD ZEVs relative to ICE vehicles, as suggested by the commenters, without a corresponding decrease in brake wear emissions would improperly bias the total downstream PM inventory impacts. After consideration of the current data sources and literature, we have found that, at this time, there is no study or source of data with sufficient information to improve upon this modeling approach for the FRM.

Despite the overall level of uncertainty in the data and the literature, based on engineering principles, it would be reasonable to expect a HD ZEV that is heavier than a comparable HD ICE vehicle to have increased tire wear emissions but expect HD ZEVs to have decreased brake wear emissions relative to ICE vehicles. Should this prove to be true, these trends are in offsetting directions. Thus, EPA feels that our current modeling approach will not significantly mispresent the PM inventory. In other words, we expect the overall impact of updating brake and tire wear emission rates for HD ZEVs in MOVES on the rule's projected benefits would be small.

<u>IPM & power sector modeling</u>

Many commenters characterized EPA's analysis of EGU emissions as being insufficiently detailed, including EPA's modeling of the impact of the Inflation Reduction Act on the power sector, independent of the impact of the final standards.

> *POET: The first concern is associated with the emission factors used for electricity generation for future years that reflect U.S. EPA's assumptions of the impact of the IRA. … Obviously, the assumption of optimistically low electricity generation emission rates by U.S. EPA leads to higher estimates for the CO2 reductions predicted to result from the Proposed Rule.*

> *AmFree et al.: That expectation is entirely speculative and, in large part, based on the availability of three tax credits that Congress recently approved as part of the IRA to incentivize manufacturing, production, and investment in low-carbon initiatives. The agency does not explain the applicability of these tax credits or provide any data or evidence showing, or even suggesting, that they will have such a material impact on the power-generation mix. Before modeling EGU emissions based on them, EPA must make an earnest effort to assess the number of EGUs that will receive the credits and whether the savings will be enough to incentivize such a major shift in their operations.*

These comments misunderstand EPA's power sector modeling with IPM. The modeling done in IPM is neither an "assumption of optimistically low electricity generation emission rates" nor "entirely speculative."

IPM's documentation, which is publicly available online[820] and in the docket, clearly explains how it models the power sector, including the relevant provisions of the Inflation Reduction Act.

[820] U.S. EPA. "Post-IRA 2022 Reference Case". Power Sector Modeling. April 5, 2023. Available online: https://www.epa.gov/power-sector-modeling/post-ira-2022-reference-case

IPM “represents economic activities in key components of energy markets – fuel markets, emission markets, and electricity markets.” It “determines the least-cost method of meeting energy and peak demand requirements over a specific period. In its solution, the model considers a number of key operating or regulatory constraints that are placed on the power, emissions, and fuel markets.” (Chapter 2.1 of IPM’s documentation.) In summary, IPM models future emissions by modeling how future energy needs can be met in the most economically advantageous way. A key economic input of the IPM modeling for the final rule’s analysis were provisions of the IRA which incentivize the manufacturing, production, and investment in low-carbon initiatives.

Therefore, by using IPM, EPA did make a reasoned effort to assess the impact of the IRA on the power generation mix. Moreover, IPM modeling includes inputs specific to the existing electric system infrastructure, including representations of specific EGUs via the National Electric Energy Data System (NEEDS)[821] which contains the generation unit records used to construct IPM’s model plants. More specific documentation on the IRA’s impact on the buildout of new EGUs can be found in Chapter 4.5 of IPM’s documentation (Inflation Reduction Impacts on New Units).

AmFree et al. asked that EPA also address many aspects of electricity generation which are also included in IPM modeling.

> *AmFree et al.: According to a recent study, changes in the electricity sector have caused EGUs to increasingly rely on coal to meet demand that exceeds their typical capacity … it is necessary to assess whether EGUs will use the same sources to power their base loads and the peak loads that will inevitably occur if the proposed rule is adopted.*

> *AmFree et al.: EPA does not explain whether or how it takes marginal emissions into account when estimating EGU emissions. Neither the notice of proposed rulemaking nor the draft regulatory impact analysis discusses this concept.*

IPM accounts for these peak-load and marginal emissions via its operating reserve requirements, as discussed in Chapter 3.7 of IPM’s documentation. At a high level, IPM models that peak loads are met plus a reserve margin determined by reliability standards. Reserve margins are generally met via electricity generation fuels that provide more flexibility, such as natural gas. With the addition of greater renewable generation driven in part by the IRA, a greater need for flexible fuels is included in IPM, with the documentation stating, “As variable renewable generation increases, it is likely that operating reserve requirements will increase due to the variability of the renewable resources.” Therefore, marginal emissions are accounted for in EPA’s EGU emissions analysis, though separating emissions between regular and marginal activity is not possible.

Furthermore, the total electricity demand at any given time attributable to heavy-duty vehicles is small relative to the total grid demand (see section 7.1 of this RTC document, noting among other things that the Edison Electric Institute concurs with this finding), so EPA expects the additional electricity demand represented by heavy-duty electric vehicles to have a minimal impact on the fuel chosen to meet operating reserve requirements.

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[821] U.S. EPA. “National Electric Energy Data System (NEEDS)”. Power Sector Modeling. October 31, 2023. Available online: https://www.epa.gov/power-sector-modeling/national-electric-energy-data-system-needs

Delek US Holdings, Inc. stated that EPA did not adequately address air quality concerns for communities near existing or new power plants (this is addressed in section 16 of this Response to Comments document), and stated that this issue is especially important during downtimes for renewable sources:

> *Delek US Holdings, Inc.: EPA does not consider the potential degradation of air quality in areas in the direct vicinity of existing or new power plants, especially as the need for baseload generation at times when the sun is not shining and the wind is not blowing rises exponentially with rapid electrification.*

Electricity generation during downtimes for renewable sources is accounted for in IPM. First, IPM modeling includes estimates of the availability of each energy source, including renewables (see Chapter 3.5.1 of IPM's documentation). Thus, IPM's modeling considers that renewable energy sources do not have 100% availability, as mentioned by Delek US Holdings, Inc., and the IPM emissions modeling quantitatively reflects this fact.

Second, energy storage (when energy is stored for later use when renewable generation exceeds demand, typically using batteries or pump storage) is a key technology for clean power generation during downtimes for renewable sources. IRA includes incentives for the buildout of energy storage capacity, which is included in the 2022 post-IRA version of IPM. Therefore, our power sector modeling also quantitatively reflects ways that clean power can be generated during downtimes for renewables.

Refinery emissions

EPA's refinery emission impacts were modeled based on the key assumption that, as domestic demand for refined diesel and gasoline falls, so too does refining activity. API and AmFree et al. comment on this assumption.

> *API: EPA's analysis assumes that lower domestic fuel demand, due to increased usage of HD ZEVs, will result in reduced refinery throughput. However, this assumption may not hold true as the U.S. has emerged as a major player in the global market for refined products, actively exporting significant quantities…. their assumption fails to consider the possibility that refinery throughput could remain steady while the U.S. simultaneously increases its exportation of refined products.*

> *AmFree et al.: EPA may be substantially overestimating the decrease in refinery emissions. The agency "assumed refinery activity decreases with decreased demand for liquid fuel from heavy-duty vehicles … EPA must explain the basis for its assumption that refineries will decrease production before it factors these sizeable reductions into the calculation.*

EPA is receptive to comments from stakeholders that U.S. refineries may increase exports to offset a reduction in domestic fuel demand. Historically, U.S. net exports of crude oil and refined products have shifted in response to changes in policy at the federal level and there are good economic reasons why U.S. refineries might continue to operate at similar levels despite reduced U.S. product demand. Therefore, we have updated our approach to refinery modeling, specifically addressing the comments we received on exports.

We performed a new analysis to determine the extent to which we should expect U.S. refineries to change activity in response to decreased domestic demand in Chapter 4.2.5 of the

RIA. Based on this work and in response to the comments we received, we updated our modeling in the FRM to assume that 50 percent of the drop in domestic demand will be reflected by reduced refinery activity. This is much lower than the 93 percent we assumed in the NPRM. We also performed a sensitivity analysis should only 20 percent of the drop in domestic demand be reflected by reduced U.S. refinery activity. This is presented in Chapter 4.9 of the RIA.

Our updated refinery emissions modeling methodology discussed in RIA Chapter 4.2.5 is also responsive to comments from EDF and Clean Air Task Force requesting that our refinery emissions modeling be more expansive.

> *EDF: EPA does consider refinery emissions but consideration appears limited to 2055 and is not reflected in the agency's cost-benefit analysis. We encourage EPA to remedy both of these issues, extending the analysis and ensuring the pollution reduction benefits are part of EPA's cost-benefit analysis.*

> *Clean Air Task Force: EPA includes emissions from onroad heavy-duty vehicles (i.e., tailpipe emissions) and upstream emissions from electric generating units (EGUs) that produce the fuel (e.g., electricity, hydrogen) that powers ZEVs. However, EPA does not include in this analysis upstream emissions from refineries that produce the fuel (i.e., gasoline or diesel) that powers combustion vehicles. In order to calculate the full net benefits of the proposed rule, and to provide parallel treatment of fuel production for ZEVs and combustion vehicles, EPA should account for refinery emissions in its cost-benefit analysis.*

> *Clean Air Task Force: In finalizing the standards, EPA should ensure that it has a complete accounting of these upstream refinery emissions to properly measure the net benefits of the options under consideration. Failing to do so would undercount the benefits associated with more stringent standards.*

The commenters' understanding of our modeling of refinery emissions for the proposed standards is correct. We improved the analysis for refinery emissions for the FRM by calculating year-over-year refinery emissions inventory impacts that can be compared with downstream and EGU emissions and assessed in our net GHG emissions impacts of the final rule. We discuss this updated methodology in RIA Chapter 4.2.5. Additionally, emissions of CO_2 and other GHGs from refineries were included in the cost-benefit analysis of the final standards.

API comments on the methodology EPA used to estimate the reduction in refinery activity given a reduction in domestic fuel demand.

> *API: While the EPA assumes that a gallon of reduced domestic demand would reduce net crude and product imports by 0.864, their assumption fails to consider the possibility that refinery throughput could remain steady while the U.S. simultaneously increases its exportation of refined products. EPA justifies its assumption that imports will fall 86.4 percent by comparing the AEO 2022 Reference case with the AEO 2022 Low Economic Growth case. This comparison is not suitable for drawing these conclusions because in the Low Economic Growth case, U.S. refined product exports are lower compared to the Reference Case, suggesting a decline in global demand for refined products. Regardless of the assumption's merits, the EPA doesn't explicitly state, in its regulatory impact*

analysis, that the reduced global demand for refined products is, in part, an assumption based on the forecasts EPA uses for its analysis and not attributable to its regulation.

This comment is based on an incorrect interpretation of the methodology EPA used to estimate refinery emission reductions.

First, the 0.864 import factor is not an indication that imports will fall 86.4%, an amount that far exceeds the estimated total domestic demand reduction that could be attributed to the standards. Instead, it represents the extent to which EPA estimated imports would decrease relative to a domestic decrease in petroleum consumption. In other words, for every gallon of reduced petroleum consumption, we estimated imports would be reduced by 0.864 gallons.

Second, the use of the AEO 2021 (we did not use AEO2022 as the comment states) Low Economic Growth Case is not indicative of an EPA assumption that the future drop in domestic demand or imports will be in part due to economic conditions. EPA used the Low Economic Growth Case as a proxy to quantitatively estimate, given a drop in domestic demand, how U.S. oil imports will be affected. However, all drop in domestic demand associated with the refinery modeling is attributed to the final standards in our analysis.

API expresses concern with the refinery emissions modeling methodology should the final standards be met by increased adoption of cleaner ICE technologies rather than ZEV adoption.

API: The analysis assumes that there will be less domestic fuel demand due to a marked uptick in the use of HD ZEVs. However, as we have noted throughout these comments, there is significant concern that the market may not reach the levels of HD ZEV penetration suggested by the proposal. If fleets continue to use ICEVs in significant numbers, which could reasonably be expected based on various factors (e.g., the life of HD vehicles, costs of purchasing new vehicles, etc.), even with an increased use in biofuels, there will continue to be a demand for conventional fuels.

Because the final CO_2 emission standards are technology neutral and are evaluated at the fleet level, it will be up to the industry to choose the manner in which they comply. As noted in sections 2.1 and 9.2 of the RTC, there are many potential compliance pathways and EPA assessed additional example potential compliance pathways in the final rule that do not include ZEV technologies in their technology mix. EPA modeled the emission impacts of the final standards consistent with the modeled potential compliance pathway, which includes ZEV technologies as well as ICE vehicle technologies that meet the MY 2027 Phase 2 emission standards. If the standards are met via improved ICE efficiency (which our analysis indicates is possible), then there will still be substantial fuel consumption reductions attributable to the final standards, since there would still be the same reductions in GHG emissions. That is, because there is a consistent CO_2 emission rate per gallon of fuel burned, we expect to see a similar decrease in total fuel demand attributable to the standards regardless of the compliance pathway chosen by the industry. This means the compliance pathway chosen by manufacturers will also have little effect on the monetized GHG emission benefits.

Upstream emission sources estimated

Several commenters provided feedback to EPA on which upstream emissions sources were modeled and how that affects the modeled net emission impacts of the final standards. AmFree et al. asserted a limitation on EPA's approach in the proposal:

AmFree et al.: First, the emissions associated with powering a vehicle—whether by electricity from an EGU or fuel from a refinery—are far from the only ones reasonably "attributed" to its operation. Depending on the vehicle, there are also emissions associated with producing, recycling, and disposing of batteries; operating charging infrastructure; and extracting, refining, transporting, and storing petroleum fuels. These emissions can be substantial and, when considered together, may undermine EPA's assumption that swapping internal- combustion-engine vehicles for electric ones will necessarily result in an environmental good.

EPA acknowledges that there are other potential emissions further upstream than those EPA included in our analysis for both ICE and ZEV technologies. It is true that, as discussed in RIA Chapter 4, our analysis of upstream emissions is limited to EGUs and refineries. This approach represents a reasonable balance between considering effects of the rule on upstream emissions and limiting that consideration to reasonably proximate and predictable effects. Because we lack the data and capacity to predict every upstream effect of the rule throughout the supply chain and the broader economy, we judge that by examining the upstream emissions of the reasonably proximate and significant aspects of certain upstream emissions sectors, EGUs and refineries, we have taken into consideration significant upstream effects of the rule on air quality, such that our analysis is sufficiently complete for consideration in the rulemaking. We expect some of the emissions sources listed by AmFree et al. (for example, the operation of charging infrastructure and the transportation of petroleum fuels) to have only marginal impacts on the magnitude of the net emission impacts. This is discussed throughout this RTC section 13, and more discussion of the consideration of lifecycle emissions in setting standards and EPA's response can be found in section 17.1 of this RTC document.

AmFree et al. also commented that this represents a change in how EPA has modeled upstream emissions for previous heavy-duty GHG rules. In this comment, they are referring to EPA's modeling for the HD GHG Phase 1 and HD GHG Phase 2 rules, which included the extraction and transportation of crude oil and distribution of finished gasoline and diesel. Similarly, Delek US Holdings, Inc. and EDF comments that EPA should consider many upstream emission sources, including those that EPA considered in the previous rules.

AmFree et al.: EPA never explains why emissions from EGUs and refineries are the only ones relevant to the analysis. Nor does it acknowledge that its current position departs from earlier GHG rulemakings, where it did consider additional upstream sources. EPA has an obligation to explain why a more cabined view of upstream emissions is appropriate here.

Delek US Holdings, Inc.: The Proposed Rule did not quantify emissions changes associated with producing or extracting crude or manufacturing refined fuels.18 It failed to assess emissions from battery manufacturing or electricity production. EPA should provide a more comprehensive analysis to comply with its directive under the Clean Air Act and better assess the resulting impact of the Proposed Rule.

EDF: EPA has not, but should, consider upstream emissions impacts associated with changing crude oil production.

EDF: EPA likewise did not consider emissions associated with transportation of gasoline and diesel fuels to refineries.

EDF: Finished fuel distribution and production and transportation of ethanol to retail fuel stations. EPA likewise failed to consider these impacts.

EDF: Emissions from the production and transportation of ethanol used in U.S. gasoline should also be considered. EPA makes no mention of these emissions.

We acknowledge that EPA's Phase 3 analysis differs from our approach in Phase 1 and Phase 2. However, EPA's upstream modeling reasonably includes the three most significant sectors in terms of understanding the impact of the standards on overall GHG and CAP/HAP emissions (downstream, EGUs, and refineries). EPA took this approach in our Phase 3 analysis for several reasons. In the illustrative AQM analysis for our most recent LMDV NPRM,[822] we did consider impacts on crude production wells and pipeline pumps, and natural gas production wells and pipeline pumps. That analysis suggested that emission reductions from crude production wells and pipeline pumps were being partially offset by increases from natural gas production well and pipeline pumps. The net oil and gas sector emissions changes are therefore small relative to those of the onroad and power sectors.

In addition, modeling EGU and refinery emissions is balanced in considering the operation of ZEV versus ICE vehicles. For both vehicle types, our analysis considers the emissions and energy consumption of the vehicle itself plus the production of the fuel it uses, be it refined liquid fuels for ICE vehicles or electricity for ZEVs. It would skew the emission results if EPA calculated reduced transport of fuels caused by a reduction in ICE vehicle usage but no corresponding increase in the transport of fueling sources, such as natural gas, used to power the increased EV usage. Similarly, EPA does not assess comparable emissions associated with refinery waste generation and management (many of those wastes are listed as hazardous under the RCRA subtitle hazardous waste program, 40 CFR Part 261 hazardous wastes K 048-052).

There were also practical reasons for EPA to model upstream emissions only from EGUs and refineries. EPA has available tools that are well suited to modeling the impacts of the standards on these two sources (i.e., IPM and a combination of the emissions modeling platform and EIA's Annual Energy Outlook). EPA determined that other modeling tools, in particular GREET and EPA's previous upstream modeling tool for emissions from previous HD GHG rules, did not have the same advantages as our chosen methodology for the purposes of modeling quantitative and detailed upstream emission impacts from the final standards.

Specifically, EPA's upstream analysis for the previous HD GHG rules was based on a spreadsheet modeling tool which incorporated upstream emission factors from GREET. These emission factors from GREET were process-level emission factors and often encompassed several upstream emissions sources together, such as both crude extraction and transport. This spreadsheet-based approach was not designed, and is not adequate, to capture the complexities associated with major shifts in transportation fuels. Furthermore, matching GREET's emission factors to more specific emissions and activities estimates from EPA's detailed models, including IPM and MOVES, would introduce additional uncertainty.

[822] U.S. EPA. "Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles: Draft Regulatory Impact Analysis". April 2023. Available online: https://nepis.epa.gov/Exe/ZyPDF.cgi/P10175J2.PDF?Dockey=P10175J2.PDF

While EPA included fewer upstream emission sources for this rule than previous HD GHG rules, it's important to note that this modeling is more detailed and rigorous, for the purposes of this rulemaking, than if we had used the same approach as we did for previous rules. Neither EPA's spreadsheet tool nor GREET are dynamic models, in which projections of future time periods depend on the simulation of prior time periods. IPM, however, is a dynamic model. Because of its dynamic nature, the inclusion of rule-specific IPM runs allows for a better understanding of how the standards (especially possible HD ZEV adoption driven by the standards) impact the full U.S. energy system.

Nevertheless, EPA does not dispute the utility of other upstream emissions modeling tools, especially GREET, for other purposes. For example, we used GREET in a comparative analysis of different hydrogen production pathways to meet the fueling needs of additional FCEVs (as we modeled in our potential compliance scenario of the final standards) in RIA Chapter 4.8. There is ongoing work to develop the capability to capture upstream and cross-sector impacts in more detail, including the use of multi-sector modeling tools such as EPA's GLIMPSE framework.[823]

Clean Fuels Development Coalition et al. also noted that there are emissions associated with the buildout of a more renewable power grid.

> *Clean Fuels Development Coalition et al.: EPA also ignores the GHG emissions associated with manufacturing more, less dense, remotely located intermittent generation sources and battery back-up, plus the need for more natural gas peaking capacity and massive transmission, substation, and transformer investment to integrate these technologies into the power grid.*

IPM modeling predicts that most of the actions taken that make the power grid cleaner are driven by economic conditions and the Inflation Reduction Act and occur regardless of the promulgation of the final standards. Therefore, most of the emissions associated with infrastructure updates for the power sector are not attributable to the final standards.

However, some infrastructure updates, especially those related to the charging of heavy-duty BEVs and hydrogen production would, at least in part, be attributable to electrification driven by the final standards. The magnitude of these emissions depends on how manufacturers choose to comply with the final standards. EPA has no tooling available to quantify these emissions directly. Given that we expect the final standards to have a small impact on electricity transmission, generation, and cost (see section 7 of this RTC document), we also expect the emissions impact of possible grid infrastructure updates to be small.

Hydrogen production for fuel cell electric vehicles

To estimate emissions from hydrogen production for fuel cell electric vehicles in the proposed rule analysis, EPA assumed that all hydrogen would be produced onsite via grid electrolysis and could therefore be represented as such in IPM. DRIA pp. 321-22. This was a simplifying assumption, and we received many comments regarding that assumption.

[823] U.S. EPA. "GLIMPSE – A computational framework for supporting state-level environmental and energy planning". February 1, 2024. Available online: https://www.epa.gov/air-research/glimpse-computational-framework-supporting-state-level-environmental-and-energy

Cummins Inc.: We also appreciate EPA's assumption that emissions generated from creating hydrogen are the same as grid emissions.

POET: A related concern is U.S. EPA's assumption that the hydrogen used by HD FCEVs and H2-ICE vehicles will be generated from very low carbon grid electricity rather than steam methane reforming or higher carbon grid electricity … U.S. EPA is essentially assuming that the carbon intensity will be at the same level as that shown for production from electrolysis using electricity from renewable or nuclear generation sources. Again, if U.S. EPA's optimistic assumptions are not realized in practice, effective GHG emissions from HD FCEVs will be much higher than forecast and the GHG reductions from the Proposed Rule will be similarly reduced.

POET: *Current hydrogen production also leads to significant upstream emissions because it is produced via steam methane reforming ('SMR') using fossil fuels as process energy. EPA hopes to rely on hydrogen produced via electrolysis using renewable grid electricity. Yet today, hydrogen produced using grid electricity, renewable or otherwise, accounts for less than 1 percent of all hydrogen produced. Most hydrogen—about 95 percent—is produced using SMR without carbon capture. The IRA and BIL incentives are meant to address this by pushing hydrogen production toward electrolysis using renewable energy or SMR with carbon capture, but that shift is in its infancy and assumptions about the rapid conversion of hydrogen production to zero-carbon sources seem highly optimistic. The IRS, for instance, has yet to release critical guidance on how it will implement the production tax credit for low-carbon hydrogen. Yet EPA essentially assumes that carbon-intensive hydrogen is equivalent to hydrogen produced via electrolysis using renewable or nuclear energy in terms of emissions. That assumption is deeply flawed,*

AmFree et al.: Although the vast majority of hydrogen used for fuel-cell vehicles is made through "steam methane reforming," "largely as part of petroleum refining and ammonia production," the agency makes the "simplifying assumption" that "all hydrogen used for FCEVs is produced via grid electrolysis of water and can therefore be entirely represented as additional demand to EGUs." Even assuming that "simplifying assumption" is warranted, EPA must accurately predict EGU emissions to measure the effect of shifting from internal-combustion-engine to fuel-cell vehicles. For the reasons described above, it has not done so.

EDF: The method of hydrogen production impacts whether hydrogen fueled vehicles decrease the vehicle's associated emissions when compared to diesel vehicles or increases them … SMR emits CO2 as a byproduct of the hydrogen production resulting in a carbon intensity of between 8 and 12 kg of CO2/kg H2. Hydrogen produced using electricity from the current U.S. average grid has a carbon intensity of 21 kg of CO2/kg H2 … the emission reductions from FCEVs and H2ICE vehicles are highly dependent on the production method of the hydrogen.

EDF: EPA should ensure its assessment of hydrogen is rigorous, comprehensive, and fully accounts for potential adverse climate and health impacts associated with hydrogen production.

ACEEE: [I]t is not clear that the hydrogen for use as a transportation fuel will generally be produced through grid electrolysis in the coming years or will have carbon emissions similar to hydrogen from grid electrolysis. EPA points to incentives for clean hydrogen production in IIJA and IRA, as well as "new transportation and other demand drivers and potential future regulation" to support this assumption. However, potential dramatic increases in the coming years in the volume of both clean hydrogen and hydrogen produced through electrolysis are insufficient to ensure that hydrogen production through SMR will decline or that hydrogen used to fuel heavy-duty vehicles will become cleaner in tandem with grid decarbonization. This is especially true given the many uses to which a growing hydrogen supply could be put.

EPA's modeling assumption that 100 percent of the hydrogen needed to fuel FCEVs would be produced by grid electrolysis is not, despite POET's characterization, an assertion that the emissions from various hydrogen production methods are the same. Indeed, we acknowledge that they are different in DRIA Chapter 4.3.3, stating ,

"[w]e recognize that the relative emissions impact of hydrogen production via SMR versus grid electrolysis depends on how electricity is produced, which varies significantly by region across the country. We also recognize that electrolysis powered by electricity from the grid on average in the U.S. may overestimate the upstream emissions impacts that are attributable to HD FCEVs in our analysis."

We used IPM to evaluate emissions from the U.S. electricity grid for the analysis. More details regarding comments on IPM modeling and EGU emissions can be found earlier in this response to comments section. EPA is reviewing a petition to regulate some methods of hydrogen production given anticipated growth in the sector spurred by IRA incentives,[824] but emissions from hydrogen production facilities are not regulated at this time. Thus, our capabilities to evaluate impacts associated with hydrogen production are currently limited.

We acknowledge there is uncertainty in how hydrogen needed for FCEVs will be produced in the future, bringing uncertainty into upstream emissions estimates for hydrogen-fueled vehicles. As described in RIA Chapter 1.8 and RTC Section 8, BIL and IRA both include provisions that incentivize reducing the emissions and carbon intensity of hydrogen production. For example, in June 2023, DOE updated Clean Hydrogen Production Standard (CHPS) guidance that establishes a target for lifecycle (defined as "well-to-gate") GHG emissions associated with hydrogen production, accounting for multiple requirements within the BIL provisions.[825] In December 2023, the Treasury Department and Internal Revenue Service proposed regulations to offer

[824] On September 15, 2023, EPA received a petition from the EDF and 13 other health, environmental, and community groups to regulate fossil and other thermochemical methods of hydrogen production, given the current emissions from these facilities and the anticipated growth in the sector spurred by IRA incentives. Petitioners advocate for regulatory safeguards to help ensure that the anticipated growth in this sector does not result in an unbounded increase in emissions of GHGs, criteria, and hazardous air pollutants (HAP). The petition requests that EPA list hydrogen production facilities as significant sources of pollution under CAA sections 111 and 112, and that EPA develop standards of performance for new and modified hydrogen production facilities plus emission guidelines for existing facilities.

[825] U.S. Department of Energy, Hydrogen Program. "Clean Hydrogen Production Standard Guidance". June 2023. Available online: https://www.hydrogen.energy.gov/library/policies-acts/clean-hydrogen-production-standard.

income tax credit for the production of clean hydrogen (45V), as established in the IRA.[826] Several programs initiated by BIL and IRA investments that could heavily influence the character of the emerging hydrogen production market are under ongoing development.

In light of the uncertainties in this area, and based on the comments received, EPA performed a comparative analysis for upstream emissions from FCEVs for the FRM. We compare emissions from grid electrolysis with other hydrogen production methods (see RIA Chapter 4.8). The analysis covers the bounds of a 100 percent grid electrolysis scenario with a 100 percent SMR sensitivity, but also evaluates other clean options such as SMR and auto-thermal reforming (ATR) with carbon capture and sequestration (CCS) technologies. We did this to acknowledge comments that noted that hydrogen today in the U.S. is predominantly produced using SMR, while demonstrating potential impacts of additional pathways expected to be possible with commercialized technologies in the timeframe of the rule.

The analysis has additional rigor and shows that the relative emissions of producing hydrogen via steam methane reforming versus electrolysis change over time. Compared to grid-based electrolysis, we estimate SMR to have lower emissions in earlier years and higher emissions in later years. This conclusion is in line with EDF comments, for example, that cite current emission factors for each process which show that SMR is lower emitting than electrolysis based on today's grid. The analysis also shows that grid-based electrolysis, especially when a large share of electricity is generated via renewable sources, is a viable pathway to achieve reductions in emissions from producing hydrogen. EPA's IPM modeling shows grid electrolysis is modeled to become lower emitting over time. Thus, over the full 2027-2055 modeling domain for the emission impacts analysis, our hydrogen production assumptions do not significantly overestimate or underestimate the cumulative upstream emission impact estimates we present in the RIA.

EDF submitted additional detail in their comment regarding hydrogen production:

> *EDF: Additionally, 40% of the energy from the electricity used to make hydrogen using electrolysis is lost in the process. When the inefficiencies of both processes are combined, it takes 2.6 times as much electricity to power a FCEV as a BEV. When considerations like compression and transportation of the hydrogen are included, three to four times more energy is needed for hydrogen road transportation compared to battery electric vehicles.*

EPA's modeling of FCEV and BEV efficiencies is in general agreement with the values estimated by EDF. EPA's analysis of hydrogen production emissions resulting from grid electrolysis included the energy needed to compress the hydrogen but assumed on-site generation instead of transporting significant amounts of hydrogen. This difference in assumptions has a small impact on the total upstream emissions estimated for HD FCEVs in our analysis.

Some commenters suggested that EPA is optimistic about the future of hydrogen and should not incentivize hydrogen without strong evidence that hydrogen will be clean.

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[826] 88 FR 89220. Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election To Treat Clean Hydrogen Production Facilities as Energy Property. Available online: https://www.federalregister.gov/documents/2023/12/26/2023-28359/section-45v-credit-for-production-of-clean-hydrogen-section-48a15-election-to-treat-clean-hydrogen.

ACEEE: EPA should not incentivize hydrogen-fueled vehicles without strong evidence that hydrogen fuel for transportation will be clean in the foreseeable future.

EDF: Emission reductions from FCEVs and H2ICE vehicles are highly dependent on the production method of the hydrogen and increase emissions relative to diesel vehicles when the hydrogen is produced by SMR, the current grid, and even the projected 2027 grid.

EDF: EPA should ensure rigorous accenting and protective safeguards are in place related to the production and use of hydrogen.

POET: Again, if U.S. EPA's optimistic assumptions are not realized in practice, effective GHG emissions from HD FCEVs will be much higher than forecast and the GHG reductions from the Proposed Rule will be similarly reduced.

As described in Preamble Section 2 and in RTC sections 2, 9, and 17.1, EPA's final Phase 3 standards are performance-based vehicle exhaust standards. We included HD FCEV technology in our modeled potential compliance pathway used for inventory modeling (and H2 ICE in some of our additional example compliance pathways) due to the large potential to reduce GHG emissions from vehicles, as well as existing manufacturer and market developments for these technologies. The final rule considers lower levels of early market FCEV adoption and infrastructure development compared to the proposed rule. The associated hydrogen consumption due to the final rule by 2032 is less than two percent of the amount of hydrogen currently produced in the U.S. annually (see RIA Chapter 1.8.3.4). Thus, the emissions impact of hydrogen consumption based on the modeled potential compliance pathway in the final standards is relatively small.

Meanwhile, given the opportunity for hydrogen to contribute to national decarbonization goals across sectors over the coming decades, EPA is engaged in whole-of-government efforts to continue to expand and implement a U.S. National Clean Hydrogen Strategy and Roadmap,[827] which aims to reduce emissions associated with the production, transport, storage, and use of hydrogen. The larger global interest in hydrogen is driven by the technology's emissions reduction potential,[828] and pressures to achieve GHG reductions is likely to increase over time.

<u>Suggested improvements in analysis</u>

Some commenters made suggestions for how EPA should improve the emission impacts analysis for the final rulemaking.

MCS Referral & Resources recommended that EPA model carbon monoxide as a greenhouse gas and quantify the benefits similarly to methane and nitrous oxide.

[827] U.S. Department of Energy. "U.S. National Clean Hydrogen Strategy and Roadmap Interagency Collaboration". Available online: https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/national-hydrogen-strategy-interagency-collaboration.pdf

[828] IEA (2019), The Future of Hydrogen, IEA, Paris https://www.iea.org/reports/the-future-of-hydrogen, Licence: CC BY 4.0

MCS Referral & Resources: Carbon monoxide should be included in all tables that estimate GHG emissions because it is a greenhouse gas. According to the IPCC, the indirect Global Warming Potential for CO over 20 years is 2.8 to 10, which is in addition to CO's direct GWG potential of approximately 1.3. Rows should be added for estimates of CO contributions to GHG emissions in Tables IX-7, 8, 12,13,16, and 17.

CO is not considered to be a GHG of significance in the IPCC's AR5 report,[829] is not included in EPA's annual GHG Sources and Sinks report,[830] and is also not included in EPA's 2009 endangerment finding for six well-mixed greenhouse gases constituting the air pollution which endangers public health or welfare.[831] Therefore, EPA did not quantify CO as a greenhouse gas for the final rulemaking analysis.

EDF makes a similar assertion about hydrogen that is leaked to the atmosphere:

EDF: A recent but growing body of evidence clearly shows that hydrogen gas in the atmosphere causes global warming and EPA must consider these impacts when setting standards. Hydrogen is a short-lived, indirect GHG that causes warming by increasing the concentration of other GHGs in the atmosphere. It is a small and slippery molecule that can easily escape from all parts of the value chain. Recent studies have found hydrogen's warming power is over 30 times larger than CO2 pound for pound over the 20-year period after it is emitted, and about 10 times larger over 100 years – values that are 2-6 times higher than previously thought.

EDF: EPA should ensure its assessment of hydrogen is rigorous, comprehensive, and fully accounts for potential adverse climate and health impacts associated with hydrogen production and use.

EDF: Accordingly, we urge EPA to consider the impact of hydrogen leakage in impacting the greenhouse gas emissions profile of H2 ICE vehicles and fuel cell vehicles.

Please see RIA Section 1.8.4 for discussion of emerging science on the global warming potential of hydrogen at scale. We are not aware of extensive literature on the health impacts of hydrogen production, but anticipate research to scale on topics such as this with development of the market over the next decade.

We did not quantify H_2 as a greenhouse gas for the final rulemaking analysis for the same reasons we did not quantify CO. EDF's comment went on to discuss various data sources and methodologies for estimating hydrogen leakage rates, which could serve as a basis for future work estimating the climate warming impacts of hydrogen gas. These comments, however, are out of scope for the final rulemaking analysis because we are not estimating hydrogen emissions as a GHG.

[829] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Available online: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf
[830] U.S. EPA (2023). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021. EPA 430-R-23-002. Available online: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021
[831] 74 FR 66496

POET suggests that EPA should quantify the emission impacts of methane and nitrous oxide in the power sector:

> *POET: However, despite the fact that electricity generation from combustion sources also results in emissions of methane and nitrous oxide, U.S. EPA fails to quantify or even mention the fact that there will be offsetting increases in emissions of these pollutants due to increased demand for electricity in Chapter 4 of the DRIA.*

We updated our power sector modeling to include estimates of methane and nitrous oxide from EGUs for the final rulemaking analysis. We also updated our refinery modeling to include year-over-year impacts of refinery methane and nitrous oxide emissions. Chapters 4.5 and 4.6 of the RIA present net impacts for CO_2, CH_4, and N_2O emissions, as well as total GHG (CO_2e) emissions.

EDF and Clean Air Task Force recommended improvements to our refinery emissions methodology, which we implemented. This is discussed more in the refinery emissions portion of this RTC section.

Points needing clarification

Several comments included incorrect assertions or points needing clarification regarding EPA's emissions modeling results.

Delek US Holdings, Inc. suggest that EPA made unfounded assumption in its modeling of the proposed standards.

> *Delek US Holdings, Inc.: EPA compounds this flaw by making unsupported assumptions regarding total emissions impacts of its proposal. While it claims that the overall analysis for combined downstream and upstream emissions "likely underestimates the net emissions reductions that may result" from the Proposed Rule, EPA failed to offer a data-based substantiation.*

This assertion is incorrect. While our statement that the modeling of the proposed standards "likely underestimates the net emissions reductions that may result" from the proposed standards is not supported by direct modeling, the statement is not unsupported. Specifically, we cite our lack of modeling of fuel extraction and transport, incomplete modeling of refinery emissions (DRIA page 349), and assumption that 100% of hydrogen for fuel cell electric vehicles will be produced by grid electrolysis (DRIA page 322) as reasons to believe our net emissions analysis may underestimate total downstream and upstream emission reductions.

In part as a response to this comment and others like it, we have made several improvements to our modeling of upstream emissions for the FRM, including evaluating more pollutants from both EGUs and refineries, calculating year-over-year refinery emissions impacts, and evaluating two sensitivity cases in our emissions modeling related to refinery emissions and emissions from hydrogen production.

While there are other upstream emission sources that we did not estimate which would decrease our net emission reduction estimates (for example, the transport of fuels for electricity generation), we evaluated the scope of those emissions and concluded that their impact on our overall emissions estimates would be small – we discuss this in more detail in the portion of this RTC on upstream emissions sources we estimated. Therefore, we support our statement in the

DRIA that our NPRM emissions inventory analysis likely underestimated total downstream and upstream emission reductions.

MCS Referral & Resources comment includes discussion about whether EPA used the same reference inventory for both the proposal and alternative scenarios. To determine this, they calculate a "pre-reduction" based on the emission reduction in absolute and percentage terms for each pollutant and scenario.

> *MCS Referral and Resources: As shown in DD Table 1 below, they are within 5% of each other in all cases except the PM estimates for 2035, which are inexplicably 11.9% higher for the EPA proposal than the alternative.*

While this is true based on their arithmetic (using 6% estimate for the proposal and 5% estimate for the alternative does result in the 11.9% difference MCS states), this error is simply introduced by rounding. The percent change for the proposal is presented as 6%, rounded down from 6.49%, while the alternative reduction is 5%, rounded up from 4.76%. Applying the "pre-reduction" calculation using these more precise percentages yields a consistent inventory within 5%.

> *MCS Referral & Resources: Critically, all these downstream pollutant estimates (pre-reduction) also should rise or fall together in 2045 and 2055, relative to the prior decade, given that they are all coming from the same group of non-electric vehicles. But as shown in the columns at right labeled % Change, this is not the case. Implausibly and inconsistently, the pre-reduction pollutant estimates for CO2, CO, PM, and NOx all showed no change or declined from 2035 to 2045 (as shown in red below), while only NOx also declined from 2045-55. The most extreme declines are seen in the pre-reduction emissions for PM in 2045, which EPA is estimating will decrease by 49% from 2035 to 2045 in its favored proposal, and by 43% in the alternative, while CO emissions declined less than 3% and CO2 emissions less than 4%. This is not credible. Over 2 decades (from 2035-55), EPA's pre-reduction emissions of both NOx and PM2.5 declined by exactly 1/3 or more, while both CO2 and CO increased. These also are not plausible or consistent estimates.*

EPA finds the reference emission inventory estimates credible, and disagrees with the assertion that the inventories, or "pre-reductions," for all pollutants should move together. The reason for this is simple – while the group of vehicles being displaced in the analysis by ZEVs is the same for all pollutants, the impact each type of vehicle has on the inventory of each pollutant is not the same. This is discussed at length in Chapter 4.3 of the RIA. See DRIA Chapters 4.3.2 (Year-over-year Impacts) and 4.3.3 (Detailed Emission Impacts).

Importantly, DRIA Chapter 4.3.3 includes a discussion of how and why different pollutants have different inventory trends over time based on the heavy-duty vehicles that are displaced by ZEVs. For example, in the proposal's DRIA, EPA says,

> *"In summary, we expect the displacement of HD ICE vehicles of all fuel types with HD ZEVs would drive broad emission reductions—we expect the displacement of diesel HD vehicles will be the primary source of NOX reductions; we project the displacement of gasoline light HD trucks will be the primary source of PM2.5 and VOC reductions; and*

we anticipate the displacement of HD CNG vehicles will be the primary source of methane reductions." DRIA p. 344.

As is discussed elsewhere in this response to comment section, POET comments that EPA failed to account for emissions of methane and nitrous oxide, both greenhouse gases, in the upstream emissions analysis. Specifically, they argue that this skews the net impacts presented in Chapter 4:

POET: This failure to properly address the overall impact of the Proposed Rule on methane and nitrous oxide emissions overstates the actual GHG emissions reduction which are shown in Table 4-15 of the DRIA.

Table 4-15 of the DRIA does not present net GHG emission reductions, but total downstream emission reductions. This is made clear by the caption "Cumulative 2027–2055 downstream GHG emission reductions from the proposed CO_2 emission standards." For the proposal analysis, EPA's downstream emissions modeling included methane and nitrous oxide, but the upstream emissions modeling did not. Therefore, EPA did not present net GHG emission reductions at all in Chapter 4 of the DRIA. Instead, EPA only presented net CO_2 emission impacts, which are modeled for all downstream and upstream emission sources considered. Thus, the proposal's GHG emission reductions are not misrepresented as POET's comment argues.

The FRM analysis includes full GHG emissions modeling (including CO_2, CH_4, and N_2O) for all sectors. Therefore, RIA Chapter 4 presents net GHG impact of the final standards considering all three modeled greenhouse gases.

POET also comments that EPA's modeling of downstream GHG emissions is skewed by failing to account for renewable fuels:

POET: The U.S. EPA Emission Inventory analysis in Chapter 4 also overstates the GHG reductions associated with the Proposed Rule by failing to account for the fact that conventional vehicles operate on fuels that are a mixture of fossil and low-carbon renewable fuels – including ethanol, renewable diesel fuel and biodiesel fuel. Based on data from EIA,9 the average ethanol content of gasoline sold in the U.S. is expected to increase from about 10% to 12% between now and 2050 while the average content of the combination of renewable and biodiesel is expected to increase from about 7% to 10% over the same range. Although the actual impact of proper accounting for renewable fuels on CO2 emissions from the Proposed Rule will be slightly smaller than the percentages listed above, they should clearly be accounted for by U.S. EPA.

Ethanol blends and biodiesel are included in the MOVES model. This is discussed in the MOVES Fuel Supply Technical Report.[832] By using fuel properties consistent with real-world blending of biofuels with fossil fuels, EPA accounts for their CO_2 emission impacts contrary to POET's assertion that we failed to account for biofuel blending in our inventory analysis.

Delek US Holdings, et al. state that, among other factors, EPA failed to assess the emissions impact from electricity production.

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[832] U.S. EPA. "Fuel Supply Defaults: Regional Fuels and the Fuel Wizard in MOVES4". August 2023. Available online: https://nepis.epa.gov/Exe/ZyPDF.cgi/P10186PT.PDF?Dockey=P10186PT.PDF

Delek US Holdings, Inc.: It failed to assess emissions from battery manufacturing or electricity production.

EPA evaluated the power sector impacts of the rule, including emissions estimates from electricity production, using IPM. However, the comment is correct that EPA did not model battery manufacturing emissions because they are out of scope for this rulemaking. We discuss upstream emissions in an earlier portion of this RTC section and life cycle analysis, in RTC section 17.

Clean Fuels Development Coalition et al. comment that EPA's power sector modeling does not include the infrastructure costs of transitioning from traditional fossil power sources to renewables:

Clean Fuels Development Coalition et al.: These costs also ignore that realizing these reductions requires the installation of new solar and wind generation, which itself has a cost.

These costs are specifically modeled by IPM and factored into the modeled decisions of the power sector organizations. More discussion on this topic can be found in the IPM & power sector modeling portion of this RTC section and in the upstream emissions sources estimated portion of this RTC section. More generally, we also discuss electricity generation infrastructure impacts in section 7 of this RTC document and discuss our estimation of program costs from the rule in RIA Chapter 3.

We reiterate that IPM modeling predicts that actions taken to make the power grid cleaner, including the installation of new solar and wind generation, are driven by economic conditions and the Inflation Reduction Act and occur regardless of the promulgation of the final standards. This means that renewable installation costs were accounted for in our power sector modeling, and that it is not appropriate to attribute those costs to the rule itself. However, we model that the final standards will increase electricity demand, and that such demand will be met by all EGU fuel types, including coal, natural gas, and renewables. The emissions associated with the increased use of fossil fuels relative to the reference case is included in our emissions modeling in RIA Chapter 4. Costs related to buildout of additional electricity infrastructure (including generation, transmission, and distribution) attributable to the HD interim standards and LD final standards, are included in the IPM and RPM analysis. The distribution costs are informed by the TEIS while generation and transmission are informed by IPM. We also discuss such electricity costs, including their impact on vehicle operator costs, in RIA 2 and RTC sections 6 and 7.

Clean Fuels Development Coalition et al.: Furthermore, researchers estimate that the 350 million EVs required to decarbonize the fleet in 2050 could use as much as half of US national electricity demand.

In MOVES, we project that there will be about 350 million vehicles on the road in 2050. However, that includes all vehicles (light-duty plus heavy-duty) and we do not project the entire fleet to be ZEVs in 2055. The total population of HD vehicles impacted by the proposed standards is less than 25 million in 2050 and our projected HD ZEV sales percentage is far lower than 100 percent. The impact the electrification from these vehicle segments will have on the total electricity demand in the United States will therefore be much smaller than the comment asserts, on the order of less than 5% (in 2050) according to our modeling. This is also discussed in section 7.1 of the RTC, which notes among other things that the Edison Electric Institute, the trade association for all the nation's investor-owned utilities, concurs with EPA's finding.

AFPM asserts that EPA did not adequately account for, or model, existing EPA standards in evaluating the emissions impact of the proposed standards.

> *AFPM: EPA makes no attempt to outline a baseline scenario whereby all stationary and mobile sources in the country achieve current EPA standards. Such a baseline is necessary because it is the only means by which the agency and the public can compare the marginal costs and benefits of further tightening emission standards and deploying different technologies and alternatives.*

In order to calculate the emissions impact of the final standards, EPA first modeled the emissions inventory without the final standards, which is referred to in our documentation as the reference case. The reference case assumes full compliance with all finalized EPA standards for both mobile and stationary sources, among other finalized federal actions such as the Inflation Reduction Act. To be clear, the reference case does not assume compliance with proposed federal actions which are not yet promulgated and hence have no immediate impact.

We did not ignore these potential actions and their impacts. We show in RTC section 7.2, and sources there cited, that there is no reasonable scenario where grid capacity is inadequate to meet demand after considering a series of EPA potential actions (under the CAA, RCRA, and the Clean Water Act) which could affect the power generating sector. Therefore, the assertion that EPA did not "attempt to outline a baseline scenario whereby all stationary and mobile sources in the country achieve current EPA standards" is incorrect.

ACEEE asserts that there in an inconsistency between the MOVES documentation and the DRIA in terms of the ratio applied to BEV energy consumption to estimate FCEV energy consumption:

> *ACEEE: We note that, in contrast to the energy efficiency ratios implied by Table 2 showing that the H2-FCEV truck uses 57% more energy per mile than the BEV, EPA adopts an assumption that a H2-FCEV uses only 25% more energy than a BEV. ACEEE looked at the sources referenced in the DRIA, which include the GREET and MOVES models, and was unable to find the basis for this claim. In fact, the MOVES document cited by the DRIA … does not appear to support the DRIA claim that an FCEV uses only 25% more energy to operate than a BEV, but instead supports the values shown in Table 2 above.*

This is a misunderstanding on the part of ACEEE. The MOVES technical report they quote is the "Greenhouse Gas and Energy Consumption Rates for Onroad Vehicles in MOVES3.R1" technical report. MOVES3.R1 was not used in the modeling of the proposed standards. Instead, we used MOVES3.R3, so the correct citation for the FCEV:BEV ratio is "Greenhouse Gas and Energy Consumption Rates for Onroad Vehicles in MOVES3.R3," in which Appendix D contains documentation regarding the ratio of 1.25:

> *The multiplier for the FCEV emission rates was derived from the relative energy consumption for heavy-duty fuel cell and battery electric vehicles as published by Islam, et al. in 2022. The authors used Autonomie to estimate the fuel savings of various alternative fuels for heavy-duty vehicles and show that FCEVs consume, on average, 1.6*

times more energy than comparable BEVs. This is consistent with values estimated in GREET 2022.

We adjusted this value down to account for the fact that MOVES calculates an energy consumption for charging and battery losses and for HVAC usage as documented in the MOVES adjustment report. FCEVs do not have batteries chargeable by grid energy, so we removed that effect by a typical charging and battery efficiency value of 15%. We found two sources regarding the relationship between FCEV energy consumption and temperature. The first, an ICCT study on FCEV tractor-trailer fuel economy, showed that FCEV energy consumption does not change with ambient temperature, while the second, a real-world study of BEV and FCEV bus energy demand, showed that FCEV energy demand changes with temperature but to a lesser extent than BEVs. Therefore, we also applied an 8% correction to the FCEV multiplier to remove the national average temperature adjustment applied in MOVES. The final result is an FCEV energy demand multiplier of 1.25.

Other comments

Some comments related to the VMT projections we used to determine emission impacts.

AmFree et al.: In earlier GHG rules for heavy-duty vehicles, EPA considered brake and tire emissions when analyzing the impact of the proposed standards. See Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2, 81 Fed. Reg. 73,478, 73,578 n.b (Oct. 25, 2016) ("HD GHG II") ("The impacts shown include all PM2.5 impacts from the rule including impacts from increased tire wear and brake wear that results from the slight increase in VMT projected as a result of this rule.").

AFPM: There also exist overall truck weight restrictions, which could require a greater number of ZEVs to move the same tonnage of cargo, thus increasing vehicle miles traveled and potentially PM emissions.

To clarify, the increase in brake and tire wear PM emissions modeled as part of the HD GHG Phase 2 rule was, as the comment cited by AmFree et al. states, caused by EPA modeling a VMT rebound effect. EPA did not model or expect a similar effect with the Phase 3 rule. See 88 FR at 26072 and RIA Chapter 6.1.

EPA does not expect VMT to be meaningfully impacted by the standards, even accounting for greater vehicle weights. This is because most heavy-duty vehicles have a GVWR that is well below legal road limits (Class 4-6 single-unit trucks, for example). Of the vehicles which can plausibly hit weight limits, MOVES has an average vehicle mass of 24.6484 metric tonnes, or roughly 54,000 pounds. This means that most heavy-duty freight vehicles can gain the added battery weight and still not hit road limits. For additional discussion on the impact to payload see RTC 3.10.1 and RIA Chapter 2.9.1.

POET: It is also important to note that use of ethanol and other renewable fuels capable of reducing GHG emissions from both new and in-use HD vehicles could be increased through incentives like those that have been provided to electricity and hydrogen through the IRA and the structure of the Proposed Rule.

This comment is out of scope of this rulemaking. Please see also section 9 of this RTC document.

> *AFPM: EPA did not fully consider that the higher purchase price of new ZEVs will keep older, more polluting trucks on the road longer.*

EPA did not model pre-buy and its environmental effects in our emission inventory modeling, but the ZEV purchaser costs were modeled in HD TRUCS and evaluated as part of our assessment of program costs. These costs are discussed in Chapter 2.10.6 of the RIA and Section 4 of the response to comment document. In addition, possible emissions effects under different fleet turnover scenarios are discussed in RIA Chapter 6.1.

ACEEE comments that some hydrogen-powered vehicles have non-zero emissions of both GHGs and criteria pollutants (such as NO_X).

> *ACEEE: EPA should not incentivize hydrogen-fueled vehicles without strong evidence that hydrogen fuel for transportation will be clean in the foreseeable future. For H2-ICEVs in particular, for which intrinsic efficiency advantages are modest, actual GHG benefits may be negative, and potential future benefits are based largely on changes to the fuel rather than to the vehicle, the zero-upstream incentive is inappropriate. It would offer manufacturers the same compliance benefit for an H2-ICEV as for a BEV or FCEV but require only relatively small changes to the engine, as described At FR 25960. The fact that H2-ICEVs produce NOx makes conferring ZEV benefits on them all the more inappropriate. Low-carbon hydrogen-fueled vehicles are best incentivized through performance-based standards.*

For clarity, EPA did not explicitly model or project adoption of HD-ICE vehicles in our modeled potential compliance pathway used for emission inventory modeling. More discussion of H2-ICE vehicles themselves, including a response to this comment’s statements about achieving compliance using H2-ICE vehicles, can be found in section 9.3 of this RTC document.

14 Climate Change Impacts

Comments by Organizations

Organization: Allergy & Asthma Network et al.

Heavy-duty vehicles are also a major source of carbon pollution. Transportation is the single biggest source of greenhouse gas emissions in the U.S., making cleaning up trucks and buses a critical part of addressing climate change. Climate change is a health emergency, leading to more frequent and intense extreme weather events like flooding, excessive heat, drought, and wildfires; longer and more intense allergy seasons; increased risks from water-borne and vector-borne diseases like Lyme Disease; and worsening air quality. [EPA-HQ-OAR-2022-0985-1532-A1, p. 2]

Organization: American Thoracic Society (ATS)

Heavy-duty vehicles are significant contributors to greenhouse gas and criteria pollutant emissions. [EPA-HQ-OAR-2022-0985-1517-A1, p. 1]

Heavy-duty vehicles constitute an important aspect of transportation in the United States. In 2021, trucks and buses accounted for only 5% of all registered vehicles but were responsible for 11% of vehicle miles traveled.1 These vehicles also play a substantial role in the United States (US) GHG emissions profile. Specifically, the transportation sector is responsible for 29% of the nation's GHG emissions, with nearly one-quarter of that originating from medium- and heavy-duty trucks.2 The emissions from heavy-duty vehicles are also at risk of increasing, with steady increases in freight movement expected through at least 2050.3 As such, EPA's proposed rule to address heavy-duty vehicle emissions presents an important opportunity to curtail this durable driver of GHG emissions. [EPA-HQ-OAR-2022-0985-1517-A1, pp. 1-2]

1. Hu, P. et al. Transportation Statistics Annual Report 2022. U.S. Dep. Transp. Natl. Transp. Libr. 28, (2022).

2. US Environmental Protection Agency. Fast Facts on Transportation Greenhouse Gas Emissions | US EPA. US Environmental Protection Agency (2023). Available at: https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gasemissions. (Accessed: 14th June 2023)

3. Bureau of Transportation Statistics. Freight Facts and Figures. U.S. Department of Transportation Available at: https://www.bts.gov/product/freight-facts-and-figures. (Accessed: 14th June 2023)

In addition to the immediate health effects, the reduction in GHGs and mitigation of rising global temperatures will reduce the frequency and severity of future health risks such as wildfires.25 GHGs contribute to the increased frequency and severity of wildfire events.26,27 Without abatement, GHGs will continue to fuel more frequent and more intense wildfires, leading to more frequent poor air quality days during which millions of vulnerable Americans are at risk of worsening underlying respiratory and cardiovascular disease.28,29 Indeed, the blanket of smoke over much of the continent from Canadian wildfires in June 2023 resulted in millions of people in the Northeast not being able to leave their homes or exercise outdoors due to health concerns related to wildfire smoke exposure. This was sighted as an unprecedented event, but unfortunately, such events are becoming more and more frequent because of climate change. [EPA-HQ-OAR-2022-0985-1517-A1, p. 3]

25. Xu, R. et al. Wildfires, Global Climate Change, and Human Health. N Engl J Med 383, 2173–2181 (2020).

26. Rice, M. B. et al. Respiratory Impacts of Wildland Fire Smoke: Future Challenges and Policy Opportunities An Official American Thoracic Society Workshop Report. Ann. Am Thorac Soc Online ahead of pri…, 1–10 (2021).

27. Abatzoglou, J. T. & Williams, A. P. Impact of anthropogenic climate change on wildfire across western US forests. Proc Natl Acad Sci U.S.A. 113, 11770–11775 (2016).

28. O'Dell, K. et al. Estimated Mortality and Morbidity Attributable to Smoke Plumes in the United States: Not Just a Western US Problem. GeoHealth 5, 1–17 (2021).

29. Hutchinson, J. A. et al. The San Diego 2007 wildfires and Medi-Cal emergency department presentations, inpatient hospitalizations, and outpatient visits: An observational study of smoke exposure periods and a bidirectional case-crossover analysis. PLoS Med. 15, 1–21 (2018).

Organization: Arizona State Legislature

To justify the proposed rule, EPA repeatedly claims that transportation represents 27% of U.S. greenhouse gas emissions, and heavy-duty vehicles contribute one-fourth of those emissions. See, e.g., 88 Fed. Reg. 25,928, 25,952, 26,047. EPA worries about reported changes in global average temperature increase and sea level rise. Id. at 26,046. 'Tens of billions of dollars of U.S. real estate could be below sea level by 2050 under some scenarios,' EPA warns. Id. at 26,047. [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

But EPA does not know if the proposed rule will avoid any of these possible disasters. EPA admits that it did not even try to find out: 'EPA did not conduct modeling to specifically quantify changes in climate impacts resulting from this rule in terms of avoided temperature change or sea-level rise . . .' Id. Perhaps this is because 'China's annual emissions are more than double those of the United States.'15 Thus, cutting emissions from a portion of one sector that comprises one-fourth of American emissions, which are less than half the emissions of China, may not make any noticeable difference to avoiding the possible climate disasters of which EPA is concerned. [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

15 Michael Birnbaum and Christian Shepherd, How the U.S. wants to pressure China to help avert climate catastrophe, THE WASHINGTON POST, May 30, 2023, available at https://www.washingtonpost.com/climateenvironment/2023/05/30/biden-us-china-climate-emissions/.

The actual climate benefits of the proposed rule must be calculated in order to weigh those benefits against the costs and transformative nature of the proposed rule. EPA's summary conclusion that implementing the proposed standards 'would contribute toward the goal of holding the increase in the global average temperature to well below 2°C above pre-industrial levels' is not good enough. Id. at 26,047 (emphasis added). [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

Organization: Clean Air Task Force et al.

2. Greenhouse gas emissions from heavy-duty vehicles endanger public health and welfare by intensifying the climate crisis.

Over thirteen years ago, based upon a massive scientific record, EPA found that new motor vehicles and engines contribute to emissions of GHGs that drive climate change and endanger the health and welfare of current and future generations. 74 Fed. Reg. at 66496. Specifically, EPA found that the intensifying climate crisis increased the frequency of warmer temperatures, heat waves, and other extreme weather, worsened air quality by increasing regional ozone pollution, increased the spread of food and waterborne illnesses, increased the frequency and severity of seasonal allergies, and increased the severity of coastal storm events due to rising sea levels. 74 Fed. Reg. at 66525–26. [EPA-HQ-OAR-2022-0985-1640-A1, p. 10]

Since EPA issued the Endangerment Finding in 2009, dire evidence of the current and future impacts of climate change has continued to accumulate. Recent studies demonstrate that climate change continues to cause heat waves and extreme weather events across the United States.6 Between May and mid-September in 2022, "nearly 10,000 daily maximum temperature records were broken."7 Additionally, 2022 was "one of the top 10 hottest years on record for daily maximum temperatures" in 13 states, as well as one of the top 10 hottest for daily minimum (nighttime low) temperatures for 31 states.8 Warmer temperatures endanger public health by increasing the risk of heart disease, worsening asthma and chronic obstructive pulmonary disease from increases of ground-level ozone, and causing dehydration and many other ailments.9 Studies have also found that heat waves and extreme weather events cause severe psychiatric and mental health impacts.10 Climate change continues to lead to higher than normal pollen concentrations and earlier and longer pollen seasons, causing worse allergies and asthma.11 The intensifying climate crisis also increases the risk of drought across the U.S, which impacts water supply, agriculture, transportation, and energy, and increases the risk and magnitude of wildfires.12 And recent projections show that sea level rise is anticipated to be on the high end of model projections.13 Studies have found that many of the dangers wrought by climate change exact a higher toll on people with low incomes and people of color.14 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 10 - 11]

7 Dahl.

8 Id

9 HHS, Climate and Health Outlook, at 2; Christopher Nolte et al., U.S. Global Change Rsch. Program, Air quality, in II Impacts, risks, and adaptation in the United States: Fourth national climate assessment 512, 515 (2018), https://nca2018.globalchange.gov/downloads/NCA4_Ch13_Air-Quality_Full.pdf (climate change leads to worsened air quality by increasing concentrations of ozone and particulate matter in many parts of the U.S.); Am. Lung Ass'n, State of the Air 2023 Report 19 (2023), https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf?ext=.pdf (describing worsened air quality resulting from climate change).

10 See, e.g., Amruta Nori-Sarma et al., Association Between Ambient Heat and Risk of Emergency Department Visits for Mental Health Among US Adults, 2010 to 2019, 79 JAMA Psychiatry 341 (2022), https://jamanetwork.com/journals/jamapsychiatry/fullarticle/2789481?; Marshall Burke et al., Higher temperatures increase suicide rates in the United States and Mexico, 8 Nature Climate Change 723 (2018), https://gspp.berkeley.edu/assets/uploads/research/pdf/s41558-018-0222-x.pdf; Sarita Silveira et al., Chronic Mental Health Sequelae of Climate Change Extremes: A Case Study of the Deadliest Californian Wildfire, Int'l J. Env't Rsch. & Pub. Health, Feb. 4, 2021, https://www.mdpi.com/1660-4601/18/4/1487 (demonstrating that climate-related extreme weather events such as wildfires can have severe mental health impacts).

11 HHS, Climate and Health Outlook, at 5.

12 See Marco Turco et al., Anthropogenic climate change impacts exacerbate summer forest fires in California PNAS, June 12, 2023, https://www.pnas.org/doi/10.1073/pnas.2213815120; Ctr. for Climate &

Energy Sol., Drought and Climate Change, https://www.c2es.org/content/drought-and-climate-change/ (last visited June 2, 2023). See also Nolte et al., at 521.

13 Benjamin Hamlington et al., Observation-based trajectory of future sea level for the coastal United States tracks near high-end model projections, Commc'n Earth Env't, Oct. 6, 2022, https://www.nature.com/articles/s43247-022-00537-z.

14 See, e.g., Sameed Khatana et al., Association of Extreme Heat With All-Cause Mortality in the Contiguous US, 2008-2017, JAMA Network Open, May 19, 2022, at 1 https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2792389 (finding extreme heat was associated with higher mortality in the U.S., particularly among older adults and black individuals); Adam Schlosser et al., Assessing Compounding Risks Across Multiple Systems and Sectors: A Socio-Environmental Systems Risk-Triage Approach, Frontiers in Climate, Apr. 24, 2023, at 09, https://www.frontiersin.org/articles/10.3389/fclim.2023.1100600/full (identifying hot spots where flood risks and water stress disproportionately impact low-income and nonwhite communities); Dahl ("[M]ore than 80% of the counties with the most frequent heat alerts—21 or more days of heat alerts over the course of the summer—have moderate to high levels of social vulnerability."). See generally EPA, Climate Change and Social Vulnerability in the United States, A Focus on Six Impacts (2021), https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf

The transportation sector has been responsible for an increasing percentage of GHG emissions in the U.S. since 2009, thereby playing an outsized role in intensifying the climate crisis. When EPA made its Endangerment Finding for GHGs, the transportation sector was responsible for 23 percent of total annual U.S. GHG emissions. 74 Fed. Reg. at 66499. Since then, transportation sector GHG emissions have only increased as a share of U.S. emissions, surpassing the electric power sector as the largest U.S. source of GHG emissions and contributing 27.2 percent of total GHG emissions in 202015 and 28.5 percent in 2021.16 After dipping in 2020 due to the COVID-19 pandemic, CO2 emissions from the transportation sector increased by 11.5 percent between 2020 and 2021.17 Transportation as an end use sector "account[ed] for 1,757.4 [million metric tons] CO2 in 2021 or 37.9 percent of total CO2 emissions from fossil fuel combustion."18 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 11 - 12]

15 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020, EPA 430-R-22-003, at ES-21 (2022), https://www.epa.gov/system/files/documents/2022-04/us-ghg-inventory-2022-main-text.pdf.

16 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021, EPA 430-R-23-002, at 2-19, 2-28 (2023), https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf.

17 Id. at 2-13

18 Id. at 2-17

HDVs are the second-largest domestic contributor of GHGs in the transportation sector. Medium- and heavy-duty vehicles represent only 5 percent of vehicles on the road.19 Yet in 2021, they accounted for 25 percent of CO2 emissions from the transportation sector.20 CO2 emissions from medium- and heavy-duty trucks increased by 75 percent from 1990 to 2021.21 This increase was driven, in part, by substantial growth in medium- and heavy-duty truck vehicle miles traveled, which increased by 66 percent between 1990 and 2021.22 Vehicle miles traveled are expected to rise in the heavy-duty vehicle sector over the coming decades.23 As a result, GHG emissions from heavy-duty vehicles represent a large portion of overall GHG emissions in the United States and contribute heavily to the intensifying climate crisis. Adopting stringent GHG emission standards for HDVs will lead to massive public health benefits by limiting these pollutants.24 [EPA-HQ-OAR-2022-0985-1640-A1, p. 12]

19 Matteo Muratori, et al., Road to zero: Research and industry perspectives on zero-emission commercial vehicles, iScience, May 19, 2023, https://www.cell.com/action/showPdf?pii=S2589-0042%2823%2900828-3.

20 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021, at 3-24, 3-25.

21 Id. at 3-25

22 Id. at 3-25.

23 U.S. Dep't of Transp. (DOT), Fed. Highway Admin., 2022 FHWA Forecasts of Vehicle Miles Traveled (VMT), at 2 (2022), https://www.fhwa.dot.gov/policyinformation/tables/vmt/2022_vmt_forecast_sum.pdf

24 See, e.g., Am. Lung Ass'n, Delivering Clean Air: Health Benefits of Zero-Emission Trucks and Electricity 5 (2022), https://www.lung.org/clean-air/electric-vehicle-report/delivering-clean-air ("Pollution from heavy-duty vehicles is harmful even if it occurs from lower volumes of traffic, and combustion vehicles and trucks still contribute to the acceleration of climate change and the health impacts stemming from it.")

The most recent synthesis of the United Nations Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms the danger to public health and welfare posed by GHG emissions from the transportation sector. The report found that global surface temperature was around 1.1ºC higher in 2011-2020 than it was in 1850-1900.25 While average annual GHG emissions growth has slowed in certain sectors such as energy supply and industry, growth in GHG emissions from the transportation sector has remained relatively constant at about 2 percent per year.26 The latest IPCC report warned that "[d]eep, rapid and sustained GHG emissions reductions, reaching net zero CO2 emissions and including strong emissions reductions of other GHGs . . . are necessary to limit warming to 1.5°C . . . or less than 2°C . . . by the end of the century."27 To have a chance at limiting global temperature increase to 1.5ºC and avoid the worst impacts of climate change, current GHG emissions from the transportation sector must drop by 59 percent by 2050 compared to 2020 emissions.28 The IPCC concluded in its 2022 report that "[l]and-based, long-range, heavy-duty trucks can be decarbonised through battery-electric haulage... complemented by hydrogen[-based]... fuels in some contexts."29 [EPA-HQ-OAR-2022-0985-1640-A1, p. 12]

25 Intergovernmental Panel on Climate Change (IPCC), Synthesis Report of the IPCC Sixth Assessment Report (AR6): Longer Report, at 6 (2023), https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_LongerReport.pdf.

26 Id. at 10.

27 Id. at 33

28 IPCC, Climate Change 2022: Mitigation of Climate Change 32 (2022), https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf.

29 Id. at 98.

Organization: Electrification Coalition (EC)

In addition to our national security challenges, the U.S. also faces the rapidly growing threat of climate change. The latest National Climate Assessment3, which Congress mandated in 1990 under the Global Change Research Act, shows that the U.S. has been observing the impacts of climate change for decades and that more frequent and extreme weather and climate-related events are creating new and increasing risks across U.S. communities – which we have recently seen with wildfires that have ravaged the country, more powerful hurricanes causing loss of lives and immense destruction, more intense tornadoes destroying communities, and extreme weather events in areas that we should not expect to see these weather events in. [EPA-HQ-OAR-2022-0985-1558-A1, p. 3]

3 https://nca2018.globalchange.gov/

To overcome these national security concerns from climate change, the U.S. must reduce carbon emissions. The EPA notes that the transportation sector is the largest source of greenhouse gas emissions, representing 27% of total greenhouse gas emissions; narrowing into the transportation sector, heavy-duty vehicles are the second largest contributor to greenhouse gas emissions, at 25%.4 [EPA-HQ-OAR-2022-0985-1558-A1, p. 3]

4 See page 25928 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

Organization: Environmental Protection Network (EPN)

The Need for and Benefits of the Proposal

As noted in the proposal, transportation is the single largest U.S. source of greenhouse gas emissions, making up 27% of the total. Within the transportation sector, all HDV (Class 2b-8) are the second largest contributor, at 25% of all transportation sources. Further, a recent Rhodium Group report revealed that greenhouse gas emissions for the transportation sector and national economy grew 1.3% in 2022.4 This upward trend is pushing the country off course from President Biden's stated goal. [EPA-HQ-OAR-2022-0985-1523-A1, pp. 1-2]

4 'Preliminary US Greenhouse Gas Emissions Estimates for 2022', Alfredo Rivera et al. (January 10, 2023).

Organization: National Parks Conservation Association (NPCA)

Pollution from Heavy-Duty Vehicles Furthers Climate Change and Harms our Parks and Communities. [EPA-HQ-OAR-2022-0985-1613-A1, p. 2]

The irrefutable consensus among leading scientists has demonstrated time and again that climate change poses an increasing existential threat to America's national parks and the world around them. According to the Intergovernmental Panel on Climate Change (IPCC) in their recently released Synthesis for the 6th Assessment Report (AR6),

- [h]uman activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals.7 [EPA-HQ-OAR-2022-0985-1613-A1, p. 2]

7 IPCC, Synthesis Report of the IPCC Sixth Assessment Report (AR6): Summary for Policymakers, Doc. 4,

The IPCC further states that current policies and laws ‘fall short of the levels needed to meet climate goals across all sectors and regions,’ and will likely result in warming that ‘will exceed 1.5°C during the 21st century and make it harder to limit warming below 2°C.’8 [EPA-HQ-OAR-2022-0985-1613-A1, p. 2]

8 Id. at 10.

Our national park system hosts some of America’s most beloved natural and cultural resources, yet our parks are uniquely vulnerable to the changing climate.9 The burning of fossil fuels has resulted in national park mean annual temperatures increasing ‘at double the rate of the U.S. as a whole’ between 1895 and 2010.10 The ecological turmoil caused by this warming and the resulting extreme weather conditions is disastrous for nearly all national park units and is expected to only get worse. As temperatures increase, climate effects are felt across all park geographic regions and locations, from coastal areas to mountain ranges.11 These climate effects include: (1) rising sea levels; (2) increasingly intense wildfires; (3) threat and harm to wildlife habitats and lifestyles; (4) the rapid growth of disruptive, invasive species; (5) extreme weather damage; (6) drier conditions leading to difficult droughts; (7) loss of snow and ice; (8) changing landscapes and disrupted ecosystems; (9) destruction of irreplaceable park structures and artifacts; and (10) altered visitation patterns and significant losses to valuable tourism revenue.12 [EPA-HQ-OAR-2022-0985-1613-A1, pp. 2-3]

9 Patrick Gonzalez et al., Disproportionate Magnitude of Climate Change in United States National Parks, 13 ENVTL. RES. LETTERS 1, 6–10 (2018), https://perma.cc/99FL-CA3S.

10 Id. at 1.

11 Id. at 3.

12 NPCA, How the Climate Crisis Is Affecting National Parks, NPCA.org (last visited Apr. 30, 2022), https://www.npca.org/reports/climate-impacts; see also Patrick Gonzalez et al., Disproportionate Magnitude of Climate Change in United States National Parks, 13 ENVTL. RES. LETTERS 1 (2018), https://perma.cc/99FL-CA3S.

Due to the propensity of such extreme events to damage national parks, our findings indicate that climate change is a very real and significant concern for 80 percent of the nation’s parks.13 If climate change continues at this rate, park wildlife and plant species’ populations will plummet, and additional extinctions are likely to occur. In the decades to come, destruction from climate change could very well cause the near total loss of numerous namesake natural features across the park system, including, but not limited to, glaciers in Glacier National Park, everglade forests in Everglades National Park, saguaro cacti in Saguaro National Park, Joshua trees in Joshua Tree National Park, and giant sequoias in Sequoia National Park. Moreover, threats such as sea-level rise and storm related flooding and erosion put a long list of cultural park resources at risk, including historic structures from the National Mall in Washington, DC to the Golden Gate National Recreation Area in San Francisco. [EPA-HQ-OAR-2022-0985-1613-A1, p. 3]

13 NPCA, Air and Climate Report: Polluted Parks, NPCA.org (2019), https://www.npca.org/reports/air-climate-report.

The transportation sector is now the largest source of GHG emissions in the United States, and HD vehicles are the second-largest contributor of domestic GHG emissions despite representing only 5 percent of vehicles on the road.14 EPA’s proposed Phase III GHG standards for heavy-duty vehicles will help address this top source of climate altering pollution, and, in so doing, protect our parks from the worst of this devastation. Taking strong action to reduce greenhouse gas emissions from heavy-duty vehicles will be a massively helpful step to limit warming below 2°C and protect our treasured national parks. [EPA-HQ-OAR-2022-0985-1613-A1, p. 3]

14 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018 at ES-25 (2020), https://perma.cc/98ZR-XNTR.

Organization: Our Children's Trust

2. EPA continues a long-standing practice of discounting the lives of children and unborn future generations when it analyzes and considers the formulation of proposed regulations to carry out its delegated authority to protect the air and human health and welfare. That charge, to protect air quality in order to protect human health and welfare, is a charge not to merely protect one living generation of adults' air quality, but to protect babies, children, and "our Posterity"—for the U.S. Constitution is clear that all sovereign authority vested in our federal government, and here as delegated to EPA, cannot be used to destroy the nation and thereby its sovereignty, precluding children of today and tomorrow from inheriting the air and water and land in sound condition and having the ability to govern themselves to also protect the lifegiving air and all generations to come. What is at stake in this proposed rule are lives of children—their health and safety. [EPA-HQ-OAR-2022-0985-1633-A1, p. 2]

The Earth's Energy Is Imbalanced and thus the EPA Must Cease Infringing the Constitutional Rights of Youth. EPA has Public Trust and Constitutional Obligations to use its Authority to Protect the Atmosphere. [EPA-HQ-OAR-2022-0985-1633-A1, p. 2]

5. Excess accumulation of greenhouse gases in our atmosphere results in an Earth energy imbalance and thus an accumulation of heat in our climate system.4 The best available science informs that Earth's energy balance can only be restored by returning the atmospheric CO2 concentration to below 350 ppm by 2100.5 Experts have opined that it is economically and technically feasible to achieve the science-based greenhouse gas emission reduction target of close to 100% by 2050, while simultaneously enhancing sequestration capacity of sinks to draw down historical cumulative CO2 emissions, placing the U.S. on an emissions trajectory consistent with returning atmospheric CO2 to below 350 ppm by 2100, which would bring long-term heating of the Earth back down to approximately 1.0°C above preindustrial temperatures, stabilizing the climate.6 Please explain how the proposed rule aligns with restoring Earth's Energy Imbalance. [EPA-HQ-OAR-2022-0985-1633-A1, pp. 2 - 3]

4 Karina von Schuckmann et al., Heat Stored in the Earth System: Where Does the Energy Go?, 12 Earth Sys. Sci. Data 2013 (2020); Kevin E. Trenberth & Lijing Cheng, A Perspective on Climate Change from Earth's Energy Imbalance, 1 Env't Research Climate 013001 (2022).

5 James Hansen et al., Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature, 8 PLOS ONE e81648 (2013), https://doi.org/10.1371/journal.pone.0081648; Karina von Schuckmann et al., Heat Stored in the Earth

System: Where Does the Energy Go?, 12 Earth Sys. Sci. Data 2013, 2014-15 (2020), https://doi.org/10.5194/essd-12-2013-2020.

6 See Our Children's Trust, Government Climate and Energy Policies Must Target <350 ppm Atmospheric CO_2 by 2100 to Protect Children and Future Generations; Mark Z. Jacobson et al., Zero Air Pollution and Zero Carbon from all Energy at Low Cost and Without Blackouts in Variable Weather Throughout the U.S. with 100% Wind-Water-Solar and Storage, 184 Renewable Energy 430 (2022), https://web.stanford.edu/group/efmh/jacobson/Articles/I/21-USStates-PDFs/21-USStatesPaper.pdf; Ben Haley et al., Evolved Energy Research, 350 PPM Pathways for the United States (2019), https://www.ourchildrenstrust.org/s/350-PPM-Pathways-for-the-United-States-gk6k.pdf; Ben Haley et al., Evolved Energy Research, 350 PPM Pathways for Florida 71 (2020) (See updated U.S. data in the Technical Supplement), https://www.ourchildrenstrust.org/s/350-PPM-Pathways-Florida-Report-pa2t.pdf; James H. Williams et al., Carbon-Neutral Pathways for the United States, 2 AGU Advances 2020AV000284 (2021); James Hansen et al., Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature, 8 PLOS ONE e81648 (2013), https://doi.org/10.1371/journal.pone.0081648; Karina von Schuckmann et al., Heat Stored in the Earth System: Where Does the Energy Go?, 12 Earth Sys. Sci. Data 2013, 2014-15 (2020), https://doi.org/10.5194/essd-12-2013-2020; Andrea Rodgers et al., The Injustice of 1.5ºC-2ºC: The Need for a Scientifically Based Standard of Fundamental Rights Protection in Constitutional Climate Change Cases, 40 Va. Env't L.J. 102 (2022).

6. Current increased average temperatures of 1°C and greater (now at ~1.2°C) are already dangerous according to the IPCC.7 Basing policies and decisions that align with temperature targets of 1.5°C is catastrophic for our children and posterity.8 The IPCC special report on Global Warming of 1.5°C (2018) stated that allowing a temperature rise of 1.5°C "is not considered 'safe' for most nations, communities, ecosystems and sectors and poses significant risks to natural and human systems as compared to the current warming of 1°C (high confidence)."9 The 2023 IPCC Summary for Policymakers for the Synthesis Report (AR6) stated: "Risks and projected adverse impacts and related losses and damages from climate change will escalate with every increment of global warming (very high confidence). They are higher for global warming of 1.5°C than at present, and even higher at 2°C (high confidence)."10 Medical experts have recently recognized that "[t]he science is unequivocal; a global increase of 1.5°C above the pre-industrial average and the continued loss of biodiversity risk catastrophic harm to health that will be impossible to reverse."11 As such, 1.5°C should not be used to guide U.S. policy that is required to be based on best available science. The EPA should not be advancing policies that knowingly make the climate crisis worse, and potentially unsolvable. [EPA-HQ-OAR-2022-0985-1633-A1, pp. 3 - 4]

7 IPCC, Summary for Policymakers, in Synthesis Report of the IPCC Sixth Assessment Report (AR6) (2023), https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_SPM.pdf.

8 See IPCC, Overarching Frequently Asked Questions: FAQ 3: How will climate change affect the lives of today's children tomorrow, if no immediate action is taken? in Climate Change 2022: Impacts, Adaptation and Vulnerability (2022) ("[T]oday's children and future generations are more likely to be exposed and vulnerable to climate change and related risks such as flooding, heat stress, water scarcity, poverty, and hunger. Children are amongst those suffering the most . . . [C]hildren aged ten or younger in the year 2020 are projected to experience a nearly four-fold increase in extreme events under 1.5°C of global warming by 2100[.]")

9 M.R. Allen et al., Technical Summary, in Global Warming of 1.5°C, at 44 (2018); see also Assessing "Dangerous Climate Change". This was similarly noted in the IPCC, Summary for Policymakers, in Climate Change 2022: Impacts, Adaptation and Vulnerability, at 13 (2022): "Global warming, reaching

1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans (very high confidence).” Note that global warming was at ~1.0°C when this report was finalized; it has now risen to 1.2°C.

10 IPCC, Summary for Policymakers, in Synthesis Report of the IPCC Sixth Assessment Report (AR6) (2023), https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_SPM.pdf.

11 Lukoye Atwoli et al., Call for Emergency Action to Limit Global Temperature Increases, Restore Biodiversity, and Protect Health, 398 The Lancet 939 (2021) (emphasis added), https://doi.org/10.1016/S0140-6736(21)01915-2.

7. Climate change is causing a public health emergency that is already adversely impacting the physical and mental health of American children through, among other impacts, extreme weather events, rising temperatures and increased heat exposure, decreased air quality, altered infectious disease patterns, and food and water insecurity.12 Children are uniquely vulnerable to climate change impacts because of their developing bodies, higher exposure to air, food, and water per unit body weight, unique behavior patterns, dependence on caregivers, political powerlessness, and longevity on the planet.13 The protection of constitutional rights of children, by following the science, is of the utmost importance and must be incorporated in all relevant EPA rulemaking and policies. [EPA-HQ-OAR-2022-0985-1633-A1, p. 4]

12 IPCC, Summary for Policymakers, in Climate Change 2022: Impacts, Adaptation and Vulnerability, at 11, 17 (2022). This summary found that the current level of global warming is already driving heat waves that cause human morbidity, heavy rains, flooding, extreme fires and drought, coral bleaching and demise, massive shifts in species habitats, loss of glaciers, snow and permafrost, as well as more destructive hurricanes. Id. at 11.

13 Samantha Ahdoot, Susan E. Pacheco & Council on Environmental Health, Global Climate Change and Children’s Health, 136 Pediatrics e1468 (2015); Rebecca Pass Philipsborn & Kevin Chan, Climate Change and Global Child Health, 141 Pediatrics e20173774 (2018); Wim Thiery et al., Intergenerational Inequities in Exposure to Climate Extremes, 374 Science 158 (2021).

8. Our Children’s Trust represents twenty-one youth plaintiffs, including eleven Black, Brown, and Indigenous youth, in the constitutional climate lawsuit, Juliana v. United States, in which the Administrator, in his official capacity, and EPA are defendants. This case asserts, and courts have found, that, through the government’s past and ongoing affirmative actions that cause climate change, it has violated the youngest generation’s constitutional rights to life, liberty, property, and equal protection of the law, as well as failed to protect essential public trust resources. In this litigation, federal courts have affirmed “that the federal government has long promoted fossil fuel use despite knowing that it can cause catastrophic climate change”14 and “has long understood the risks of fossil fuel use and increasing carbon dioxide emissions”.15 The Ninth Circuit Court of Appeals found that there was evidence showing that the federal government was a substantial factor in causing the youth’s constitutional injuries because “[a] significant portion of [GHG] emissions occur in this country; the United States accounted for over 25% of worldwide emissions from 1850 to 2012, and currently accounts for about 15%.”16 Without immediate effective action, our children and future generations will continue to suffer injury with long-lasting and potentially irreversible consequences.17 These judicially-recognized facts should guide EPA’s

policies and practices so they can identify, and alter, those policies that exacerbate American youth's existing climate change injuries. [EPA-HQ-OAR-2022-0985-1633-A1, pp. 4 - 5]

14 Juliana v. United States, 947 F.3d 1159, 1164 (9th Cir. 2020).

15 Juliana v. United States, 947 F.3d 1159, 1166 (9th Cir. 2020).

16 Juliana v. United States, 947 F.3d 1159, 1169 (9th Cir. 2020).

17 See Assessing "Dangerous Climate Change"; James Hansen et al., Ice Melt, Sea Level Rise and Superstorms: Evidence from Paleoclimate Data, Climate Modeling, and Modern Observations that 2°C Global Warming Could be Dangerous, 16 Atmos. Chem. & Phys. 3761 (2016); U.S. Global Change Research Program, Fourth National Climate Assessment, Vol. II (2018); David I. Armstrong McKay et al., Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points, 377 Science eabn7950 (2022); Nico Wunderling et al., Global Warming Overshoots Increase Risks of Climate Tipping Cascades in a Network Model, 13 Nature Climate Change 75 (2023). Note that many researchers use the temperature targets set during the Paris Accord as a point of reference, not as a sanctioning of those levels of average planetary heating.

9. Under the 5th Amendment to the U.S. Constitution, the government is restrained from engaging in conduct that infringes upon fundamental rights to life, liberty, and property, and equal protection of the law, all of which includes a climate system that sustains human life and liberty. Under the Public Trust Doctrine, embedded in our Constitution and other founding documents, and in the very sovereignty of our Nation, U.S. residents (both present and future, i.e., Posterity) have a right to access and use crucial natural resources, like air and water. The U.S. government, and its executive agencies, have fiduciary duties as trustees to manage, protect, and prevent substantial impairment to our country's vital natural resources which the government holds in trust for present and future generations.18 [EPA-HQ-OAR-2022-0985-1633-A1, p. 5]

18 Juliana v. United States, 217 F. Supp. 3d 1224, 1254 (D. Or. 2016).

Organization: Southern Environmental Law Center (SELC)

I. GHG emissions and other harmful pollutants from heavy-duty vehicles cause significant environmental, public health, and economic harms.

The transportation sector is the largest source of GHG emissions in the United States,3 and this is also true for most states in the South. In fact, transportation is the primary source of carbon dioxide (CO_2)—the most prevalent GHG in our atmosphere—in every state in SELC's region except for Alabama, where it is the second largest source.4 In Georgia, Tennessee, North Carolina, South Carolina, and Virginia, emissions from transportation sources account for nearly half of all CO_2 emissions.5 Within the transportation sector, heavy-duty vehicles are responsible for a disproportionate share of the GHG pollution. Nationwide, trucks account for 25 percent of all climate change-inducing pollution from the transportation sector despite comprising less than 10 percent of vehicles on the road.6 The disproportionate harm caused by trucks is also evident in the South. In North Carolina, heavy-duty vehicles make up only 6 percent of the total fleet, but they contribute significantly to heat-trapping GHG emissions from the state's transportation sector;7 in Virginia, heavy-duty vehicles make up only about 5 percent of the state's fleet, yet they contribute 26 percent of all GHG emissions from transportation sources.8 In the coming years, heavy-duty vehicle traffic is expected to increase,9 and higher regional growth rates are projected in the South.10 [EPA-HQ-OAR-2022-0985-1554-A1, p. 1-2]

3 The transportation sector generates 27 percent of all GHG annual emissions in the United States. See id. at 25928.

4 Based on 2020 CO2 emissions. U.S. ENERGY INFO ADMIN., State Carbon Dioxide Emission Data Tables, tbl. 3 (Oct. 11, 2022), https://www.eia.gov/environment/emissions/state/.

5 Id.

6 How to Eliminate Pollution from Heavy-Duty Vehicles, UNION OF CONCERNED SCIENTISTS (Apr. 29, 2022), https://www.ucsusa.org/resources/heavy-duty-vehicles-and-nox. See also Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926 (Apr. 27, 2023).

7 N.C. Governor Roy Cooper's Action on Zero-Emission Trucks and Buses will Improve Air Quality, and Position North Carolina to Reap Billions in Net Health and Economic Benefits, ENV'T DEF. FUND (Oct. 25, 2022), https://www.edf.org/media/nc-governor-roy-coopers-action-zero-emission-trucks-and-buses-will-improve-airquality-and. See also N.C. DEP'T ENV'T QUALITY, North Carolina Greenhouse Gas Inventory 5 (Jan. 2022), https://www.deq.nc.gov/air-quality/ghg-inventory-report-2022/download?attachment (stating that medium- and heavy-duty vehicles combined contribute 16 percent of the state's transportation GHG emissions).

8 VA. DEP'T ENV'T QUALITY, Virginia Greenhouse Gas Inventory 3-4 (Nov. 2021), https://www.deq.virginia.gov/home/showpublisheddocument/12633/637725680592630000; see also Highway Statistics 2019, U.S. DEP'T OF TRANSP. (Nov. 2020), https://www.fhwa.dot.gov/policyinformation/statistics/2019/mv1.cfm.

9 2023 data indicates that heavy-duty truck traffic will increase up to 50 percent by 2050. U.S. DEP'T OF ENERGY & U.S. DEP'T OF TRANSP., THE U.S. NATIONAL BLUEPRINT FOR TRANSPORTATION DECARBONIZATION 30 (2023), https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf.

10 Dana Lowell & Jane Culkin, M.J. BRADLEY & ASSOCS., Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness 13 (July 2021), https://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf.

GHG emissions are the primary driver of climate change,11 and the United States is already experiencing the environmental, public health, and economic impacts of a changing climate.12 While the effects of climate change are well-documented nationwide, the geography and demographics of the South make the region particularly vulnerable to climate change. A 2023 analysis of climate vulnerabilities across the United States found that the 100 census tracts with the highest overall climate vulnerability are located in 28 counties in nine southern states, including Alabama, Georgia, Tennessee, North Carolina, and South Carolina.13 Climate vulnerability, or the predisposition to climate change-related hazards due to "greater exposure to climate risks and lower ability to prepare, adapt, and recover from their effects," often correlates with race, income, and other socioeconomic factors.14 The two counties with the highest number of census tracts among the 100 most vulnerable are located within SELC's region: Shelby County, Tennessee has 21 of the top 100 most vulnerable tracts, and Mobile County, Alabama has 14.15 [EPA-HQ-OAR-2022-0985-1554-A1, p. 2-3]

11 See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SYNTHESIS REPORT OF THE IPCC SIXTH ASSESSMENT REPORT (AR6): SUMMARY FOR POLICYMAKERS 4 (2023) ("Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020.").

12 See generally Kristie L. Ebi et al., Climate Change and Human Health Impacts in the United States: An Update on the Results of the U.S. National Assessment, 114 ENV'T HEALTH PERSPS. 1318 (2006); Solomon Hsiang, et al., Estimating Economic Damage from Climate Change in the United States, 346 SCIENCE 1362 (2017); FOURTH NATIONAL CLIMATE ASSESSMENT, U.S. GLOB. CHANGE RSCH. PROG. (2018), https://nca2018.globalchange.gov/.

13 P. Grace Tee Lewis et al., Characterizing Vulnerabilities to Climate Change Across the United States, 172 ENV'T INT'L 1, 6 (2023).

14 Id. at 1.

15 Id. at 6.

Rising temperatures are one of the many effects of climate change. The decade from 2010 to 2020 was the warmest on record in the South, and the region is already experiencing a higher percentage of intensifying heat waves than other parts of the country.16 Longer and more intense heat waves reduce air quality and cause heat-related illnesses like heat cramps, heatstroke, heat exhaustion, kidney-associated diseases, and asthma.17 These health effects are especially likely in vulnerable populations such as children, outdoor workers, and the elderly.18 In addition, the South is home to some of the fastest-growing metropolitan areas in the country.19 Auto-oriented development often increases impervious surfaces and reduces tree canopy cover, which combined with climate change can create and exacerbate heat island effects, resulting in more emergency room visits, reduced life expectancy, and worsened mental health outcomes in impacted communities.20 These impacts are often most acute in communities of color that have suffered a history of environmental injustice.21 [EPA-HQ-OAR-2022-0985-1554-A1, p. 3]

16 Southeast, U.S. CLIMATE RESILIENCE TOOLKIT (June 28, 2021), https://toolkit.climate.gov/regions/southeast.

17 See generally Mary L. Williams, Global Warming, Heat-Related Illnesses, and the Dermatologist, 7 INT'L J. WOMEN'S DERMATOLOGY 70 (2021). See also Daniel Helldén et al., Climate Change and Child Health: A Scoping Review and an Expanded Conceptual Framework, 5 LANCET PLANETARY HEALTH 164, 166 (2021).

18 Williams, supra note 17, at 75-76; Helldén et al., supra note 17, at 166.

19 See Andy Kiersz, This map shows the fastest growing and shrinking cities in America over the last decade, BUSINESS INSIDER (Aug. 13, 2021), https://www.businessinsider.com/2020-census-fastest-growing-and-shrinkingmetro-areas-2021-8; Adam J. Terando et al., The Southern Megalopolis: Using the Past to Predict the Future of Urban Sprawl in the Southeast U.S., 9 PLOS ONE 1 (2014).

20 See Brad Plumer & Nadja Popovich, How Decades of Racist Housing Policy Left Neighborhoods Sweltering, N.Y. TIMES (Aug. 24, 2020), https://www.nytimes.com/interactive/2020/08/24/climate/racism-redlining-cities-globalwarming.html (examining the health effects of a heat island in Richmond, Virginia).

21 See, e.g., Groundwork RVA, Climate Safe Neighborhoods, https://gwmke.maps.arcgis.com/apps/Cascade/index.html?appid=9b784d9e79324d1f97210b25afe1b91d (analyzing historic redlining maps and satellite imagery to establish a relationship between housing segregation and vulnerability to extreme heat and flooding in Richmond, Virginia).

With over 12,000 miles of coastline,22 the South is also experiencing frequent flooding due to increased extreme storm events and sea level rise. Sea level has been rising at a rate about three times the global pace along the mid-Atlantic coast.23 In the Hampton Roads region of Virginia—which has the highest rate of sea level rise on the East Coast24—the sea level has risen by more than a foot over the last 80 years,25 and scientists predict an additional rise of 1.5

to 2 feet by 2050.26 As warmer ocean temperatures result in heavier, more frequent rainfalls and slower-moving hurricanes, inland flooding is also increasing.27 The number of Category 4 and 5 hurricanes in the mid-Atlantic basin—such as Hurricanes Ian, Irma, Michael, Mathew, and Florence—has grown substantially since the 1980s.28 These weather events cause serious injuries and fatalities,29 property damage, respiratory effects from mold exposure, and may lead to public emergencies and infrastructure disruptions, stressing health services and communities.30 [EPA-HQ-OAR-2022-0985-1554-A1, p. 3-4]

22 Shoreline Mileage of the U.S., NOAA OFFICE FOR COASTAL MGMT. (May 9, 2016), https://coast.noaa.gov/data/docs/states/shorelines.pdf.

23 Sönke Dangendorf et al., Acceleration of U.S. Southeast and Gulf Coast Sea-Level Rise Amplified by Internal Climate Variability, 14 NATURE COMMS. 1 (2023).

24 Brett Buzzanga et al., Toward Sustained Monitoring of Subsidence at the Coast Using InSAR and GPS: An Application in Hampton Roads, Virginia, 47 GEO. RSCH. LETTERS 1, 1 (2020); see also Kasha Patel, Land Around the U.S. is Sinking. Here Are Some of the Fastest Areas, WASH. POST (May 30, 2023), https://www.washingtonpost.com/climate-environment/2023/05/30/land-sinking-us-subsidence-sea-level/ (finding that the Hampton Roads region is sinking at a rate of more than 3.5 millimeters per year).

25 Sea Level Rise and Tidal Flooding in Norfolk, Virginia, UNION OF CONCERNED SCIENTISTS (Mar. 30, 2016), https://www.ucsusa.org/resources/sea-level-rise-and-tidal-flooding-norfolk-virginia.

26 John D. Boon, et al., Anthropocene Sea Level Change: A History of Recent Trends Observed in the U.S. East, Gulf, and West Coast Regions, VA. INST. MARINE SCI. III-2 (2018); see also Peter Coutu, Sea Level Rise Continues to Accelerate; Hampton Roads Should Prepare for 1.7 Feet by 2050, Report Says, THE VIRGINIAN PILOT (Feb. 9,2020), https://www.pilotonline.com/2020/02/09/sea-level-rise-continues-to-accelerate-hampton-roads-shouldprepare-for-17-feet-by-2050-report-says/.

27 Craig E. Colton, Hurricane Michael Could Bring More Inland Flooding to Southeast States, THE CONVERSATION (Oct. 10, 2018), https://theconversation.com/hurricane-michael-could-bring-more-inland-flooding-to-southeaststates-104681; see also Inland Flooding, U.S. CLIMATE RESILIENCE TOOLKIT (Apr. 12, 2022), https://toolkit.climate.gov/topics/coastal-flood-risk/inland-flooding.

28 Southeast & The Caribbean, THIRD NATIONAL CLIMATE ASSESSMENT, U.S. GLOB. CHANGE RSCH. PROG. (2014), https://nca2014.globalchange.gov/report/regions/southeast.

29 See Angel Adegbesan, Hurricane Ian Death Toll in U.S. Hits 100 Across Three States, TIME (Oct. 8, 2022), https://time.com/6220855/hurricane-ian-death-toll/; Robbie M. Marks et al., Association of Tropical Cyclones With County-Level Mortality in the U.S., 327 J. AM. MED. ASS'N 946, 954 (2022).

30 Deborah N. Barbeau et al., Mold Exposure and Health Effects Following Hurricanes Katrina and Rita, 31 ANN. REV. PUB. HEALTH 165, 168 (2010); Carla Stanke et al., The Effects of Flooding on Mental Health: Outcomes and Recommendations from a Review of the Literature, PLOS CURRENT DISASTERS 2, 13 (2012); Hayley T. Olds et al., High Levels of Sewage Contamination Released from Urban Areas After Storm Events: A Quantitative Survey with Sewage Specific Bacterial Indicators, 15 PLOS MED. 1, 13-15 (2018).

There are also massive economic costs to climate change, and studies have found that the future costs will be unequally distributed across the United States.31 Relative to the rest of the nation, the South will face the largest economic losses from climate change, with low-income and minority communities particularly affected.32 Lower income counties in the South may lose between 5 and 20 percent of gross domestic product per year—compared to an average yearly loss of 1.2 percent nationally—for every additional degree of warming by the 2080s.33 [EPA-HQ-OAR-2022-0985-1554-A1, p. 4]

31 See, e.g., Hsiang, et al., supra note 12, at 1363.

32 Id.

33 Id. See also Brad Plumer & Najda Popovich, As Climate Changes, Southern States Will Suffer More Than Others, N.Y. TIMES (June 29, 2017), https://www.nytimes.com/interactive/2017/06/29/climate/southern-states-worseclimate-effects.html.

Organization: State of California et al. (2)

A. Reducing GHG Emissions from Heavy-Duty Vehicles Is A Necessary Part of Tackling the Growing Climate Emergency

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change ("IPCC Report") confirms the widespread and irreversible impacts caused by anthropogenic climate change.2 Annual mean temperatures across North America have trended upward since 1960.3 Nine of the United States' ten warmest years on record have occurred since 1998, while worldwide, all ten of the warmest years on record have occurred since 2005.4 Indeed, April 2023 was the fourth-warmest April on record, with the second-highest ocean temperatures of any month on record.5 There is a "virtually certain" chance that 2023 will rank among the ten warmest years on record, with a 93 percent chance it will rank among the top five.6 [EPA-HQ-OAR-2022-0985-1588-A1, pp.2-3]

2 IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)] ("Summary for Policymakers"). In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-33, doi:10.1017/9781009325844 at 9, 20 ("Sixth Assessment").

3 Id. at 1936 (Sixth Assessment).

4 U.S. Environmental Protection Agency, Climate Change Indicators: Weather and Climate, https://www.epa.gov/climate-indicators/weather-climate (last updated Aug. 1, 2022).

5 National Oceanic and Atmospheric Administration, April 2023 was Earth's fourth warmest on record (May 12, 2023), https://www.noaa.gov/news/april-2023-was-earths-fourth-warmest-on-record ("NOAA").

6 NOAA, supra note 5.

As temperatures rise, threats to public health and the environment in our States and Cities continue to mount. The IPCC Report emphasizes the importance of limiting warming, ideally to 1.5 degrees Celsius,7 although even this level of warming would pose unavoidable risks to humans and ecosystems.8 The transportation sector is the largest source of GHG emissions in the United States, with heavy-duty vehicles being the second-largest contributor within that sector. Reducing GHG emissions from heavy-duty vehicles is thus an essential element of addressing the growing climate emergency already impacting our residents. Our comments focus on the following climate impacts with economic, health, and societal damage in our States and Cities: wildfire damage, flooding and drought, melting of snowpack and diminishing water supply, and sea-level rise. [EPA-HQ-OAR-2022-0985-1588-A1, p.3]

7 Summary for Policymakers, supra note 2, at 13–15, 19–20.

8 Id. at 13–17 (Summary for Policymakers).

1. Increased Risk of Wildfire Damage

Rising temperatures combined with drier conditions are increasing the risk of wildfires.9 By engendering warm and dry conditions,10 climate change has contributed to more extreme wildfires in North America.11 Consistent with this projection, the 2020 wildfire season was unprecedented—wildfires in Colorado burned more than 665,000 acres,12 and historic wildfires burned 10.2 million acres across California, Oregon, and Washington.13 California is uniquely vulnerable to wildfires because it has a short rainy season with significant plant growth in the winter followed by dry periods that turn the plant growth into potential fuel sources, making these areas highly fire-prone.14 Indeed, a major commercial insurer cited wildfire risk as the reason it recently stopped accepting applications for homeowners insurance in California.15 The places at greatest risk of wildfire damages are in the "Wildland-Urban Interface," "where houses and wildland vegetation meet or intermingle,"16 and California has more homes in this Interface than any other state.17 Increasing wildfires also endanger electrical transmission and distribution assets in Northern California, where critical power lines cross highly fire-prone areas.18 Warming has also led to longer fire seasons.19 Since the 1970s, wildfire season in the Western U.S. has extended from five months to over seven months long.20 In the coming decades, climate change is projected to further increase fire activity across North America.21 [EPA-HQ-OAR-2022-0985-1588-A1, pp.3-4]

9 U.S. Global Change Research Program 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018 ("Fourth National Climate Assessment"); Zachary A. Holden, et al., Decreasing fire season precipitation increased recent western US forest wildfire activity, 115 PNAS E8349, E8349 (Sept. 4, 2018), https://www.pnas.org/doi/epdf/10.1073/pnas.1802316115 ("[D]eclines in summer precipitation and wetting rain days have likely been a primary driver of increases in wildfire area burned.").

10 Sixth Assessment, supra note 2, at 1948 (Ch. 14).

11 Id. at 1939 (Sixth Assessment).

12 John Ingold, Five charts that show where 2020 ranks in Colorado wildfire history, The Colorado Sun (Oct. 20, 2020), https://coloradosun.com/2020/10/20/colorado-largest-wildfire-history/.

13 Adam B. Smith, 2020 U.S. billion-dollar weather and climate disasters in historical context, Climate.gov (Jan. 8, 2021), https://www.climate.gov/print/837056.

14 Scott Stephens et al., Prehistoric Fire Area and Emission from California's Forests, Woodlands, Shrublands and Grasslands, 251 Forest Ecology and Mgmt. 205, 205 (2007); Eric Kaufman, Climate and Topography, in ATLAS OF THE BIODIVERSITY OF CALIFORNIA 12 (2003); Jon Keeley, Fire in Mediterranean Climate Ecosystems – A Comparative Overview, 58 Isr. J. of Ecology & Evolution 123,124 (2012).

15 Juliana Kim, State Farm has stopped accepting homeowner insurance applications in California, NPR (May 28, 2023), https://www.npr.org/2023/05/28/1178648989/state-farm-home-insurance-california-wildfires-inflation.

16 Volker Radeloff et al., Rapid Growth of the US Wildland-Urban Interface Raises Wildfire Risk, 115 Proc. Nat'l Acad. Sci. 3314, 3314 (2018).

17 U.S. Fed. Emergency Mgmt. Admin., Wildland-Urban Interface: A Look at Issues and Resolutions 10 (2022).

18 Larry Dale, Assessing the Impact of Wildfires on the California Electricity Grid iv (2018).

19 Sixth Assessment, supra note 2, at 1948.

20 U.S. Department of Agriculture, Wildfire, https://www.climatehubs.usda.gov/taxonomy/term/398 (last accessed May 26, 2023).

21 Sixth Assessment, supra note 2, at 1948 (Ch. 14).

These massive wildfires have broad impacts across our States and Cities. The 2020 wildfires—which conservatively cost an estimated $16.5 billion22—put half a million Oregonians under evacuation warnings or orders,23 led to the displacement of about 100,000 people in California,24 and killed 46 people in California, Oregon, and Washington.25 The particulate matter produced by wildfires is hazardous to human health and disruptive to daily activities,26 disrupting education in California due to cancelled classes for 1.1 million students27 and reducing test scores, leading to reduced long-term future earnings.28 This public health concern grows as the frequency and intensity of wildfires increase and is not limited to States where the wildfires are burning. The rising heat from the wildfires takes particulate matter and toxic gases in the smoke into the jet stream, which can carry those hazardous substances thousands of miles and cause harmful air pollution across the country. During the 2020 wildfire season and again in July of 2021, smoke from wildfires burning on the West Coast caused New York City to experience some of the worst air quality in the world.29 And in June 2023, New York City was once again blanketed in smoke, resulting in the highest measurements of 2.5 micron particles since recording began in 1999.30 The combination of fierce wildfires in Canada and airflow patterns prompted the U.S. National Weather Service to issue air quality alerts for most of the Atlantic seaboard.31 [EPA-HQ-OAR-2022-0985-1588-A1, pp.4-5]

22 Id.; Nat'l Oceanic & Atmospheric Admin., Billion-Dollar Disasters: Calculating the Costs, https://www.ncdc.noaa.gov/monitoring-references/dyk/billions-calculations (last visited June 13, 2023).

23 Associated Press News, Latest: 500,000 people in Oregon forced to flee wildfires (Sept. 10, 2020), https://apnews.com/article/kate-brown-fires-us-news-wa-state-wire-ca-state-wire-8e4e0818146a72c713de625e902f9962.

24 World Meteorological Organization, State of the Global Climate 2020 36 (2021), https://library.wmo.int/doc_num.php?explnum_id=10444 (last visited June 16, 2023).

25 Smith, supra note 13.

26 Daniel Jacob and Darrel Winner, Effect of Climate Change on Air Quality, 43 Atmospheric Envtl. 51, 60 (2009).

27 Ricardo Cano, School Closures from California Wildfires This Week Have Kept More than a Million Kids Home, CalMatters (Nov. 15, 2018), https://calmatters.org/environment/2018/11/school-closures-california-wildfires-1-million-students/.

28 Jeff Wen & Marshall Burke, Lower Test Scores from Wildfire Smoke Exposure, 5 Nature Sustainability 947, 951-52 (2022).

29 See, e.g., Oliver Milman, New York air quality among worst in world as haze from western wildfires shrouds city, The Guardian (Jul. 21, 2021), https://www.theguardian.com/us-news/2021/jul/21/new-york-air-quality-plunges-smoke-west-coast-wildfires.

30 Aatish Bhatia, Josh Katz, & Margot Sanger-Katz, Just How Bad was the Pollution in New York?, N.Y.Times (June 9, 2023), https://www.nytimes.com/interactive/2023/06/08/upshot/new-york-city-smoke.html.

31 Tyler Clifford, US East Coast blanketed in veil of smoke from Canadian fires, Reuters (June 8, 2023), https://www.reuters.com/business/environment/us-states-under-air-quality-alerts-canadian-smoke-drifts-south-2023-06-07/.

2. Increased Risk of Severe Flooding and Severe Drought

Warmer temperatures also contribute to the severity of flooding experienced by our States and Cities. High-intensity rainfall (and other extreme weather events) create flooding risks32 and heavy precipitation can overwhelm water control infrastructure.33 In three events in summer 2022 alone, streets and homes in Dallas Fort-Worth were flooded after 18 hours of heavy precipitation, causing hundreds of car crashes and other water-related emergencies;34 Death Valley, California received nearly a year's worth of rain in three hours,35 causing the loss of a critical portion of a water system, the Emergency Operations Building, and over 600 feet of the water main;36 and the St. Louis metropolitan area experienced its most intense rainfall since 1874, causing catastrophic flash flooding.37 California also experiences intense floods from "atmospheric rivers"—narrow, intense bands of moist air that transport large amounts of water vapor towards Earth's poles.38 California's mountain ranges force this warm moist air upwards, causing the water vapor to fall as rain.39 These particular California topographic features render the atmospheric rivers devastating to local communities in the state.40 [EPA-HQ-OAR-2022-0985-1588-A1, pp.5-6]

32 Id. at 1962 (Sixth Assessment); Kiana Courtney et al., Rising Waters: Climate Change Impacts and Toxic Risks to Lake Michigan's Shoreline Communities, Environmental Law and Policy Center (2022), https://elpc.org/wp-content/uploads/2022/08/ELPCRisingWatersReport_2022.pdf.

33 Id. at 1952 (Sixth Assessment).

34 Associated Press, Heavy rain floods streets across the Dallas-Fort Worth area (August 22, 2022), https://www.npr.org/2022/08/22/1118928105/dallas-fort-worth-texas-flooding.

35 Jennette Jurado & Nico Ramirez, Death Valley Experiences 1,000 Year Rain Event, National Park Service (Aug. 7, 2022), https://www.nps.gov/deva/learn/news/death-valley-experiences-1-000-year-rain-event.htm.

36 Id.

37 Samuel Oakford, John Muyskens, Sarah Cahlan & Joyce Sohyun Lee, America Underwater: Extreme floods expose the flaws in FEMA's risk maps, The Washington Post (Dec. 6, 2022), https://www.washingtonpost.com/climate-environment/interactive/2022/fema-flood-risk-maps-failures/.

38 Michael Dettinger, Climate Change, Atmospheric Rivers, and Floods in California – A Multimodel Analysis of Storm Frequency and Magnitude Changes, 47 J. Am. Water Res. Ass'n 514, 515 (2011).

39 See U.S. Nat'l Weather Serv., Orographic Lifting, https://forecast.weather.gov/glossary.php?letter=o (last visited Oct. 31, 2022).

40 Thomas Corringham et al., Atmospheric Rivers Drive Flood Damages in the Western United States, 5 Sci. Advances 1, 3 (2019).

Warmer temperatures also contribute to the severity of drought experienced by our States and Cities. In 2022, Massachusetts experienced significant or critical drought conditions across the entire state, leading to drought-induced fires, water restrictions, and water quality and availability impacts on private wells and water-dependent habitats across the state.41 Since early 2020, the southwestern United States has experienced one of the most severe long-term droughts of the past 1,200 years, triggered by multiple seasons of record low precipitation and near-record temperatures.42 Drought also afflicted the Pacific Northwest in 2020, caused by the mountain snowpack melting quickly rather than gradually into the foothills and plateau.43 Droughts in the western United States have caused substantial economic and environmental damage.44 California is particularly vulnerable to the increased risk of drought as warming temperatures "lead[] to more precipitation falling as rain rather than snow, faster melting of winter snowpack, greater rates of evaporation, and drier soils."45 Between September 2019 and August 2022, California experienced the driest three-year stretch on record.46 [EPA-HQ-OAR-2022-0985-1588-A1, p.6]

41 Massachusetts Drought Status (Sept. 8, 2022), http://bit.ly/3hKCnwR (last visited Nov. 28, 2022); Press Release, Mass. Exec. Off. of Energy & Env't Aff., Massachusetts Continues to Experience Drought Conditions (July 21, 2022), http://bit.ly/3Vi0RfS.

42 Climate Change Impacts on Agriculture and Food Supply, U.S. Environmental Protection Agency, https://www.epa.gov/climateimpacts/climate-change-impacts-agriculture-and-food-supply#37foot (last updated Dec. 13, 2022).

43 Rebecca Lindsay, Drought emerges across the Pacific Northwest in spring 2020, Climate.gov (May 26, 2020), https://www.climate.gov/news-features/event-tracker/drought-emerges-across-pacific-northwest-spring-2020.

44 Sixth Assessment, supra note 2, at 1953.

45 Gabriel Petek, California Legislative Analyst's Office, What Can We Learn From How the State Responded to the Last Major Drought? 2 (May 2021).

46 U.S. Nat'l Oceanic and Atmospheric Admin., Climate at a Glance Statewide Time Series: California Precipitation, https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series/4/pcp/36/8/1895-2022?base_prd=true&begbaseyear-1895&endbaseyear=2022 (last visited Jan. 8 2023); see also Rachel Becker, Four in a Row: California Drought Likely to Continue, CalMatters (Sep. 28, 2022), https://calmatters.org/environment/2022/09/california-drought-likely-to-continue/.

Both droughts and floods will become more intense as the Earth warms, which may result in, among other impacts, the degradation of water supply security,47 ecological vulnerabilities,48 and water quality impairment.49 This threat is becoming increasingly dramatic on the Colorado River, where key reservoirs have been pushed to their limits.50 Indeed, Arizona recently announced that it would not approve new housing construction in the Phoenix metropolitan area due to a limited supply of groundwater.51 If reservoir levels continue to fall, the water supply of 25 million Americans in Arizona and California faces increasing risk.52 [EPA-HQ-OAR-2022-0985-1588-A1, pp.6-7]

47 Public Health, Drought.gov, https://www.drought.gov/sectors/public-health (last visited Jan. 30, 2022).

48 Shelley D. Crausbay et al., American Meteorological Soc'y, Defining Ecological Drought for the Twenty-First Century 2545 (Dec. 2017).

49 Id. at 1953 (Sixth Assessment).

50 Joshua Partlow, Disaster scenarios raise the stakes for Colorado River negotiations, The Washington Post (Dec. 17, 2022), https://www.washingtonpost.com/climate-environment/2022/12/17/colorado-river-crisis-conference/.

51 Christopher Flavelle & Jack Healy, Arizona Limits Construction Around Phoenix as Its Water Supply Dwindles, N.Y. Times (June 1, 2023), https://www.nytimes.com/2023/06/01/climate/arizona-phoenix-permits-housing-water.html.

52 Id.

Most of California's precipitation occurs as snow, so water availability depends on the mountain snowpack,53 which supplies approximately 30 percent of California's annual water demand.54 Rising atmospheric temperatures decrease that snowpack, regardless of precipitation changes.55 Indeed, California's water management systems have been built around the natural reservoir of the snowpack, which will melt earlier and faster in higher temperatures. Projections show that carry over storage—the volume of water in reservoirs before the start of the wet season in late fall—in California's two largest reservoirs, Shasta and Oroville, will decline by about one-third by the end of the century.56 Reductions in snowpack and river flow may require the state to invest in expensive new water resources such as water desalination or other alternative solutions.57 [EPA-HQ-OAR-2022-0985-1588-A1, p.7]

53 Moetasim Ashfaq et al., Near-term Acceleration of Hydroclimatic Change in the Western U.S., 118 J. Geophysical Res.: Atmospheres 10,676, 10,676 (2013).

54 Cal. Dep't of Water Res., Early Winter Storms Provide Much-Needed Sierra Snowpack (Dec. 30, 2021), https://water.ca.gov/New/News-Releases/2021/Dec-21/DWR-12-30-21-Snow-Survey.

55 James Thorne et al., The Magnitude and Spatial Patterns of Historical and Future Hydrologic Changes in California's Watersheds, 6 Ecosphere 1, 17 (2015); see also Leah Fisher and Sonya Ziaja, California's Fourth Climate Assessment Statewide Summary Report 57 (2018), https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf.

56 Fisher and Ziaja, supra note 55 at 57.

57 Patrick Gonzalez et al., 2018: Southwest. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [D.R. Reidmiller et al., (eds.)] at 1101, 1112.

3. Sea Level Rise

Climate change causes sea level rise in two primary ways: 1) by melting ice sheets and glaciers, and 2) by warming seawater, which consequently expands.58 In the past three decades, rates of sea level rise have accelerated along most North American coasts.59 Sea level rise has caused flooding, erosion, and infrastructure damage along the western Gulf of Mexico and the southeast US coasts,60 and is even more dangerous in combination with dynamic processes like storm surge flooding and ocean acidification.61 California's 3,500-mile coastline is particularly susceptible to the dangers of sea-level rise, with even typical tides and storms producing extreme high-water events. Projected sea level rise will likely cause severe economic disruption and damage to the nearly 27 million Californians—more than any other State in the nation—who live in a coastal county.62 Projections show that somewhere between 31 to 67 percent of Southern California beaches may be lost by 2100.63 By the middle of the century, flooding from rising sea levels and storms is likely to make billions of dollars of coastal property unusable.64 In a worst case scenario of 6.6 feet of sea level rise combined with a 100-year storm, the resultant flooding in Southern California could affect a quarter of a million people, $50 billion worth of property, and $39 billion worth of buildings.65 A projected sea level rise of 0.9 meters by 2100 would place 4.2 million people at risk of inundation in US coastal cities.66 [EPA-HQ-OAR-2022-0985-1588-A1, pp.7-8]

58 Sea Level, NASA Global Climate Change, https://climate.nasa.gov/vital-signs/sea-level/ (last accessed May 23, 2023).

59 Sixth Assessment, supra note 2, at 1936–37.

60 Id. at 1950 (Sixth Assessment).

61 Fourth National Climate Assessment, at 324.

62 U.S. Nat'l Oceanic and Atmospheric Admin., Fast Facts: Economics and Demographics, https://coast.noaa.gov/states/fast-facts/economics-and-demographics.html (last visited Oct. 31, 2022).

63 Fisher and Ziaja, supra note 55 at 9.

64 Fourth National Climate Assessment, supra note 9, at 330.

65 Id.

66 Sixth Assessment, supra note 2, at 1963 (Ch. 14).

For all these reasons, reducing GHG emissions from heavy-duty vehicles—the second largest source of GHGs within the transportation sector in the United States—is a critical step in tackling the climate emergency. [EPA-HQ-OAR-2022-0985-1588-A1, p.8]

Organization: World Resources Institute (WRI)

EPA studies show that medium- and heavy-duty vehicles generate 23 percent of the transportation sector's greenhouse gas emissions (GHG), contributing to the severity of climate change impacts, including heat waves, drought, sea level rise, extreme climate and weather events, coastal flooding, and wildfires. Some populations may be especially vulnerable to these and other climate change impacts, including low-income communities, people with disabilities, people of color, and Indigenous populations. Furthermore, studies (such as the recent 'Zeroing in on Healthy Air' from the American Lung Association) show that regulations and policies designed to reduce GHG emissions, such as through accelerating electric transportation, will have the added benefit of reducing other forms of pollution, such as air toxics and particular matter, that impact public health and disproportionately impact overburdened communities. [EPA-HQ-OAR-2022-0985-1601-A1, pp. 3 - 4]

Organization: Zero Emission Transportation Association (ZETA)

b. Reducing HDV Emissions Protects the Environment and the Climate

Emissions from diesel engines have detrimental impacts not only on human health, but on natural ecosystems as well. A study from the University of Southampton demonstrated that exposure to diesel exhaust has negative impacts on pollinators and that NOx emissions altered the smell of five out of the eleven most common single compound floral odors.13 In areas where diesel exhaust is present, a 2022 study found that there were 70% fewer pollinators and 90% fewer flower visits.14 A separate study from the Journal of Environmental Health Science and Engineering suggests that prolonged exposure to internal combustion engine exhaust has potentially significant impacts on agro-ecosystems and plant germination.15 [EPA-HQ-OAR-2022-0985-2429-A1, p. 6]

13 "Diesel fumes alter half the flower smells bees need," University of Southampton, (October 19, 2015) https://www.southampton.ac.uk/news/2015/10/diesel-fumes-alter-flower-smell-for-bees.page

14 James M.W. Ryalls, Ben Langford, Neil J. Mullinger, Lisa M. Bromfield, Eiko Nemitz, Christian Pfrang, Robbie D. Girling, 'Anthropogenic air pollutants reduce insect-mediated pollination services', Environmental Pollution, Volume 297, 2022, 118847, ISSN 0269-7491, accessed May 24, 2023 https://doi.org/10.1016/j.envpol.2022.118847.

15 Afsharnia F, Moosavi SA. “Effects of diesel-engine exhaust emissions on seed germination and seedling growth of Brassicaceae family using digital image analysis.” (September 28, 2021) https://ncbi.nlm.nih.gov/pmc/articles/PMC8617225/

While HDVs make up just 10 percent of vehicles on the road, they generate more than 25 percent of the total GHG emissions from the transportation sector.16 As the nature of anthropogenic climate change is becoming increasingly evident,17 the urgency needed in addressing its causes is becoming greater.18 Electrification is the best path forward for reducing transportation emissions, and HDV electrification in particular presents an outsized opportunity for emissions reductions. In addition to emitting higher volumes of pollutants compared to other classes of vehicles, commercial HDVs also spend more time on roads.19 The average Class 8 semi travels 63,000 miles every year—more than four times the vehicle miles traveled (VMT) of a single passenger vehicle.20 All this additional time spent on the road means more GHG emissions over the life of a HDV meaning it is even more urgent to decarbonize this segment of the transportation sector. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 6 - 7]

16 “How to Eliminate Pollution from Heavy-Duty Vehicles,” Union of Concerned Scientists, (February 11, 2022), accessed May 15, 2023 https://www.ucsusa.org/resources/heavy-duty-vehicles-and-nox#:~:text=The%20problem%20with%20heavy%2Dduty%20vehicles&text=Carbon%20dioxide%2C%20methane%2C%20and%20nitrous,this%20sector%20continues%20to%20grow.

17 B. Santer, et.al. “Exceptional stratospheric contribution to human fingerprints on atmospheric temperature,” PNAS, (May 8, 2023) accessed May 15, 2023 https://www.pnas.org/doi/10.1073/pnas.2300758120

18 “Carbon dioxide levels in atmosphere mark a near-record surge,” Washington Post, (June 5, 2023) accessed June 6, 2023 https://www.washingtonpost.com/climate-environment/2023/06/05/carbon-dioxide-growing-climate-change/

19 Katie Zehnder et al. “Ohio Freight Electrification,” Ohio Department of Transportation (August 2021) https://drive.ohio.gov/wps/wcm/connect/gov/c6eb7b83-7d19-4f14-b430-761849a3de98/20210812_OhioFreightElectrification_Full_Report_Final_v1.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-c6eb7b83-7d19-4f14-b430-761849a3de98-nLAJ7H6

20 Id.

EPA Summary and Response:

Summary:

Many commenters (Allergy & Asthma Network et al, American Thoracic Society (ATS), Clean Air Task Force et al., Environmental Protection Network (EPN), National Parks Conservation Association (NPCA), Southern Environmental Law Center (SELC), State of California et al., World Resources Institute (WRI), Zero Emission Transportation Association (ZETA)) stressed that climate change is a top public health priority and a public health emergency. These commenters stated that climate change is endangering the public health and welfare of all populations, including children, by increasing risks of heart disease, mental health, pollen seasons, allergies, drought, frequent flooding, and other listed impacts. One of these commenters stated that climate change also poses an increasing threat to America’s national parks (National Parks Conservation Association). These commenters stated that massive economic costs to climate change and studies have found that the future costs will be unequally distributed across the US. where, the geography and demographics of the South make the region particularly vulnerable to climate change.

Many of the commenters identified a litany of harms associated with the on-going climate crisis, and the heavy-duty sector's contribution to the GHG emissions which are driving that crisis. Harms identified in the comments included:

- Worsening air quality, especially ozone levels (Allergy and Asthma network, Clean Air Task Force);
- -- rise in vector borne disease (Allergy and Asthma Network)
- -- flooding (e.g. Southern Env. Law Center, State of Cal.)
- -- drought (e.g. State of Cal.)
- Excessive heat (CATF, State of Cal.)
- Wildfires (American Thoracic Society, Electrification Coal., National Parks Conservation Ass/n,)
- Adverse mental health implications (CATF, Our Children's Trust)
- -- sea level rise (CATF, St. of Cal.)
- -- disproportionate impact on disadvantaged communities, both domestic and worldwide (Southern Env Law Ctr., CATF, World Resources inst.)
- --national security implications (Electrification Coal.)
- Disastrous impacts on parks from invasive species (National Parks Conservation Ass'n)
- -- loss of needed snowpack (National Parks Conservation Ass'n, State of Cal.)
- -- termination of property insurance due to wildfire and other climate-related risks (State of Cal.)
- Enormous financial losses, already in the billions of dollars annually from wildfires alone (Southern Env. Law Center, State of Cal.)

This group of commenters stated that although heavy duty vehicles comprise only about 5% of on-road vehicles, they account for nearly one third of VMT – hence their substantial contribution to this on-going endangerment.

Arizona State Legislature stated that the proposed rule is arbitrary and capricious because it fails to model and calculate the climate change impacts in order to weigh the benefits against the costs and the transformative nature of the proposed rule. Without a showing that the rule will result in some type of quantifiable effect to prevent climate harms, this commenter questions its legality, and asserted that EPA's summary conclusion that the standards would contribute towards the goal is not good enough.

Our Children's Trust suggested that EPA is not appropriately discounting the lives of children and unborn future generations when it analyzes and considers the formulation of proposed regulations to carry out its delegated authority to protect the air and human health and welfare, and that children are uniquely vulnerable to climate change. The commenter asserts that failure to manage, protect, and prevent substantial impairment to the earth, air, and climate would violate the federal government's fiduciary obligations under the Fifth Amendment of the Constitution and the Public Trust Doctrine. The commenter also asserted that in this rule the Ninth Circuit's findings in *Juliana v. United States*, 947 F.3d 1159, 1164 (9th Cir. 2020), on the federal government's role should guide EPA's policies and practices so that EPA can identify, and alter, those policies that exacerbate American youth's existing climate change injuries. Finally, the commenter argued that 1.5°C presents significant risks to the planet when compared to 1°C, and that therefore the EPA should not use a 1.5°C target to guide policy.

Response:

The EPA appreciates that many commenters are concerned about past, present, and future climate change and the many impacts on human health and welfare that result from climate change. The GHG reductions resulting from this rule will be a meaningful contribution to slowing the rate of future climate change. Importantly, EPA has found in the record for this rulemaking that the standards will significantly reduce GHG emissions - approximately one billion metric tons in net CO_2 cumulative emission reductions between 2027 and 2055. See preamble section V and RIA chapter 4, which provide more detail on these emissions estimates and how they were calculated. Because this reduction is due to one action, for one sector, for one nation, it is a meaningful contribution. *See Coalition for Responsible Regulation*, 684 F. 3d at 332 ("EPA found that the emission standard would result in meaningful mitigation of greenhouse gas emissions. For example, EPA estimated that the Rule would result in a reduction of about 960 million metric tons of CO2e emission over the lifetime of the model year 2012-2016 vehicles affected by the new standards.") Climate change is not expected to be solved by any single action, but rather by a large number of them. As the Supreme Court recognized, "Agencies, like legislatures, do not generally resolve massive problems in one fell regulatory swoop. ... And reducing domestic automobile emissions is hardly a tentative step." Massachusetts v. E.P.A., 549 U.S. 497, 524 (2007); . Thus, EPA disagrees with the commenters that EPA has not provided a basis for this action consistent with the requirements of CAA section 202(a)(1)-(2). See section 2.4 of this RTC for response to comments regarding the stringency of the final rule relative to the proposal.

While EPA did not conduct additional climate modeling in support of this rulemaking, EPA is not required to do so in setting the Phase 3 standards under CAA section 202(a)(1)-(2). See *Coal. For Resp. Regulation*, 684 F. 3d at 128 (noting that EPA section 202(a)(1) authority is not "conditioned on evidence of a particular level of mitigation" but rather that that authority is triggered by a showing of significant contribution, which was made in EPA's Endangerment Finding; plus, , as just quoted above, the record under review in that case showed estimated "meaningful" emission reductions some millions of tons less than projected under the Phase 3 rule). Indeed, CAA section 202(a)(1)-(2) does not require the agency to calculate the benefits of its rulemaking at all, and the commenter failed to adduce any statutory authority or other legal basis for the proposition that EPA must calculate benefits generally or specifically must model avoided temperature change or sea level rise.

We also note that, for purposes of E.O. 12866, EPA has estimated the value of the benefits of these reductions by applying the SC-GHG, which is a sufficient means of calculating benefits and so makes it unnecessary to conduct any further climate modelling for that purpose. The development of the SC-GHG involves the use of climate models in order to estimate the damages of an additional ton of emissions and is therefore a reasonable approach that uses the appropriate tool in benefit-cost analysis. When considering those monetized climate benefits, the monetized benefits of the rule far exceed its costs. EPA's reliance on SC-GHG to assess the climate benefits of this rulemaking is clearly reasonable. As we explain in preamble section VII.A and RIA Chapter 7, the SC-GHG is based on a voluminous record, significant public process, and the well-considered judgment of experts.

In response to Our Children's Trust, EPA follows applicable guidance and best practices when conducting its benefit-cost analyses, including OMB Circular A-4 and EPA's Guidelines for Preparing Economic Analyses. With respect to the application of discount rates, EPA notes that we "use constant discount rates (1.5-percent, 2-percent, and 2.5-percent) similar to the near-term Ramsey discount rates to calculate the present and annualized value of SC-GHGs for internal consistency" (from the notes on Table VII-2). That approach to discounting follows the same approach that the February 2021 TSD recommends "to ensure internal consistency—i.e., future damages from climate change using the SC-GHG at 2.5 percent should be discounted to the base year of the analysis using the same 2.5 percent rate." EPA has also consulted the National Academies' 2017 recommendations on how SC-GHG estimates can "be combined in RIAs with other cost and benefits estimates that may use different discount rates." The National Academies reviewed "several options," including "presenting all discount rate combinations of other costs and benefits with [SC-GHG] estimates." With regards to Our Children's Trust criticism and assertions regarding a 1.5°C target, the EPA is setting standards under Clean Air Act section 202(a)(1)-(2) as described in preamble sections I and II. With regards to Our Children's Trust discussion of the unique vulnerability of children to climate change, the EPA does recognize these vulnerabilities (see, e.g., the EPA report *Climate Change Impacts on Children's Health and Well-Being in the U.S.*), and the emissions reductions resulting from this rule will make an important contribution to efforts to limit climate change and its anticipated impacts to children relative to a future without this rule.

With respect to comments raising Public Trust legal theories, the Agency does not dispute that climate change poses a serious threat, nor that addressing climate change requires the active involvement of the federal government. Commenters espouse novel Constitutional and Public Trust legal theories not relevant to this rulemaking and cite *Juliana v. United States,* 947 F.3d. 1159 (9th Cir.), *Juliana v. United States*, 217 F. Supp. 3d 1224, 1254 (D. Or. 2016) and *Held v. Montana,* No. CDV-2020-307 (1st Dist. Ct. Mont., 2023). The Agency notes that the referenced district court decision in Juliana was overruled for lack of jurisdiction, and further notes that the referenced 9th Circuit decision did not reach the merits of the Constitutional and public trust theories at issue in that case. Juliana v. United States, 947 F.3d 1159, 1175 (9th Cir. 2020), reh'g en banc denied, 986 F.3d 1295 (9th Cir. 2021). Further, *Held v. Montana* (currently subject to appeal) is a case decided by a Montana state court judge interpreting Montana's constitution.

EPA follows applicable guidance and best practices when conducting its benefit-cost analyses, including OMB Circular A-4 and EPA's Guidelines for Preparing Economic Analyses. With respect to the application of discount rates, EPA notes that it used the same discount rate as the rate used to discount the value of damages from future GHG emissions, for internal consistency. That approach to discounting follows the same approach that the February 2021 TSD recommends "to ensure internal consistency—i.e., future damages from climate change using the SC-GHG at 2.5 percent should be discounted to the base year of the analysis using the same 2.5 percent rate." EPA has also consulted the National Academies' 2017 recommendations on how SC-GHG estimates can "be combined in RIAs with other cost and benefits estimates that may use different discount rates." The National Academies reviewed "several options," including "presenting all discount rate combinations of other costs and benefits with [SC-GHG] estimates."

15 Health and Environmental Effects of Non-GHG Pollutants

Comments by Organizations

Organization: Allergy & Asthma Network et al.

Reducing greenhouse gas emissions that drive climate change from the transportation sector is a top public health priority, and maximizing the benefits to cleaning up conventional pollution from the heavy-duty vehicle sector at the same time is a health equity imperative. We urge EPA to finalize the strongest possible heavy-duty greenhouse gas standards by the end of 2023, at least as strong as those in the Advanced Clean Trucks program (ACT). These standards should ensure real-world pollution reductions and spur the transition to zero-emission trucking. [EPA-HQ-OAR-2022-0985-1532-A1, p. 1]

Health Impacts of Heavy-Duty Vehicle Emissions

Emissions from traffic are a complex mixture of pollutants that make people sick and shorten lives. In 2022, the Health Effects Institute (HEI) released the largest systematic review of its type to date that looked at hundreds of studies on traffic pollution and related health effects between1980 and 2019. The review concluded with a high level of confidence that long-term exposure to traffic pollution is linked with all-cause, circulatory and ischemic heart disease mortality; with a moderate to high level of confidence that it is linked to lung cancer mortality, asthma onset in children and adults and acute lower respiratory infections; and with a moderate level of confidence that it is linked to term low birth weight and small for gestational age in fetuses, active asthma in children and respiratory mortality, ischemic heart disease events and diabetes in adults.1 The review also found that the evidence for health impacts of traffic related air pollution has grown since the last HEI study in 2010. [EPA-HQ-OAR-2022-0985-1532-A1, pp. 1 - 2]

1 Health Effects Institute. Special Report 23. A Special Report of the HEI Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution June 2022, updated April 2023. https://www.healtheffects.org/publication/systematic-review-and-meta-analysis-selected-health-effects-long-term-exposure-traffic

The heavy-duty vehicle sector is a driver of these health impacts. Despite making up less than 10 percent of all vehicles on the road, medium- and heavy-duty vehicles produce the majority of harmful on-road emissions, including conventional air pollutants like fine particulate matter (PM2.5), and nitrogen oxides (NOx). NOx is a precursor of another air pollutant, ozone, which in addition to causing health harm is also a greenhouse gas. [EPA-HQ-OAR-2022-0985-1532-A1, p. 2]

Organization: American Thoracic Society (ATS)

Heavy-duty vehicles are significant contributors to greenhouse gas and criteria pollutant emissions. [EPA-HQ-OAR-2022-0985-1517-A1, p. 1]

In addition to GHG generation, heavy-duty vehicles are a major source of criteria air pollutants in the US.4 As outlined in the proposed rule, implementing stricter CO2 emission standards will also reduce primary criteria air pollutants levels. Heavy-duty vehicles directly contribute to criteria air pollutant generation via engine combustion, engine crankcase exhaust, vehicle evaporative emissions, and vehicle refueling emissions. They also indirectly increase criteria air pollution from electrical generating units and refinery emissions. [EPA-HQ-OAR-2022-0985-1517-A1, p. 2]

4. Anenberg, S. C. et al. Impacts and mitigation of excess diesel-related NOx emissions in 11 major vehicle markets. Nature 545, 467–471 (2017).

Generation of criteria air pollutants is dependent on GHG emissions. Global temperature elevations from GHG emissions directly increase criteria pollutant levels, such as ozone and particulate matter with a diameter <=2.5μm (PM2.5), by accelerating photochemical reactions in the atmosphere and increasing the frequency of wildfires.5 Based on estimates of net effects from the proposed rule, EPA projects reductions in nitrogen oxides (NOx), PM2.5, volatile organic compounds (VOCs), and sulfur dioxide (SO2) by 70,838 (28%), 967 (39%), 20,775 (37%), & 518 U.S. tons, respectively, by calendar year 2055. As ozone is a secondary criteria air pollutant that forms from the reaction of NOx and VOCs,6 as NOx and VOC emissions reduce, so will ozone levels. Thus, limiting GHG emissions through the regulation of heavy-duty trucks reflects a primary prevention tool to mitigate excessive criteria air pollutant levels as well as reducing harmful exposure to those living in closest proximity to busy roads. This is critically important given the numerous adverse human health effects of excess exposures to these pollutants. [EPA-HQ-OAR-2022-0985-1517-A1, p. 2]

5. Perera, F. & Nadeau, K. Climate Change, Fossil-Fuel Pollution, and Children’s Health. N Engl J Med 386, 2303–2314 (2022).

6. Orru, H., Ebi, K. L. & Forsberg, B. The Interplay of Climate Change and Air Pollution on Health. Curr Env. Heal. Rep 4, 504–513 (2017).

Organization: Clean Air Now

Most heavy-duty trucks on the road today are powered by diesel engines, the exhaust from which poses a direct threat to human health and the environment. Diesel engines emit a mixture of pollutants, including NOx, VOCs, and $PM_{2.5}$, all of which have been directly linked to severe health consequences, including neurological, cardiovascular, respiratory, reproductive, and immune system damage. [EPA-HQ-OAR-2022-0985-1579-A1, p. 2]

Organization: Environmental Defense Fund (EDF)

Despite making up less than 10 percent of vehicles on the road, the buses, trucks, and tractor trailers that distribute our goods are the largest contributor to ozone-forming oxides of nitrogen (NOx) emissions from all highway vehicles.2 They are also responsible for a significant amount of health-harming fine particulate matter (PM2.5) and more than 430 million tons of climate pollution3 – nearly a quarter of all transportation sector emissions and more than the entire country of Australia.4 [EPA-HQ-OAR-2022-0985-1644-A1, p. 7]

2 EPA Fact Sheet: Heavy-Duty 2027 and Beyond: Clean Trucks Final Rulemaking (December 2022), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P101695R.pdf.

3 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2021, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021.

4 International Energy Agency, Atlas of Energy (2020), http://energyatlas.iea.org/#!/tellmap/1378539487.

The health burden from truck and bus pollution is substantial, causing adverse health impacts in utero, in infants and children, and in adults and the elderly – with those who live closest to our nation's roads and highways, ports, distribution centers, freight depots, and other well-known sources of truck pollution facing the greatest harms. EPA has estimated that 72 million people live within 200 meters of a truck freight route, and relative to the rest of the population, people of color and those with lower incomes are more likely to live near truck routes.5 Please see EDF's comments on the Proposed Rule, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 87 Fed. Reg. 17414 (Mar. 28, 2022) dated May 16, 2022 and resubmitted to this docket for a more thorough discussion of the substantial health and environmental harms associated with the diesel and GHG emissions from medium- and heavy-duty vehicles.6 [EPA-HQ-OAR-2022-0985-1644-A1, p. 7]

5 87 Fed. Reg. 17451 (Mar. 28, 2022).

6 EDF's comments on the Proposed Rule, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 87 Fed. Reg. 17414 (Mar. 28, 2022) dated May 16, 2022 (Attachment A).

1. Impacts of diesel fumes on children

Nationally, about 26 million children take 480,000 buses to and from school each day. School buses travel about 12,000 miles per year per bus or almost 6 billion cumulative miles per year and over 90 percent of these school buses run on diesel.102103 Diesel exhaust is composed of very fine particles of carbon and a mixture of toxic gases and has been named a human carcinogen by the World Health Organization. There is no known safe level of exposure to diesel exhaust for children, especially those with respiratory illness. Evidence shows that school aged children are especially vulnerable to the health harming impacts of diesel pollution and that it can have long term consequences.104 105 And as diesel school buses drive their routes, toxic air pollutants remain in the cabin of the vehicle – exposing children for extended periods of time.106 Research conducted by Environment & Human Health Inc. has shown that harmful PM2.5 pollution levels on school buses can exceed surrounding areas by five to 10 times.107 [EPA-HQ-OAR-2022-0985-1644-A1, p. 47-48]

102 New York School Bus Contractors Association, School Bus Fast Facts, https://www.nysbca.com/fastfacts.

103 Lydia Freehafer and Leah Lazer. The State of Electric School Bus Adoption in the US, World Resources Institute, (April 26, 2023). https://www.wri.org/insights/where-electric-school-buses-us (Attachment T)

104 Liu NM, Grigg J. Diesel, children and respiratory disease. BMJ Paediatr Open. 2018 May 24;2(1):e000210. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5976105/#R4

105 Beatty T.K.M., Shimshack J.P. School buses, diesel emissions, and respiratory health J. Health Econ., 30 (5) (2011), pp. 987-999. https://www.sciencedirect.com/science/article/abs/pii/S0167629611000701#preview-section-references

106 Emissions From School Buses Increase Pollution Levels Inside the Bus, EDF. https://www.edf.org/sites/default/files/5342_School_bus_pollution_studies.pdf (Attachment U).

107 John Wargo, Children's Exposure to Diesel Exhaust on School Buses, EEHI (February 2022).

Recent studies have shown that reducing student exposure to diesel school bus pollution can have a meaningful impact on student health and cognitive functioning, including test score gains in math and English.110 Zero-emitting electric school buses reduce students' exposure to harmful air pollutants, while reducing climate pollution and saving school districts money on fuel and maintenance costs. [EPA-HQ-OAR-2022-0985-1644-A1, p. 48]

110 Austin W., Heutel G., Kreisman D. School bus emissions, student health and academic performance Econ. Educ. Rev., 70 (2019), pp. 109-126. https://www.sciencedirect.com/science/article/abs/pii/S0272775719301530#preview-section-cited-by

Organization: Evergreen Action

Heavy duty vehicles are responsible for 25 percent of greenhouse gas emissions within the transportation sector, while also accounting for significant amounts of soot and smog that disproportionately impacts low-income populations and communities of color. Meaningfully addressing public health burdens and meeting this administration's climate targets of 50-52% emissions reduction by 2030 will require strong standards to significantly cut vehicle pollution within this decade. [EPA-HQ-OAR-2022-0985-1595-A1, p. 1]

Organization: Lion Electric, Co. USA

Additionally, heavy-duty vehicles, such as delivery vans, garbage trucks, and 18- wheelers, are prolific polluters; accounting for 10% of on-road vehicles, they are responsible for nearly 30% of transportation-related GHG, 45% of on-road nitrogen oxides and 57% of particulate matter emissions. This truck tailpipe pollution contributes to asthma, bronchitis, cardiovascular diseases, and premature death. EPA, Do the Right Thing on Truck Pollution (nrdc.org). [EPA-HQ-OAR-2022-0985-1506-A1, p. 2]

Organization: MCS Referral & Resources

Comment 5

At https://www.federalregister.gov/d/2023-07955/p-1503

In a discussion of carbon monoxide health effects, EPA claims: "Controlled human exposure studies of subjects with coronary artery disease show a decrease in the time to onset of exercise-induced angina (chest pain) and electrocardiogram changes following CO exposure. " [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

EPA gives no reference for this claim, which is not true. While a few studies commissioned by EPA from Aronow et al in the 1970s and Allred et al in the 1980s claimed to find this result, both were undermined by falsifying their methods and results. See: https://www.dropbox.com/s/fmwp8bmke2e8zfo/Donnay%202015%20SOT%20poster%20on%20EPA%20CO%20NAAQS%20Fraud.pdf?dl=0 [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

Not surprisingly, subsequent efforts to reproduce these findings have been unsuccessful. See these 14 studies that found contradictory results: https://pubmed.ncbi.nlm.nih.gov/?term=29343136,24923364,21933352,17321552,16937915,11696871,10492650,8210613,8441830,6695663,6750056,7304396,7389699,4640286&format=abstract [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

Given these facts, we recommend that EPA stop claiming that people with coronary artery disease show a decrease in time to exercise-induced angina or ECG changes after CO exposure. They do not. [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

Comment 8

EPA should acknowledge the literature that identifies CO as a carcinogen, which the 2010 ISA did not review. Over 100 studies show that relatively low levels of CO in the endogenous range act as a carcinogen, boosting the growth of cancers, including all types of leukemias and almost all types of solid tumors. See for example:

Ambient air pollution is associated with the increased incidence of breast cancer in US. Wei Y, Davis J, Bina WF. Int J Environ Health Res. 2012;22(1):12-21. doi: 10.1080/09603123.2011.588321.

Ambient carbon monoxide exposure and elevated risk of mortality in the glioblastoma patients: A double-cohort retrospective observational study. Yoon SJ, Noh J, Son HY, Moon JH, Kim EH, Park SW, Kim SH, Chang JH, Huh YM, Kang SG. Cancer Med. 2020 Dec;9(23):9018-9026. doi: 10.1002/cam4.3572. Epub 2020 Nov 7

Heme Oxygenase-1 and Carbon Monoxide Regulate Growth and Progression in Glioblastoma Cells. Castruccio Castracani C, Longhitano L, Distefano A, Di Rosa M, Pittalà V, Lupo G, Caruso M, Corona D, Tibullo D, Li Volti G. Mol Neurobiol. 2020 May;57(5):2436-2446. doi: 10.1007/s12035-020-01869-7. Epub 2020 Feb 27.

Carbon monoxide (CO)/heme oxygenase (HO)-1 in gastrointestinal tumors pathophysiology and pharmacology - possible anti- and pro-cancer activities. Krukowska K, Magierowski M.Biochem Pharmacol. 2022 Jul;201:115058. doi: 10.1016/j.bcp.2022.115058. Epub 2022 Apr 28. [EPA-HQ-OAR-2022-0985-1629-A1, p. 4]

Organization: Southern Environmental Law Center (SELC)

In addition to GHG emissions, heavy-duty vehicles are significant sources of other harmful pollutants such as particulate matter (PM), sulfur oxides (SOX), carbon monoxide (CO), and nitrogen oxides (NOX).34 These “criteria pollutants” have damaging effects on our environment and air quality—NOX is a central precursor to photochemical smog;35 acid rain results from sulfur dioxide (SO2) and NOX emissions;36 and PM is the primary cause of reduced visibility and regional haze in the United States.37 Additionally, exposure to criteria pollutants has been linked to respiratory and cardiovascular problems such as an increased incidence of asthma and heart disease, reduced lung function, and a greater number of overall hospitalizations,38 and all of these pollutants have a health-based National Ambient Air Quality Standard (NAAQS) established by EPA.39 As with GHG emissions, heavy-duty vehicles are also responsible for an outsized portion of criteria pollutants—heavy-duty diesel vehicles alone account for 20 percent of all NOX and 25 percent of PM2.5 pollution emitted by vehicles in the United States.40 As noted in the Federal Register notice, “72 million people live within 200 meters of a truck freight route,”41 and over 10 million students attend schools within 200 meters of major roads,42 making exposure to heavy-duty vehicle tailpipe pollution a serious public health issue nationwide. [EPA-HQ-OAR-2022-0985-1554-A1, p. 5]

34 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 25935 (Apr. 27,2023).

35 Nitrogen Oxides, UCAR CTR. FOR SCI. EDUC. (2017), https://scied.ucar.edu/learning-zone/air-quality/nitrogenoxides.

36 Id. See also What is Acid Rain?, U.S. EPA (last updated June 1, 2023), https://www.epa.gov/acidrain/what-acidrain.

37 Particulate Matter Basics, U.S. EPA (last updated July 18, 2022), https://www.epa.gov/pm-pollution/particulatematter-pm-basics.

38 Lowell & Culkin, supra note 10, at 13; see also U.S. EPA, Regulatory Impact Analysis: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards 168-85 (Dec. 2022), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1016A9N.pdf [hereinafter "2022 Regulatory Impact Analysis"].

39 U.S. EPA, Criteria Air Pollutants, https://www.epa.gov/criteria-air-pollutants (last accessed June 8, 2023).

40 Diesel Engines & Public Health, UNION OF CONCERNED SCIENTISTS (Feb. 11, 2022), https://www.ucsusa.org/resources/diesel-engines-public-health#1.

41 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 25935 (Apr. 27, 2023).

42 2022 Regulatory Impact Analysis, supra note 38, at 185

Organization: State of California et al. (2)

B. Tighter GHG Standards Will Also Help Reduce Non-GHG Emissions and Help States to Attain and Maintain Federal Air Quality Standards

Heavy-duty vehicles are also a significant source of air pollutants that contribute to ambient concentrations of ozone, inhalable particulate matter (PM2.5), and air toxics.67 Exposure to ozone and PM2.5 has serious health effects and is associated with increased risk of premature deaths, emergency room visits, and hospital stays.68 A range of adverse respiratory effects are linked to these pollutants such as asthma, respiratory inflammation, and decreased lung function and growth.69 [EPA-HQ-OAR-2022-0985-1588-A1, p.8]

67 88 Fed. Reg. at 26,047.

68 Id. at 26,049-51.

69 Id.

In particular, PM2.5 poses serious health risks as the fine particles can lodge deep into the lungs and possibly enter into the bloodstream, causing irregular heartbeat, heart attacks, as well as increased risk of lung cancer.70 Recent evidence also suggests a causal relationship between PM2.5 exposure and a host of other negative health impacts, including male and female reproductive and developmental effects from long-term exposure (i.e., fertility, pregnancy, and birth outcomes), metabolic effects from long-term and short-term exposure, and nervous system effects from short-term exposure.

71 Heavy-duty engine emissions also contribute to ambient levels of air toxics, 72 such as benzene, formaldehyde, acetaldehyde, and naphthalene, which are known or suspected to cause cancer and other serious health effects.73 [EPA-HQ-OAR-2022-0985-1588-A1, pp.8-9]

70 Control of Air Pollution from Aircraft Engines: Emission Standards and Test Procedures, 87 Fed. Reg. 6324, 6331 (Feb. 3, 2022).

71 Id.

72 McKeon, Thomas P. et al. (2021) Environmental Science and Pollution Research, Environmental exposomics and lung cancer risk assessment in the Philadelphia metropolitan area using ZIP code–level hazard indices, vol. 28, 31758–31769, 31764; Cancer & Environment Network of Southwestern Pennsylvania, National Air Toxics Assessment and Cancer Risk in Allegheny County Pennsylvania (updated May 2021), https://www.catf.us/wp-content/uploads/2021/07/NATA-Factsheet-Final-May-2021.pdf.

73 88 Fed. Reg. at 26,054-58.

The Clean Air Act ("CAA") requires EPA to set and regularly review and revise federal health-based ambient air quality standards for "criteria pollutants," including PM2.5, NOx, and ground-level ozone.74 These National Ambient Air Quality Standards ("NAAQS") aim to protect the health of their residents from air pollution resulting from emissions of criteria air pollutants. The NAAQS for ozone, established in 2015 and retained in 2020, is an 8-hour standard with a level of 70 parts per billion, although EPA recently announced that it may reconsider the previous administration's decision to retain the ozone NAAQS.75 EPA is also implementing the previous 8-hour ozone standard, set in 2008 at a level of 75 parts per billion. For PM2.5, there are two NAAQS that were set in 1997, revised in 2006 and 2012, and retained in 202076: an annual standard (12.0 micrograms per cubic meter) and a 24-hour standard (35 micrograms per cubic meter). [EPA-HQ-OAR-2022-0985-1588-A1, p.9]

74 42 U.S.C §§ 7408-7409.

75 See U.S. Environmental Protection Agency, Ozone National Ambient Air Quality Standards (NAAQS), https://www.epa.gov/ground-level-ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs (last accessed June 16, 2023); U.S. Environmental Protection Agency, EPA to Reconsider Previous Administration's Decision to Retain 2015 Ozone Standards, https://www.epa.gov/ground-level-ozone-pollution/epa-reconsider-previous-administrations-decision-retain-2015-ozone (last accessed June 16, 2023).

76 On June 10, 2021, EPA announced that it will reconsider the previous administration's decision to retain the PM NAAQS. See Press Release, EPA, EPA to Reexamine Health Standards for Harmful Soot that Previous Administration Left Unchanged (June 10, 2021), https://www.epa.gov/newsreleases/epa-reexamine-health-standards-harmful-soot-previous-administration-left-unchanged.

Depending on whether the air quality in an area meets the NAAQS for a particular pollutant, EPA designates the area as being in "attainment" or "nonattainment." EPA further classifies areas that are in nonattainment according to the severity of their air pollution problem, and areas with more severe pollution levels are given more time to meet the standard while being subject to more stringent control requirements under State Implementation Plans. [EPA-HQ-OAR-2022-0985-1588-A1, p.9]

As of May 31, 2023, there were 34 ozone nonattainment areas for the 2008 ozone NAAQS77 and 47 ozone nonattainment areas for the 2015 ozone NAAQS.78 Sixteen of the 8-hour ozone nonattainment areas are located in California and the only two extreme nonattainment areas in the nation are located in the South Coast Air Basin and San Joaquin Valley of California.79 Indeed, for the South Coast Air Basin to meet the federal ozone standards, overall NOx emissions need to be reduced by 70 percent from today's levels by 2023, and approximately 80 percent by 2031.80 The New York Metropolitan area (CT-NJ-NY) ozone nonattainment area failed to reach attainment by the deadline for serious nonattainment of the 2008 ozone NAAQS and was re-classified to severe nonattainment status for that NAAQS.81 And Wisconsin has three remaining nonattainment areas for the 2015 ozone NAAQS, all located downwind of some of the largest intermodal operations in the country.82 Many areas of the country are also currently in nonattainment for the PM2.5 NAAQS standards, and as of May 31, 2023, more than 31 million people live in PM2.5 (2006) nonattainment areas.83 [EPA-HQ-OAR-2022-0985-1588-A1, pp.9-10]

77 U.S. Environmental Protection Agency, Green Book, 8-Hour Ozone (2008) Nonattainment Area Summary, https://www3.epa.gov/airquality/greenbook/hnsum.html (last accessed June 16, 2023).

78 U.S. Environmental Protection Agency, Green Book, 8-Hour Ozone (2015) Nonattainment Area Summary, https://www3.epa.gov/airquality/greenbook/jnsum.html (last accessed June 16, 2023).

79 2016 State Strategy for the State Implementation Plan for Federal Ozone and PM2.5 Standards (State SIP Strategy), https://ww2.arb.ca.gov/resources/documents/2016-state-strategy-state-implementation-plan-federal-ozone-and-pm25-standards.

80 California Air Resources Board (CARB), Staff Report, Initial Statement of Reasons for Omnibus Rule at II-2 (June 23, 2020), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/isor.pdf (Omnibus ISOR).

81 87 Fed. Reg. 60,926 (Oct. 7, 2022).

82 Letter from State of Wisconsin to EPA Regional Administrator re: Attainment Planning for the 2015 Ozone National Ambient Air Quality Standard (Dec. 30, 2022), https://dnr.wisconsin.gov/sites/default/files/topic/AirQuality/AttainmentPlanLetter12302022.pdf.

83 U.S. Environmental Protection Agency, Green Book, PM-2.5 (2006) Nonattainment Area Summary, https://www3.epa.gov/airquality/greenbook/rnsum.html (last accessed June 16, 2023).

Substantial emission reductions are critically necessary given the extraordinary challenges that California faces to attain and maintain ozone and PM2.5 NAAQS and, thereby, protect public health. And, as noted, other States need to reduce these emissions in order to protect their residents. Reducing emissions from heavy-duty vehicles sold nationwide will help all states attain and maintain NAAQS for these pollutants, particularly since vehicles sold in one State can, and are, driven in or through others. According to California's Emission FACtors ("EMFAC") 2017 emissions inventory model, almost a million heavy-duty vehicles operate on California roads each year and contribute 31 percent of all statewide NOx emissions.84 Heavy-duty vehicles are responsible for 32 percent of mobile source NOx emissions in the South Coast Air Basin.85 Medium and heavy-duty vehicles are responsible for 52 percent of the NOx and 45 percent of the PM2.5 emitted by on-road vehicles in New York. Heavy-duty vehicles play an important role in the transport of goods for interstate commerce and frequently cross state borders.86 Therefore, stringent federal standards would assist states—including those with state regulatory programs applicable to in-state sales—attain and maintain the NAAQS. [EPA-HQ-OAR-2022-0985-1588-A1, p.10]

84 Omnibus ISOR at ES-1.

85 CARB presentation, Measures for Reducing Emissions from On-Road Heavy-Duty Vehicles (June 3, 2021), http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/heavy-duty-trucks-presentations-06-03-21.pdf?sfvrsn=8.

86 See Omnibus ISOR at ES-17.

Organization: World Resources Institute (WRI)

There are 20 million children that rely on the nation's fleet of over 480,000 school buses to transport them safely to school every day. More than 90 percent of the school buses on the road today are diesel-powered, a known carcinogen linked to a range of negative health outcomes and cognitive development impacts. [EPA-HQ-OAR-2022-0985-1601-A1, p. 1]

Pollution Impacts Children's Health
Enacting the strongest emissions standards is essential for children's health. Currently, diesel school buses represent more than 90 percent of the 480,000 school buses on the road today, transporting over 20 million students daily and driving 3.3 billion miles annually. Children are particularly susceptible to the negative health effects of diesel exhaust from school buses, a known carcinogen linked to reduced lung development and increased risk for asthma and pneumonia in children, among other risks. In addition, there is evidence that reducing diesel exhaust exposure can improve not only students' respiratory health, but also their academic outcomes. [EPA-HQ-OAR-2022-0985-1601-A1, p. 3]

Organization: Zero Emission Transportation Association (ZETA)

a. Reducing HDV Emissions Protects Public Health

Diesel fumes, in particular, pose a substantial risk to human health8—and an overwhelming majority of ICE-powered HDVs run on diesel.9 On-road diesel emissions are responsible for poor air quality, impaired respiratory systems, and cardiovascular issues. Exposure to these toxins has both cancerous and noncancerous health risks, including potential neurological, cardiovascular, respiratory, reproductive, and immune system damage.10 [EPA-HQ-OAR-2022-0985-2429-A1, p. 5]

8 "Diesel Exhaust," Occupational Safety and Health Administration, accessed May 15, 2023 https://www.osha.gov/diesel-exhaust#:~:text=Workers%20exposed%20to%20diesel%20exhaust,respiratory%20disease%20and%20lung%20cancer

9 "Trucking," Diesel Technology Forum, accessed May 15, 2023 https://dieselforum.org/trucking#:~:text=More%20than%2015%20million%20commercial,are%20powered%20by%20diesel%20engines.

10 Id. at Page 5

A large portion of the U.S. population remains vulnerable to these dangers. 45 million people in the United States live within 300 feet of a major traffic facility or corridor.11 Proximity to these roadways exposes residents to needless health risks and replacing older truck and bus fleets with electrified alternatives has the potential to yield significant public health benefits. According to the American Lung Association, the widespread transition to zero-emission transportation by 2050 can produce up to $72 billion in avoided health costs, save approximately

6,300 lives, and prevent more than 93,000 asthma attacks and 416,000 lost workdays each year.12 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 5 - 6]

11 “Research on Near Roadway and Other Near Source Air Pollution.” Overviews and Factsheets, Environmental Protection Agency (December 15, 2022) https://www.epa.gov/air-research/research-near-roadway-and-other-near-source-air-pollution.

12 “Road to Clean Air: Benefits of a Nationwide Transition to Electric Vehicles,” American Lung Association, accessed May 5, 2023 https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf

EPA Summary and Response:

Summary:

Commenters noted the needed reductions in emissions of non-GHG air pollutants, in particular $PM_{2.5}$ and ozone precursors, that are associated with the proposed heavy-duty GHG standards. The commenters mentioned that the non-GHG emission reductions would impact air quality and health and cited health effects associated with these pollutants. Several commenters pointed to findings specifically related to exposure to diesel PM from school buses and the need to reduce emissions from school buses. One commenter particularly noted that states need the emission reductions to attain and maintain the ozone and $PM_{2.5}$ NAAQS. In addition, a commenter stated that EPA was relying on long-since discredited studies for its finding that people with coronary artery disease show a decrease in time to exercise-induced angina or ECG changes after CO exposure, and that EPA needs to acknowledge studies identifying CO as carcinogenic. Another commenter noted that maximizing the benefits to cleaning up conventional pollution from the heavy-duty vehicle sector is a health equity imperative.

Response:

Section VI.B of the preamble describes the health and environmental effects caused by emissions of criteria and toxic pollutants. EPA agrees that emissions from heavy-duty trucks and upstream sectors contribute to concentrations of ozone, $PM_{2.5}$, NO_2, SO_2, CO, and air toxics, which are all associated with impacting human health. Heavy-duty trucks and buses continue to contribute significantly to air pollution at the local, regional, and national level, often disproportionally affecting communities of color and low-income populations, see Section 18 of this document for responses related specifically to environmental justice. EPA also agrees that protecting children’s health is a high priority, and that children can have increased vulnerability and susceptibility for adverse health effects from air pollution exposures. For responses to comments on maximizing the stringency of the standards please see Section 2.4 of this document.

Some commenters agree with or reiterate scientific information that the EPA had included in the proposal, and some commenters provide additional scientific or technical information regarding criteria and air toxic pollutant impacts from diesel trucks, including school buses, and upstream sources, or offer their views or opinions regarding such information. The EPA does not interpret these supportive comments as indicating disagreement with the evidence on health or welfare effects information that was presented in the proposal, but rather understands these comments to suggest that the additional information they provide should also be considered as support for finalizing the standards.

In response to commenters who identify potential health or welfare effects of criteria and air toxic pollutants through scientific information, views, or analyses, that were not addressed in the proposed or final action, the EPA notes that the health and welfare evidence presented in Section VI.B of the preamble sufficiently summarizes the potential health and welfare impacts of all pollutants that would be reduced or increased by the proposal. After consideration of comments, we did not alter our discussion and consideration of non-GHG pollutant impacts from the proposal. As explained in preamble Section II and V, while the final standards do not directly address non-GHG pollutants and EPA did not consider any potential non-GHG pollutant impacts of vehicle emissions in selecting the proposed CO_2 emission standards, EPA's assessment is that the net non-GHG emission impacts are supportive of the final standards.

With respect to comments related to CO exposure and health effects, we note that the EPA's statement that "controlled human exposure studies of subjects with coronary artery disease show a decrease in the time to onset of exercise-induced angina (chest pain) and electrocardiogram changes following CO exposure," is based on findings of multiple studies reviewed in the 2010 CO Integrated Science Assessment (ISA).[833]

As the commenter notes, the underlying data for this claim is partially based on results from an HEI multicenter study that investigated the effects of CO exposure in individuals with coronary artery disease. This effort resulted in three peer-reviewed publications, which have been cited more than 250 times: Allred et al 1989a[834], Allred et al 1989b[835], and Allred et al 1991.[836] These studies found that exposures to CO decreased the time to onset of angina during exercise by 4.2% (low exposure group) or 7.1% (high exposure group) and decreased the time to development of ischemic ST-segment changes during exercise by 5.1% (low exposure group) or 12.1% (high exposure group). In addition, several other studies investigating individuals with stable angina also demonstrated that CO exposure during exercise decreases the time to onset of

[833] U.S. EPA (2010). Integrated Science Assessment for Carbon Monoxide. U.S. Environmental Protection Agency. Washington, DC. EPA/600/R-09/019F.
[834] Allred EN; Bleecker ER; Chaitman BR; Dahms TE; Gottlieb SO; Hackney JD; Hayes D; Pagano M; Selvester RH; Walden SM; Warren J (1989a). Acute effects of carbon monoxide exposure on individuals with coronary artery disease. Health Effects Institute. Boston, MA.
[835] Allred EN; Bleecker ER; Chaitman BR; Dahms TE; Gottlieb SO; Hackney JD; Pagano M; Selvester RH; Walden SM; Warren J (1989b). Short-term effects of carbon monoxide exposure on the exercise performance of subjects with coronary artery disease. N Engl J Med, 321: 1426-1432.
[836] Allred EN; Bleecker ER; Chaitman BR; Dahms TE; Gottlieb SO; Hackney JD; Pagano M; Selvester RH; Walden SM; Warren J (1991). Effects of carbon monoxide on myocardial ischemia. Environ Health Perspect, 91: 89-132.

angina, as well as reduces the duration of exercise and increases ventricular arrhythmias.[837,838,839,840,841]

All ISAs undergo review by an independent Clean Air Scientific Advisory Committee (CASAC), whose members have expertise in a variety of scientific fields relevant to air pollution and air quality issues. In their final Advisory Report for the 2010 CO ISA, CASAC referenced the importance of the above studies ("The most compelling CO-related cardiovascular results remain those from the controlled human exposure studies of Allred et al; Kleinman et al; and Sheps et al.") and expressed support for the related causality determination ("The Panel members concur with the ISA's conclusion that a causal relationship is likely to exist between relevant short-term CO exposure and CV morbidity.").[842]

We have also reviewed the fourteen studies recommended by the commenter. Out of the fourteen studies, none were directly comparable to those discussed above (i.e., controlled human exposure to CO in individuals with coronary artery disease). Three of the recommended studies were review articles,[843,844,845] three were experimental animal studies,[846,847,848] and eight studies

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[837] Adams KF; Koch G; Chatterjee B; Goldstein GM; O'Neil JJ; Bromberg PA; Sheps DS; McAllister S; Price CJ; Bissette J (1988). Acute elevation of blood carboxyhemoglobin to 6% impairs exercise performance and aggravates symptoms in patients with ischemic heart disease. J Am Coll Cardiol, 12: 900-909.

[838] Anderson EW; Andelman RJ; Strauch JM; Fortuin NJ; Knelson JH (1973). Effect of low-level carbon monoxide exposure on onset and duration of angina pectoris: a study in ten patients with ischemic heart disease. Ann Intern Med, 79:46-50.

[839] Kleinman MT; Davidson DM; Vandagriff RB; Caiozzo VJ; Whittenberger JL (1989). Effects of short-term exposure to carbon monoxide in subjects with coronary artery disease. Arch Environ Occup Health, 44: 361-369.

[840] Kleinman MT; Leaf DA; Kelly E; Caiozzo V; Osann K; O'Niell T (1998). Urban angina in the mountains: effects of carbon monoxide and mild hypoxemia on subjects with chronic stable angina. Arch Environ Occup Health, 53: 388-397.

[841] Sheps DS; Herbst MC; Hinderliter AL; Adams KF; Ekelund LG; O'Neil JJ; Goldstein GM; Bromberg PA; Dalton JL; Ballenger MN; Davis SM; Koch GG (1990). Production of arrhythmias by elevated carboxyhemoglobin in patients with coronary artery disease. Ann Intern Med, 113: 343-351.

[842] Brain JD; Samet JM.. (2010). Review of Integrated Science Assessment for Carbon Monoxide (Second External Review Draft). Clean Air Scientific Advisory Committee, Science Advisory Board. Washington, DC. EPA-CASAC-10-005.

[843] Andreadou, I.; Iliodromitis, E. K.; Rassaf, T.; Schulz, R.; Papapetropoulos, A.; Ferdinandy, P. (2015). The role of gasotransmitters NO, H2S and CO in myocardial ischaemia/reperfusion injury and cardioprotection by preconditioning, postconditioning and remote conditioning. Br J Pharmacol, 172(6): 1587–1606.

[844] Mennear J. H. (1993). Carbon monoxide and cardiovascular disease: an analysis of the weight of evidence. Regul Toxicol Pharmacol, 17(1): 77–84.

[845] Weir, F. W.; Fabiano, V. L. (1982). Re-evaluation of the role of carbon monoxide in production or aggravation of cardiovascular disease processes. J Occup Med, 24(7): 519–525.

[846] Varadi, J.; Lekli, I.; Juhasz, B.; Bacskay, I.; Szabo, G.; Gesztelyi, R.; Szendrei, L.; Varga, E.; Bak, I.; Foresti, R.; Motterlini, R.; Tosaki, A. (2007). Beneficial effects of carbon monoxide-releasing molecules on post-ischemic myocardial recovery. Life Sci, 80(17): 1619–1626.

[847] Rochetaing, A.; Barbé, C.; Kreher, P. (2001). Acute ischemic preconditioning and high subchronic CO exposure independently increase myocardial tolerance to ischemia. Inhal Toxicol, 13(11): 1015–1032.

[848] Foster J. R. (1981). Arrhythmogenic effects of carbon monoxide in experimental acute myocardial ischemia: lack of slowed conduction and ventricular tachycardia. Am Heart J, 102(5): 876–882.

were conducted in humans.[849,850,851,852,853,854,855,856] Out of the eight human studies, two did not investigate a CO exposure (17-18), and one was an epidemiologic study evaluating the effects of acute CO exposures at non-ambient levels(19). The remaining five studies investigated potential cardiovascular effects of CO exposure in healthy individuals (20 - 24), a topic which was discussed in the previous ISA. In reference to effects on exercise-induced angina, the 2010 CO ISA stated that "no such effects have been observed in healthy adults following controlled exposures to CO." Furthermore, it states, "Although some studies have reported CO-induced hemodynamic changes among healthy adults at COHb concentrations as low as 5%, this effect has not been observed consistently across studies."[1] These statements are consistent with the provided studies and do not alter the conclusions of the 2010 CO ISA.

The 2010 CO ISA focused on publications from 1999 to May 2009, and no studies were identified which investigated potential carcinogenic effects of CO. The studies which the commenter provides, published from 2012 to 2020, will be considered for inclusion in the next ISA for CO.

[849] Ghio, A. J.; Case, M. W.; Soukup, J. M. (2018). Heme oxygenase activity increases after exercise in healthy volunteers. Free Radic Res, 52(2): 267–272.
[850] Starling, M. R.; Moody, M.; Crawford, M. H.; Levi, B.; O'Rourke, R. A. (1984). Repeat treadmill exercise testing: variability of results in patients with angina pectoris. American Heart J, 107(2): 298–303.
[851] Aslan, S.; Uzkeser, M.; Seven, B.; Gundogdu, F.; Acemoglu, H.; Aksakal, E.; Varoglu, E. (2006). The evaluation of myocardial damage in 83 young adults with carbon monoxide poisoning in the East Anatolia region in Turkey. Hum Exp Toxicol, 25(8): 439–446.
[852] Keramidas, M. E.; Kounalakis, S. N.; Eiken, O.; Mekjavic, I. B. (2012). Carbon monoxide exposure during exercise performance: muscle and cerebral oxygenation. Acta Physiol, 204(4): 544–554.
[853] Adir Y; Merdler A; Haim SB; Front A; Harduf R; Bitterman H (1999). Effects of exposure to low concentrations of carbon monoxide on exercise performance and myocardial perfusion in young healthy men. Occup Environ Med, 56: 535-538.
[854] Turner, J. A.; McNicol, M. W. (1993). The effect of nicotine and carbon monoxide on exercise performance in normal subjects. Respir Med, 87(6): 427–431.
[855] Davies, D. M.; Smith, D. J. (1980). Electrocardiographic changes in healthy men during continuous low-level carbon monoxide exposure. Environ Res, 21(1): 197–206.
[856] Ekblom, B.; Huot, R. (1972). Response to submaximal and maximal exercise at different levels of carboxyhemoglobin. Acta Physiol Scand, 86(4): 474–482.

16 Air Quality Impacts of Non-GHG Pollutants

Comments by Organizations

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

4. EPA fails to properly evaluate the environmental costs and benefits of the Proposed Rule.

The Proposed Rule predicts net emissions reductions but does not adequately evaluate local ambient air quality impacts from increased power generation spurred by the mass adoption of electric vehicles. Although EPA modeled changes to power generation anticipated by the Proposed Rule as part of its upstream analysis, EPA does not consider the potential degradation of air quality in areas in the direct vicinity of existing or new power plants.95 [EPA-HQ-OAR-2022-0985-1659-A2, p. in areas in the direct vicinity of existing or new power plants.95 [EPA-HQ-OAR-2022-0985-1659-A2, p. 26]

95 Id. at 25,983.

Organization: Delek US Holdings, Inc.

c. BEVs increased demand for power generation will also result in greater emissions of criteria pollutant emissions.

The Proposed Rule predicts net emissions reductions but does not adequately evaluate local ambient air quality impacts from increased power generation spurred by the mass adoption of electric vehicles. Although EPA modeled changes to power generation anticipated by the Proposed Rule as part of its upstream analysis, EPA does not consider the potential degradation of air quality in areas in the direct vicinity of existing or new power plants, especially as the need for baseload generation at times when the sun is not shining and the wind is not blowing rises exponentially with rapid electrification.38 [EPA-HQ-OAR-2022-0985-1561-A1, p. 8]

38 Proposed Rule at 25,983.

Organization: MCS Referral & Resources

Comment 3

At https://www.federalregister.gov/d/2023-07955/p-1440

EPA describes Carbon Monoxide as "a colorless, odorless gas emitted from combustion processes." This is a true statement as far as it goes but not a complete one. EPA should acknowledge that CO is emitted by rainwater, freshwater, saltwater, and most soils as well as by all mammals via their lungs, skin, and eyes. It also is produced in the atmosphere from the oxidation of methane, isoprene, terpene, and acetone.
See: https://www.ipcc.ch/site/assets/uploads/2018/03/TAR-04.pdf [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

Comment 4

At https://www.federalregister.gov/d/2023-07955/p-1443

EPA writes "The lifetimes of the components present in diesel exhaust range from seconds to days." This is not true of CO, whose lifetime in air is weeks to months [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

EPA Summary and Response:

Summary:

Two commenters, Delek U.S. Holdings, Inc. and AFPM, asserted that EPA has failed to assess localized air quality impacts due to increased criteria pollutant emissions in areas proximate to EGUs. One commenter also noted that vehicle electrification will increase energy demand and emissions from power plants, and that this increased demand will result in even more emissions from power plants when renewables (wind and solar) are unavailable.

A commenter, MCS Referral & Resources, pointed out an error in the description of the sources of CO and in the description of diesel exhaust component lifetimes.

Response:

As described in Section VI.C of the preamble, we did not conduct air quality modeling for this rule. Our consideration of statutory factors does not require air quality modeling, and for the purposes of this rule, which focuses on GHGs, we believe our assessment of non-GHG emissions (and the associated monetized benefits per ton reduced) is sufficient. As described in Section V of the preamble, we modeled and present projected changes in emissions, including from the EGU sector, due to this rule. Our modeling of projected emissions from the power sector was done using the Integrated Planning Model (IPM), which we note considers both the fact that renewables are not always available and ways clean power can be supplied when they are not. Please see Chapter 4.2.4 of the RIA and Section 13 of this Response to Comment document for more information on the IPM modeling done to project emissions from the power sector.

As further discussed in Section V of the preamble, Chapter 4.2.4 of the RIA, and Section 13 of this Response to Comment document, we project that emissions from EGUs will increase, and we expect that increased emissions from EGUs may increase ambient concentrations of some pollutants in areas downwind of EGUs. We also expect the power sector to become cleaner over time as a result of the IRA and future policies, which will reduce the air quality impacts of EGUs.

After consideration of comments by MCS, clarifying edits have been made to the CO background section to indicate that CO can also be formed by photochemical reactions, as well as being formed by incomplete combustion. In addition, clarifying edits have also been made to the diesel exhaust background section to indicate that lifetimes of components of diesel exhaust can range from seconds to months, rather than seconds to days.

17 Life Cycle and Critical Minerals

17.1 Life Cycle Assessment

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

AVE asks EPA to fully account for upstream emissions for all technologies. [EPA-HQ-OAR-2022-0985-1571-A1, p. 6]

EPA's narrow focus on tailpipe emissions creates obvious contradictions. In the Proposal, EPA does not recognize H2-ICE platforms that use a pilot ignition for combustion as a ZEV technology irrespective of the significant CO_2 reductions compared to today's diesel trucks. Still, EPA acknowledges that the increased number of BEV trucks on the road (as a result of the Proposal) will significantly diminish the predicted 1.8 billion metric tons of CO_2 reductions from the new standard because of emissions from energy used to power the U.S. electrical grid. "We project a cumulative increase from calendar years 2027 through 2055 of approximately 0.4 billion metric tons of CO_2 emissions from EGUs as a result of the increased demand for electricity associated with the proposal…" 16 [EPA-HQ-OAR-2022-0985-1571-A1, p. 6]

16 Federal Register / Vol. 88, No. 81 / Thursday, April 27, 2023 / at 25935

Simply put, the production of electricity to power new BEVs will reduce the estimated CO_2 savings from these trucks by over 22%. EPA should seek to offset this reduction by strengthening the Proposal's support for renewable diesel, renewable natural gas, and vehicles that use lower carbon fuels. Only analyzing ZEVs at the tailpipe distorts environmental gains and will delay the air quality improvements the U.S. is striving to achieve. [EPA-HQ-OAR-2022-0985-1571-A1, p. 6]

Congress has repeatedly seen the need to employ lifecycle assessments for future compliance standards and has asked EPA to look beyond a vehicle's tailpipe when analyzing GHG emissions. [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

"Vehicle Emissions Lifecycle Analysis. -- The Committee encourages the Agency to build upon its efforts to develop standardized modeling to evaluate the full lifecycle of all vehicle technologies and transportation fuels by integrating full lifecycle analysis accounting into new vehicle standards aimed at reducing greenhouse gas emissions. The Agency is also encouraged to coordinate with other federal agencies that are conducting similar lifecycle models for vehicles to best understand the full impact of standards seeking to reduce greenhouse gas emissions." 17 [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

17 H. Rept. 117-400 - Department Of The Interior, Environment, & Related Agencies Appropriations Bill, 2023 at P.86

Continuing to focus solely on tailpipe emissions for future standards also ignores President Biden's January 25, 2021, Executive Order, in which he stressed the need for environmental standards to account for all greenhouse gas emissions. [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

"Sec. 5. Accounting for the Benefits of Reducing Climate Pollution. (a) It is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account. Doing so facilitates sound decision-making, recognizes the breadth of climate impacts, and supports the international leadership of the United States on climate issues." 18 [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

18 7040 Federal Register / Vol. 86, No. 14 / Monday, January 25, 2021 / Presidential Documents

We support a transition from a tailpipe-based standard to a more complete life-cycle assessment. This approach is consistent with technology neutrality and will allow the U.S. to truly reach its environmental goals by promoting cleaner more efficient technologies. [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

Organization: American Council for an Energy-Efficient Economy (ACEEE)

Failure to include upstream emissions accounting will undermine the standards

The proposed rule would prolong the policy of assigning zero emissions to ZEVs through Phase 3. In the Phase 2 heavy-duty rule, EPA justified its decision to extend its zero-upstream treatment of electric vehicles:

As we look to the future, we project limited adoption of all-electric vehicles into the market. Therefore, we believe that this provision [zero upstream] is still appropriate. Unlike the 2017–2025 light-duty rule, which included a cap whereby upstream emissions would be counted after a certain volume of sales (see 77 FR 62816–62822), we believe there is no need to establish a cap for heavy-duty vehicles because of the small likelihood of significant production of EV technologies in the Phase 2 timeframe.26 [EPA-HQ-OAR-2022-0985-1560-A1, p. 11]

26 https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf

As this rationale suggests, however, ignoring upstream emissions in vehicle compliance values could have serious adverse consequences at a time when the objective is to move ZEVs into the mainstream throughout the heavy-duty vehicle market. The timeframe of Phase 3 is just such a time. [EPA-HQ-OAR-2022-0985-1560-A1, p. 12]

Upstream emissions resulting from the fueling of ZEVs will remain significant throughout the Phase 3 time frame, and excluding them from vehicles' compliance certification values will prevent the standards from helping to reduce those emissions. In particular, the standards will not promote vehicle efficiency, one of the most important means of reducing emissions for ICEVs and ZEVs alike. [EPA-HQ-OAR-2022-0985-1560-A1, p. 12]

Another adverse effect of zero-upstream accounting is that it distorts the relative emissions of ICEVs and BEVs. ANL's GREET 2022 model projects that a MY 2030 BEV tractor emits 52% as much CO2 on a well-to-wheels basis as a comparable diesel tractor would. The nominal reduction from BEV adoption under the rule, by contrast, would be 100%. As a result, if a manufacturer were to exceed EPA's projected ZEV adoption—which is a distinct possibility under the proposed standards—emissions reductions under the program could fall well below the anticipated reductions. [EPA-HQ-OAR-2022-0985-1560-A1, p. 12]

Treating hydrogen-fueled vehicles as ZEVs adds to the risk of zero-upstream accounting

EPA expanded the definition of ZEVs to include hydrogen FCEVs (H2-FCEVs) in the heavy-duty 2027 final rule and now proposes to expand it further to include hydrogen ICEVs (H2-ICEVs) (FR 25994, footnote 517). Considering hydrogen-fueled vehicles to be ZEVs compounds the problems created by ignoring upstream emissions for BEVs, however. Both H2-FCEVs and H2-ICEVs currently have pump-to-wheels efficiencies closer to diesel vehicles than to battery electric vehicles, as illustrated by the numbers for long-haul combination trucks in Table 2. [EPA-HQ-OAR-2022-0985-1560-A1, p. 12.] [See Table 2, Energy usage and GHG emissions rates of MY 2030 long-haul combination trucks, on page 12 of docket number EPA-HQ-OAR-2022-0985-1560-A1.]

Including upstream emissions in vehicle certification emissions values based on national average GHG emissions associated with fuel production and distribution would achieve this outcome, both for electricity and for hydrogen. Refining this approach to better reflect the real-world benefits of ZEVs, for example by averaging upstream emissions over the life of the vehicle based on projected carbon reductions in electricity and hydrogen production and/or by weighting emissions geographically by vehicle sales distribution, would be appropriate ways to preserve the program's incentive for ZEV production while maintaining the performance basis of the standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 15.]

The longer EPA delays accounting for upstream emissions in ZEV compliance values, the more difficult it will be to introduce this feature when ZEV shares are high. The federal government has provided large subsidies for heavy-duty ZEV purchase and charging infrastructure, which is the best way to incentivize their adoption beyond the credits these vehicles could obtain through performance-based standards. EPA properly notes that advanced technology multipliers should be phased out as heavy-duty EV adoption ramps up rapidly and as monetary incentives are offered (FR 25931); similarly, zero-upstream accounting should cease in this phase of the standards. [EPA-HQ-OAR-2022-0985-1560-A1, p. 15.]

Distorting performance-based standards with unearned emissions reduction credits has undermined vehicle standards for decades and this practice should be avoided in future rules. Furthermore, the incentive upstream accounting provides to steadily increase the efficiency of BEV and hydrogen-fueled vehicles would improve the sustainability and affordability of these vehicles in the future. Absent upstream accounting, the EPA rule loses all oversight of the emissions caused by these vehicles, and the market is left to maximize their efficiency and maintain a downward emission trajectory. [EPA-HQ-OAR-2022-0985-1560-A1, p. 15.]

If EPA is not prepared to fully implement upstream accounting by MY 2027, it could phase in this treatment over the time frame of Phase 3. At the bare minimum, EPA should affirm in the final rule that, after MY 2032, the presumption is that upstream emissions will be accounted for in vehicle certification values. This will enable EPA to ensure that emissions reductions do in fact continue to progress as ZEVs achieve dominance in the market. [EPA-HQ-OAR-2022-0985-1560-A1, p. 15.]

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Upstream Emissions. In addition to overstating reductions in downstream emissions, the proposed rule fails to account properly for increases in "upstream" emissions—those that "are not emitted by the vehicle itself but can still be attributed to its operation." Draft RIA at 310. In evaluating this category, EPA improperly cabins its analysis to only those emissions caused by electric-generating units ("EGUs") and refineries—i.e., emissions generated to provide power to operate vehicles. See 88 Fed. Reg. at 26,039–40; Draft RIA at 310. This marks another unexplained shift in agency policy. And even when examining this limited set of upstream sources, the agency makes unfounded assumptions and methodological choices that are (once again) skewed in favor of the proposed rule. [EPA-HQ-OAR-2022-0985-1660-A1, p. 57]

First, the emissions associated with powering a vehicle—whether by electricity from an EGU or fuel from a refinery—are far from the only ones reasonably "attributed" to its operation. Draft RIA at 310. Depending on the vehicle, there are also emissions associated with producing, recycling, and disposing of batteries; operating charging infrastructure; and extracting, refining, transporting, and storing petroleum fuels. These emissions can be substantial and, when considered together, may undermine EPA's assumption that swapping internal- combustion-engine vehicles for electric ones will necessarily result in an environmental good. [EPA-HQ-OAR-2022-0985-1660-A1, p. 57]

The International Energy Agency's discussion of emissions from mining illustrates this point. According to the IEA, "the production and processing of energy transition minerals are energy-intensive" and involve "relatively high emission[s]." Role of Critical Minerals at 15, 130; see also Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, Am. Transp. Rsch. Inst., https://tinyurl.com/3ktjd85v ("Mining and processing produce considerable CO2 and pollution issues."). For this reason, producing an electric vehicle is a more carbon- intensive process than producing a conventional one. Role of Critical Minerals at 194. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 57 - 58]

EPA never explains why emissions from EGUs and refineries are the only ones relevant to the analysis. Nor does it acknowledge that its current position departs from earlier GHG rulemakings, where it did consider additional upstream sources. See HD GHG I, 76 Fed. Reg. at 57,301 ("To project these impacts, EPA estimated the impact of reduced petroleum volumes on the extraction and transportation of crude oil as well as the production and distribution of finished gasoline and diesel."); HD GHG II, 81 Fed. Reg. at 73,852 ("To project these impacts, Model B estimated the impact of reduced petroleum volumes on the extraction and transportation of crude oil as well as the production and distribution of finished gasoline and diesel."). EPA has an obligation to explain why a more cabined view of upstream emissions is appropriate here. See Am. Fed'n of Gov't Emps, 25 F.4th at 12. [EPA-HQ-OAR-2022-0985-1660-A1, p. 58]

C. The Method For Measuring Compliance Is Irrational

The proposed rule provides that EPA will test vehicle compliance with the new standards by considering solely the grams of pollutants emitted from the tailpipe. See 88 Fed. Reg. at 25,935 n.61 ("We are continuing and are not reopening the existing approach taken in both HD GHG Phase 1 and Phase 2, that compliance with the vehicle exhaust CO2 emission standards is based on CO2 emissions from the vehicle."). Although this method might have been appropriate to measure compliance with past regulations, it makes little sense here, given the agency's new focus on electric heavy-duty vehicles. Because the proposed rule effectively requires manufacturers to shift from internal-combustion engine vehicles (which cause emissions mostly from the tailpipe) to electric vehicles (which cause emissions mostly by other means), a granular focus on tailpipe emissions will not give EPA an accurate picture of the amount of emissions attributable to any manufacturer's fleet. [EPA-HQ-OAR-2022-0985-1660-A1, p. 60]

Indeed, EPA correctly recognized elsewhere in the proposed rule that upstream emissions are relevant to its overall effort to address the "human-induced buildup of GHGs in the atmosphere." 88 Fed. Reg. at 25,953. For instance, when estimating the proposed rule's impact on overall emissions, as well as the costs and benefits that it generates, EPA took into account at least some (though far from all relevant) upstream emissions. See id. at 26,039–40, 26,075–76. In doing so, EPA acknowledged that it would be irrational to adopt a rule that decreases downstream emissions but has the effect of increasing overall emissions. The same principle applies here: It would be irrational to find a manufacturer's fleet compliant if the vehicles within the fleet have lower tailpipe emissions but that cause emission of harmful pollutants in other ways (for example, through their production, or generation of the electricity used to power them) that exceeds the levels permitted for tailpipe emissions. EPA offered no explanation for this inconsistent approach to upstream emissions. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 60 - 61]

Moreover, factoring a broader set of emissions into the compliance calculation will not be difficult or unduly burden EPA. The agency has already developed a method for attributing some of these emissions to manufacturers. In its proposed rule for light- and medium-duty vehicles, EPA explained that it initially planned to take emissions from electricity generation into account by "attribut[ing] a pro rata share of national CO2 emissions from electricity generation to each mile driven under electric power minus a pro rata share of upstream emissions associated with . . . gasoline production." Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184, 29,252 (May 5, 2023). That method remains available here. And EPA could develop similarly simple and administrable techniques to account for other key sources of upstream emissions like battery production. [EPA-HQ-OAR-2022-0985-1660-A1, p. 61]

For all of these reasons, EPA's proposed method of calculating compliance is irrational. Any final rule must comprehensively account for the emissions generated by electric vehicles to ensure that EPA's solution (a widespread shift to electric vehicles) bears a rational connection to its regulatory goal of reducing harmful emissions. Cf. Am. Fed'n of Gov't Emps., 25 F.4th at 9 (faulting agency for failing to explain why the standard it adopted will address "the principal problem the new standard is designed to fix"). [EPA-HQ-OAR-2022-0985-1660-A1, p. 61]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

2. EPA Fails to Adequately Account for the Lifecycle Emissions of ZEVs.

As discussed above, because EPA may only prescribe standards applicable to vehicles that "cause or contribute" to air pollution, its standards cannot account for ZEVs with no tailpipe emissions. However, if EPA is authorized to promulgate such standards, those standards must account for any upstream emissions from upstream electric generating units ("EGU"), and the mining of battery materials. The failure to do so ignores the policy objectives of the statute and creates an uneven playing field that substantially disadvantages ICEVs and fails to address a major aspect of GHG emission reduction. Indeed, Clean Air Act Section 202(a)(4)(B) requires that EPA calculate these lifecycle emissions impacts. [EPA-HQ-OAR-2022-0985-1659-A2, p. 24]

EPA's reference to electric vehicles as "zero emission vehicles" is misleading. For instance, the fuel source of a BEV—a battery composed of GHG emissions intensive minerals and the electricity generated to power the battery—produces emissions. The fact such emissions occur upstream of the vehicle's operation and therefore lack tailpipe emissions stacks the deck in favor of this technology, even though they do cause emissions. There is no logical basis for omission because, as EPA is aware, concerns about GHG emissions relate to their longer-term global concentrations. Consequently, all vehicle related emissions should be an important consideration regardless of where such emissions occur. Without comparing lifecycle ZEV emissions to lifecycle emissions from ICEVs, EPA cannot know if or how much its standards are actually decreasing emissions on a relevant scale. Thus, while EPA is not required to solve all emissions problems in one rulemaking, EPA cannot even claim to be solving part of the problem here without addressing upstream and downstream emissions. EPA's approach of mandating BEVs cannot possibly be reasonable if it is merely shifting emissions from one source to another at the cost of hundreds of billions of dollars—trillions when costs to upgrade EV infrastructure are factored in—or could do so more cost-effectively by choosing a different approach.92 [EPA-HQ-OAR-2022-0985-1659-A2, p. 25]

92 5 U.S.C. § 706(2)(A); cf, Antonin Scalia, "Regulatory Review and Management," Regulation Magazine 19 (Jan./Feb. 1982) ("Is it conceivable that a rule would not be arbitrary or capricious if it concluded with a statement to the effect that 'we are taking the foregoing action despite the fact that it probably does more harm than good, and even though there are other less onerous means of achieving precisely the same desirable results'?").

The flaw in EPA's approach is illustrated by the fact that emissions standards easily become meaningless by changing the engine's location. The Proposed Rule would treat a BEV charged by a diesel-powered generator as if it had zero tailpipe emissions, notwithstanding the fact that it remains "powered" by a diesel engine located outside the vehicle. A HDV directly powered by a diesel engine inside the vehicle, however, is credited with the emissions produced by that engine. Thus, the source of the "fuel" matters, the location should not. EPA arbitrarily ignores emissions from ZEVs. [EPA-HQ-OAR-2022-0985-1659-A2, p. 25]

EPA compounds this flaw by making unsupported assumptions regarding total emissions impacts of its proposal. While it claims that the overall analysis for combined downstream and upstream emissions "likely underestimates the net emissions reductions that may result" from the Proposed Rule, EPA failed to offer a data-based substantiation. The Proposed Rule failed to assess emissions from battery manufacturing or electricity production. EPA acknowledges that its standards will increase the demand for electricity and that demand will subsequently increase emissions from the electric generating sector, but it makes no real attempt to quantify those emissions or compare them to alternative options for reducing emissions from this sector. EPA should provide a more comprehensive analysis to comply with its directive under the Clean Air Act and better assess the resulting impact of the Proposed Rule. [EPA-HQ-OAR-2022-0985-1659-A2, p. 25]

Organization: American Petroleum Institute (API)

b. API supports the concepts of a lifecycle approach to GHG emissions reductions.

i. EPA should use a lifecycle assessment (LCA) approach vs. tailpipe only

To effectively achieve emissions reductions in the transportation sector, we believe that technology-neutral solutions are needed, utilizing an approach that addresses fuels, vehicles, and infrastructure systems. This is best accomplished through holistic policies that encompass the lifecycle emissions of both the fuel and the vehicle. This combination makes for the most effective reduction of transportation GHG emissions, as emissions occur at multiple stages of the lifecycle of internal combustion engine vehicles (ICEVs) and battery electric vehicles (BEVs) and the fuels used in them. Further, utilizing a lifecycle approach would enable quantification of the emissions associated with heavy-duty (HD) vehicles, and allow technologies to be identified that provide more expeditious and robust GHG emissions reductions. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 4 - 5]

Use of a lifecycle approach would better achieve the goals of the proposed rule, as it would allow the agency and stakeholders alike to fully identify and reduce transportation sector carbon emissions and to identify and develop meaningful solutions. The reductions achieved by EPA's existing programs – including the Phase 1 and Phase 2 HD GHG rules, and criteria pollutant programs – are due in large part to addressing emissions holistically, and utilizing all available and emerging technology to do so.1 The myopic focus on tailpipe emissions in the proposed rule essentially means that the rule would only address certain transportation carbon emissions, while ignoring other sources of emissions and potential emissions reduction solutions. A lifecycle approach would allow EPA to quantify all of the emissions associated with HD vehicles, and to mitigate those emissions more effectively. [EPA-HQ-OAR-2022-0985-1617-A1, p. 5]

1 By EPA's own account, transportation pollution has been reduced significantly since the passage of the Clean Air Act – fuel sulfur levels are 90 percent lower and new heavy-duty vehicles are nearly 99 percent cleaner than 1970 models (https://www.epa.gov/transportation-air-pollution-and-climate-change/history-reducing-air-pollution-transportation), and new heavy-duty diesel engines being manufactured today achieve near-zero criteria pollutant emissions with increasing fuel efficiency and lower CO_2 emissions.

ii. Zero emission vehicles also have emissions impacts

As with ICEVs, ZEVs have carbon emissions impact associated both with their production and throughout their lifetime which EPA should incorporate in its analysis. While ZEVs can be an important part of a diverse transportation future to reduce GHG emissions, they do produce GHG emissions. Battery electric vehicle (BEV) and fuel cell electric vehicle (FCEV) production, use, and the disposal of BEV batteries, are not zero-emission activities. Further, all fuels – whether conventional fuels or electricity – have associated carbon emissions regardless of their source. As noted in the results of a report by the American Transportation Research Institute (ATRI), BEVs and FCEVs generate significant CO_2 emissions and will continue to have CO_2 emissions impacts in the future. Further, for certain HD truck classes, especially in the near term, BEVs may be more CO_2 emissions-intensive relative to comparable ICEVs in performing the same work (see Table 17, Figure 11).2 While meaningful reductions have historically been accomplished by focusing on tailpipe emissions from the vehicle, the growing market share of different technologies that include significant upstream emissions warrant inclusion of those emissions in the standard. [EPA-HQ-OAR-2022-0985-1617-A1, p. 5]

2 "Understanding the CO_2 Impacts of Zero-Emission Trucks", American Transportation Research Institute, May 2022.

The HD ZEV market is nascent, which has resulted in limited data on their emissions impacts and the proposal does not present or consider the actual GHG emissions associated with their production and use. We encourage the agency to not only acknowledge and address the CO_2 emissions of HD ZEVs, but to also continue to study the impacts. (As noted below in these comments, we strongly recommend that EPA include both a readiness assessment prior to program implementation as well as a program review once implementation begins.) The nascent HD ZEV market makes it hard to adequately assess the emissions impact due to the lack of available technology to actually evaluate. Yet, there will be CO2 emissions associated with the production and use of ZEVs, and it is important to address these emissions to provide a full picture of the emissions impacts and mitigation needs. [EPA-HQ-OAR-2022-0985-1617-A1, pp. 5 - 6]

Organization: Anonymous Public Comment

I am commenting on the EPA'S Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles proposal and its potential negligence towards the environment. I agree with parts of the proposal, specifically the impending restrictions on emissions standards. According to Phase 2 heavy duty vehicles produced in the model year 2028 and beyond will be held to stricter emissions standards. This would be greatly beneficial as it would not require a fleet overhaul. This would keep this stage from being economically taxing on current fleets. Additionally this would allow for gradual shifts that allow for current fleets to plan ahead and not get caught off guard by emissions restrictions. With this said I do disagree with the proposition of incentivizing electric heavy duty vehicles. At surface level this may seem like it benefits the environment however the other side of this coin is that it will incentivize fleet owners scraping their current vehicles in favor of electric vehicles. With the current quantity of semi trucks in America breaching 4 million (Zippia 2023), a massive shift towards new electric vehicles would cause hundreds of thousands of semi trucks to end up in the dump. Present in these scraped cars are many toxic chemicals like lead and mercury (EPA, 2023). Without proper disposal these chemicals could escape landfills and pollute water sources that you and I drink from through the contamination of toxic leachate. In addition to the initial environmental tax of scrapped vehicles, this plan would do very little to actually reduce emissions. According to Penn state 88% of U.S. energy comes from nonrenewable sources with 11% coming from coal, a fuel source that is half as efficient as oil. A switch to electric semi trucks would only remask the issue of increasing emissions and it would have the potential to cause an increase in emissions due to the use of coal to produce the energy for transportation instead of oil. The money that would be spent on incentives would be better spent elsewhere on technologies like carbon capture and storage. [EPA-HQ-OAR-2022-0985-1867]

Organization: Banks, Ben

The proposal for requiring 'ZEV' purchases on a percentage basis is too early, not attainable and cost restrictive. Let alone, our studies have shown that our net carbon footprint would be worse with a Battery Electric Vehicle (BEV) fleet, compared to our modern diesel fleet today. [EPA-HQ-OAR-2022-0985-1473-A1, p. 1]

'ZEV' is a misleading acronym. While electric vehicles may not have tailpipe emissions, approximately 60% of our electricity today is generated by fossil fuels. Cobalt, Lithium, etc., required to manufacture batteries for BEV's are primarily sourced overseas, with poor environmental standards, mined with equipment with no emission standards and/or with child and slave labor. [EPA-HQ-OAR-2022-0985-1473-A1, p. 1]

The current tunnel vision approach to ZEV's fails to consider the significant opportunities that are likely to come with hydrogen. Perhaps equally important is the recent use of R99, a renewable diesel fuel that is a direct replacement for petroleum based fuel. Studies have shown R99 emissions at 30-40% that of petroleum based fuel. When comparing the total lifecycle carbon footprint of a BEV (production, electricity generation, disposal), R99 has actually been shown to have less of a carbon footprint than BEV and does not rely on Russia, The Democratic Republic of Congo, or China to source materials for production. (Reference ATRI study at the link below) [EPA-HQ-OAR-2022-0985-1473-A1, p. 1]

> https://truckingresearch.org/2022/05/03/new-atri-research-quantifies-the-environmental-impacts-of-zero-emissiontrucks/

Yet another significant consideration is our nation's ability to provide enough electricity to charge commercial BEV's. While California is 'leading the way' on ZEV integration, the state doesn't generate enough power for their consumption needs today. [EPA-HQ-OAR-2022-0985-1473-A1, p. 1]

> https://truckingresearch.org/2022/12/06/new-atri-research-evaluates-charging-infrastructure-challenges-for-the-u-selectric- vehicle-fleet/

While admirable in nature, the goal of converting a significant portion or our new commercial truck production over to BEV in a decade is not cost effective, is not achievable and will likely have a worse environmental impact than focusing on realistic alternatives, such as R99 and hydrogen power. Interestingly enough, American Transportation Research Institute (ATRI) data was used in the calculation of maintenance expense on Internal Combustion Engine (ICE) commercial motor vehicles, but no reference of the valuable studies above was made in the subject NPRM. We believe strongly that the EPA needs to not only focus on greenhouse gas emissions (GHG), but the true, net carbon footprint involved with ZET/BEV commercial motor vehicles. Focusing solely on GHG and neglecting the overall global carbon impact fails to truly make the best decisions for our environment. [EPA-HQ-OAR-2022-0985-1473-A1, pp. 1-2]

Organization: BorgWarner Inc.

BorgWarner urges EPA to avoid tailpipe-specific ZEV definitions.

BorgWarner supports EPA moving beyond analyzing vehicle emissions only at the tailpipe and proposes that EPA incorporate accounting of upstream emissions for compliance purposes. As we are investing in advanced technologies, it is important to look at the overall environmental impact to determine broad pathways to achieve our emission reduction goals. This approach is consistent with technology neutrality, global carbon neutrality goals, and a holistic environmental impact assessment. [EPA-HQ-OAR-2022-0985-1578-A1, pp. 5 - 6]

Organization: Bradbury, Steven G.

Furthermore, EPA has deliberately left out of its cost-benefit equation entirely the upstream carbon dioxide emissions associated with EV production.49 The minerals and components used in EV batteries are mostly processed or manufactured in China using power generated from coal. While the U.S. has achieved huge reductions in carbon dioxide emissions by converting coal-fired power plants to natural gas, China's and other Asian nations' carbon emissions are growing rapidly because of their heavy reliance on coal, and EPA's rules will only accelerate that dynamic.50 An automotive engineering analysis published in 2022 estimated that the carbon dioxide emissions from producing the battery used in one small EV (the Nissan Leaf) were equivalent to driving an ICE vehicle 24,000 miles (two years of driving), and those from producing the battery used in a large EV (the Tesla Model S) were equivalent to driving an ICE vehicle 60,000 miles (five years of driving).51 In these rulemaking proposals, EPA has completely ignored the fact that EVs start out their lives on the road with such a huge head start (two to five years worth) in carbon dioxide emissions over their ICE counterparts. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 17-18]

49 See id. at 29197, 29254.

50 See Robert Bryce, "The Iron Law of Electricity Strikes Again as Vietnam Boosts Coal Burn," June 17,

2023, https://robertbryce.substack.com/p/the-iron-law-of-electricity-strikes.

51 See Tristan Burton, et al., Convergent Science, Inc., "A Data-Driven Greenhouse Gas Emission Rate Analysis for Vehicle Comparisons," SAE Int'l Journal of Electrified Vehicles, April 13, 2022, https://doi.org/10.4271/14-12-01-0006 (also available at https://www.sae.org/publications/technicalpapers/content/14-12-01-0006/).

EPA's benefits analysis is flawed and arbitrary.

On the benefits side of the ledger, EPA claims sky-high monetized benefits from the asserted reductions in carbon dioxide emissions—to the tune of upwards of a trillion dollars.64 These estimates are based on predicted reductions in the amount of gasoline and diesel fuel that would be burned if the U.S. auto fleet converts to EVs at the rates projected by EPA. But they completely ignore the very large increase in carbon dioxide emissions that would necessarily occur from the projected expansion in the production of EV batteries. They also ignore the upstream emissions of carbon dioxide from the increased electricity generation that would be needed to charge the projected fleet of EVs. [EPA-HQ-OAR-2022-0985-2427-A2, p. 22]

64 See id. at 29200, 29344.

EPA's refusal to account for these huge offsetting emissions of carbon dioxide fundamentally distorts its analysis of net benefits in a manner that arbitrarily favors the Agency's preferred regulatory outcome. It is, in fact, false and misleading to label EVs "zero-emission vehicles" when the production of EV batteries and the charging of the batteries over the life of the vehicles both generate enormous amounts of carbon dioxide. [EPA-HQ-OAR-2022-0985-2427-A2, p. 22]

Organization: Chevron

1. Lifecycle GHG based standards

The proposals are focused on tailpipe GHG emissions rather than lifecycle emissions. Therefore, upstream GHG emissions for fuel and vehicle manufacturing are not included in the analysis, favoring "zero tailpipe emission" technologies like Battery Electric Vehicles (BEV) and Fuel Cell EVs (FCEV). [EPA-HQ-OAR-2022-0985-1552-A1, p.3]

We recommend EPA revise the proposed standards to incorporate a lifecycle GHG assessment of truck propulsion and fuel technologies, as outlined in recent research published by the American Transportation Research Institute (ATRI)1. This analysis uses recent research concerning lifecycle analysis included in the most recent Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model. GREET accounts for the greenhouse gas emissions associated with: the production of truck chassis; propulsion and fuel technology including engines, batteries, fuel cells and liquid fuel production; the use of these vehicles over one million miles using different fuel and propulsion systems; and the emissions associated with the recycling of these vehicles at the end of their service lives. ATRI concludes that heavy-duty internal combustion engines powered by biomass-based diesel fuel offers greater lifecycle emission reductions than relying exclusively on either battery electric or fuel cell solutions. [EPA-HQ-OAR-2022-0985-1552-A1, p.3]

1 Understanding the CO2 Impacts of Zero-Emission Trucks, American Transportation Research Institute, May 2022

One study from the University of British Columbia2 compared the lifecycle GHG emissions from a variety of heavy-duty powertrain technologies coupled with different fuel sources. These technologies included battery electric, hydrogen fuel cell, and conventional diesel internal combustion engines. The study found that the lifecycle GHG emissions were dependent on the individual production pathways for the electricity, hydrogen, and renewable diesel fuels. Diesel engines fueled by renewable diesel can contribute lower overall GHG emissions than electric vehicles using electricity from high carbon intensity sources. The ultimate choice of fuel and vehicle technology for a particular application should consider multiple factors in addition to the carbon intensity value. These factors include customer preference, vehicle usage, fuel supply chain reliability, infrastructure development, economic drivers, and environmental impact. [EPA-HQ-OAR-2022-0985-1552-A1, p.3]

2 Comparative Life Cycle Analysis of Heavy-Duty Vehicles (Class 7/8) Fueled by Renewable Diesel, Electricity, and Hydrogen, University of British Columbia Sustainable Scholars, August 2022

Similar research commissioned by the Diesel Technology Forum 3 finds that trucks fueled using biomass-based diesel may offer lower lifecycle emissions compared to the operation of battery electric trucks, especially in regions of the country that may not experience fast adoption of renewables that reduce the carbon intensity of electricity. Refueling a fleet of Class 7 and 8 trucks with B20 (20 percent biodiesel and 80 percent ultra-low sulfur diesel) offers immediate GHG reductions that would not be met for several years by replacing the same fleet of trucks with all-electric solutions using the carbon intensity of the California grid. Repowering these same Class 7 and 8 trucks using 100 percent biomass-based diesel would outperform battery electric options using the California grid electricity past 2032. We understand that this research accompanies the comment submitted by the Diesel Technology Forum. [EPA-HQ-OAR-2022-0985-1552-A1, p.4]

3 Environmental Benefits of Medium- and Heavy- Duty Zero Emission Vehicles Compared with Clean Bio- & Renewable-Fueled Vehicles 2022-2032, Prepared for Diesel Technology Forum by Stillwater Associates LLC, July 19, 2022, https://dieselforum.egnyte.com/dl/MWHPcRW4e6

California's long-term climate policy has narrowly focused on exploration of electrification scenarios across the mobile source sectors. However, a study by Ramboll4 took a broader view and analyzed multi-technology pathways, which included a combination of lower-emission (75% to 100% lower) vehicle technologies and fuel mixes (including lower carbon intensity liquid and gaseous fuels). The Ramboll study demonstrated that there are faster paths to meeting near-term federal health requirements, making progress on climate goals, and achieving greater reductions per dollar spent. [EPA-HQ-OAR-2022-0985-1552-A1, p.4]

4 Ramboll "Multi-Technology Scenarios: Heavy-Heavy Duty Truck Sector". 2021. Available here: https://www.arb.ca.gov/lists/com-attach/78-sp22-kickoff-ws-B2oFdgBtUnUAbwAt.pdf

Organization: Clean Fuels Development Coalition et al.

II. EPA lacks the Statutory Authority to Ignore Upstream Emissions for Electric Vehicles.

EPA has statutory authority to prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). This presents an interpretive dilemma. On the one hand, if electric vehicles are not "vehicles" "which cause, or contribute to" a given type of air pollution, then EPA may not set standards for them. Id. On the other, if electric vehicles are "vehicles" "which cause, or contribute to" a given type of air pollution, then EPA must set "standards applicable to the[ir] emissions." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 12]

The proposal tries to solve this problem by splitting the baby.8 EPA reasons that electric vehicles are vehicles that "cause or contribute to air pollution," but EPA just chooses to set their contribution to zero. This cannot be right. Cf. C.S. Lewis, That Hideous Strength 291 (Samizdat ed., 2015) ("Just imagine a man who was too dainty to eat with his fingers and yet wouldn't use forks!"). If electric vehicles truly emit no emissions, then they are not the sort of vehicle EPA can regulate. [EPA-HQ-OAR-2022-0985-1585-A1, p. 12]

8 Of course, the point of the story about Solomon is that the baby wasn't split. See 1 Kings 3:16- 28 ("Give the living child to the first woman, and by no means put him to death; she is his mother.").

Of course, EPA freely admits that electric vehicles do produce upstream emissions, and that these upstream emissions matter. This is true and very important. And the proposal does consider upstream emissions when determining the rule's impact on total emissions. 88 Fed. Reg. 25,936. EPA's position is that this inconsistent approach to electric vehicles' upstream emissions is reasonable because it treats upstream emissions of all vehicles, electrified or not, the same way for compliance purposes. But that is precisely what makes the rule unreasonable. Electric vehicles produce many times the upstream carbon-dioxide emissions as conventional vehicles, and those upstream emissions account for 100% of an electric vehicle's carbon-dioxide emissions from use. In contrast, upstream emissions are only a small part of a conventional vehicles' total emissions. EPA's across-the-board failure to consider upstream emissions for purposes of compliance means that its rule considers most of gasoline-powered vehicles' carbon-dioxide emissions, but none from electric vehicles. Treating upstream emissions of all vehicles, electrified or not, the same way puts a thumb on the scale against conventional vehicles in favor of electric vehicles, and for no good reason the proposal gives. See FCC v. Prometheus Radio Project, 141 S. Ct. 1150, 1158 (2021) (An agency's bare preference for one technology cannot satisfy the requirement that it "reasonably consider[] the relevant issues and reasonably explain[] the decision."). At the very least, ignoring these emissions for compliance without cost-benefit analysis is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 12 - 13]

EPA tries to work around this obvious inconsistency by refusing to address it: "We are continuing and are not reopening the existing approach taken in both HD GHG Phase 1 and Phase 2, that compliance with the vehicle exhaust CO2 emission standards is based on CO2 emissions from the vehicle." 88 Fed. Reg. 25,931, n.61. But it cannot so refuse. The proposal would constructively reopen the issues, making a fresh challenge timely. See Sierra Club v. EPA, 551 F.3d 1019, 1026 (D.C. Cir. 2008). Where prior rulemakings "did not give [petitioners] adequate … incentive to contest the agency's decision," the decision is "constructively reopened" by the new rule. National Ass'n of Mfrs. v. Department of Interior, 134 F.3d 1095, 1104 (D.C. Cir. 1998). Here, the proposal's novel use of its preexisting "framework" to mandate heavy-duty electric vehicles—rather than just providing flexibility—"significantly alters the stakes of judicial review" and thus constructively reopens the matter. Kennecott Utah Copper Corp. v. Department of Interior, 88 F.3d 1191, 1227 (D.C. Cir. 1996). [EPA-HQ-OAR-2022-0985-1585-A1, p. 13]

A. EPA has authority to consider the lifecycle emissions from different fuels in its standard setting.

Section 202(a)(3)(A)(ii) authorizes EPA to look beyond the basic engine to set its engine or vehicle emission standards. Specifically, it states that, "in establishing classes or categories of vehicles or engines for purposes of regulations under this paragraph, the Administrator may base such classes or categories on gross vehicle weight, horsepower, type of fuel used, or other appropriate factors." 42 U.S.C. § 7521(a)(3)(A)(ii) (emphasis added). To account for the "type of fuel used," EPA would need to engage in lifecycle emissions analysis. EPA has often eschewed lifecycle analysis because of the nature of the pollutants it regulates, but it is the obvious best fit for carbon regulation. Section 202(a)(1) gives EPA's authority to issue rules setting emissions standards for "air pollutants" that it finds may reasonably be anticipated to endanger public health or welfare. And while most air pollutants work on the local and regional level, which makes lifecycle analysis a poor fit, greenhouse gases' harms are all at the global level. Except in truly extreme concentrations, CO_2 emissions do not lead to adverse health effects if breathed in. [EPA-HQ-OAR-2022-0985-1585-A1, p. 15]

Clean Air Act Section 202(a)(4)(A) and (B) require that EPA consider whether its proposed standards "will cause or contribute to an unreasonable risk to public health, welfare or safety", including whether the proposed standard "causes, increases, reduces, or eliminates emissions of any unregulated pollutants" and to assess "the availability of other devices, systems, or elements of design which may be used to conform to requirements prescribed under this subchapter without causing or contributing to such unreasonable risk." EPA's proposal not only fails to consider unreasonable risks associated with lifecycle emissions (and safety) of forced electrification of the heavy-duty fleet, but also fails to calculate the lower lifecycle emissions impacts (and lower safety risks) for other regulatory constructs including increased reliance on alternative liquid fuels. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 15 - 16]

V. The Proposed Rule Misleads Consumers by Using the Term "Zero-emissions Vehicle" to Refer to Vehicles that EPA Concedes Produce Emissions.

While it is true that all-electric vehicles have no tailpipe emissions, it is completely false to claim that they are "zero-emissions vehicles." EPA acknowledges that what it calls "ZEVs" have upstream emissions. 88 Fed. Reg. 25,936. Despite this, the proposal repeatedly describes these vehicles as having no emissions. This is per se unreasonable, and it also enables illegal marketing by auto-manufacturers. Seizing on EPA's label, dozens of auto-manufacturers have described their electric vehicles as "zero-emissions." See, for example:

- "…we have also built the broadest combination of zero-emissions technologies dedicated to the commercial vehicle industry like battery electric and fuel cell electric powertrain solutions and electrolyzers for green hydrogen production." Cummins Launches Accelera by Cummins to Advance the Transition to a Zero-Emissions Future, Cummins Newsroom (Mar. 8, 2023), https://www.cummins.com/news/releases/2023/03/08/cumminslaunches-accelera-cummins-advance-transition-zero-emissions-future (last accessed June 15, 2023).

- "…the Biden Administration rolled out an executive order to advance light-duty electrification and 'smart fuel efficiency and performance standards' for medium- and heavy-duty trucks. Walmart and PepsiCo are encouraged by this ambition and momentum and are ready to work with the Administration, Congress, and state and local officials in shaping effective solutions that will enable a zero emissions future for fleets." Luke McCollum, VP Supply Chain Sustainability, Walmart and Roberta Barbieri, VP Global Sustainability, PepsiCo, Here's How Policy Can Design a Reliable and Resilient Zero Emissions Future for Transportation Fleets, LinkedIn (Dec. 14, 2021), https://www.linkedin.com/pulse/heres-how-policy-can-design-reliableresilient-zero-emissions-cortes/?published=t (last accessed June 15, 2023).
- "Nikola Corporation (Nasdaq: NKLA), a global leader in zero-emission transportation and energy infrastructure solutions, and Proterra Inc (Nasdaq: PTRA), a leading innovator in commercial vehicle electrification technology, today announced a strategic, multi-year supply agreement to power Nikola zero-emission semi-trucks with Proterra¡¦s industry-leading battery technology." Nikola and Proterra Agree to Long-Term Battery Supply for Zero-Emission Class 8 Semi Trucks, Nikola (Jan. 18, 2022), https://www.nikolamotor.com/press_releases/nikola-and-proterraagree- to-long-term-battery-supply-for-zero-emission-class-8-semitrucks-150/ (last accessed June 15, 2023).
- "Mustang Mach-ER SUV gives you 0-V60 thrills, expansive range and zero emissions." 2023 Ford Mustang Mach-E, Ford, https://www.ford.com/suvs/mach-e/?intcmp=hp-cta-vhp-mache (last accessed June 15, 2023).
- "We are aggressively going after every aspect of what it takes to put everyone in an EV because we need millions of EVs on the road to make a meaningful impact toward building a zero-emissions future." Our Path to an All-Electric Future, General Motors, https://www.gm.com/electricvehicles (last accessed June 15, 2023).
- "Roadtripping in your EV is not only zero emissions, it's zero-limits." Going EV, Nissan, https://www.nissanusa.com/vehicles/electriccars.html (last accessed June 15, 2023).
- "Zero Emissions. Zero Worries. ...get into your emissions-free Fisker Ocean." Fisker Ocean, Fisker, https://www.fiskerinc.com/ocean (last accessed June 15, 2023).
- "The Golf Style eHybrid means you can drive with zero emissions." Way to Zero, Volkswagen, https://www.volkswagen.co.uk/en/electric-andhybrid/sustainability/way-to-zero.html (last accessed June 15, 2023). [EPA-HQ-OAR-2022-0985-1585-A1, pp. 17 - 19]

There is no point on the grid powered entirely by wind, solar, or hydro energy. Even in California, where renewable energy is a priority, daily evening peak load is still routinely supplied by approximately 70 percent fossil fuels. See e.g., Today's Outlook, California ISO, https://www.caiso.com/TodaysOutlook/Pages/supply.html#section-supply-trend (data from August 2022, showing more than 70 percent of energy from natural gas, coal, and imports). According to a report by the California Energy Commission, demand from residential and nonresidential EV chargers could amount to more than 1 GW by 2025, causing significant impacts at the local level. Gavin Bade, CEC: California EV Chargers Will Add 1 GW of Peak Demand by 2025, Utility Dive (Mar. 20, 2018), https://www.utilitydive.com/news/ceccaliforniaev-chargers-will-add-1-gw-of-peak-demand-by-2025/519517/. [EPA-HQ-OAR-2022-0985-1585-A1, p. 19]

Manufacturing an electric vehicle also produces a significant number of greenhouse-gas emissions, much more than is required to produce a conventional vehicle. As does the electricity production, transmission, and distribution supply chain associated with electric vehicles, including chargers and operation and maintenance, can be greenhouse-gas intensive. Key components of the electrical infrastructure, such as copper and grain-oriented electrical steel, require energy-intensive extraction and processing, which contribute to the overall carbon emissions. As electric vehicles become increasingly common, the necessary infrastructure will balloon. [EPA-HQ-OAR-2022-0985-1585-A1, p. 19]

Making false claims in the marketing of products is prohibited by the Federal Trade Commission Act, which prohibits "unfair or deceptive acts or practices in or affecting commerce" 15 U.S.C. § 45. Because it facilitates these deceptive acts and promotes innumerable other false "zero emission" statements, the proposal is arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1585-A1, p. 19]

Organization: ClearFlame Engine Technologies

EPA Could Adopt a Lifecycle Approach to Dedicated Alternative Fuel Vehicles in the Final Rule [EPA-HQ-OAR-2022-0985-1654-A2, p. 9]

We agree with other commenters that EPA has the authority to set Phase 3 GHG emissions standards based on lifecycle GHG reductions, rather than limiting itself to reducing tailpipe emissions only. [EPA-HQ-OAR-2022-0985-1654-A2, p. 9]

Courts interpreting Section 202 have found that EPA has significant discretion in how it sets emissions reduction standards. This is necessary to address the many complicated scientific, design, and engineering concerns regarding how best to reduce air pollution. The D.C. Circuit has observed that '[m]anufacturers produce a wide variety of motor vehicles of different sizes, some using different engine technologies resulting in unusual emission characteristics.' Nat. Res. Def. Council, Inc. v. U. S. Envtl. Prot. Agency, 655 F.2d 318, 322 (1981). EPA's authority to set emissions reduction standards is flexible enough to create engine certification pathways that account for the lifecycle emissions reductions that result from the switch from fossil to biogenic carbon emissions.22 [EPA-HQ-OAR-2022-0985-1654-A2, p. 9]

> 22 We believe that incorporating E98 and other renewable SLFs will also make the Final Rule more defensible against a legal challenge. As EPA knows, courts may invalidate rules if the agency has 'entirely failed to consider an important aspect of the problem' or 'offered an explanation for [their] decision[s] that runs counter to the evidence before the agenc[ies].' Motor Vehicles Mfrs. Ass'n v. State Farm Mutual Automobile Ins. Co., 463 U.S. 29, 43 (1983). Further, West Virginia v. EPA faulted EPA for using its Clean Air Act authority to 'substantially restructure the American energy market' in a way that 'Congress had conspicuously and repeatedly declined to enact itself.' 142 S. Ct. 2587, 2610 (2022) (quotation omitted).

To be clear, ClearFlame strongly supports the use of electric and hydrogen vehicles to decarbonize transportation where they can provide a cost-effective solution at scale. We support the rapid deployment of all fuels and technologies that can help our nation hit its climate goals. However, by incentivizing two technologies in the Blueprint (i.e., electric and hydrogen vehicles) while ignoring the potential benefits of dedicated alternative fuel vehicles, we are concerned that the Proposal could be susceptible to legal critique. Adding certification pathways and other incentives for dedicated SLF vehicles to the Final Rule would make the program more defensible as a continuation of historical carbon-reducing policies repeatedly established by Congress to incentivize ethanol and other biofuels to reduce the use of carbon-emitting fossil fuels and increase the use of low-carbon, renewable biofuels produced on farms and in our rural communities across the nation.

Carbon dioxide is different from the criteria pollutants EPA has historically regulated. Its impacts are global, and its adverse effects are not limited to the places where they are emitted. To mitigate these effects as quickly as possible, a different approach to regulating carbon dioxide emissions is warranted that captures the full lifecycle benefits of ethanol and other biofuels and integrates it into EPA's certification pathways when they replace fossil diesel fuel in a dedicated engine system. [EPA-HQ-OAR-2022-0985-1654-A2, p. 10]

As noted above, when biofuels emit carbon dioxide when burned, that carbon dioxide is biogenic. In the context of a tailpipe-only rule, it is correct to state that this combustion does not add to climate change, because the natural carbon cycle has not been altered (in contrast to burning fossil fuels, which introduces extracted carbon into the atmosphere). In other words, a tailpipe-focused CO2 rule should treat biogenic carbon as 'zero emissions' for the same reason as hydrogen—because neither directly contains fossil-derived carbon. [EPA-HQ-OAR-2022-0985-1654-A2, p. 10]

If, instead, EPA chooses to develop a lifecycle-focused rule to align with climate impact in the strongest possible way, a different accounting is needed – but fortunately, science offers an equally rigorous way of determine total (i.e. lifecycle emissions). From a lifecycle perspective, a preponderance of research substantiates that ethanol is roughly 50 percent lower than diesel when taking into account the upstream impacts from the production and distribution of the two fuels.23 A lifecycle-based emissions rule would account for the fact that consumption of 1 MJ of ethanol has 50% the GHG impact as 1 MJ of diesel – and so, when comparing two identical engines consuming energy at the same rate, one running on ethanol would receive half the emissions certification calculation as one running on diesel. [EPA-HQ-OAR-2022-0985-1654-A2, p. 10]

23 Based on GREET calculation.

A lifecycle regulatory framework would best align with the real-world GHG reduction outcomes we want to drive. It would incentivize investment in (and adoption of) solutions that guarantee displacement of fossil-fuels with lower lifecycle carbon alternatives. The more we can convert the fleet of ICE vehicles to engines that can only operate on fuels with lower lifecycle carbon emissions, the less we will need to rely on fossil fuels that increase the atmosphere's net carbon load, i.e., that drive climate change. The lifecycle benefits of such technologies should be integrated into the Final Rule to encourage this transition, and we believe that EPA has the authority to take this step. [EPA-HQ-OAR-2022-0985-1654-A2, p. 10]

To do so, EPA can address lifecycle emissions reductions by integrating the significant data and experience EPA has obtained in administering in the Renewable Fuel Standard (RFS) program and other resources (such as GREET) to determine the full lifecycle emissions reductions of a dedicated alternative fuel vehicle, which would then be integrated into its certification pathways. [EPA-HQ-OAR-2022-0985-1654-A2, p.11]

Indeed, in pilot projects and in an independent Total Cost of Ownership, ClearFlame's engine results in a 42% lifecycle GHG emissions reduction, compared t (TCO) analysis,25 our dedicated E98 engine showed 22% lower lifecycle emissions than a BEV truck based on the average U.S. national grid mix.26 The same TCO study also found that based on national carbon intensity averageso traditional diesel.28 Forcing vehicles to switch to technologies that could instead increase lifecycle emissions cannot be what the Clean Air Act requires or incentivizes. 'Since the earliest days of the CAA, Congress has emphasized that the goal of section 202 is to address air quality hazards from motor vehicles, not to simply reduce emissions from internal combustion engines to the extent feasible.'29 While EPA is referring to electric vehicles here, the sentiment could apply to dedicated alternative fuel vehicles as well. By integrating lifecycle analysis into the certification of dedicated alternative fuel engines, the Final Rule can accelerate and increase the overall emissions benefits of the program. [EPA-HQ-OAR-2022-0985-1654-A2, p.11]

25 ClearFlame Total Cost of Ownership Analysis, Conducted by Gladstein, Neandross & Associates (GNA), pages 19-20.

26 Id. Note that the average U.S. national grid mix excludes California and Oregon.

28 Id. Note that the average U.S. national grid mix excludes California and Oregon.

29 Proposal at 25950.

Organization: Dana Incorporated

Sustainable Sourcing

Sustainable sourcing of materials is still a concern in the production of HD BEVs, and there is little consideration of the manufacturing side in the NPRM proposal. The proposal is mainly focused on in use CO2 reduction rates of HID vehicles. In assessing the impact of its proposals, EPA should consider the impact of manufacturing of the full propulsion system to ensure that the cross-over point combining CO2 emissions in manufacturing and in-use vehicle emissions is reasonable for the targeted adoption rate proposed. A cross-over point should be provided in addition to what is provided on break-even timing for HD BEV owners. [EPA-HQ-OAR-2022-0985-1610-A1, p. 3]

Organization: Delek US Holdings, Inc.

III. The Proposed Rule Underestimates the Lifecycle GHG Emissions of BEVs

Contrary to the naming convention, ZEVs—including BEVs—are not truly zero-emission vehicles. In fact, the lifecycle GHG emissions of BEVs exceed that of ICE-powered vehicles. If EPA is authorized to promulgate such standards, those standards must account for any upstream emissions from electric generating units. The failure to do so creates an uneven playing field that substantially disadvantages ICE engines. [EPA-HQ-OAR-2022-0985-1561-A1, p. 4]

EPA's reference to electric vehicles as "zero emission vehicles" is misleading. The fuel source of a BEV—a battery composed of carbon intensive minerals and the electricity generated to power the battery—produces emissions. The fact such emissions occur 100% upstream of the vehicle's operation and therefore fall outside of the tailpipe emissions calculation stacks the deck in favor of this technology. There is no logical basis for this omission because, as EPA is aware, GHG emissions have a global impact. Consequently, controlling air pollutant emissions should be important regardless of where such emissions occur. [EPA-HQ-OAR-2022-0985-1561-A1, p. 4]

The flaw in EPA's approach is illustrated by the fact that emissions standards easily become meaningless by changing the engine's location. A BEV charged by the owner through the use of a diesel-powered generator has zero emissions, notwithstanding the fact that it remains "powered" by a diesel engine located outside the vehicle. A HDV directly powered by a diesel engine inside the vehicle, however, is credited with the emissions produced by that engine. Thus, the source of the "fuel" matters. EPA's myopic approach fails to account for such impacts. [EPA-HQ-OAR-2022-0985-1561-A1, pp. 4 - 5]

Organization: Environmental Defense Fund (EDF)

Apply a Utility / Correction Factor to Vehicles Fueled with Hydrogen. We also urge EPA to account for the wide variation in hydrogen fueled vehicles' emissions benefits in measuring their emissions for compliance with the standards. EPA proposes to count hydrogen powered vehicles as having zero emissions, similar to how it has treated BEVs in the past. However, EPA's prior justifications for treating BEVs this way do not apply to hydrogen powered vehicles.221 Not only do hydrogen powered vehicles not provide clear emissions benefits absent further controls on where the hydrogen they operate on comes from, but due to potential leakage of hydrogen from the vehicles and criteria pollutant emissions from H2ICEVs, they do have vehicle and tailpipe emissions that must be accounted for. Additionally, EPA has previously noted the existence of other emissions reduction programs or controls related to upstream emissions as justifying its focus on tailpipe emissions.222 However, emissions from hydrogen production are currently unregulated, making it especially important that EPA adopt an approach that considers and reflects how hydrogen fueled vehicles are powered and operated. [EPA-HQ-OAR-2022-0985-1644-A1, 84-85]

221 EPA's decision to treat BEVs as having zero-emissions was based on a careful consideration of the emissions benefits associated with BEVs because the original purpose of this approach was to "recognize the benefits of . . . dedicated alternative-fueled vehicles." 76 Fed. Reg. 57123. Because of the emissions issues associated with hydrogen powered vehicles, including the fact that they likely do have tailpipe emission through hydrogen leakage, this same justification cannot justify their parallel treatment. Additionally, EPA has previously considered it important to its focus on tailpipe emissions that the upstream emissions are regulated by other rules.

222 76 Fed. Reg. 51705 (Aug. 27, 2012) ("There is no good reason to consider [the lifecycle emission of different types of fuels] here, especially where there already is a separate fuel based program, the RFS program, that is directly aimed at achieving the result POP Diesel seeks--a fuel program that achieves a reduction in lifecycle GHG emissions associated with the diesel fuel used by motor vehicles, through a mandate to use certain renewable diesel fuels.).

In this regard, EPA should not treat hydrogen fueled vehicles like BEVs but instead similarly to how the agency treats PHEVs,223 where EPA recognizes that sometimes PHEVs operate on battery power with real emissions benefits and other times the vehicle is powered by its ICE engine with emissions profiles more similar to fossil-powered vehicles. 224 For hydrogen fueled vehicles, EPA could adopt an approach to calculating their GHG emissions that includes a conservative low- GHG utility factor representing emissions attributable to hydrogen fueled vehicles assuming those vehicles are fueled using average, current forms of hydrogen production. For instance, a current factor would need to reflect the fact that most hydrogen is produced using SMR and does not result in real-world emission benefits when compared to diesel vehicles.225 [EPA-HQ-OAR-2022-0985-1644-A1, 85]

223 See 40 CFR § 600.116-12.

224 88 Fed. Reg. 29253 (May 5, 2023) ("Because the tailpipe CO2 produced from PHEVs varies significantly between [charge depleting] and [charge sustaining] operation, both the charge depleting range and the utility factor curves play an important role in determining the magnitude of CO2 that is calculated for compliance.").

225 This utility factor should also differ for H2ICEs, and FCEVS, which have differing emissions benefits.

Organization: Hexagon Agility Inc.

Hexagon Agility strongly encourages the U.S. Environmental Protection Agency ('EPA') to utilize a life cycle approach to emissions, taking into account the full well to wheel impact of heavy-duty vehicles. While the Proposed Rules suggests that EPA intends to take both a fuel and technology neutral approach to achieving emission reductions, in reality that cannot be achieved with a tailpipe only focus. This is because heavy duty vehicles running on renewable natural gas ('RNG') or other clean fuels such as hydrogen do not get any credit under the current Proposed Rule. Heavy duty vehicles running on RNG are available, scalable and cost effective, and provide for the fastest way to decarbonize the transport sector. Specifically, we request that EPA revise the Proposed Rule to include a mechanism to give emissions credit to heavy duty vehicles running on renewable or other clean fuels, including long haul, transit and refuse vehicles. [EPA-HQ-OAR-2022-0985-1507-A1, p. 1]

Organization: KALA Consulting, LLC

These comments are divided into several sections:

3. Objections to refusing to include "Upstream" GHG considerations when choosing regulatory definitions of actual and associated emissions for electrically recharged vehicles by using the excuse that upstream emissions are not considered for GHG calculations for petroleum-based liquid fuels when such calculations have been made by others and are easily verifiable by EPA. We argue that upstream emissions should and must be included in any calculations for GHG reductions while Criteria Pollutants should continue to be based on either individual vehicle tail-pipe emissions or corporate or manufacturer duty-type fleet averages. [EPA-HQ-OAR-2022-0985-2675-A2, p. 1]

Comment

3. The EPA appears to be using a very "special" consideration of emissions that are to be counted as regulated emission from Battery Electric Vehicles (BEV). In unbelievable statements of contorted logic, the EPA has set forth what we describe as a complete artifice designed to promote and "force" a major change to vehicle propulsion starting in model year 2027. While it is true that during operation BEVs produce no criteria pollutants and emit no GHG gasses, the same cannot be said for the probable sources of the electric power used to recharge the batteries of BEVs. We wish this were not so, but we must deal factually with emissions associated with BEV recharging. If the EPA is serious about GHG reductions, they MUST include and consider the GHG emissions of grid-connected Electric Generating Units (EGU). Much like the water that

comes from our faucets, several water sources could be being used to provide that water. So it is with electricity. No one can distinguish or filter out clean electrons coming from wind and solar sources and “dirty” electrons coming from GHG-intensive electric generation. [EPA-HQ-OAR-2022-0985-2675-A2, p. 8]

Power that comes into homes and businesses may well be a mix of so-called clean energy and emission-laden dirty energy produced by burning fossil fuels. In fact, the mix of electricity generation varies greatly by state or region, depending on what the “serving utility” chooses to use for generation. Some regions rely almost entirely on fossil fuel and nuclear generation methods, while others have added or switched to renewable energy production methods, such as wind and solar as part of their generation mix. There are few if any regions of the United States that are completely powered by renewable or GHG-free energy. There are GHG implications for most of the so-called renewable generation methods. Solar panels are often produced with high Global Warming Potential (GWP) chemicals being released and there are GHG emissions associated with the steel, carbon fibers, plastics and copper conductors used in wind turbines. All this is to say there are GHG emissions associated with virtually all forms of electric generation that cannot be ignored when considering whether or not the introduction of a new form of vehicle propulsion that relies on recharging batteries will have associated GHG emissions. The latest figures from the Energy Information Agency for 2022, show the mix of energy production for the US: [EPA-HQ-OAR-2022-0985-2675-A2, p. 9]

U.S. utility-scale electricity generation by source, amount, and share of total in 20221 Data as of February 2023 [See figure, EPA-HQ-OAR-2022-0985-2675-A2, p. 9]

As you can see, 60.2% of overall US electricity generation was still produced by burning fossil fuels with their associated GHG and other pollutant emissions. When we aggregate how much GHG emissions might be attributable to recharging Battery Electric Vehicles we normally do so on a nation-wide scale using the latest available information. Since regional electric power generation is so varied, we cannot say a BEV in Southern California will have lower associated GHG emissions than one recharging in St. Paul, Minnesota. [EPA-HQ-OAR-2022-0985-2675-A2, p. 9]

Therefore, as of 2022, we can say in aggregate, there is a 60% chance that the electrons used to recharge BEVs over the next few years will be from fossil CO2 emitting fossil fuel generating plants. That is why, any scientific calculations made for the GHG contributions that a BEV makes must consider how the recharging power delivered to the BEV was generated. A BEV may have zero operating emissions but they do NOT have zero GHG emissions associated with their use. It is our considered engineering opinion that much of the so-called “low-hanging fruit” for renewable generation in the US has already been implemented and is now on-line or soon will be. [EPA-HQ-OAR-2022-0985-2675-A2, p. 10]

Think about an Electric Utility company that has literally made billions of dollars of investments in coal and/or natural gas fired power plants. In their board room minds, they are doing just fine making electricity in the same old way as they did 50 years ago and feel no compunction at all about charging their customers more for electricity when the cost of the fossil fuels they burn go up. Why would such a business feel compelled to create “stranded assets” of their fossil-fired generating facilities long before their estimated useful life expires and switch over to renewable forms of electricity generation? Might it be because the board of directors and the management suddenly “feel” like it is the “right” thing to do for the planet. Really??

Seriously, businesses have built-in inertia when they have made large investments in what brings in revenue for the business and for their stock holders. They might agree that new generating capacity should be renewable, but there is great impetus to expand their existing fossil fuel-fired facilities with a new generator unit. [EPA-HQ-OAR-2022-0985-2675-A2, p. 10]

So, the 60% fossil fuel number may stubbornly stay close to that figure for some time. The EPA attempted to control both pollutant and GHG emissions from power plants when the “Clean Power Plan” was part of policy thrusts, but they were less than successful in courts and countering the Utility and Fossil Fuel lobbies in Congress. [EPA-HQ-OAR-2022-0985-2675-A2, p. 10]

https://www.nationofchange.org/2022/07/05/the-supreme-court-has-curtailed-epas-power-to-regulate- carbon-pollution-and-sent-a-warning-to-other-regulators/

Given that background, let us look at how EPA proposes to treat and count emissions from BEV vehicles from excerpts from the Federal Register publication:

From Section III. B. 7. “Treatment of PEVs and FCEVs in the Fleet Average: As originally envisioned in the 2012 rule, starting with MY 2022, the compliance value for BEVs, FCEVs, and the electric portion of PHEVs in excess of individual automaker cumulative production caps would be based on net upstream emissions accounting (i.e., EPA would attribute a pro rata share of national CO2 emissions from electricity generation to each mile driven under electric power…). The 2012 rule would have required net upstream emissions accounting for all MY 2022 and later electrified vehicles. However, in the 2020 rule, prior to upstream accounting taking effect, EPA revised its regulations to extend the use of 0 g/mile compliance value through MY 2026 with no production cap, effectively continuing the practice of basing compliance only on tailpipe emissions for all vehicle and fuel types.” [EPA-HQ-OAR-2022-0985-2675-A2, p. 10]

Let’s stop here and parse out this set of statements. Prior to the cited text, EPA gave some history on how they were thinking about applying regulations for BOTH criteria pollutants and GHG emissions. Ostensibly because the number of BEVs was so small, auto makers were given credit for emission reductions, particularly GHG reductions, up to a company-wide vehicle production cap (a maximum value over which the company would not receive any emission credits). That is why the “individual automaker cumulative production caps” is part of the cited statements above. EPA states that their original thinking on GHG emissions from BEVs would be “based on net upstream emissions accounting,” which they further explain would be a “pro-rata share of national CO2 emissions from electricity generation to each mile driven under electric power.” As we discussed above, a nation-wide aggregation of the share of recharging GHG emissions attributable to fossil fueled generation would be about 60% as of 2022. [EPA-HQ-OAR-2022-0985-2675-A2, p. 11]

However, for some reason the EPA made a decision prior to doing any actual “upstream” CO2 accounting in their 2020 rulemaking that they would NOT do any upstream (meaning emissions attributable to activities that produced either the fuel in a gas tank or electricity to recharge a battery) accounting specifically for GHG emissions AND for criteria pollutants. EPA seems to justify its astonishing position on not accounting for GHG emissions related to battery recharge by saying they are treating all vehicles the same by not trying to account for all upstream emissions for BOTH liquid petroleum fuels and recharge electricity. [EPA-HQ-OAR-2022-0985-2675-A2, p. 11]

Let us state for the record that we agree with EPA for regulatory treatment of criteria pollutants from BEVs as zero grams per mile. We don't see any other way of accounting for both upstream and operations-attributable emissions, even though there were emissions related to the production of the materials used in the BEV, those emissions are virtually the same as those for producing a conventional gasoline vehicle. The only emission exceptions would be for battery production and electric motor components that would have different emission profiles than gas engine parts. We think these are minor differences and the upstream emissions for both the gasoline and BEV vehicles themselves are a wash. [EPA-HQ-OAR-2022-0985-2675-A2, p. 11]

However, KALA, in the most strenuous way possible, disagrees that upstream GHG emissions for battery recharge should treated the same way as zero grams per mile. The justification that you are treating each vehicle type the same is simply not tenable in any stretch of the imagination. We think that the EPA may have been incorrectly influenced by electrification zealots within the agency who when discussing how BEV GHG emissions should be handled argued something like this: [EPA-HQ-OAR-2022-0985-2675-A2, p. 11]

Hey guys we all know that we want to electrify the fleet as much as possible, after all we know that electrification is the only way to truly get GHG emissions under control in a big way, don't we? So, hey, let's figure out a way to justify treating the emissions from BEVs as zero all the way around even though we know there are upstream GHG emissions for battery recharge. Maybe if we say that we will treat emissions the same as "tail pipe' emissions while operating the vehicles, we can get away with counting BEV emissions as zero and really push the auto makers away from gasoline into making predominantly BEVs. [EPA-HQ-OAR-2022-0985-2675-A2, p. 11]

Now, we don't know how the decision was made to treat BEV GHG emissions as zero without any regard for how different BEVs are. The method used for regulating tail pipe emissions from gasoline vehicles requires fuel to be stored in the gas tank and that fuel is used to power the internal combustion engine, which emits both GHG and other air pollutants. That is no different than filling a battery up with "electric fuel" and then accounting for the emissions that made the BEV go down the road. It just so happens that the emissions to fill up the BEV's "tank" occur before the stored energy is used, but that is because the mode of propulsion and the way in which energy is stored and "refilled" is so different in a BEV. [EPA-HQ-OAR-2022-0985-2675-A2, p. 12]

No matter how the EPA moved from the "correct" way to treat BEV emissions by accounting for net upstream GHG emissions as a pro-rata share of national CO2 emissions from electric generation to the "insane" way of completely ignoring them, the initial way of treating GHG emissions from BEVs was the correct first impulse. Otherwise we have no way of comparing GHG emissions from gasoline and diesel powered vehicles and BEVs. It could be that the EPA attempted to make calculations for that pro-rata share of national electric generation CO2 emissions (as an engineer that is what I would do) and found the results not to their liking. That could well be because of the abysmal final efficiency of converting the energy in fossil fuels into rolling motion of a BEV. We offer an info graphic way of showing that terrible efficiency below: [EPA-HQ-OAR-2022-0985-2675-A2, p. 12]

[See figures from EPA-HQ-OAR-2022-0985-2675-A2, pp. 12-13]

The science and engineering behind the GHG emission figures associated with BEVs has principally to do with efficiencies of conversion of fossil fuels (remember we still have 60.2% of all electricity being generated by fossil fuels) to electricity and the losses that are seen in transmission, recharge of batteries and conversion of electric charge stored in batteries to rolling motion of the vehicle. The GHG impact of this horrendously low final efficiency is that far more GHG is produced to propel a BEV one mile than a comparable gasoline-powered vehicle. We believe it is entirely possible that the EPA understood the implications of such poor efficiencies, decided that it was in the national interest of the country to electrify the US fleet anyway regardless of the true GHG emission aspects of BEVs and found a way to drive or "Steer" fleet change over by ignoring upstream GHG emissions associated with BEV battery recharge in the regulatory scheme. We hope that is not the case, but it sure looks and feels that way. [EPA-HQ-OAR-2022-0985-2675-A2, p. 13]

EPA further continues to justify the compliance treatment of BEVs in Section III. B. 7. "EPA is proposing to make the current treatment of PEVs and FCEVs through MY 2026 permanent. EPA proposes to include only emissions measured directly from the vehicle in the vehicle GHG program for MYs 2027 and later (or until EPA changes the regulations through future rulemaking) consistent with the treatment of all other vehicles. Electric vehicle operation would therefore continue to be counted as 0 g/ mile, based on tailpipe emissions only…. The program has now been in place for a decade, since MY 2012, with no upstream accounting and has functioned as intended, encouraging the continued development and introduction of electric vehicle technology." [EPA-HQ-OAR-2022-0985-2675-A2, p. 13]

What did the EPA just say? They brazenly state that no matter what, GHG emissions from BEVs would continue to be counted as zero grams per mile. The program that counts emissions that way has "functioned as intended" to encourage BEV development and introduction into the vehicle fleet. Did they really just say that? Yes, EPA seems to be saying that it doesn't matter how illogical their counting method is for BEVs for GHGs, they are going to continue to do it that way and their motives to encourage or even force BEV transition and displacement through regulation becomes clear. [EPA-HQ-OAR-2022-0985-2675-A2, p. 14]

EPA further tries to justify their zero GHG emissions policy by again stating in Section III.B. 7. the following: "This approach of looking only at tailpipe emissions and letting stationary source GHG emissions be addressed by separate stationary source programs is consistent with how every other light duty vehicle calculates its compliance value. If EPA deviated from this tailpipe emissions approach by including upstream accounting, it would appear appropriate to do so for all vehicles, including gasoline- fueled vehicles." [EPA-HQ-OAR-2022-0985-2675-A2, p. 14]

We applaud the EPA for attempting, once again, to reduce stationary source (Electric Generating Units are considered to be stationary emissions sources) emissions. But, we are questioning the motives of the EPA for counting emissions from BEVs. As explained above, the equivalence way of looking at attributable GHG emissions is the "Filled Tank" approach suggested in this comment. How it was filled and whether or not the tank has associated emissions either from burning the stored contents of the tank in the case of liquid fuels or consuming the energy stored in a battery should make no difference in attributing GHG emissions to either situation. The only difference is when the related emissions occurred, before the stored energy was used or after the stored energy was used. This minor temporal difference cannot be ignored unless the EPA has an ulterior motive of forcing the change over of vehicle types in the US fleet through regulation. [EPA-HQ-OAR-2022-0985-2675-A2, p. 14]

The excuse in the cited FedReg text above that if EPA somehow deviated from the tail pipe emissions approach by including upstream [emissions] accounting they might have to do so for gasoline-fueled vehicles. Our response to that "terrible burden" on the EPA to account for upstream petroleum emissions is that such an argument is specious at best and just another vacuous justification. So what if the EPA had to account for upstream petroleum emissions. That might give us a higher resolution picture of the entirety of the vehicle GHG problem in a larger context. If the EPA considers the issue of accounting for upstream petroleum emissions too great a burden, the good news is that others have actually done this accounting. The group that we believe had the best methodology for accounting GHG emissions at stages of petroleum production and refining is the Renewable and Appropriate Energy Laboratory (RAEL) at UC Berkeley In a paper by the late Alex Farrell, GHG emissions at production stages provided total upstream emissions leading up to gasoline burned in ICEs. That group had a uniquely legible way to portray those upstream emissions graphically as shown below. [EPA-HQ-OAR-2022-0985-2675-A2, p. 14]

http://rael.berkeley.edu/old_drupal/sites/default/files/EBAMM/FarrellEthanolScience012706.pdf [EPA-HQ-OAR-2022-0985-2675-A2, p. 14]

Fig. 2. Alternative metrics for evaluating ethanol based on the intensity of primary energy inputs (MJ) per MJ of fuel and of net greenhouse gas emissions (kg CO2-equivalent) per MJ of fuel. For gasoline, both petroleum feedstock and petroleum energy inputs are included. ‘‘Other’’ includes nuclear and hydrological electricity generation. Relative to gasoline, ethanol produced today is much less petroleum intensive but much more natural gas and coal-intensive. Production of ethanol from lignite fired biorefineries located far from where the corn is grown results in ethanol with a high coal intensity and a moderate petroleum intensity. Cellulosic ethanol is expected to have an extremely low intensity for all fossil fuels and a very slightly negative coal intensity due to electricity sales that would displace coal. [EPA-HQ-OAR-2022-0985-2675-A2, p. 15]

The caption explains the units for GHG emissions calculated, which should be easily converted to what ever units EPA would like to use for its purposes. So, please, EPA, don't tell us such calculations would be a huge burden since someone else has done them for you. [EPA-HQ-OAR-2022-0985-2675-A2, p. 15]

Overall Comment #3 Conclusions:

A. Despite EPA's published protestations that their new rulemaking will provide leeway for multiple methods of vehicle propulsion to continue and that they have no wish to direct which propulsion method is the one they prefer, the evidence from statements made in describing the unreasonable "regulatory trick" of counting ONLY BEV tail pipe emissions for GHGs, has and will "Steer" automakers decisions toward BEVs as THE compliance solution. When EPA essentially says: "BEVs would be counted as 0 g/ mile in compliance calculations. The program has now been in place for a decade with no upstream accounting and has functioned as intended, encouraging the continued development and introduction of electric vehicle technology.," there is no doubt left in our minds as to the intentions of the EPA to change out ICE vehicles for BEVs through regulatory fiat. [EPA-HQ-OAR-2022-0985-2675-A2, p. 15]

Now, back to the Most Probable Time-of-Day for Recharge (MPTODR) issue. If most BEV owners will choose to recharge overnight, this is the time when utility companies are generating what is called Base Load. Base Load is the minimum power output load that a utility company has for its daily load swings. This is the time when most people are asleep and not using a lot of electric power, as opposed to increased power needs when people are up and using more electricity. Most utility companies use the Base Load time period to do maintenance on their Intermediate and Peaking generators. With a massive increase in BEV recharging needs in the overnight Base Load time frame, utility companies may have to run their Intermediate generating units during that time, as well as for meeting daytime loads. [EPA-HQ-OAR-2022-0985-2675-A2, p. 34]

Many utility companies use coal-fired generation for Base Load power needs because they cannot switch coal-fired generators on and off like they could a natural gas-fired turbine generator. It can take days for a large coal generating station to come up to temperature from cold start and start making electricity. We believe that some utility companies will choose to add coal-fired or natural gas-fired generating capacity to meet increased Base Load demand, rather than adding renewables, which would need to be wind power because solar power is not available at night. Whatever generating mix utility companies decide to use to meet BEV recharging demand, the proportion of fossil-fueled generation will be larger because solar will not be available during the MPTODR. This is another aspect of making the upstream calculations for fossil-fired pro rata GHG accounting that we are urging EPA to do for attributable BEV GHG emissions. [EPA-HQ-OAR-2022-0985-2675-A2, p. 34]

Organization: Lubrizol Corporation (Lubrizol)

Each of the Blueprint's strategies can yield extremely low-carbon performance. However, the lifecycle emissions of each technology should be considered and integrated into the Final Rule. We are concerned about the unintended consequences of a "tailpipe-only" approach that neglects upstream emissions and other emissions impacts of future engines and vehicles. Our concern is equally valid, whether the technology is an ICE vehicle operating on petroleum diesel, an ICE vehicle operating on a SLF, an ICE vehicle operating on hydrogen, a battery-electric vehicle, or fuel cell vehicle. The end goal should be a heavy-duty vehicle market that emits as few GHGs as possible, on a lifecycle basis. [EPA-HQ-OAR-2022-0985-1651-A2, p. 2]

Organization: Lynden Incorporated

Overall Negative Environmental Impacts

'Zero Emission Vehicles' do not make sense economically or operationally, so to justify the transition to these vehicles there must be an overall environmental benefit. However, 'Zero-Emission Vehicles' are not carbon-neutral or emission-free, they are just 'emissions somewhere else'. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

The emissions associated with fuel production and electric generation should be considered when ranking vehicles for the EPA's Greenhouse Gas Emissions Standards. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

California's own Low-Carbon Fuel Standard shows that even with all the renewables in their electric grid, electric vehicles provide only a 6% advantage in greenhouse gas emissions compared to traditional diesel4. For most of the Country, where electricity is generated by coal and natural gas, running an electric vehicle produces substantially more greenhouse gas emissions compared to diesel. According to American Transportation Research Institute, any significant reduction in CO_2 is not realized until 2050 when it is predicted that the mix of power is transformed to more renewable options5. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

4 Lookup table for gasoline and diesel and fuels that substitute for gasoline diesel https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/ca-greet/lut.pdf

5 U.S. Energy Information Administration. (February 8, 2021). 'EIA projects renewable share of U.S. electricity generation mix will double by 2050.' EIA. Available online: https://www.eia.gov/todayinenergy/detail.php?id=46676

These metrics only consider the electricity needed to run the vehicle itself. It does not include the 5% line loss in transmitting the electricity through power lines to the charging stations nor the 8% of energy lost as heat when charging the vehicle. These losses alone negate any CO_2 emissions benefit of electric vehicles. [EPA-HQ-OAR-2022-0985-1470-A1, p. 3]

In addition, any thoughtful rule, with the goal of reducing emissions from the freight industry needs to consider the ability to move freight, not the empty truck. A battery electric truck that weighs 9,000 lbs more than its diesel counterpart will need to make 20% additional trips to move the same amount of freight, thereby increasing associated electric emissions by 20% plus line loss and charging inefficiency. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

To electrify the trucking fleet in the U.S., the entire global production of these minerals would need to be commandeered for 6-30 years6. The environmental impact of mining and refinement of these minerals as well as the impact of battery waste and disposal should be considered as well as the ramifications to national security when we become dependent on other countries for those materials. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

6 Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet (December 2022) American Transportation Research Institute (ATRI). https://truckingresearch.org/2022/12/06/charging-infrastructure-challenges-for-the-u-s-electric-vehicle-fleet/

Organization: Manufacturers of Emission Controls Association (MECA)

To drive future U.S. technology leadership, EPA should recognize the need to include life cycle analysis in future rulemaking. This is particularly relevant to heavy-duty vehicles because of the magnitude of their power demand, battery size and charging time. Efficiency regulations have historically driven vehicle manufacturers and technology suppliers to continue to innovate and develop better materials, components, and vehicle systems to reduce energy demand, operating costs and related emissions of vehicles. By assigning realistic "non-zero" emission values to EVs and FCEVs, EPA will provide a regulatory incentive to further improve the electric efficiency of components and powertrain technologies that will further reduce vehicle related environmental impacts. [EPA-HQ-OAR-2022-0985-1521-A1, p. 8]

Organization: Mille Lacs Band of Ojibwe (Band)

Conceptually, the Band fully supports the aggressive decarbonization of heavy-duty vehicles, and reductions in other greenhouse gas (GHG) emissions as put forth in both the proposed rule and in the alternative also offered in the rule. However, the Band is concerned that EPA has not taken into consideration the GHG emissions associated with mining and processing of critical metals, GHG emissions associated with the manufacturing of these heavy-duty vehicles, and then material management associated with disposal of these heavy-duty vehicles at the end of their use life. If the processes involved before these heavy-duty vehicles go to market, and the processes involved after these heavy-duty vehicles go off from use life, both have significantly more GHG emissions involved, then it doesn't matter what GHG standards for heavy-duty vehicles are, if the result is United States not actually accomplishing net GHG emissions reduction, this will be a serious threat to the health of the people and of the environment. Because of this, we encourage EPA to make provisions in this rule that set up for new rulemaking for GHG reductions in the processes leading up to the sales of these vehicles that comply with the new GHG emissions standards, to set up for new rulemaking for GHG reductions in the processes after these vehicles come off their use life, and to have the three rules working in tandem to ensure there is actual GHG emissions reductions across the United States. [EPA-HQ-OAR-2022-0985-1609-A1, p.2]

Organization: Moving Forward Network (MFN) et al.

Second, EPA should update the EJ analysis to thoroughly analyze the "cradle to grave" impacts of the proposal and the potential disproportionate and cumulative impacts that EJ communities may face as a consequence of the rule. For example, the EJ analysis acknowledges that electricity generating units disproportionately impact communities of color and may experience some disbenefits where fossil fuel is burned for electricity generation. 72 However, EPA failed to fully consider the upstream and downstream impacts associated with energy generation, especially the disproportionate impacts and potential harms to EJ communities. This is critical to analyze, and EPA should quantify and evaluate these impacts in detail and include measures to avoid and mitigate these effects. [EPA-HQ-OAR-2022-0985-1608-A1, p. 31-32]

72 U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3, EPA-420-D-23-004. (April 2023). p. 398. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

The proposed rule fails to consider the full lifecycle impacts associated with technologies that will be used to comply with the rule. This includes a full life cycle analysis of the battery supply chain; a life cycle analysis of hydrogen (including grey, blue, green, and any other forms of hydrogen) that could fuel trucks and assessing the emissions associated with hydrogen combustion; and life cycle analysis of diesel and natural gas fuels that could comply with the rule. Conducting these "cradle to grave" analyses is necessary to consider the localized environmental justice harms that could result from technology choices. [EPA-HQ-OAR-2022-0985-1608-A1, p.32]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

The Proposed Rule Fails to Account for the Lifecycle Emissions of Electric Trucks.

Under the Proposal, electric trucks effectively serve as the only means of compliance with the standards in part because the Agency focuses solely on tailpipe emissions rather than the full lifecycle emissions of heavy-duty vehicles. This is a flawed approach. EPA should incorporate lifecycle GHG emissions into its analysis to fairly consider multiple technologies and ensure an accurate accounting of the lifecycle carbon intensity associated with particular fuels and technologies. This will facilitate continued investment in non-electric decarbonization technologies alongside investments in EV HD trucks, while simultaneously anticipating and addressing regional differences applicable to such emissions. [EPA-HQ-OAR-2022-0985-1603-A1, p. 7]

This analysis should include everything from the acquisition of critical minerals, the use of natural resources for refining and processing, engine and battery manufacturing, tailpipe emissions, and other confounding variables like prolonged internal combustion engine ('ICE') turnover rates and vehicle end-of-life consequences. Importantly, a lifecycle analysis of EVs will better equip EPA to understand the varying costs and emissions reductions associated with all technologies and best inform manufacturers and consumers of their options. [EPA-HQ-OAR-2022-0985-1603-A1, p. 7]

Though HD EVs do not directly have tailpipe emissions, other segments along the lifecycle of the EV do. The fuel source of an EV—a battery composed of carbon intensive minerals and the electricity generated to power the battery—produces meaningful emissions to which the Proposal turns a blind eye. Addressing the impact of climate change, however, requires mitigating emissions irrespective of whether they originate from a tailpipe, a mining operation, a power plant, or a battery plant. Consequently, emissions standards should account for the entire lifecycle emissions [EPA-HQ-OAR-2022-0985-1603-A1, p. 7]

EPA makes flawed assumptions regarding the total emissions impacts of the Proposal. While it claims that the overall analysis for combined downstream and upstream emissions 'likely underestimates the net emissions reductions that may result' from the Proposed Rule, EPA fails to substantiate this claim with sufficient data or detailed analysis. The Proposed Rule did not quantify emissions changes associated with producing or extracting crude or manufacturing refined fuels.15 [EPA-HQ-OAR-2022-0985-1603-A1, p. 7]

15 Proposed Rule at 26,044.

While diesel-powered trucks generally emit more carbon dioxide during operation, the emissions associated with the manufacturing of diesel-powered trucks are significantly lower than those emitted from both battery-electric and fuel-cell electric trucks.16 A recent examination conducted by Volvo provides an analogous case study of emissions resulting from light-duty vehicle manufacturing. The impacts are exaggerated for HD trucks. Volvo concluded that the 'accumulated emissions from the [m]aterials production and refining, [Lithium-ion] battery modules and Volvo Cars manufacturing phases of C40 Recharge are nearly 70 percent higher than for XC40 ICE.'17 Volvo explains, '[e]lectrification of cars causes a shift of focus from the use phase to the materials production and refining phase.'18 HD electric trucks, which require substantially more manufacturing components, have an even greater emissions impact. [EPA-HQ-OAR-2022-0985-1603-A1, pp. 7-8]

16 See AMERICAN TRANSPORTATION RESEARCH INSTITUTE, 'Understanding the CO2 Impacts of Zero-Emission Trucks,' (May 3, 2022) available at https://truckingresearch.org/2022/05/understanding-the-co2-impacts-of-zero-emission-trucks/ ('The marginal environmental benefits of electric trucks are due, in large part, to lithium-ion battery production – which generates more than six times the carbon of diesel truck production.'); see also David Biello, SCIENTIFIC AMERICAN, 'Electric Cars Are Not Necessarily Clean,'(May 11, 2016) available at https://www.scientificamerican.com/article/electric-cars-are-not-necessarily-clean/ ('Your battery-powered vehicle is only as green as your electricity supplier'); see also Nina Lakhani, THE GUARDIAN, 'Revealed: How US Transition to Electric Cars Threatens Environmental Havoc,' the Guardian, (January 24, 2023) available at https://www.theguardian.com/us-

news/2023/jan/24/us-electric-vehicles-lithium-consequences-research. ('The US's transition to electric vehicles could require three times as much lithium as is currently produced for the entire global market, causing needless water shortages, Indigenous land grabs, and ecosystem destruction.').

17 Elisabeth Evrard, et al., VOLVO, 'Carbon footprint report – Volvo C40 Recharge,' (2021), pg. 24, available at https://www.volvocars.com/images/v/-/media/Market-Assets/INTL/Applications/DotCom/PDF/C40/Volvo-C40-Recharge-LCA-report.pdf.

18 Id. at pg. 5.

The Proposed Rule similarly fails to adequately evaluate local ambient air quality impacts from increased power generation. Though EPA modeled changes to power generation anticipated by the Proposed Rule as part of its upstream analysis, the Agency does not consider the potential degradation of air quality in areas in the direct vicinity of existing or new power plants.19 This is further complicated by the fact that emissions associated with electricity generation are not consistent across the U.S. In contrast to EPA's generalized emissions benefits, the emissions advantages of EVs are much lower in states with relatively high carbon profiles for electricity generation than those states with relatively low carbon profiles. Indeed, the Fuels Institute analyzed these differences and concluded that in states with high-carbon intensity electric generation, such as West Virginia, ICE vehicles produced decidedly fewer carbon emissions relative to EVs over the entire 200,000 mile life of the vehicles.20 Of course, the Report recognizes emissions advantages to EVs in those low-carbon states as well, but these differences further illustrate the importance of considering a more heterogenous approach to the HD freight industry. [EPA-HQ-OAR-2022-0985-1603-A1, p. 8]

19 Proposed Rule at 25,983.

20 Ricardo Inc., TRANSPORTATION ENERGY INSTITUTE, 'Lifecycle Analysis Comparison' (Jan. 2022) available https://transportationenergy.org/wp-content/uploads/2022/10/FI_Report_Lifecycle_FINAL.pdf.

The Proposed Rule also overlooks the emissions impacts from the substantial expansion of the electrical grid. While EPA credits emissions reductions from assuming the power sector will become cleaner over time using renewable generation and electricity storage (i.e., batteries), it ignores the impacts of building out that infrastructure. New power generation, renewable power generation, and energy storage require the same critical minerals necessary for EV batteries. Increased electricity demand compounds the stress on critical minerals. Indeed, copper and aluminum—both needed for HD electric trucks—are also the two main materials in wires and cables. Battery storage equipment for solar and other renewable energy sources rely on similar battery chemistries as HD electric trucks.21 The simultaneous spike in demand for materials such as copper and aluminum for both the grid and EV manufacturing will increase extraction and refining efforts globally, potentially exacerbating consequences on a regional level.22 By failing to consider geographic electricity generation differences and the potential benefits of a non-homogenized truck population, the Proposal misses the opportunity to most effectively respond to emissions concerns and, more importantly, could indirectly lead to increased emissions in certain regions. A full accounting of the relative advantages and disadvantages of the different vehicle technologies is necessary to ensure the Proposal harnesses the benefits of competition among different current and potential future vehicle technologies. [EPA-HQ-OAR-2022-0985-1603-A1, pp. 8-9]

21 And, as described above, higher prices on these materials could have a major impact on future grid investments. International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions

(March 2022), 77–80, available at https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.

22 The U.S. is almost entirely dependent on other countries, especially China, for materials essential to manufacturing heavy-duty electric trucks, meaning the Proposal may potentially raise national security concerns.

Organization: Natural Gas Vehicles for America (NGVAmerica)

NGVAmerica supports EPA finalizing regulations that achieve needed emission reductions and incorporate a strong fuel- and technology-neutral performance standard. Future standards must incorporate realistic expectations about the pace, cost, and deployability of technology, and to ensure success must encourage engine makers and vehicle manufacturers to deploy a variety of available, scalable, and cost-effective technologies. To achieve these objectives and drive manufacturers toward zero-emission technology, EPA must incorporate well-to-wheel emission or life-cycle assessments into its regulations. We therefore request that EPA develop and approve a method of calculating and certifying emission reductions related to the use of low-carbon and carbon-negative biofuels. [EPA-HQ-OAR-2022-0985-1522-A1, p. 1]

The time has come for EPA to fully embrace all low-carbon technologies and provide a level playing field in its regulations. EPA staff previously stated to NGVAmerica in meetings that the Renewable Fuel Standard Program already incentivizes low-carbon fuels like RNG and that its vehicle regulations are not intended for that purpose. EPA staff also has acknowledged in meetings with NGVAmerica that when it comes to greenhouse gas emissions, moving to a life cycle analysis (LCA) or well-to-wheels (WTW) approach would be preferable, and previously indicated as part of the proceedings for the 2012 light-duty GHG regulations that it would move away from the tailpipe only approach once automakers surpass sales of 200,000 vehicles. EPA under the Biden Administration, however, has abandoned that prior commitment. [EPA-HQ-OAR-2022-0985-1522-A1, p. 2]

There are ample studies that support the importance of evaluating well-to-wheel emissions. A September 2022 study published in the Journal Sustainable Energy & Fuels included the following:

The results show that in both the U.S. and EU markets, waste-streams-to-energy technologies, such as CNG production via AD of wet waste resources, offer the biggest opportunities to reduce WTW GHG emissions. …Drop-in renewable diesel fuels, produced from forest residues or wood waste feedstock via thermochemical conversion technologies, including FT and pyrolysis technologies, could potentially reduce GHG emissions more than 75% in both the U.S. and the EU, despite the varying energy efficiency of the conversion routes and feedstocks used.3 [EPA-HQ-OAR-2022-0985-1522-A1, pp. 3 - 4]

3 Journal of Sustainable Energy & Fuels, Decarbonization potential of on-road fuels and powertrains in the European Union and the United States: a well-to-wheels assessment, (Published Sept. 1, 2022) (Decarbonization potential of on-road fuels and powertrains in the European Union and the United States: a well-to-wheels assessment - Sustainable Energy & Fuels (RSC Publishing).

This report looks at benefits in the U.S. and Europe, references numerous other studies, and its authors include several prominent experts on greenhouse gas emissions. A White Paper entitled Smart CO2 Standards for Negative Emissions Mobility published by the European Biogas Associations references nearly a dozen studies with similar findings regarding emission reduction benefits and cost-effectiveness of RNG reductions. A copy of that document is included in Appendix A. [EPA-HQ-OAR-2022-0985-1522-A1, p. 4.] [See Docket Number EPA-HQ-OAR-2022-0985-1522-A1, pages 14-28, for Appendix A.]

Another excellent report on the importance of accounting for well-to-wheel emissions and life-cycle emissions was prepared in 2021 by Frontier Economics for NGVA Europe. That report was specifically prepared with the intention of highlighting the need for regulatory standards that account for well-to-wheel emissions. The frontier economics evaluation included a comparison based on conventional natural gas, 100 percent biomethane, and a mixture of 40 percent conventional natural gas and 60 percent biomethane. This study supports the contention that a mixture of biomethane of 60 percent biomethane is cost-competitive from a purchase perspective with electric vehicle technology while also delivering greater emission CO2 equivalent emission reductions. A copy of this report is included in Appendix B. [EPA-HQ-OAR-2022-0985-1522-A1, p. 4.] [See Docket Number EPA-HQ-OAR-2022-0985-1522-A1, pages 29-102, for Appendix B.]

A report4 prepared by Ramboll US Consulting, Inc. for the Western States Petroleum Association provides additional evidence on the cost-effectiveness and well-to-wheel benefits of natural gas vehicles and other low-emission technologies. The report evaluated California's plans to focus almost exclusively on electrification as the solution to address transportation related emissions including NOx emissions and greenhouse gas emissions. [EPA-HQ-OAR-2022-0985-1522-A1, p. 4]

4 Ramboll Multi-Technology Pathways Study - Western States Petroleum Association (wspa.org)

The report's executive summary includes the following:

- Expanded implementation of zero-emission and Low-NOx vehicles, coupled with increased introduction of renewable liquid and gaseous fuels, can deliver (as shown in Figures ES-1) and more cost-effective benefits than a zero-emission vehicle (ZEV)-only approach.
- As advanced low-emitting trucks are commercially available (citation omitted) to deliver benefits to communities sooner, multi-technology pathways can help achieve emission reductions without reliance on infrastructure and technology upgrades that will take years to resolve.
- There is growing potential for renewable fuels, including those with negative carbon intensity, to [sic] achieve GHG reductions, which CARB has not acknowledged fully in the MSS nor assessed the potential for early and cost-effective GHG reductions through these multi-technology vehicle pathways.
- Low-emission heavy-duty trucks are cost-competitive with (or cheaper than) battery electric vehicles (BEVs). This is true even though battery technology promises (such as greater energy density/lower cost) have not been adequately demonstrated and related transmission/distribution infrastructure cost have not been included in the state's analyses. [EPA-HQ-OAR-2022-0985-1522-A1, pp. 4 - 5]

In addition to the greenhouse gas emission benefits, it is important to note that virtually all new natural gas engines already achieve emission reductions of nitrogen oxides that surpass the reductions required by EPA recently finalized low-NOx rule for medium and heavy-duty vehicles. All new natural gas trucks and buses regardless of whether they operate on conventional natural gas or RNG therefore provide meaningful reductions of this important pollutant. EPA's regulations provide averaging, banking, and trading credits to manufacturers that exceed emission requirements (i.e., deliver lower emitting engines). The new regulations are expected to further encourage the development and sale of natural gas engines. The incentive for lower polluting natural gas engines however could be offset by this rulemaking if EPA does not amend its proposal to incorporate well-to-wheel, greenhouse gas emission benefits of NGVs. [EPA-HQ-OAR-2022-0985-1522-A1, p. 17]

Organization: Neste US

I. A LIFE CYCLE ANALYSIS BETTER ACCOUNTS FOR A VEHICLE'S GHG EMISSIONS

While regulating emissions from vehicle tailpipes makes sense for relatively short-lived criteria pollutants like particulate matter and nitrogen oxides, a life cycle analysis is necessary to fully account for a vehicle's GHG emissions in two important ways. [EPA-HQ-OAR-2022-0985-1615-A1, p. 1]

First, while electric vehicles (EVs) and hydrogen fuel cell electric vehicles (FCEVs) have no tailpipes, their production and daily use both produce GHG emissions. Those emissions come both from the fossil-fueled power plants that charge EVs or produce hydrogen for FCEVs, as well as the substantial resources needed to produce their EV batteries. Unfortunately, the Agency does not consider those life cycle emissions in this proposed rule. Consequently, the proposal favors technologies that merely shift emissions upstream. [EPA-HQ-OAR-2022-0985-1615-A1, p. 1]

Second, while the combustion of fossil fuels and biofuels both emit CO2, their contribution (or lack thereof) to the concentration of CO2 in the atmosphere is quite different. As EPA noted in the development of an accounting framework for biogenic CO2 from stationary sources, "fossil and biogenic carbon interact with the overall carbon cycle on very different time scales."1

"CO2 emissions from the consumption of fossil fuels will inevitably increase the amount of carbon in the atmosphere on policy-relevant time scales, but such an outcome is not inevitable with the consumption of biologically based feedstocks. The amount of biologically based feedstocks consumed [...] during a year may be partially or completely balanced by the amount of feedstock that grows during the year.2 [EPA-HQ-OAR-2022-0985-1615-A1, pp. 1 - 2]

1 U.S. Environmental Protection Agency, Accounting Framework for Biogenic CO2 Emissions from Stationary Sources, September 2011 https://www.epa.gov/sites/default/files/2016-08/documents/biogenic-co2-accounting-framework-report-sept-2011.pdf

2 Ibid

For both of these reasons, the Agency should reconsider the methodology used to calculate GHG emissions from heavy-duty vehicles. Applying a life cycle analysis, instead of counting emissions solely from a vehicle's tailpipe, would more accurately reflect the relative climate impacts of each technology. [EPA-HQ-OAR-2022-0985-1615-A1, p. 2]

Organization: POET

EPA is not limited to considering only tailpipe emissions in developing its proposed standards. Indeed, the rule would arguably be arbitrary and capricious if it were only to address tailpipe emissions. EPA should also credit lifecycle GHG emissions reductions. The reason for this is straightforward. GHGs are not like other regulated air pollutants: they are a global contaminant. The endangerment finding that motivated EPA to issue the Proposed Rule recognized that GHGs are problematic wherever and whenever they are emitted, not just when they are released from a single point in their lifecycle such as at a tailpipe. Focusing only on tailpipe emissions ignores the significant lifecycle GHG emissions reductions that renewable fuels offer by displacing fossil fuels. It also ignores that tailpipe-focused solutions, such as electrification or hydrogen-based technologies—though they are becoming greener—still largely depend on fossil fuels and carbon-intensive processes that release significant upstream emissions. [EPA-HQ-OAR-2022-0985-1528-A1, p. 2]

It is also worth noting that, even if EPA does not adopt the lifecycle approach to assess GHG emissions from heavy-duty vehicles, it could still distinguish between biogenic and fossil carbon sources and credit the former as carbon neutral. This approach would at least recognize the carbon neutrality of combusting renewable fuels. [EPA-HQ-OAR-2022-0985-1528-A1, p. 2]

EPA Has the Authority to Set GHG Emissions Standards Based on Lifecycle GHG Emissions Reductions, Rather Than Standards Based Only on Reducing Tailpipe Emissions. [EPA-HQ-OAR-2022-0985-1528-A1, p. 7]

EPA has broad authority under Clean Air Action 202 to set vehicle emissions standards as it sees fit. That authority necessarily extends not only to tailpipe emissions reductions; it also includes other emissions in the fuel and vehicle manufacturing lifecycle. [EPA-HQ-OAR-2022-0985-1528-A1, p. 7]

Clean Air Act 202(a) allows EPA to set vehicle emissions standards for any air pollutant the Administrator determines may reasonably be anticipated to endanger public health or welfare. EPA may regulate emissions of such a pollutant ‘from any class or classes of new motor vehicles or new motor vehicle engines.’19 The statute does not expressly limit EPA to regulating emissions only from vehicle tailpipes or the engines themselves. Instead, it is broadly worded to include emissions of any air pollutant that ‘cause[s], or contribute[s] to, air pollution.’20 Lifecycle (upstream) emissions, especially for GHGs, fit that description,21 as EPA itself has recognized.22 [EPA-HQ-OAR-2022-0985-1528-A1, pp. 7-8]

19 42 U.S.C. 7521(a)(1).

20 Id.

21 Other constraints in 202(a) do not bar EPA from considering lifecycle emissions. The statute states that EPA’s standards must apply to vehicles and engines during their useful life, cannot take effect until after a time that the EPA Administrator determines is necessary for the development and application of the technologies needed to meet EPA’s standards, and must consider costs. Id. 7521(a). None of those provisions prohibit EPA from considering a vehicle’s lifecycle GHG emissions in regular a class or classes of motor vehicles.

22 Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29184 at 29197 (May 5, 2023).

Other provisions setting specific requirements for certain vehicles and pollutants do not apply. GHGs are not like 'hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate matter.'23 EPA's general 202(a) authority controls. And in Massachusetts v. EPA, the Supreme Court confirmed that EPA has broad authority to regulate additional, non-specified pollutants, provided EPA determines they endanger the public health or welfare.24 [EPA-HQ-OAR-2022-0985-1528-A1, p. 8]

23 See 42 U.S.C. 7521(a)(3)(A)(i).

24 See Massachusetts v. EPA, 549 U.S. 497, 506-07 (2007).

Courts interpreting 202 have also found that EPA has significant discretion. That discretion is necessary to allow EPA to leverage its expertise to address the many complicated scientific, design, and engineering concerns regarding how best to reduce air pollution. The D.C. Circuit has observed that '[m]anufacturers produce a wide variety of motor vehicles of different sizes, some using different engine technologies resulting in unusual emission characteristics.'25 If EPA's authority to set emissions standards is flexible enough to address those varying vehicle characteristics, it should be similarly flexible to allow EPA to credit lifecycle emissions reductions. [EPA-HQ-OAR-2022-0985-1528-A1, p. 8]

25 Nat. Res. Def. Council, Inc. v. U. S. Envtl. Prot. Agency, 655 F.2d 318, 322 (1981).

EPA's approach in the Proposed Rule is consistent with this view. EPA observes that, '[s]ince the earliest days of the CAA, Congress has emphasized that the goal of section 202 is to address air quality hazards from motor vehicles, not to simply reduce emissions from internal combustion engines to the extent feasible.'26 While EPA is referring to electric vehicles, that sentiment applies to other technologies as well. The goal is not simply to reduce ICE emissions. It is to address air quality hazards from carbon dioxide emissions associated with classes of vehicles. One ton of GHG emissions causes the same harm whether resulting from tailpipe emissions or upstream emissions. And, in both cases, the emissions would not occur but for the production of a class or classes of vehicles. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 8-9]

26 88 Fed. Reg. at 25950.

Therefore, GHG emissions from any phase of a vehicle's lifecycle should be equally subject to 202(a). Biofuels address those hazards caused by GHG emissions by reducing emissions on a lifecycle basis. At a minimum, the benefits generated by bioethanol in reducing lifecycle GHG emissions should be recognized through a crediting mechanism or other compliance flexibility benefits. [EPA-HQ-OAR-2022-0985-1528-A1, p. 9]

EPA's discussion of the legislative and regulatory history regarding automotive emissions under the Clean Air Act repeatedly refers to alternative power sources and fuels.27 Nothing in the record suggests that alternative power sources excluded other low-carbon alternatives, such as renewable fuels. Both the goals of the Clean Air Act and legislative and regulatory history support EPA's broad authority to address motor vehicle carbon emissions beyond just electrification. [EPA-HQ-OAR-2022-0985-1528-A1, p. 9]

27 Id.

EPA's proposed rule for light-duty and medium-duty vehicles, in fact, confirms that EPA believes it can regulate upstream emissions under 202. EPA notes that current regulations would require 'upstream emissions accounting for BEVs and PHEVs as part of a manufacturer's compliance calculation' to begin in MY 2027.28 EPA is proposing to eliminate that upstream emissions accounting.29 But the fact that the current regulations do account for upstream emissions demonstrates that EPA knows it has the power to account for upstream, i.e., lifecycle emissions. EPA clearly has this authority. EPA is not limited only to regulating tailpipe emissions. [EPA-HQ-OAR-2022-0985-1528-A1, p. 9]

28 88 Fed. Reg. at 29197.

29 Id.

Incorporating lifecycle emissions reductions into the Proposed Rule is the best reading of 202 for carbon dioxide as an air pollutant, because, unlike other regulated substances, carbon dioxide (as a GHG) is a global, rather than a local, pollutant, meaning that it does not necessarily cause adverse effects in the specific places where emitted. GHGs instead result in adverse effects at a global scale when they enter the atmosphere and linger, contributing to rising sea levels and eroding coastlines, flooding, more frequent and intense storms, melting polar icecaps, and droughts. The proposed standards that concentrate only on GHG tailpipe emissions could end up promoting technology pathways that would eliminate tailpipe emissions from the transportation sector while inadvertently increasing lifecycle GHG emissions. A GHG emissions rule that results in an increase in net GHG emissions is the very definition of arbitrary and capricious. [EPA-HQ-OAR-2022-0985-1528-A1, p. 9]

Failing to Account for Lifecycle Emissions Could Lead to Absurd Results. [EPA-HQ-OAR-2022-0985-1528-A1, p. 11]

EPA risks implementing a rule that leads to absurd results if it omits the lifecycle emissions benefits of biofuels. The rule could end up incentivizing transportation fuels that greatly increase upstream carbon emissions in the near- and medium-term. Today, electricity generation remains largely fossil-based. Increasing electricity demand in the near-term with ZEVs could drive up fossil fuel use while the country sorts through the many challenges associated with developing renewable electric generating facilities and the transmission capacity to support the clean power those facilities will produce.33 Additionally, EPA ignores that the higher demand for electricity will lead to increased emissions of both methane and nitrous oxide, potent GHGs that are released when electricity is generated using fossil fuels.34 BEVs will also require extracting certain metals at a far larger scale. That extraction can be energy-intensive and much of it occurs in countries where mining can severely degrade the environment, including by clear-cutting rainforests that store vast amounts of carbon.35 [EPA-HQ-OAR-2022-0985-1528-A1, p. 11]

33 See Attachment A, Trinity Consultants, Review of U.S. EPA's Proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, at 8-10 (June 16, 2023).

34 Id. at 9 (noting that the 'failure to properly address the overall impact of the Proposed Rule on methane and nitrous oxide emissions overstates the actual GHG emissions reduction which are shown in Table 4-15 of the DRIA').

35 J. Emont, EV Makers Confront the 'Nickel Pickle,' Wall Street Journal (June 4, 2023), https://www.wsj.com/articles/electric-vehicles-batteries-nickel-pickle-indonesia-9152b1f (describing the EV makers shift from cobalt mining in the Democratic Republic of Congo to nickel mining by clear-cutting Indonesian rainforests).

Incorporating renewable fuels could also shore up the rule against a challenge that it violates West Virginia v. EPA. That case overturned the Clean Power Plan because the Supreme Court determined that the Plan went too far toward requiring a shift from conventional sources of electricity generation to renewables, which in the Court's view, would have substantially restructured the American energy market.42 Crediting biofuels in the Proposed Rule would have the opposite effect. Biofuels are already a key component of the American transportation sector. This is not the case in which, as the Supreme Court stated in West Virginia v. EPA, the 'history and the breadth of the authority that [EPA] has asserted, and the economic and political significance of that assertion, provide a reason to hesitate before concluding that Congress meant to confer such authority.'43 Congress has given EPA plain authority to incentivize biofuels under the Clean Air Act and RFS. Those preexisting programs have encouraged producers to make billions of gallons of renewable fuels every year. Congress' mandate was clear. The RFS was meant to encourage the production of renewable fuels that are 'used to replace or reduce the quantity of fossil fuel present in a transportation fuel.'44 EPA must interpret its 202 authority in a manner that is consistent with the other directives that Congress has imposed on the transportation sector. [EPA-HQ-OAR-2022-0985-1528-A1, pp. 12-13]

42 See W. Va. v. EPA, 142 S. Ct. at 2616.

43 Id. at 2595 (quotations omitted).

44 42 U.S.C. 7545(o)(1)(J).

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

In addition, CARB funded research by UC Davis,13 shows a PHEV 60 has the same life cycle GHG emissions as a Tesla model S because of the weight of the Tesla and it has fewer GHG life cycle emissions than a heavier BEV with 400- or 500-mile AER. Toyota's publicly available tool also correctly shows this result.14 Furthermore, the UC Davis analysis does not include battery manufacturing GHG emissions. Using data from the USDOE cradle to grave analysis,15we estimate that adding 350 miles more of AER adds about 10 grams per mile of GHG emissions to the above analysis for a light duty EV. Further, a flex fuel vehicle requirement to enable low carbon fuels for these stronger PHEVs would further lower their life cycle GHG. The figure below further illustrates the large emissions from battery manufacturing for light duty BEVs and PHEVs and helps illustrate the issue for heavy duty BEVs and PHEVs. [EPA-HQ-OAR-2022-0985-1647-A2, pp. 13 - 14.] [Refer to the graph on p. 14 of docket number EPA-HQ-OAR-2022-0985-1647-A2.]

13 https://ww2.arb.ca.gov/sites/default/files/2020-06/12-319.pdf Figure 82

14 GitHub - khamza075/PVC: A software for assessing the efficacy of various vehicle powertrains at mitigation of greenhouse gas emissions. Also see https://app.carghg.org/

15 See page 143 at https://greet.es.anl.gov/publication-c2g-2016-report. Extrapolate from 210 to 410-mile all electric range and divide by 150,000-mile vehicle life.

Organization: Transfer Flow, Inc.

A singular fixation focusing only on tailpipe emissions reduction does not consider important life-cycle emission analysis.3 Vehicular emissions should be considered from the cradle to the grave, from manufacturing and usage to end-of-life disposal of both the vehicle and the energy source used to power the vehicle or equipment. Requiring new vehicles sold to either be battery electric vehicles (BEVs), plug-in electric hybrids (PHEV), or fuel-cell battery electric vehicles crowds out and ignores other viable and proven near-zero technologies. [EPA-HQ-OAR-2022-0985-1534-A1, p. 3]

3 https://www.youtube.com/watch?v=S1E8SQde5rk

Implementation of any and all available near-zero technologies should be encouraged for a multitude of reasons. All near-zero technologies should be ramped up and implemented as quickly as feasible in order to help meet the EPA's pollution prevention goals. Encouraging the sales of all new vehicles or equipment to contain some sort of electric vehicle technology and, therefore, also contain a heavy-duty battery instead of encouraging the adoption of the plethora of currently available near-zero technologies is a disservice to the citizens of our great country. [EPA-HQ-OAR-2022-0985-1534-A1, p. 3]

Organization: Valero Energy Corporation

E. EPA has not adequately considered the consequences of the proposed rule with regard to byproducts and coproducts of petroleum refining.

In its consideration of demand destruction on domestic petroleum refining, EPA fails to consider the full breadth of products made from petroleum that are consumed every day in the United States. A partial list of more than 6,000 products made from oil and gas is provided in Table 1. [EPA-HQ-OAR-2022-0985-1566-A2, p. 44.] [See Table 1, Products Made from Oil and Gas, on page 45 of docket number EPA-HQ-OAR-2022-0985-1566-A2.]

EPA fails to consider how the U.S. will source asphalt to pave its roads, tires to support its electrified transportation sector, and a multitude of other consumer products and pharmaceuticals that are integral to day-to-day life of Americans if domestic petroleum refining is phased out or disrupted.212 For example, the amount of asphalt produced is in direct correlation to the amount of liquid transportation fuel refined. Asphalt is a co-product and cannot be independently manufactured.213 The loss of domestic asphalt production would force rail transport of higher volumes and from further distances, driving up costs and GHG emissions, and compounding the burden on communities already impacted by excessive train lengths that in some cases have resulted in fatalities.214 If the United States' asphalt needs were to exceed the potential for railed supplies, incremental asphalt would need to be imported by marine vessel, likely from Asia. EPA's proposal neither accounts for the GHG burdens being outsourced by EPA's policies nor the logistics-related increases in GHG emissions. [EPA-HQ-OAR-2022-0985-1566-A2, p. 44]

212 See Table 1, below.

213 https://www.wsj.com/articles/you-cant-build-roads-without-oil-fossil-fuel-refining-asphalt-renewables-synthetic-materials-consumer-products-biden-11664982934

214 https://www.washingtonpost.com/nation/interactive/2023/long-trains-block-intersections-paramedics/

Further, the proposed rule fails to account for how the amount of sulfur available in the United States will be adversely impacted. The chemical can be used in "construction materials, traditional batteries, rubber (vulcanization), pharmaceuticals, paper bleaching, water treatment, cosmetics/skin care, detergents,…and most importantly fertilizers."215 Most of the world's sulfur is now produced through the Claus Recovery Method, which is used at oil and natural gas refineries to keep sulfur dioxide from escaping into the atmosphere.216 On average, this process in the U.S. alone creates 8 million tons of sulfur every year.217 Without this product, there would be a sulfur deficiency in many crops throughout the U.S.218 It is a key ingredient in phosphate fertilizers with nearly 50% of sulfur supply worldwide being used in this manner.219 Total U.S. economic impact is about $130 billion with 487,330 fertilizer industry related jobs in the U.S. with wage earnings of $34.31 billion.220 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 44 - 45]

215 Glossary, The Sulphur Institute, https://www.sulphurinstitute.org/about-sulphur/glossary/#uses (last visited June 2, 2023).

216 B. Gene Goar, Sulphur Recovery Technology, Conference abstract from the American Institute of Chemical Engineers Spring National Meeting (Apr. 1986), available at https://www.osti.gov/biblio/5599326.

217 Mineral Commodity Summaries 2023, United States Geological Survey, at p. 170-71, https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf.

218 The Sulphur Cycle, The Sulphur Institute, https://www.sulphurinstitute.org/pub/?id=30177057-bc30-5bd9-0719-6380f37c76f9.

219 Chemical Economics Handbook, S&P Global Commodity Insights, https://www.spglobal.com/commodityinsights/en/ci/products/sulfur-chemical-economics-handbook.html.

220 Fertilizer Grows Jobs: Feeding Crops While Growing the U.S. Economy, The Fertilizer Institute (2020), http://economicimpact.tfi.org/.

Sulfur is also used in manufacturing copper and lithium for batteries. For copper smelting in the U.S., "approximately 1.4 million tons of [sulfur] is required."221 For the electric vehicle future that some agencies anticipate, an additional 85,000 tons of sulfur would be needed in only two years for copper production alone.222 For lithium, the "crushed ore is leached for several days with diluted [sulfuric] acid."223 With current projections for the lithium need, it is possible 21% of current sulfur will be used in the process.224 [EPA-HQ-OAR-2022-0985-1566-A2, p. 45]

221 Brief for the Sulfur Institute as Amici Curiae Supporting Petitioner at 13, Nat'l Res. Def. Council v. National Highway Traffic Safety Admin. (2022) (No. 22-1080).

222 Id.

223 Id.

224 Id. at 14. For more information on the impacts of EVs on sulfur supply, see Brief for the Sulfur Institute as Amici Curiae Supporting Petitioner at 4, Nat'l Res. Def. Council v. National Highway Traffic Safety Admin. (2022) (No. 22-1080).

This list above from the U.S. DOE makes clear that "car battery cases," "car enamel" and "automotive parts" are "products made from oil and natural gas." Petroleum products have been key components of EV innovation, making vehicles lighter and more efficient through the application of plastics, engineered polymers, and fiber-reinforced composites integral to EV design.226 EVs need petrochemicals, and petrochemicals will continue to play a critical role in further reducing the weight of EVs, which will help increase their range.227 The HD Phase 3 GHG Rule should not only account for leakage associated with the production of petrochemicals necessary to produce EVs, but also analyze the impact discontinued oil and refining production will have on the U.S.'s ability to encourage EV production to scale with its proposals. [EPA-HQ-OAR-2022-0985-1566-A2, p. 46]

226 https://www.visualcapitalist.com/how-much-oil-electric-vehicle/

227 Id.

III. Transportation decarbonization should embrace all technologies.

Exclusive reliance on ZEV technologies ignores both the full lifecycle GHG emissions of ZEVs and the benefits of low-carbon liquid fuels and other emerging technologies. EPA should evaluate the merits of all fuels and vehicle technologies on a full lifecycle basis. [EPA-HQ-OAR-2022-0985-1566-A2, p. 50]

Despite being treated by regulators as zero-emission vehicles, electric vehicles are not emissions free – in fact, when it comes to HDV, they are not even the most effective technology available today to reduce GHG emissions. Low carbon fuels have been and will continue to be essential to decarbonization of the transportation sector. Over the past few years, commenters and other entities have provided EPA information about other available and emerging technologies. EPA should consider information provided and seek out additional information in order to complete a robust analysis of available and emerging technologies that can include liquid fuels and will achieve similar emission reductions but involve less risk than a ZEV only approach. [EPA-HQ-OAR-2022-0985-1566-A2, p. 50]

For example, a lifecycle analyses conducted by Southwest Research Institute finds that GHG emissions from a heavy-duty internal combustion engine vehicle ("ICEV") that runs on renewable diesel with a carbon intensity of 25 gCO2e/MJ results in 60% fewer lifecycle GHG emissions when compared to a battery electric vehicle ("BEV"), as illustrated by Figure 9. [EPA-HQ-OAR-2022-0985-1566-A2, p. 50. See Figure 9, Heavy-Duty Long-Haul Vehicle Lifecycle Emissions, on page 51 of docket number EPA-HQ-OAR-2022-0985-1566-A2.]

California has felt the real-world implications of its climate policy with rolling blackouts and sky-high energy prices; it is now implementing a broader approach to GHG reductions that includes investment in carbon capture and fossil fuel infrastructure to ensure future system reliability. EPA's proposal need not focus on an arbitrary rejection of continued reliance on liquid fuels infrastructure; rather, it can and should present a transparent, technology-neutral approach that allows for innovation that would better serve America's most vulnerable communities. [EPA-HQ-OAR-2022-0985-1566-A2, p. 51]

EPA should include consideration of emerging innovative approaches and new technologies for reducing GHG emissions from ICEVs, such as on-board carbon dioxide (CO2) capture and subsequent sequestration. Analysis from a Northwestern University research team has shown that cost-effective diesel tractor trucks combined with well-developed on-board carbon capture technologies offer a practical way to make large freight vehicles carbon neutral when running on fossil fuels and even carbon negative when running on biofuels.235 Given existing liquid fuel infrastructure, "rapid adoption of such vehicles should be possible and CO2 emissions can be continuously decreased."236 Further, EPA should consider how to reconcile its efforts in the vehicles rules with the mandates of the RFS, and should reconsider how it evaluates ICE vehicles' GHG emissions so that appropriate recognition is given to lifecycle reductions achieved through the RFS, state carbon-intensity reduction measures such as the California Low

Carbon Fuel Standard, and emerging measures such as carbon sequestration. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 51 - 52]

235 Schmauss, Travis A. & Barnett, Scott A, "Viability of Vehicles Utilizing On-Board CO2 Capture," ACS Energy Letters 2021, 6, 8, 3180-3184 (August 18, 2021) https://doi.org/10.1021/acsenergylett.1c01426.

236 Id.

EPA's asserted authority also implicates another key "consideration[] of national policy": national security. NHTSA has acknowledged that the United States "has very little capacity in mining and refining any of the key raw materials" for electric vehicles. 86 Fed. Reg. 49,602, 49,797 (Sept. 3, 2021). And unlike biofuels and petroleum, most of the supply of critical components of batteries and motors for electric vehicles is controlled by hostile or unstable foreign powers, in particular China. Shifting to electric vehicles would thus make the American automotive industry critically dependent on one of the Nation's primary geopolitical rivals.

Specifically, China is by far the largest source of graphite, which is used for lithium-ion batteries, and rare-earth elements like neodymium, which are used for permanent-magnet motors. By some estimates, a transition to electric vehicles would raise demand for graphite by 2500% and rare-earth elements by 1500%. International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* 97 (March 2022). Another key component of lithium batteries, cobalt, is controlled by the Democratic Republic of the Congo, which is implicated in significant human-rights concerns (including child labor), and Chinese state-owned enterprises have a controlling interest in 70% of Congo's cobalt mines. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 55 - 56]

Organization: Western States Trucking Association (WSTA)

We have been extensively involved in the efforts to change both California and federal emissions standards and request that USEPA conduct a full life-cycle assessment of battery electric vehicles ("BEV") before adopting the proposed rule. [EPA-HQ-OAR-2022-0985-1533-A1, p. 1]

Our request is motivated by our conclusion that BEVs are not "zero emissions" and have significant environmental and social impacts that USEPA should not ignore. The attached documents calculate that BEVs have a carbon intensity of 62 to 90 (gCO2e/MJ) in California when combining the energy required to produce electricity to charge the BEVs and the manufacturing process of the battery from the mining of the minerals though the battery and vehicle manufacturing. [Attachments "Western States Trucking Association Comments to California Air Resources Board" and "Comments to the California Air Resources Board regarding environmental justice and the technical report 'Lifecycle Greenhouse Gas Impacts of Electric Vehicle Manufacturing'" can be found on pages 3-40 of EPA-HQ-OAR-2022-0985-1533-A1.] This has implications for a national rule as USEPA proposes.

Organization: Westport Fuel Systems

Well To Wheels Emissions Compared to Tailpipe Only Measurements

We urge the EPA to consider the merits of well to wheels (WTW) emissions rather than tailpipe only emissions in the evaluation of technologies in the rule. For example, a vehicle equipped with an HPDI fuel system using RNG provides a CO2 reduction of approx. 20% tank to wheels (mode dependent) compared to a reference diesel vehicle. It also has low CH4 emissions (current European product: < 0.5g/kWh as per Euro VI). The EPA GHG Standards being a CO2 equivalent standard encompassing CH4, it accomplishes the over-arching objective of reducing GHG emissions. However, on a WTW basis, the GHG reductions – including CO2, CH4 and N2O measured on a CO2 equivalent (CO2e) basis – realized with an HPDI system fuelled by RNG are far greater and more accurately represent the actual vehicle emissions. Indeed, the large benefits of RNG are derived from the Well To Tank portion. In California, the RNG vehicle fuel portfolio has been carbon negative since 20201. In North America overall, 69% of all on-road fuel used in natural gas vehicles in 2022 was RNG2. According to NGVAmerica, RNG used as a transportation fuel offset a total of 5.63 million tons of CO2e in 2022. [EPA-HQ-OAR-2022-0985-1567-A1, p. 4]

1 Source: Fly in pg 1 (ngvamerica.org)

2 Source: NGV RNG Driving Down (ngvamerica.org)

The full impact of vehicle CO2 emissions is represented best by a full lifecycle analysis or WTW emissions rather than tailpipe only measurements. We encourage the EPA to consider how the Phase 3 Rule can reflect the value of using low carbon fuels, such as RNG and green hydrogen in the calculations of zero emissions vehicles. While a tailpipe measurement gives a particular result, the measurement cannot account for the full impacts of the fuel used, even for BEVs. [EPA-HQ-OAR-2022-0985-1567-A1, p. 4]

EPA Summary and Response:

Summary:

Notwithstanding EPA's explicit statements that it was "continuing and … not reopening the existing approach … that compliance with the vehicle exhaust CO2 standards is based on CO2 emissions from the vehicle," 88 FR at 25956/1, a number of commenters maintained that lifecycle GHG emissions should be reflected in the emission standards themselves as well as in the compliance regime for the standards (i.e., certification). These commenters included fuel suppliers, fuel producers, several fleets and dealers, and a few environmental groups. No entity regulated by this rulemaking raised this issue. In addition, no commenter questioned the appropriateness of EPA considering upstream emissions as part of its overall assessment of CO_2 emission impacts, non-CO_2 emission impacts, or use in cost-benefit calculations. Borg Warner explicitly endorsed EPA's approach to counting BEVs and FCEVs as zero emitting for standard setting and compliance purposes.

The remainder of this section addresses exclusively the issue of life cycle in the standard setting process and in determining compliance with standards. Comments relating to EPA's consideration of upstream emissions in calculating emission impacts are addressed in section 13 of this document and other sources there cited.

A threshold issue addressed by some of the commenters is whether EPA has the legal authority to predicate using some type of lifecycle approach in standard setting. Some of these commenters (Clear Flame, POET) cited the discretion afforded by CAA section 202 (a) (1).

Other commenters cited CAA sections 202 (a)(3)(A) and 202 (a)(4)(A) and (B) (Clean Fuels Development Coalition, AFPM).

Most of these commenters' arguments were based on considerations of policy. They point out that ZEVs in fact have greenhouse gas emissions associated with their production and their fuel source, i.e., emissions upstream of the vehicle tailpipe (and some commenters would consider downstream emissions as well, such as emissions attributable to battery disposal). Given these emissions, they maintain, it is more consistent with the Act's emission reduction goals, and the technology-neutral basis of the Phase 3 rule, to account for those emissions in the standards (e.g., comments of ACEEE, AmFree, Delek, Clear Flame). Certain proponents of alternative fuel use presented studies and other information which they characterized as showing that ICE vehicles powered by various types of biofuels would emit less than a comparable BEV vehicle, and, in any case, alleged that emission reductions from alternative fuel-powered vehicles would accrue immediately rather than after fleet turnover. (Comments of Alliance for Vehicle Efficiency, ACEEE, API, Valero.) Some commenters went further and argued that EPA would be acting arbitrarily by ignoring lifecycle impacts in the standards, since this would amount to just moving pollution around rather than reducing it, and would otherwise arbitrarily fail to solve the problem the rule is addressing. (Comments of American Fed. of Petroleum Mfr's, POET).

Commenters were divided as to how a lifecycle approach could be reflected in the standards. Indeed, it was not always clear if the commenters intend for the approach only to apply to standards for ZEVs, or for all vehicles. With respect to ZEVs, suggestions ranged from accounting only for GHG emissions from the electricity generating source (potentially including an accounting for electricity lost in transmission and distribution), to emissions from battery manufacture, battery disposal, electricity supply chains, and mining of materials critical to battery production (including from overseas mining venues). (e.g., Comments of AFPM, API, National Ass'n of Convenience Stores, Western Trucking, Lynden, Valero Energy Corporation.) Commenters were unclear as to whether their suggestions applied to GHG emissions only, or to other pollutants as well (although some pointed out that GHGs are exceptional, being global pollutants, such that a lifecycle accounting was justified). (Comments of Clear Flame, Delek.)

Some of these same types of comments addressed FCEVs and Hydrogen ICE vehicles:

- AVE noted that EPA's narrow focus on tailpipe emissions means that EPA does not recognize H2-ICE vehicles that use a pilot ignition for combustion as ZEVs, even though H2 ICEVs reduce CO2 emissions compared to today's diesel trucks. Though ACEEE observed that EPA proposed to expand the definition of ZEV to include H2 ICEVs.
- ACEEE described problems with considering H2-fueled vehicles as ZEVs, asserting that this strategy adds to the risk of zero-upstream accounting (i.e., not considering lifecycle emissions). They believe that upstream emissions should be accounted for in ZEV compliance values and, if EPA is not prepared to do so by MY 2027, then EPA could phase in a remedy during the timeframe of the Phase 3 rule.
- Ben Banks suggested there are possible benefits to focusing on hydrogen or other fuels like renewable diesel, when considering a total lifecycle carbon footprint. Hexagon Agility similarly asked for consideration of emissions credits for other clean fuels like renewable natural gas. ClearFlame believes the rule should not be limited to electric and hydrogen vehicles and should treat biogenic carbon emissions from biofuels as zero-emissions at tailpipe.

- Chevron cited a study that showed that lifecycle GHG emission from various HD powertrain technologies vary based on production pathway, suggesting that multiple factors should come into play when making vehicle choices.
- CFDC noted the term ZEV is misleading, given that ZEVs have upstream emissions. Lubrizol also called for lifecycle emissions accounting. MFN noted that a lifecycle analysis, including for all forms of hydrogen, is necessary to consider localized environmental justice harms. Neste, POET, and Westport stated that if emissions from hydrogen production are not accounted for, there is merely a shift in emissions from tailpipe to upstream.

These comments are summarized and responded to broadly throughout this section. Additional comments related to calculating emissions impacts associated with upstream hydrogen are in Section 13.

Several commenters noted that EPA also did not consider emissions from mining and resource extraction processes as well as from battery production:

> *AmFree et al.: The International Energy Agency's discussion of emissions from mining illustrates this point. According to the IEA, "the production and processing of energy transition minerals are energy-intensive" and involve "relatively high emissions." For this reason, producing an electric vehicle is a more carbon- intensive process than producing a conventional one.*

> *AFPM: The need for expanded grid capabilities simultaneous to expanded ZEV production places a more pressing demand on materials like copper and aluminum thereby increasing extraction and refining efforts throughout the global market.*

> *AFPM: The mining sector will also need to grow exponentially to meet ZEV demand as anticipated, and required, by the Proposed Rule. Mining is an energy- and environmental resource-intensive activity. … One study demonstrates that the steps for extracting, and processing critical minerals are responsible for approximately 20 percent of the lifecycle GHG emissions.*

> *Steven G. Bradbury: But they completely ignore the very large increase in carbon dioxide emissions that would necessarily occur from the projected expansion in the production of EV batteries.*

Response:

EPA reiterates, as it did at proposal, that it is not reopening the issue of a lifecycle approach to Phase 3 emission standards. At the same time, EPA has a legal obligation to respond to the comments it receives. In responding, EPA notes that we are not here "undertak[ing] a serious, substantive reconsideration of the existing" position. *Growth Energy v, EPA*, 5 F. 4th 1, 21 (D.C. Cir. 2021). The following responses reflect EPA's prior statements addressing this issue, not any type of substantive reassessment. See *Pub. Emps. for Env't Resp. v. EPA*, 77 F. 4th 899, 913 (2023) ("PEER cites no cases, and we are aware of none, in which an agency reopened an issue by merely responding to a petition for rulemaking submitted by a third party," citing *Am. Rd.& Transp. Builders Ass'nv. EPA,* 705 F. 3d 453, 457 (D.C. Cir. 2013) ("[A]n agency's response to a petitioner's comments cannot provide the sole basis for reopening").

EPA is adhering to the approach from Phase 1 and 2: the section 202(a)(1) GHG emission standards for all heavy-duty vehicles, including ICE vehicles and ZEV, are based on emissions from the vehicle, and these are the standards to which the vehicles are certified. Indeed, this has been EPA's consistent approach to heavy-duty vehicle and engine standards since EPA began regulating the HD industry five decades ago: to establish standards and compliance based on emissions from the vehicle itself, not from other upstream or downstream sources. As EPA stated in the Response to Comments in the recent HD2027 final rule,

> EPA ... disagrees that it is required to perform a lifecycle analysis of vehicle and fuel production before setting engine and vehicle emission standards, or to treat emissions of air pollutants attributable to electricity generation, or the mining, production or disposal of batteries for electric vehicles, as emissions "from" new motor vehicles under CAA section 202(a). The Clean Air Act's entire structure evidences a clear divide between stationary sources (regulated under other sections of the Act, especially Title I) and mobile sources (regulated under Title II). There may be indirect impacts of stationary source regulation on mobile sources and vice versa, and it may be appropriate to consider those impacts in some circumstances. But it would be inappropriate and contrary to the plain text of the Clean Air Act to conflate the consideration of indirect impacts, when appropriate, with actually treating stationary source emissions as mobile source emissions. Cf. Coal. for Responsible Regul., Inc. v. E.P.A., 684 F.3d 102, 128–29 (D.C. Cir. 2012) ("EPA was not arbitrary and capricious by not considering stationary-source costs in its analyses"). EPA interprets the Clean Air Act as generally directing EPA to consider regulation of emissions for each sector according to the applicable statutory requirements for each program. While EPA may also elect to consider upstream emissions in certain appropriate circumstances, such consideration is not required by statute.[857]

EPA has also spoken to the enormous practical difficulties of trying to incorporate a lifecycle approach into the standard setting process. First, "even if we were able to accurately and fully account for life cycle impacts of one technology... this would not allow us to address life cycle emissions for other technologies...Given the complexity of these rules and the number of different technologies involved, we see no way to treat the technologies equitably". 81 FR at 73528/2. Commenters to this proposal did not address this concern. Nor did they address EPA's second reason for not considering the approach: "[t]his rulemaking ...is not regulating manufacturing processes, distribution practices, or the locations of manufacturing facilities. And yet each of these factors could impact life cycle emissions. So while we could take a snapshot of life cycle emissions at this point in time for specific manufacturers, it may or may not have any relation to life cycle emissions in 2027 (sic), or for other manufacturers." Id.

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[857] HD2027 RTC section 19.3 at 1180-81, available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1016AMU.pdf. See also *Motor & Equip. Mfrs. Ass'n, Inc. v. E.P.A.*, 627 F.2d 1095, 1118 (D.C. Cir. 1979) ("there is no indication that Congress intended section 202's "cost of compliance" consideration to embody "social costs" of the type petitioners advance. Every effort at pollution control exacts social costs. Congress, not the Administrator, made the decision to accept those costs. Section 202's "cost of compliance" concern, juxtaposed as it is with the requirement that the Administrator provide the requisite lead time to allow technological developments, refers to the economic costs of motor vehicle emission standards and accompanying enforcement procedures. … It relates to the timing of a particular emission control regulation rather than to its social implications.").

With respect to comments from alternative fuel providers, EPA notes (again) that there is no reason to "issu[e] rules that effectively would turn th[is] rul[e] into a fuel program." 81 FR at 73500/2 (Oct. 25, 2016). There already is a statutory program which encourages use of renewable fuels in transportation, including in heavy duty engines, which moreover requires EPA to consider lifecycle greenhouse gas emissions. Id.; see also 76 FR at 57124 (Sept. 15, 2011) (Renewable Fuel Standards provisions, not section 202 (a)(1), are the appropriate means of evaluating and encouraging use of alternative fuels). The RFS program is the Congressionally mandated and appropriate means of evaluating lifecycle implications of biofuels, and of encouraging their use, as appropriate.[858] There is no legal mandate or otherwise compelling reason to achieve the same purpose through Section 202(a)(1) -- a provision directed at reducing emissions "from … motor vehicles." Thus, "EPA's engine and vehicle emission standards … have been in place for decades as tailpipe standards. [EPA] find[s] no reasonable basis in the comments or elsewhere to change fundamentally from this longstanding approach." 81 FR at 73528/2. As stated in the HD Phase 2 rulemaking, "[t]he agencies are not issuing rules that effectively would turn these rules into a fuel program, rather than an emissions reduction and fuel efficiency program." 81 FR at 73500.

Lifecycle emissions, especially those related to resource extraction, affect the total environmental footprint of ZEVs and ICE vehicles. However, doing so in the context of modeling emission inventory impacts attributable to the final GHG standards is fraught and presents scope challenges. For example, resource extraction is a very large worldwide industry that supports many other manufacturing industries. Attributing any activity specifically to the standards is very difficult and highly uncertain. Another challenge is that the emissions from the mining sector are constantly changing as processes evolve, power grids become cleaner, and the areas of the mining itself change. See 81 FR at 73528 noting similar concerns. Therefore, calculating future emissions for this sector, especially in later years such as through the 2030s and 40s, is exceedingly difficult. These arguments also exist in the context of battery production itself. We note further that for a comparison to be valid, there would need to be an accounting of emissions associated with all aspects of petroleum extraction, all aspects of mineral extraction needed for catalytic converters (rhodium, palladium, platinum), and all aspects of lead acid battery production and subsequent management, which the commenters do not appear to advocate.

EPA also notes that accounting for these upstream emission processes in the context of an increase in ZEV production while failing to do equivalent accounting for a reduction in ICE production would unreasonably skew the emission impacts estimates. Many of the same metals that are in demand for ZEV production would also be in demand for ICE production, so whether the standards would truly result in an increase in all mining, resource extraction, and production emissions is not clear. And, because such a broad accounting of these emission processes for both ICE and ZEV vehicles would include emissions from around the world, accounting for these emissions presents scope challenges.

[858] To the extent the RFS statute is of any relevance in understanding section 202(a)(1), but see CAA section 211(o)(12) (savings clause), it indicates that when Congress wanted the agency to consider lifecycle emissions, it knew how to say that clearly. See also 26 USC 45V (providing a credit for clean hydrogen considering certain lifecycle emissions). Sections 202(a)(1)-(2) do not contain any such language, and particularly in light of the Act's overall division between mobile and stationary source regulation, any mandate to consider lifecycle emissions ought not to be inferred.

EPA notes further that the emission benefits of certain alternative fuels are recognized at the tailpipe (in addition to whatever credit may be obtained under the RFS program). 76 FR at 57124. In fact, EPA has charted out a non-ZEV compliance pathway that includes substantial percentages of alternative fueled vehicles with ICE. See preamble section II.F.4. In response to comments that alternative fuel vehicles can provide CO_2 emission reduction benefits immediately and without the need for new supporting infrastructure, to the extent that is true for vehicle emissions, EPA notes that pathways like this example potential compliance pathway remain an option. As further discussed in our response in RTC section 9.1, the existing test procedures set out in 40 CFR 1036.505 and 40 CFR 1036.550 allow for carbon-mass-specific net energy content of all carbon containing fuels to be accounted for in GEM. Low carbon fuels, like CNG and LNG, may be accounted for subject to certain requirements if the use of the fuel results in lower CO_2 emissions in the vehicle exhaust. However, to use fuels as part of the engines and vehicles certification, under our existing requirements the manufacturer is required to get approval from the EPA and one of the requirements of this approval is that the manufacturer must show that the vehicle and engine only use the specific fuel when operating in-use.

EPA notes further that the commenters maintaining that use of alternative fuels producing GHG emission benefits sooner (on a lifecycle basis) than ZEV deployment did not address the temporal issue of emissions associated with producing the additional quantities of agricultural biofuels. When crop production is expanded to produce more biofuels, a carbon debt is incurred through land use change emissions, by releasing carbon stored in vegetation and soil as one clears land and prepares it for cropping. That carbon debt must be "paid back" over time by displacing fossil fuel consumption with biofuels using the crops grown on that land. This 'debt' can require decades to pay back.[859]

Certainty of emission benefits (again, on a lifecycle basis) is by no means clear cut either. For example, in its recent RFS volume-setting rulemaking (the "Set Rule"), EPA analyzed the GHG-saving potential of soybean biodiesel, which is both the most widely-used domestic biofuel in the diesel pool and one of the biofuels most capable of increasing production to the magnitude needed for large-scale utilization within the HDV sector. EPA's analysis of the existing literature and comparison of biofuel modeling tools documented significant uncertainty regarding the GHG emissions profile of soybean oil biodiesel, including some uncertainty as to whether this fuel's GHG emission profile is favorable compared to diesel.[860]

EPA also notes the irony that many of the commenters raising concerns about lifecycle accounting are the same ones who claimed EPA's standards implicate the major questions doctrine because they represent a significant and novel expansion of EPA's regulatory authority. Despite their putative concern about the expansion of agency power, these commenters seem to suggest the agency should further extend its regulatory ambit under section 202(a)(1) to include a broad range of stationary sources, including not only major point sources, but area sources and

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[859] For discussion of the carbon debt and payback time see for example: Fargione, J., Hill, J., Tilman, D., Polasky, S., & Hawthorne, P. (2008). Land clearing and the biofuel carbon debt. Science, 319(5867), 1235-1238. For more recent modeling of the temporal profile of biofuel GHG emissions see Sections 6.7 and 7.7 of the EPA Model Comparison Exercise Technical Document (EPA-420-R-23-017):
https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017P9B.pdf

[860] See Chapter 4 of the Regulatory Impact Analysis (EPA-420-R-23-015) accompanying 88 FR 44468 and also EPA's Model Comparison Technical Document (EPA-420-R-23-017) accompanying this FRM.
https://www.epa.gov/renewable-fuel-standard-program/final-renewable-fuels-standards-rule-2023-2024-and-2025

agricultural operations, both domestic and foreign. A comprehensive lifecycle analysis of motor vehicle control technologies could be extraordinarily far ranging, including assessment of factors ranging from practices for clearing agricultural land for farming palm oil in Malaysia, to the environmental standards for cobalt mines in the Democratic Republic of Congo, to spills of diesel fuel at countless retailers across the United States. See the further response in RTC 17.2 below. And while a lifecycle analysis could potentially be less far-reaching, the commenters requesting lifecycle accounting uniformly failed to advance a coherent basis for why the statute requires or permits the lifecycle accounting line to be drawn at a particular industry or degree of nexus. See 81 FR at 73528/2 raising similar concerns. Regardless of whether the agency has authority to account for these or other lifecycle emissions in the manner advocated for by these commenters, we think that so extending the agency's authority is neither necessary nor appropriate for administering a statutory program focused on reducing vehicular emissions.

Responses to specific comments:

Summary:

EPA has legal authority to consider life cycle emissions in the standard setting process under CAA section 202(a)(1) given the breadth of discretion afforded by that provision. Further, the provision does not specify regulation from vehicles. Rather, it refers to standards applicable to emissions of air pollutants from a class or classes of motor vehicles which contribute to that air pollution. (Clear Flame, POET).

Response:

First, these commenters' reading of section 202(a)(1) is problematic. The provision refers to emissions "from any class or classes of new motor vehicles" and EPA's endangerment determination identified new motor vehicles – specifically, passenger cars, light-duty trucks, motorcycles, buses, and medium and heavy-duty trucks – as the classes contributing to the air pollution which endangers. EPA's contribution finding respecting these classes of motor vehicles considered only the emissions from the vehicles in the classes. See 74 FR at 66537-540 (Dec. 15, 2009.)[861] The finding did not consider emissions from other sources of air pollutants (e.g., mines, farms, power plants, refineries, etc.). Therefore, EPA does not perceive that the reference to 'class or classes' in section 202(a) advances the commenter's argument.

If the provision is read as discretionary, as the commenters urge, EPA has explained in past rules why it is inappropriate to exercise that discretion to include lifecycle-based standards. As noted and referenced above, there is both a clear demarcation in the CAA between stationary and mobile sources, and an entire statutory program devoted to consideration of alternative vehicular fuel use. There is no compelling reason to import all of those considerations into the section 202 (a)(1) standard setting process for heavy duty vehicles. As EPA has stated, this would turn an emissions program into a fuel program, and obliviate the distinction between the two now codified in the Act. See, e.g., 81 FR at 73500 (quoted above).

[861] See, e.g., 74 FR at 55538/1 (contribution finding relates to the "emissions from the source category"; id. at 55540/2 (contribution finding relates to "[e]missions from the CAA section 202(a) source categories constitute the major part of the emissions from the transportation sector" and id. showing transportation and electricity sector contributions separately. In addition, "motor vehicle" refers exclusively to vehicles, so the finding can only relate to vehicular emissions. CAA section 216 (definition of 'motor vehicle').

Summary:

CAA sections 202(a)(3)(A) and 202(a)(4)(B) authorize consideration of lifecycle emissions in the standard setting process. (Clean Fuel Dvl. Coal., AmFree, AFPM).

Response:

Section 202(a)(3)(A) is not applicable here. It applies to enumerated pollutants, not to GHGs. (Indeed, commenter POET noted this distinction.) EPA does agree that the provision can be potentially illustrative for purposes of interpreting section 202(a)(1), but disagrees that the reference to subcategorizing based on "type of fuel use" compels lifecycle standards as commenter Clean Fuel Development maintains. The natural meaning of that phrase is subcategorizing based on the fuel used by a vehicle, for example, gasoline versus diesel, not on lifecycle emissions relating to fuel type, recognizing for example that vehicles of different fuel types may have different emissions characteristics. Moreover, section 202(a)(3)(A)(ii) is discretionary ("the Administrator *may* base such classes or categories"), and so cannot be read to compel any particular approach.

Sections 202(a)(4)(A) and (B) are directed to whether emission control devices used to comply with the vehicular emission standards in vehicles might pose unreasonable safety risks. See section 202 (a)(4) (A) ("devices …used in a new motor vehicle"; "if such device … contributes to … unreasonable risk … in its operation or function"); and section 202(a)(4)(B) ("whether … the use of any device" affects emissions of unregulated pollutants, and whether any risk posed by "the use of such device" can be eliminated). These provisions consequently are directed at risks posed by devices used in the vehicle, not to upstream emissions. EPA has carefully evaluated the potential safety risks of ZEV technologies in preamble Section II, RIA Chapter 1, and RTC section 4.6. We note, moreover, the significant expansion of regulatory authority the commenter's approach suggests: to conform to section 202(a)(4) EPA must evaluate the public health, welfare, and safety risks associated with gasoline refining and distribution, electricity generation and transmission, mining, and agriculture, in the U.S. and in foreign nations. It would be odd, to say the least, for such a capacious command to lie hidden in an ancillary provision of the statute.

Summary:

Given that there are upstream and downstream emissions associated with BEVs, terming them zero emission vehicles is misleading. Without accounting for such emissions, EPA is improperly assessing the environmental impacts of its standards, and potentially just transferring pollution from one source to another. This can be demonstrated by an example: if a BEV were to be fueled by electricity from a stationary diesel generator, it would count as a zero emission vehicle, yet its overall impact would be the same as an ICE operating on diesel fuel. EPA's distinctions are consequently arbitrary, and potentially counterproductive. (AFPM, API, CFDC, Delek.)

Response:

EPA is not ignoring emissions from upstream sources. See Preamble section V, RIA Chapter 4, and RTC section 13. These analyses show that the net GHG emission impacts of the Phase 3 rule are overwhelmingly positive, taking into account GHG emissions from both vehicles and upstream sources. With respect to non-GHG emissions, when considering emissions from vehicles, refineries, and EGUs, by 2055 there are net decreases in emissions from all pollutants except $PM_{2.5}$; when the net changes in emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors (e.g., VOC, NOx,

SO_2) are considered together, there are positive $PM_{2.5}$ health benefits beginning in 2040 and, overall, a positive present value and annualized value of $PM_{2.5}$ health benefits when using a 2 percent and 3 percent discount rate. Thus, EPA does not accept the assertion in some of the comments (e.g., AmFree) that the Phase 3 rule fails to positively address the problem which prompts the need for the rule.

Second, the commenters ignore that upstream, and for that matter, downstream potential emission impacts from stationary sources are controlled via other EPA regulatory programs. Thus, electricity generation, battery manufacture, and recycling and disposal of spent batteries are all comprehensively regulated under other EPA programs. For example, EPA regulates electric generating units under many programs such as the Mercury and Air Toxics Standards (CAA), the Cross State Air Pollution Rule (CAA), the Cooling Water Intake Systems Rule (CWA), the Coal Combustion Residuals Rule (RCRA), the Steam Electric Power Generating Effluent Guidelines (CWA), as well as under various actions of particularly applicability such as State and Federal Implementation Plans to implement the National Ambient Air Quality Standards and the visibility protection program. See also 88 FR 24854 (proposing further controls on hazardous air pollutants emitted by steam electric power units), and 88 FR 33240 (May 11, 2023) (proposing GHG emission standards for existing coal- and oil-fired steam generating units, and for new and some existing gas fired steam electric generating units). With respect to the commenters' example of ZEVs being charged by electricity from a stationary source diesel generator, we note that notwithstanding some viral social media videos,[862] there is no evidence that this is happening in a way that significantly affects the emissions reductions achieved by the standards. Moreover, EPA notes that there are emission standards for such generators under the NESHAP for Reciprocating Internal Combustion Engines. 40 CFR subpart ZZZZ. Disposal of lithium-ion batteries, or (more likely) their recycling, is regulated comprehensively under EPA rules implementing the Resource Conservation and Recovery Act, see 40 CFR Part 173, and their transport is regulated comprehensively under DOT Hazardous Material Rules in 49 CFR Parts 171-180 (see RTC section 4.6 "safety" responses, and RTC section 4.7 "recycling" responses.) Moreover, on October 23, 2023, EPA announced plans to propose further regulations adding to the safety standards for management of spent lithium-ion batteries.[863] Many of these same activities are regulated by other jurisdictions as well, including by U.S. States and foreign governments and their local jurisdictions.

As noted above, the delineation between mobile and stationary source standard setting is in keeping with the structure of the Act, whereby Congress directed EPA to control stationary sources under Title I of the Act, and mobile sources under Title II. For these reasons, EPA rejects the assertion of commenters that it has ignored these issues and consequently arbitrarily failed to consider an issue of importance in the rulemaking.

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[862] See, e.g., https://www.usatoday.com/story/news/factcheck/2023/11/15/ev-charger-is-solar-and-diesel-powered-not-247-diesel-fact-check/71568937007/ (determining that video showing "EV charging station with diesel generator that 'runs 24 hours of the day, seven days a week'" was "false").

[863] The Unified Regulatory Agenda Entry reads, in relevant part, "EPA is proposing universal waste standards specially tailored for lithium batteries, separate from the existing general battery universal waste category. This change in the RCRA regulations would benefit those generating and managing waste lithium batteries by improving the safety standards and reducing fires from end-of-life lithium batteries, while continuing to promote recycling."

Summary:

Commenters had various suggestions as to which lifecycle emissions should figure into the standard setting process. All recommending the approach would include emissions associated with electricity generation. Others would include emissions associated with battery production. (AFPM, NGV America.) Commenters also mentioned inclusion of electricity supply chain-related emissions (CFDC), emissions associated with battery "disposal" (API, Nat'l Ass'n, of Convenience Stores, West Trucking), and mining of materials critical to battery manufacture, including cobalt and other minerals presently supplied primarily from overseas (Western Trucking, Mille Lacs Band of Ojibwe).

Response:

The differing perspectives of commenters on where to draw the line for what is included in a lifecycle analysis illustrates the difficulties of importing a lifecycle approach into the section 202(a) GHG standard setting and compliance process, and reinforces EPA's long- established choice not to do so. Aside from the practical difficulties of making reliable accounting for emissions from overseas extractive activities, these commenters are not advocating consideration of emissions associated with extraction of precious and semi-precious metals used in ICE emission control systems, or extraction of lead used for lead-acid batteries.

As noted above, these commenters do not appear to be advocating a similar approach for fossil fuels, whereby all emissions and other impacts of locating, extracting, and processing fossil fuels, or all emissions associated with growing, harvesting, and transporting biofuels, would be accounted for in the vehicular standard setting process. Nor have the commenters urging consideration of end-of-life battery disposal and recycling emission issues addressed emissions relating to disposal and recycling of lead acid batteries, or of wastes from petroleum refining. [864]

Summary:

Various commenters submitted quantified analyses purporting to show that ICE vehicles operating with biofuels, in particular renewable biodiesel, would actually emit less GHGs (or comparable amounts of GHGs) than comparable BEV or FCEV vehicles when their respective lifecycle GHG emissions are accounted for. (API, Chevron, ClearFlame, NGVAmerica, NACS). Commenter Strong Plug-In Hybrid Ass'n submitted a similar comment with respect to PHEVs.

Response:

These studies pose methodological issues, or scope issues, that make them of limited value for comparison with the Phase 3 final rule. "Decarbonisation potential of on-road fuels and powertrains in the European Union and the United States: a well-to-wheels assessment" (Sustainable Energy Fuels, 2022 6, 4398) (cited by NGV) deals exclusively with light duty vehicles. (See e.g., at 4404). NGV also includes as an Appendix to its comments the study "CO2 Abatement: Costs of mobility and other Road Transport Options" (Frontier Economics 2021). The only heavy-duty vehicles considered in the study are class 8 sleeper cabs (vehicles

[864] Among other things, petroleum refining results in the generation of a number of hazardous wastes, listed as hazardous wastes K048-K052 under the regulations (40 CFR Part 261.32) implementing subtitle C of the Resource Conservation and Recovery Act.

over 40,000 tonnes (sic)), and of these, only FCEVs (study at, e.g., 2, 6, 20). EPA thus does not view either of these studies as making particularly useful comparisons with the Phase 3 rule.

The American Transportation Research Institute study, "Understanding the Impacts of Zero-Emission Trucks" figured in in a number of the comments (API, Ben Banks, Chevron among them). Fuels examined were diesel, biodiesel (B100), renewable diesel, and LNG, compared with BEV and FCEV. The study considers CO_2 emissions from vehicle production – including battery production, operation, and disposal/recycling. Commenters cite the study as showing (correctly) that there are CO_2 emissions associated with battery production and vehicle end-of-life (API), and further cite it as showing that CO_2 emissions from renewable diesel and possibly B100 are less for ICE vehicles considering emissions associated with production and disposal/recycling. This latter assertion is problematic. First, the study evaluates Class 8 sleeper cabs exclusively (study at 17), and thus sheds minimal light on all of the remaining Phase 3 vehicle subcategories. Vehicle disposal and recycling considers only lithium-ion battery recycling CO_2 emissions, but it fails to consider emissions associated with disposal or recycling of lead-acid batteries. The study appears to consider that all hydrogen is produced via the SMR process, and thus fails to account for the IRA incentives for low-emission hydrogen. Most problematically, the study assumes production of a second battery for BEVs, assuming replacement is needed at 500,000 miles (study at 20). The study says without specific citation that this assumption is consistent with the GREET model, and with undocumented conversations with unnamed OEMs. This assumption is counter to EPA's well-documented determinations regarding battery deterioration (see, e.g., Preamble Chapter 2 Battery Component Sizing and Weight: Battery), as well as the provisions relating to warranty and deterioration in the final rule which reasonable posit no battery replacement before 1,000,000 miles (more specifically, 2,000 cycles). EPA thus does not regard this study as of particular comparative value.

"Comparative Life Cycle Analysis of Heavy-Duty Vehicles (Class 7/8) Fueled by Renewable Diesel, Electricity, and Hydrogen" (Univ. of British Columbia, 2022), cited by Chevron, is also a problematic comparison. It shows that GHG emissions of BEVs and FCEVs are superior to any other mode in its lifecycle analysis, although CO_2 emissions from 100% renewable diesel via soybeans are within a comparable order of magnitude (study at 1). The study considers Class 8 vehicles exclusively and assumes operations over 400,000 km (approximately 248,000 miles). Study at 19. The emission benefits of ZEVs over the longer useful life reasonably assumed for Phase 3 would therefore be correspondingly greater than those evaluated in this study. In addition, the study considers lithium-ion battery disposal emissions as part of the embedded emissions in a BEV, but it does not evaluate emissions associated with management of spent lead-acid batteries.

The final study cited is by Ramboll US Consulting, "Multi-Technology Pathways Study" (2021) prepared for the Western States Petroleum Association (cited by Chevron, among others). The study is California-specific, and commenters Chevron and NGV cite it for the proposition that renewable fuel options could deliver GHG reductions sooner and more cost-effectively than a BEV-only approach (the study does not consider FCEVs) if one accounts for upstream emissions from electricity generating sources. (Study at 1.) However, the study analyzes emissions exclusively from heavy heavy-duty trucks (greater than 33,000 lbs) and provides no basis for extrapolation to the rest of the heavy-duty sector.

Summary:

EPA itself has used a lifecycle approach for light-duty electric vehicles, whereby emissions associated with the source of electricity are considered for compliance once there is a given volume of sales in a model year. EPA should not ignore those upstream emissions in the Phase 3 rule, since doing so dilutes the rule's benefits and exaggerates the difference in emission impacts of ICE and BEV vehicles. Nor is the zero emission needed any longer as an incentive. (ACEEE.)

Response:

The commenter notes correctly that the light-duty vehicle rule (although not the heavy-duty rules) included a provision capping the number of BEVs whose tailpipe emissions count as zero. EPA adopted the cap to balance the competing concerns of promoting highly promising (then) relatively new technologies with concerns about decreasing overall emission reductions associated with the program. 77 FR at 62817, 62818 (Oct. 15, 2012). EPA rejected the need for such a cap in the heavy-duty GHG rules. 81 FR at 73500/3 (Oct. 25, 2016). With respect to accounting for electricity production emissions, EPA does so fully in its analysis of emissions impacts. Moreover, as the commenter notes, GHG emissions associated with electricity generation are decreasing with the increased use of renewables. EPA reiterates its prior position that the appropriate means of addressing those emissions is through the Act's stationary source provisions.

Summary:

Several commenters said a lifecycle standard-setting approach was important for protecting disadvantaged communities. (AVE, MFN.)

Response:

EPA notes that BEVs and FCEVs not only have zero tailpipe GHG emissions, but zero tailpipe emissions of all other pollutants. Their operation consequently has very significant collateral benefits, including for disadvantaged communities. See generally RTC section 21. (Commenter MFN recognizes these benefits in its comments urging an aggressive standard for drayage trucks predicated on high adoption rates of ZEVs.) As described in preamble section V, EPA has undertaken an analysis of the upstream and downstream emission impacts of the final rule's standards, which were set consistent with EPA's historic approach to standard setting, and EPA considers that analysis of the net impacts as supportive of the final standards. See also section 18.3 of this RTC addressing issues of Environmental Justice.

Summary:

Commenter AVE points to statements from the House Report to a 2022 appropriations bill, and statements from Executive Order 13990 as support for a lifecycle approach to setting GHG emission standards.

Response:

EPA does not view a statement in legislative history to a post-enactment 2022 appropriation bill as modifying its standard-setting authority under section 202 (a)(1) of the Act 52 years after its enactment. Nor could the cited Executive Order modify that statutory authority, and in any case, it is not on point since the directive is to consider global damages in assessing the social cost of carbon. EPA has done so, which value is reflected in its cost-benefit analysis to this rule.

Summary:

NGV America cites undocumented conversations with unspecified agency staff which the commenter characterizes as EPA staff support for a lifecycle approach to GHG vehicular standard setting.

Response:

Given the absence of documentation of these contacts – indeed, not even a year when the purported conversations occurred – it is impossible to assess the accuracy of the commenter's characterization of them. In any case, agency staff are not the agency decisionmaker. The EPA Administrator is. For the commenter to speak of a 'breached commitment' by the administration is consequently both incorrect and inappropriate.

Summary:

Steven G. Bradbury stated: *They also ignore the upstream emissions of carbon dioxide from the increased electricity generation that would be needed to charge the projected fleet of EVs … EPA's refusal to account for these huge offsetting emissions of carbon dioxide fundamentally distorts its analysis of net benefits in a manner that arbitrarily favors the Agency's preferred regulatory outcome. It is, in fact, false and misleading to label EVs "zero-emission vehicles" when the production of EV batteries and the charging of the batteries over the life of the vehicles both generate enormous amounts of carbon dioxide.*

Response: This comment is incorrect. While EPA uses the name "zero-emission vehicle" to reference vehicles with no tailpipe emissions by convention, EPA never asserts or models the vehicles as having no emissions attributed to their activity. EPA's emission impacts analysis includes EGU emissions resulting from the charging demand (and hydrogen production using electrolysis) in Chapter 4 of the RIA. Specifically, Chapter 4.3.3 details the methodology EPA used to estimate EGU emissions, and results for the standards are presented in Chapter 4.5.

Summary

The comment from KALA Consulting ("KALA"),[865] much of which is directed exclusively to the proposed light-duty vehicle proposed rule, touched on issues pertaining to lifecycle-based standards common to both the light- and heavy-duty rulemakings. The life cycle comment is addressed here. The remainder are addressed in the LMDV RTC.

KALA criticizes EPA for referring to BEVs as "zero emission vehicles" when there are upstream emissions associated with fueling them. As noted in the previous response, EPA has accounted for upstream emissions associated with both electricity generation and petroleum refining and has monetized those reductions in assessing the phase 3 rule's costs and benefits. In this regard, we note that KALA states mistakenly that EPA failed to account for electricity transmission losses in its analysis (Comment p. 13). See RIA chapter 4.1 noting that the 2022 post-IRA version of the Integrated Planning Model accounts for both energy generation and transmission. KALA is also incorrect in asserting that EPA has failed to consider issues associated with time-of-day recharging (Comment p. 34). Assessment of time-of-day charging is

[865] Particularly misguided is the commenter's critique of EPA's statement that OEMs are likely to include BEVs in their compliance strategies independent of the EPA standards as an indication of "zealots … so passionate about their 'Mission from God' that they have to tell everybody about it." Comment p. 8. In fact, OEMs have already introduced HDV BEVs into the market in advance of both the California ACT regulation and EPA's Phase 3 proposal. 88 FR at 25939-942.

in fact is a critical part of EPA's analysis of both emission impacts and costs of the Phase 3 rule. See RIA Chapter 4.2.4.1 (load profiles reflecting total daily demand from HD BEV charging for each vehicle type in MOVES), RIA Figures 4-1 and 4-2 (HD BEV time-of-day charging profiles for weekdays and weekends), and RIA Chapter 2.6.2.1.4 (depot dwell times by HDV BEV vehicle types).

Response:

Like a number of other commenters, KALA believes the section 202(a) GHG emission standards (although not standards for criteria pollutants or air toxics) should reflect upstream emissions along with tailpipe emissions. KALA would draw the line at upstream GHG emissions associated with electricity generation, and it would do the same for gasoline and diesel-fueled vehicles. Comment p. 14 (probably referring exclusively to light-duty vehicles, although the commenter's principle could apply to HDV as well). Among the bases for the commenter's suggestion is its mistaken assumption that EGU GHG emission profiles are unlikely to improve (Comment p. 10), and failing to account for the effect of the IRA or any of the other factors reflected in EPA's IPM modelling showing renewables becoming an increasingly large portion of the EGU power-generating energy source. See RIA Chapters 4.2.4.2 and 4.4.2. Nor does KALA discuss why its upstream analysis stops at the EGU or refinery. For example, there is no discussion of whether to consider methane emissions associated with petroleum extraction.

KALA acknowledges EPA's statement that the Clean Air Act clearly delineates between mobile and stationary sources, but disagrees with EPA's further statement that stationary source GHG emissions can be and are being controlled by EPA regulatory programs addressing stationary sources. We respectfully disagree. KALA also does also does not speak to any potential legal impediments to including stationary source emissions as part of a mobile source section 202(a) standard (e.g., "from any class … of new motor vehicle").

Summary:

Valero expressed concerns about the impact of the rule on secondary petroleum products and said that if we expect refinery throughput to decrease due to reduced US product demand, we must account for the impact of reduced refinery throughput on refinery byproducts: sulfur and petrochemical feedstocks.

Response:

Regarding the consequences of the proposed rule with regard to the byproducts and coproducts of petroleum refining (asphalt to pave roads, tires, other consumer products and pharmaceuticals) and sulfur availability (used in construction materials, traditional batteries, rubber, and a multitude of other products), to the extent that US refinery production volume decreases, there likely would be a lower quantity of some coproducts produced at US refineries as gasoline and diesel fuel demand decreases in the US. Demand for coproducts such as sulfur and petrochemical feedstocks may need to be supplemented with imports from elsewhere.

If US refineries produce less fuel, we would expect elemental sulfur production to diminish in direct proportion to the reduced throughput at refineries. This is because all refineries remove sulfur from their fuels to meet gasoline and diesel fuel sulfur regulations and sell the sulfur, so sulfur production in the US would decrease if their gasoline and diesel production decreases. Sulfur, however, is also produced by refineries around the world, and is also a ubiquitous substance readily found and inexpensively mined from natural sulfur deposits found around the world, including here in the US. We therefore expect the sulfur market to remain adequately supplied.

The refining industry produces numerous petrochemical feedstocks and it is useful to distinguish the aromatic-based petrochemical feedstocks from the nonaromatic ones. Of the petroleum refineries in the US, around one third of them have aromatic extraction units. Refiners produce these aromatic compounds in reformers specifically intended to produce large amounts of aromatic compounds, such as benzene, toluene, xylene, cumene, and ethyl benzene, for the petrochemical industry. The aromatic rich hydrocarbons are then sent to an aromatic extraction facility onsite where the various aromatic compounds are separated and then shipped to petrochemical companies which process the feedstocks into various types of plastics, paints and adhesives.

Another petrochemical feedstock produced at refineries is propylene which is used by petrochemical plants to produce polypropylene. Propylene is a byproduct of refinery fluidized catalytic cracker units (FCCU). If demand for propylene outstrips U.S. supply, refiners have the flexibility to produce more by adding a catalyst additive to the FCCU.

Even if there are refinery closures due to reduced U.S. refined product demand, we likely would not see a similar, or potentially any, drop off in petrochemical feedstock production. Only a portion of the refineries in the U.S. produce petrochemical feedstocks and due to the likely improved refinery margins from producing petrochemical feedstocks along with motor vehicle fuels and other refinery products, it is likely that refineries producing petrochemical feedstocks would tend to keep operating while other refineries would shut down. Another potential source of petrochemical feedstocks is from renewable sources.

17.2 Critical Materials and Supply Chain Considerations

Comments by Organization

Oganization: American Free Enterprise Chamber of Commerce (AmFree) et al.

In sum, the vulnerable and volatile supply chain for critical minerals is a challenge that cannot be overcome in a matter of a few years. Rather than thrusting manufacturers into a sea of risk and uncertainty, EPA should wait until the global market stabilizes or the domestic market develops before effectively mandating a widespread shift to electric vehicles.4 [EPA-HQ-OAR-2022-0985-1660-A1, p. 42]

4 Supply-chain problems are also likely to affect the manufacture of fuel-cell vehicles. Fuel-cell vehicles “rely on a platinum catalyst, which is a major downside to this technology, as platinum group elements are expensive and deposits concentrated enough for economic mining are rare.” *The Effect of Critical Material Prices* at 3. “According to the United States Geological Survey, platinum group elements are among the rarest elements on earth and are found in earth curst in concentrations of around 0.5 parts per billion.” *Id.* at 4. And just like the materials needed for batteries, production of platinum group elements is highly concentrated in South Africa, “accounting for 72% in 2017.” *Id.*

Organization: Arizona State Legislature

The proposed rule is arbitrary and capricious because of erroneous estimates about energy security and critical mineral availability. [EPA-HQ-OAR-2022-0985-1621-A1, p. 31]

EPA calculates a $1.3 billion benefit from energy security resulting from the proposed rule. 88 Fed. Reg. 26,082. The $1.3 billion benefit estimate represents that energy security benefits of reducing U.S. oil consumption and U.S. oil imports. A reduction of U.S. petroleum consumption and imports reduces both financial and strategic risks caused by potential sudden disruptions in the supply of imported petroleum to the U.S. EPA also addresses the issue of mineral security. In EPA's view, 'increased vehicle electrification in the United States will not lead to a critical long-term dependence on foreign imports of minerals or components, nor that increased demand for these products will become a vulnerability to national security.' Id. at 25,962. EPA believes that existing foreign production is adequate simply because of other countries' investment in supply chains, and the Bipartisan Infrastructure Law and Inflation Reduction Act combined with market forces will cause American companies to develop their own supply chains. Id. EPA also reasons that minerals imported into the United States can be reclaimed and thus increase America's supply of those minerals. Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 31]

EPA's own statistics show that foreign production of critical minerals presents an energy security problem. According to EPA:

- As shown in Figure II–1, in 2019 about 50 percent of global nickel production occurred in Indonesia, Philippines, and Russia, with the rest distributed around the world. Nearly 70 percent of cobalt originated from the Democratic Republic of Congo, with some significant production in Russia and Australia, and about 20 percent in the rest of the world. More than 60 percent of graphite production occurred in China, with significant contribution from Mozambique and Brazil for another 20 percent. About half of lithium was mined in Australia, with Chile accounting for another 20 percent and China about 10 percent.[EPA-HQ-OAR-2022-0985-1621-A1, p. 31]
- According to the 100-day review under E.O. on America's Supply Chains (E.O. 14017), of the major actors in mineral refining, 60 percent of lithium refining occurred in China, with 30 percent in Chile and 10 percent in Argentina. 72 percent of cobalt refining occurred in China, with another 17 percent distributed among Finland, Canada, and Norway. 21 percent of Class 1 nickel refining occurred in Russia, with 16 percent in China, 15 percent in Japan and 13 percent in Canada. Similar conclusions were reached in an analysis by the International Energy Agency, shown in Figure II–2. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 31-32]

Id. at 25963-64. Indeed, the United States imports most of the minerals needed for the current electric vehicle production demand, with a net import reliance of 100% for manganese, 100% for graphite, 76% for cobalt, 48% for nickel, and more than 25% for lithium.76 As the EPA recognizes, 'Currently, the United States is lagging behind much of the rest of the world in critical mineral production.' 88 Fed. Reg. 25,964. [EPA-HQ-OAR-2022-0985-1621-A1, p. 32]

76 Congressional Research Service, Critical Minerals in Electric Vehicle Batteries, Aug. 29, 2022, 9, available at https://crsreports.congress.gov/product/pdf/R/R47227.

EPA's electric vehicle mandate will surge demand for critical minerals that the United States will have to import. According to the International Energy Agency, in the 'global energy transition like the one President Biden envisions, demand for key minerals such as lithium, graphite, nickel and rare-earth metals would explode, rising by 4,200%, 2,500%, 1,900% and 700%, respectively, by 2040.'77 The American Transportation Research Institute estimates that replacing the existing American vehicle fleet with electric cars will require 6.3 to 34.9 years of current global production of critical minerals and 8.4 to 64.4 percent of global reserves, depending on the material.78 EPA does not account for the greenhouse gas emissions resulting from this dramatically expanded mining production. [EPA-HQ-OAR-2022-0985-1621-A1, p. 32]

77 Carrie Sheffield, Hypocrite Biden blocks mineral mining his clean-energy goals require, New York Post, Mar. 22, 2023, available at https://nypost.com/2023/03/22/biden-blocks-mineral-mining-his-clean-energy-goals-require/.

78 American Transportation Research Institute, supra note 50, at 2.

EPA's electric vehicle mandate will force American dependence on China. In 2019, China accounted for 80% of the world's total production of raw materials for electric batteries.79 China's reach extends around the world. In the Democratic Republic of the Congo, for example, 15 of 19 cobalt-producing mines are owned or financed by Chinese companies.80 China also refines 95% of the world's cobalt supply.81 China controls 65% of the global lithium processing and refining capacity and is securing deals to extract lithium from mines in Latin America.82 [EPA-HQ-OAR-2022-0985-1621-A1, p. 32]

79 Institute for Energy Research, China Dominates the Global Lithium Battery Market, Sept. 9, 2020, available at https://www.instituteforenergyresearch.org/renewable/china-dominates-the-global-lithium-battery-market/.

80 Shin Watanabe, Chinese cobalt producer to double Congo output with eye on top spot, NIKKEI ASIA, Jan. 7, 2022, available at https://asia.nikkei.com/Business/Markets/Commodities/Chinese-cobalt-producer-to-double-Congooutput-with-eye-on-top-spot.

81 Elaine Dezenski, The United States' Energy Future Needs Critical Minerals—and Latin America, NEWSWEEK, Mar. 24, 2023, available at https://www.newsweek.com/united-states-energy-future-needs-critical-minerals-latin-americaopinion-1789379.

82 Id.

'China's dominance in EV battery manufacturing is similar to its dominance in mining an extraction of the minerals used in batteries.'83 China accounts for more than 70% of global electric vehicle battery cell production capacity. 84 Of the 13 top battery production companies, seven have headquarters in China. 85 [EPA-HQ-OAR-2022-0985-1621-A1, pp. 32-33]

83 Congressional Research Service, supra note 84, at Summary.

84 Id. at 7.

85. Id

In the proposed rule, EPA identifies domestic production efforts for only one mineral lithium. 88 Fed. Reg. 25,966. The global supply of lithium needs to increase by 42 times by 2040 or 2050 to meet demand for electric vehicles. But 'getting approval for [new mines] can still take years, if not decades.' And the Biden Administration admits it does not even know where all critical minerals may exist: 'The United States' non-fuel mineral resources are significantly under-mapped relative to those of other developed nations; only 12 percent of U.S. territory has modern high-resolution geophysical surveys of the subsurface, and only 35 percent is covered by detailed geologic mapping of the surface and near-surface.' The Alaska governor noted that the White House's 250-page report on critical minerals mentions Australia 60 times, Canada 32 times, but Alaska only once, in a footnote. 89 [EPA-HQ-OAR-2022-0985-1621-A1, p. 33]

86 Ana Swanson, The U.S. Needs Minerals for Electric Cars. Everyone Else Wants Them Too., The New York Times, May 21, 2023, available at https://www.nytimes.com/2023/05/21/business/economy/minerals-electric-cars-batteries.html.

87 Id.

88 The White House, Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth, June 2021, 197, available at https://www.whitehouse.gov/wp-content/uploads/202l/06/100-daysupply-chain-review-report.pdf.

89 Carrie Sheffield, Hypocrite Biden blocks mineral mining his clean-energy goals require, New York Post, Mar. 22, 2023, available at https://nypostcom/2023/03/22/biden-blocks-mineral-mining-his-clean-energy-goals-require/.

Under the apparent strategy of 'if you subsidize it, they will come,' EPA brushes off these inconvenient facts by focusing on the public and private focus on manufacturing electric batteries in the United States. 88 Fed. Reg. 25,966-967. But even if America builds all of the manufacturing capacity needed to supply EPA's forced electric vehicle demand, manufacturing still requires critical minerals that China has and America does not. Other than recycling critical minerals from old batteries, EPA proposes m1 solutions to this grave energy security problem. [EPA-HQ-OAR-2022-0985-1621-A1, p. 33]

Organization: Bradbury, Steven G.

- Harming our national security. Finally, EPA minimizes the fact that forcing a faster switchover to EVs will threaten America's national security by making us more dependent on China and other unfriendly foreign nations for the production and processing of critical inputs required for EVs. China controls nearly 70 percent of global EV battery manufacturing capacity—including 70 percent of the world's lithium supply; 80 percent of the necessary rare earth minerals; and approximately 75 percent of the magnets needed for EV motors—and it boasts 107 of the 142 lithium-ion battery mega-factories planned or under construction in the world today (with only 9 planned for the U.S.).57 [EPA-HQ-OAR-2022-0985-2427-A2, p. 20]

57 See https://secureenergy.org/safe-urges-bipartisan-coordinated-policy-to-lead-new-tech-in-autoindustry-and-protect-against-chinese-supply-chain-dominance-in-new-report/.

The average EV battery uses about 8-10 kilograms of lithium (even more for higher performance batteries), and the world today mines a total of about 130,000 tons of lithium per year. That means if the EPA succeeds in converting 60 percent of annual U.S. car sales to EVs (about 7.8 million vehicles), those EVs (just for the U.S. market) would require 60 percent of the entire world's current production of lithium.58 [EPA-HQ-OAR-2022-0985-2427-A2, p. 20]

58 See https://pubs.usgs.gov/periodicals/mcs2023/mcs2023-lithium.pdf.

Similarly, each EV battery requires about 10 kilograms of cobalt, which translates into one metric ton for each 100 EVs and 10,000 tons of cobalt for one million new EVs. There are only between 150,000 and 190,000 tons of cobalt mined every year worldwide (the lion's share from the Democratic Republic of the Congo). Here again, if 60 percent of annual U.S. auto sales were EVs by 2030 (7.8 million vehicles), those

EVs (just in the U.S.) would consume about 78,000 tons of cobalt— half the world's supply.59 [EPA-HQ-OAR-2022-0985-2427-A2, p. 20]

59 See https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-cobalt.pdf.

To put these percentages in perspective, according to the International Energy Agency (IEA), "In 2022, about 60% of lithium, 30% of cobalt and 10% of nickel demand was for EV batteries" worldwide.60 Because the U.S. market accounts for less than 20 percent of new vehicle sales globally,61 and other governments, particularly China and the EU, are pushing for similar rapid transitions to EVs, the overall worldwide supply of the critical minerals needed to produce EV batteries will have to increase at a truly astounding rate in the next several years to meet the EPA's assumptions.62 [EPA-HQ-OAR-2022-0985-2427-A2, p. 21]

60 IEA, Global EV Outlook 2023: Trends in batteries, https://www.iea.org/reports/global-ev-outlook-2023/trends-in-batteries.

61 See Alex Kopestinsky, "20 In-Depth Global and US Auto Sales Statistics for 2023," Policy Advice, March 23, 2023, https://policyadvice.net/insurance/insights/us-auto-sales-statistics/.

62 See Doomberg, "Separation Anxiety," June 27, 2023, https://doomberg.substack.com/p/separationanxiety (explaining why it is doubtful "the world can mine a sufficient amount of the necessary battery materials to meet anticipated demand").

EPA predicts all of our strategic dependencies for these inputs will vanish quickly over time, with the assist of government subsidies, as new mines open up in the U.S. and Canada and new factories are built here and production capacity is brought to our shores.63 The reality, of course, is that there is little prospect that the Biden administration or local permitting authorities will fast-track the environmental approvals needed for all of these new mining operations and production facilities, even if the projects were otherwise shovel ready. [EPA-HQ-OAR-2022-0985-2427-A2, p. 21]

63 See 88 FR at 29318-24.

Organization: California Air Resources Board (CARB)

In response to U.S. EPA on the supply chain for HD ZEVs, CARB staff finds that increased uptake of HD ZEVs is unlikely to have a negative impact on the supply chain as actions are already underway to expand domestic production of materials necessary for ZEV production. [EPA-HQ-OAR-2022-0985-1591-A1, p.31]

Manufacturers and other suppliers are making significant domestic investments to bolster the supply chain in part due to the recently passed IRA. The IRA strengthens domestic supply chains by incentivizing production of materials and components critical to decrease the U.S.' carbon emissions in line with declared goals. These investments are already occurring at the same time manufacturers are identifying ways to produce key components with less or no use of critical materials. This current trajectory is expected to continue, which alleviates raised concerns regarding supply chain disruptions due to the transition to ZEVs. The IRA is also a clear signal for the nationwide move to ZEVs, and multiple states have already adopted the ACT regulation with many others committed to transitioning to ZEVs. [EPA-HQ-OAR-2022-0985-1591-A1, pp.31-32]

CARB staff note this under all standards in U.S. EPA's proposal, a large portion of sales will remain combustion-powered. The existing fleet is almost completely combustion-powered and can also continue to operate for decades. So, to the extent that ZEVs will cause shifts in the supply chain, these will be gradual over time, and limited, rather than an immediate or complete shift. Through action by industry and government, the transition to ZEVs will occur without negatively impacting the supply chain. [EPA-HQ-OAR-2022-0985-1591-A1, p.32]

As part of the Final Environmental Analysis for the ACF regulation and associated Response to Comments, CARB staff evaluated the usage of critical minerals involved in the production of ZEVs.80,81 CARB staff recognizes that its rules and regulations aimed to decarbonize the state through the use of ZE technology may induce new demand for various metals including lithium, graphite, cobalt, nickel, copper, manganese, chromium, zinc, and aluminum. While the degree to which ZEV production will vary depending on evolving technologies, recycling practices, and how overall demand for ZEVs are met, new sources of critical materials have been identified both domestically and internationally including new mining in the Imperial Valley. [EPA-HQ-OAR-2022-0985-1591-A1, p.32]

80 CARB, Attachment D Final Environmental Analysis for the Proposed Advanced Clean Fleets Regulation, 2023. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acffinalea.docx

81 CARB, Response to Comments on the Draft Environmental Analysis for the Proposed Advanced Clean Fleets Regulation, 2023. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acfrtc.pdf

The California Energy Commission's (CEC) Lithium Valley Commission estimates that the Imperial Valley may have sufficient lithium supplies to meet 40 percent of the world's total lithium demand, which would be coupled with renewable energy and more sustainable extraction processes. The report notes that lithium recovery technologies proposed for use in Imperial County, direct lithium extraction from geothermal brine, result in a much lower environmental effect than hard rock mining and evaporation ponds. Direct lithium extraction technologies are designed to recover lithium and other minerals as the geothermal brine flows through pipelines and tanks and over a surface or substance that removes the lithium and other minerals before returning the brine deep underground.82

82 Paz, Silvia (Chair); Kelley, Ryan E. (Vice Chair); Castaneda, Steve; Colwell, Rod; Dolega, Roderic; Flores, Miranda; Hanks, James C.; Lopez, Arthur; Olmedo, Luis; Reynolds, Alice; Ruiz, Frank; Scott, Manfred; Soto; Tom; Weisgall, Jonathan. Report of the Blue Ribbon Commission on Lithium Extraction in California. California Energy Commission. Publication Number: CEC-300-2022-009-D. Dec 2022 (web link: https://efiling.energy.ca.gov/GetDocument.aspx?tn=247861&DocumentContentId=82166, last accessed March 2022).

Furthermore, industry is also rapidly moving to batteries with different chemistries or formats to address concerns with mineral supply chain issues or human rights concerns.86 These alternative battery chemistries use different metals and can offer similar performance at a lower cost which will ultimately result in a lower vehicle cost to the fleet owner. For example, there is a growing use of lithium iron phosphate batteries in the LD ZEV market which are generally a lower cost alternative and do not require cobalt mining.87 [EPA-HQ-OAR-2022-0985-1591-A1, p.33]

Mineral demand in proportion to vehicle performance is expected to continue to decline with manufacturers already talking about vehicle lifetime capable battery durability of 1.2 million kilometers (750,000 miles) and 1.5 million kilometers (930,000 miles) for production HDVs--

distances which exceed U.S. EPA's proposed extension of regulatory useful life for class 8 vehicles.88,89 [EPA-HQ-OAR-2022-0985-1591-A1, pp.33-34]

86 Visnic, Bill. "GM's Ultium Battery System Future-Proofed." SAE International. May 2020 (web link: https://www.sae.org/news/2020/05/gm-ultium-battery-update, last accessed March 2022).

87 Chemical and Engineering News, Lithium Iron Phosphate comes to America, 2023 (web link: https://cen.acs.org/energy/energy-storage-/Lithium-iron-phosphate-comes-to-America/101/i4, last accessed February 2023).

88 IAA Transportation 2022: Daimler Truck unveils battery-electric eActros LongHaul truck and expands e-mobility portfolio, September 18, 2022. https://media.daimlertruck.com/marsMediaSite/en/instance/ko/IAA-Transportation-1182022-Daimler-Truck-unveils-battery-electric-eActros-LongHaul-truck-and-expands-e-mobilityportfolio.xhtml?oid=52032525

89 Northvolt and Scania unveil green battery capable of powering trucks for 1.5 million kilometers, April 19, 2023. https://northvolt.com/articles/northvolt-scania-cell/

Based on this information, U.S. EPA's findings regarding BEV and FCEV technology may be conservative and underestimate the status of the ZEV market. As a result, there is an opportunity to capitalize on the ZEV market's momentum and establish stronger standards that recognize the capabilities of BEVs and FCEVs. [EPA-HQ-OAR-2022-0985-1591-A1, p.34]

Organization: Chevron

Stakeholders have expressed concern about the supply and availability of critical minerals and supply chains for battery manufacturing, many of which are sourced from China. EPA should quantitatively assess the impact this regulation will have on the nation/worldwide demand of lithium and other rare earth metals, and the emissions that will be produced as a result of mining and shipping these materials. EPA should consider environmental impacts from mining of semi-precious metals and potential mitigations. The proposal does not address the potential hazards, construction, noise, or other impacts and potential mitigations for these impacts. [EPA-HQ-OAR-2022-0985-1552-A1, p.7]

Organization: Clean Air Task Force et al.

c. The critical mineral supply will be able to support increases in HD BEVs, and critical mineral needs should not be considered a constraining factor precluding a rule at least as protective of public health and welfare as the ACT rule implemented nationwide.

As EPA's proposal explains, increased HD BEV penetration rates (along with increasing numbers of BEVs in the light-duty sector) will require a robust supply of critical minerals including lithium, nickel, and cobalt. There are currently substitutes for nickel and cobalt depending on the battery chemistry utilized, and EPA cites research finding that even for lithium, "global supplies of cathode active material (CAM) used as a part of the cathode manufacturing process and lithium chemical product are expected to be sufficient through 2035." 88 Fed. Reg. at 25964.238 As comments submitted by the Moving Forward Network explain in more detail, the critical mineral supply will be able to support increases in HD BEVs, and critical mineral needs should not be considered a constraining factor precluding a rule at least as protective of public health and welfare as the ACT rule implemented nationwide. [EPA-HQ-OAR-2022-0985-1640-A1, p. 57]

238 EPA cites preliminary projections prepared by Li-Bridge for DOE in November 2022. 88 Fed. Reg. at 25964.

EPA's proposal notes the significant influence of increasing investments in the development of a sufficient mineral supply chain. Critical minerals supply—both domestically and from nations with which the United States has friendly relations—will likely increase beyond currently anticipated projects, particularly in light of increasing investment in mining research and development. In 2022, investment in critical mineral mining rose by 30 percent, with companies specializing in lithium development experiencing a "record pace of growth" and increasing their spending by 50 percent.239 These investments will likely lead to additional lithium and other critical mineral supplies, supporting increasing numbers of HD BEVs. For example, according to the California Energy Commission, an emerging project at California's Salton Sea could supply enough lithium to meet all future U.S. demand and 40 percent of the world's demand.240 The Salton Sea's lithium supply has been called "staggering," and the area has been referred to as the "Saudi Arabia of lithium," with "something like 50 to 100 years' worth of lithium production."241 A project conducted by the Lawrence Berkeley National Laboratory, U.C. Riverside, and Geologica Geothermal Group, Inc. to quantify and characterize the lithium in the Salton Sea has received $1.2 million in funding from the Department of Energy's Geothermal Technologies Office.242 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 57 - 58]

239 IEA, World Energy Investment 2023, at 103-104.

240 Katie Brigham, The Salton Sea Could Produce the World's Greenest Lithium, If New Extraction Technologies Work, CNBC (May 4, 2022), https://www.cnbc.com/2022/05/04/the-salton-sea-could-produce-the-worlds-greenest-lithium.html.

241 Julie Chao, Quantifying California's Lithium Valley: Can It Power Our EV Revolution?, Lawrence Berkeley Nat'l Lab'y (Feb. 16, 2022), https://newscenter.lbl.gov/2022/02/16/quantifying-californias-lithium-valley-can-it-power-our-ev-revolution/.

242 Id.

Moreover, as EPA's proposal and Moving Forward Network's comments explain, recycling has significant potential to add to the battery critical minerals supply, including lithium supply. Several studies support this proposition243 and some automakers are already implementing and/or preparing for robust mineral recovery from recycling. For example, Tesla has explained that "[n]one of our batteries (manufacturing scrap or fleet returns) go to landfills," that "[s]ignificant resources [have been] put toward the development of scalable battery recycling technology for nickel- and iron-based cathode chemistries, including recovery and re-use of lithium," and that "[t]his will directly decrease the demand for mining in the long term."244 An interactive BEV supply chain map detailing recent investments already shows 18 battery recycling projects in North America, with the potential to support at least 1.2 million BEVs annually.245 These recycling projects have added benefits in that they could "unlock new domestic value streams and job opportunities, and reduce the cost of batteries."246 [EPA-HQ-OAR-2022-0985-1640-A1, p. 58]

243 Alexander Tankou et al., ICCT, Scaling Up Reuse and Recycling of Electric Vehicle Batteries: Assessing Challenges and Policy Approaches, at i (2023), https://theicct.org/wp-content/uploads/2023/02/recycling-electric-vehicle-batteries-feb-23.pdf ("The global demand for raw materials and these associated impacts could be substantially reduced through battery reuse and recycling practices"); Jessica Dunn, Are There Enough Materials to Manufacture All the Electric Vehicles Needed?,

Union of Concerned Scientists (Nov. 15, 2022), https://blog.ucsusa.org/jessica-dunn/are-there-enough-materials-to-manufacture-all-the-electric-vehicles-needed/ (noting that mineral reserves will be sufficient for electrification goals when combined with a high amount of battery recycling and finding that "[i]n 2050, recovered material can supply approximately 45–52% of cobalt, 40–46% of nickel, and 22–27% of lithium demand for EVs"); Jessica Dunn, Transforming Transportation: Opportunity for a Sustainable and Equitable Electric Future, Union of Concerned Scientists (May 8, 2023), https://blog.ucsusa.org/jessica-dunn/transforming-transportation-opportunity-for-a-sustainable-and-equitable-electric-future/; Union of Concerned Scientists, Electric Vehicle Batteries Fact Sheet, at 3 (2021), https://www.ucsusa.org/sites/default/files/2021-02/ev-battery-recycling-fact-sheet.pdf (noting that "recycled materials from used batteries could meet a significant portion of new demand in the future," with battery recycling able to "create a more stable domestic source of materials for battery production" and "reduce the demand for raw materials").

244 Tesla, 2022 Impact Report 162 (2022), https://www.tesla.com/ns_videos/2022-tesla-impact-report.pdf.

245 See Charged, EV Supply Chain Dashboard (noting 8 projects operating or operating partially; 4 projects under construction; 1 pilot project; and 5 planned projects).

246 Alexander Tankou et al., ICCT, Scaling Up Reuse and Recycling of Electric Vehicle Batteries: Assessing Challenges and Policy Approaches, at i (2023), https://theicct.org/wp-content/uploads/2023/02/recycling-electric-vehicle-batteries-feb-23.pdf.

Finally, EPA is correct that "[a]s with any emerging technology, a transition period must take place in which a robust supply chain develops to support production." 88 Fed. Reg. at 25962. The United States government is continuously making plans to support this robust supply chain development.247 [EPA-HQ-OAR-2022-0985-1640-A1, p. 58]

247 See, e.g., Fed. Consortium for Advanced Batteries, National Blueprint for Lithium Batteries, 2021–2030 (2021), https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf; Aakash Arora et al., Li-Bridge, Building a Robust and Resilient U.S. Lithium Battery Supply Chain (2023), https://www.anl.gov/sites/www/files/2023-02/Li-Bridge%20Industry%20Report_2.pdf.

Nor is this the first time that the automotive industry has had to address critical mineral supply chain questions, and the industry has proven that it can rise to such challenges. For example, metal supply chain concerns arose during the move toward catalytic converters, and equipping all new vehicles with catalytic converters was seen at the time as a challenging "awesome prospect."248 At the time, "[c]atalyst companies were concerned about their ability to obtain adequate supplies of noble metals if they would be used extensively in automotive catalytic converters."249 Contemporaneous considerations of the "primary technical barriers" to catalytic converter adoption included "reducing the amount of precious metals used in each converter to a point where aggregate demand can be supplied without exhausting world reserves in the near future."250 The only significant reserves of the necessary platinum group metals were located in the Republic of South Africa and the former USSR, "neither of which [could] be considered secure sources of supply."251 Despite these concerns—which sound very similar to some of the rhetoric surrounding the battery minerals conversation—the automotive industry was able to rise to the challenge and succeed in incorporating catalytic converters in all U.S. vehicles. The industry can do the same today. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 58 - 59]

248 J.R. Mondt, Cleaner Cars: The History and Technology of Emission Control Since the 1960s, at 105 (2000). See also EPA, Tier 2 Report to Congress, at E-13 to E-15 (1998), https://nepis.epa.gov/Exe/ZyPDF.cgi/940054QY.PDF?Dockey=940054QY.PDF (noting that in the late 1990s there were concerns regarding increasing concentrations of palladium in automotive catalyst applications, and resulting future supply and price concerns).

249 Mondt, at 99.

250 Daniel Dexter, Case Study of the Innovation Process Characterizing the Development of the Three-Way Catalytic Converter System, at S-3 to S-4 (1979) https://rosap.ntl.bts.gov/view/dot/10766.

251 Id. at S-4, 20.

Organization: Clean Fuels Development Coalition et al.

A transition to an electric heavy-duty fleet also implicates policy matters of national importance well outside of EPA's mission and expertise, including "deciding how Americans will get their energy," West Virginia, 142 S. Ct. at 2612, and the national security implications of importing billions of tons of critical minerals from hostile foreign powers like China, see 88 Fed. Reg. 25,966 (recognizing that "most global battery manufacturing capacity is currently located outside the U.S."). [EPA-HQ-OAR-2022-0985-1585-A1, p. 7]

E. There is not (and will not be) enough international mining and manufacturing capacity for the global EV push.

Beyond price, the proposal also systematically neglects the fact that there are simply not enough minerals, particularly lithium, available to sustain global electric vehicle growth. The U.C. Davis Climate + Community Project explains that the "primary driver of lithium demand—and new lithium mines—is EVs. Global EV sales for 2022 are estimated to reach 10.6 million, a 60 percent increase from 2021 (and a 333 percent increase from 2020) that has been driven largely by China and Europe." Thea Riofrancos et al., Achieving Zero Emissions with More Mobility and Less Mining, U.C. Davis Climate + Community Project (Jan. 2023), https://subscriber.politicopro.com/eenews/f/eenews/?id=00000185-e562-de44-a7bfed7751a00000. In 2021, global lithium production was estimated at just over 100,000 metric tons and consumption at 93,000 metric tons. Id. But "cumulative global lithium demand" could reach "30.3 million metric tons in 2050" and "exhaust[ ] currently existing reserves by 2045." Id. Replacing "the ICE vehicles on the road with EVs on a 1:1 basis is infeasible." Id. [EPA-HQ-OAR-2022-0985-1585-A1, p. 26]

As Gill Pratt, chief executive of the Toyota Research Institute, told reporters "[I]t's going to take decades for battery material mines, renewable power generation, transmission lines and seasonal energy-storage facilities to scale up." Daniel Leussink, Not enough resources for EVs to be only cleaner car option, Toyota says, Reuters (May 18, 2023), https://www.reuters.com/business/autos-transportation/notenough-resources-evs-be-only-cleaner-car-option-toyota-says-2023-05-18/. This is an insuperable obstacle to EPA's proposal. [EPA-HQ-OAR-2022-0985-1585-A1, p. 26]

G. The proposal's purchaser acceptance calculations are based on the availability of tax credits that themselves require domestic manufacturing.

The proposal also repeatedly relies on the tax credits from the IRA to justify the proposed rule. These tax credits are split into two types: 30D credits for "clean vehicles" and 45W credits for "commercial clean vehicles." To qualify for the credit, the former contains a requirement for critical minerals and battery components to be sourced domestically or in a country with which the United States has a free trade agreement. Most—but not all—heavy-duty vehicles fall into the latter category. The proposed rule ignores the effect of domestic sourcing requirements on vehicles in the former category. [EPA-HQ-OAR-2022-0985-1585-A1, p. 29]

As amended by the IRA, the 30D tax credits require an increasing share of minerals to be produced domestically and explicitly exclude vehicles whose components are minerals are sourced from foreign entities of concern—any foreign entity that is "owned by, controlled by, or subject to the jurisdiction or direction of a government of a covered nation (as defined in section 2533c(d) of title 10)"—currently China, Russia, North Korea, and Iran.12 In its proposal, EPA makes no mention of what fraction of minerals are mined domestically and glosses over the fact that China is a key supplier of some 85% of the global stock of critical minerals (including rare earths, copper, cobalt, etc.), Robert Bryce, The Electric-Vehicle Push Empowers China, Wall St. J. (Dec. 23, 2021), and that almost no vehicles will be able to qualify for this credit in the near future. And indeed, as of April 17, 2023, only 16 vehicles qualify for the light duty tax credit and some only qualify for half of the tax credit because they only meet the critical mineral or battery components standards. Hannah Northey, Biden's EV bet is a gamble on critical minerals, E&E News (Apr. 18, 2023), https://www.eenews.net/articles/bidens-ev-bet-is-also-a-gamble-on-criticalminerals/. This list will be further narrowed as the thresholds for domestic sourcing increase and when the foreign entity of concern requirements take effect. [EPA-HQ-OAR-2022-0985-1585-A1, p. 29]

12 The Department of the Treasury and the IRS's proposed regulation interpreting these rules is unlawful. Commentors here have submitted separate comments on that docket to that effect. See Comments of American Free Enterprise Chamber of Commerce on "Section 30D New Clean Vehicle Credit," RIN 1545-BQ52. For all of the reasons stated in that comment, most of this tax benefit will be largely unavailable here.

Neglecting that many vehicles will be excluded from these tax credits further undermines EPA's assertions of feasibility. [EPA-HQ-OAR-2022-0985-1585-A1, p. 29]

F. The proposed rule also gets energy security costs backwards— electric vehicles are worse for energy security, not better.

As discussed above, EPA gives a substantial benefit to energy security from reduced oil consumption but ignores the impacts to energy security that come from an increased importation of minerals.13 EPA waves these increased mineral security costs away saying, "mineral security is not a perfect analogy to energy security" and explaining that once the minerals are here, they are here, and "[b]y 2050, battery recycling could be capable of meeting 25 to 50 percent of total lithium demand for battery production." 88 Fed. Reg. 25,968–25,969. [EPA-HQ-OAR-2022-0985-1585-A1, pp. 35 - 36.]

13 This also ignores that the United States is a net exporter of oil. "The United States is the largest producer of oil, responsible for nearly a fifth of the world's oil production. Thanks to the hydraulic fracturing revolution, the United States is a net exporter of oil. China, on the other hand, is the world's largest net importer of oil. China has few oil reserves, and its dwindling domestic supplies come from legacy fields that require expensive enhanced-recovery methods. China's demand for oil is also rapidly increasing. This explains China's long-term bet on powering transportation with electricity: China can use its abundant coal reserves, hydropower, and growing nuclear capabilities to power battery-electric cars, vans, and trucks." C. Boyden Gray, American Energy, Chinese Ambition, and Climate Realism, 4 American Affairs Journal (Winter 2021), https://americanaffairsjournal.org/2021/11/american-energy-chinese-ambition-and-climate-realism/. "First, policies that restrict the domestic supply of oil and gas and mandate renewable and electric car deployment will reduce U.S. geo-political power. The United States is the world's largest producer of oil and gas. It is a net loser from unilateral restrictions on domestic hydro-carbons, while Russia, Saudi

> Arabia, and Iran have the most to gain, as a decline in U.S. supply increases their power to set cartel prices. China, on the other hand, is the largest net importer of oil and gas, but the dominant producer of 'green' substitutes like solar panels, battery cells, and critical minerals. 'Greening' the U.S. economy at the scale envisioned by the Biden administration would damage U.S. growth while jeopardizing U.S. national security and even global stability. It would empower antagonistic regimes like Russia, Saudi Arabia, and Iran, while reducing U.S. leverage with China." Id.

This is unreasonable. To begin with, EPA's aside about battery recycling only accounts for lithium and not the countless other mineral required in an electrical vehicle battery. Nor does the proposal propose any reasonable account of how the other 50 to 75 percent of even the lithium needed to manufacture a battery will be sourced domestically. [EPA-HQ-OAR-2022-0985-1585-A1, p. 36.]

In the present day, China dominates critical mineral supply chains. China controls nearly two-thirds of all lithium, four-fifths of the refined cobalt market, and nearly all processed natural graphite. The United States has nearly no control of critical mineral supply chains and produces less than a tenth of the world's battery cells, while China is the world's leading producer. China controls much of the extraction of these materials and has 90 percent of the world's rare earth element processing capacity, cornering the market for the core minerals of electric car batteries, and dominating battery and renewable supply chains. See C. Boyden Gray, American Energy, Chinese Ambition, and Climate Realism, 4 American Affairs Journal (Winter 2021), https://americanaffairsjournal.org/2021/11/american-energychinese-ambition-and-climate-realism/. EPA acknowledges that there are very few domestic battery manufacturing plants, but assumes, without justification, that American manufacturers will increase production to a point sufficient to entirely eliminate the energy security costs flowing from this massive transition. DRIA at 172. [EPA-HQ-OAR-2022-0985-1585-A1, p. 36.]

Organization: Daimler Truck North America LLC (DTNA)

EPA Request for Comment, Request #12: We request comment on our assessment of heavy-duty battery designs, critical materials, and battery manufacturing.

- DTNA Response: As discussed in Section II.B.3.a of these comments, EPA should address the impacts of complex supply chains, projected future domestic mining and production capability, and global trade and geopolitics on its battery cost projections, as these projections influence the proposed CO2 standard stringency levels. The Company also suggests that EPA periodically review available technologies, critical materials, and battery manufacturing, to reassess its suitability and cost projections. [EPA-HQ-OAR-2022-0985-1555-A1, p. 160]

Organization: Delek US Holdings, Inc.

II. EPA's Proposed Rule Will Increase Domestic Reliance on Foreign Supply Chains.

Today, the U.S. is virtually independent8 in terms of transportation fuels (i.e., petroleum- and ethanol-based liquid fuel products) for ICE-powered vehicles. Although EPA spends a not insignificant amount of space in its draft Regulatory Impact Analysis ("DRIA") assessing energy security, EPA limits itself to drawing broad conclusions regarding future projections for exports, imports, and consumption of crude oil and refined petroleum products.9 But this ignores the larger concern regarding energy and national security: an unfavorable transition from reliable, abundant, domestically-sourced fuels to a complex supply chain reliant on foreign-sourced critical minerals. [EPA-HQ-OAR-2022-0985-1561-A1, p. 3]

8 While "energy independence" has varying definitions, we are using the term consistent with EPA's use in the Proposed Rule—"[t]he goal of U.S. energy independence is the elimination of all U.S. imports of petroleum and other foreign sources of energy, but more broadly it is the elimination of U.S. sensitivity to the variations in the price and supply of foreign sources of energy"). Proposed Rule at 26,077.

9 EPA, Draft Regulatory Impact Analysis for Proposed Rule, 480 (Apr. 2023) [hereinafter "DRIA"]. Notably, EPA concludes that U.S. oil consumption is projected to be fairly steady for the time period from 2027 to 2050" and will actually increase gradually over that time. Id.

Most illustrative of the future foreign reliance resulting from EPA's Proposed Rule is the lithium-ion battery supply chain controlled nearly entirely by China. China controls each step of battery production and, by 2030, is anticipated to "make more than twice as many batteries as every other county combined."10 This is because China controls 41% of the world's cobalt, 28% of the world's lithium, and 78% of the world's graphite; China also refines 95% of manganese, 74% of cobalt, 70% of graphite, 67% of lithium, and 63% of nickel.11 And even if the U.S. had sufficient resources to extract and refine independent of foreign sources, a refinery takes two to five years just to build—not accounting for the time necessary for permitting, construction, and operations, including waste disposal.12 Beyond the raw materials, China also makes the battery components—73% of NMC cathodes and 99% of LFP cathodes—compared to 1% made domestically.13 Indeed, "[e]xperts say it is next to impossible for any other country to become self-reliant in the battery supply chain, no matter if it has cheaper labor or finds other global partners. Companies anywhere in the world will look to form partnerships with Chinese manufacturers to enter or expand in the industry."14 EPA's reliance on federal funding and tax incentives—such as those under the Bipartisan Infrastructure Law ("BIL")15 and the Inflation Reduction Act (IRA)16—to conclude a domestic supply chain is forthcoming is, therefore, misplaced. Regardless of these funding sources, domestic manufacturing alone is unable to meet the production goals EPA is requiring. [EPA-HQ-OAR-2022-0985-1561-A1, pp. 3 - 4]

10 Agnes Chang and Keith Bradsher, NY TIMES, "Can the World Make an Electric Car Battery Without China?" (May 17, 2023) available at https://www.nytimes.com/interactive/2023/05/16/business/china-ev-battery.html.

11 Id.

12 Id.

13 Id.

14 Id.

15 Public Law 117-58, Nov. 15, 2021.

16 Public Law 117-169, Aug. 16, 2022.

Although EPA has acknowledged that a "transition period must take place in which a robust supply chain develops to support production of [critical minerals]," the limited time afforded under the Proposed Rule is simply insufficient to build this supply chain.17 [EPA-HQ-OAR-2022-0985-1561-A1, p. 4]

17 Proposed Rule at 25,962.

EPA also assumes the power sector is expected to become cleaner over time using wind/solar generation and electricity storage (i.e., batteries), but ignores the environmental impacts of the overall increase in critical minerals demand for electrical grid storage and how that compounds the stress on critical minerals for the ZEVs themselves. But the expansion of electrical grids—even ignoring the Proposed Rule's increased demand—requires a large amount of earth minerals and metals. Indeed, copper and aluminum—both needed for ZEVs—are also the two main materials in wires and cables and, as described above, higher prices could have a major impact on future grid investments.39 The need for expanded grid capabilities simultaneous to expanded ZEV production places a more pressing demand on materials like copper and aluminum thereby increasing extraction and refining efforts throughout the global market. [EPA-HQ-OAR-2022-0985-1561-A1, pp. 8 - 9]

39 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions (Mar. 2022), 77–80 available at https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.

Organization: Electrification Coalition (EC)

While the proposed standards seem feasible considering the expected expansion of U.S. battery production capacity, additional U.S. government support will be needed to expand domestic critical mineral production and battery component manufacturing capacity. [EPA-HQ-OAR-2022-0985-1558-A1, p. 7]

The EPA is specifically requesting comment on their assessment and data to support the assessment of battery critical raw materials and battery production for the final rule.20 The EC notes that overall the proposed standards seem feasible given policies in the Bipartisan Infrastructure Law (BIL) and the IRA that are expected to expand U.S. battery production, yet additional U.S. federal government support will be needed. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 7-8]

20 See page 25962, 25969 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

SAFE analysis shows that Class 4-8 ZEVs will make up a small share of battery and critical raw materials demand through 2030. Under a 33 percent ZEV penetration rate, electrified medium and heavy-duty trucks and buses are excepted and require a total of 50 GWh of battery production capacity.21 This number rises to 87 GWh when the penetration rate increases to 47 percent.22 In comparison, the DOE expects domestic battery production capacity to reach 1,000 GWh by 2030 to meet our growing demand which is mostly driven by light-duty EVs. [EPA-HQ-OAR-2022-0985-1558-A1, p. 8]

21 The 33 percent penetration rate is based on NREL's ZEV sales penetration rate under the central scenario. Each vehicle category is assumed to be produced with a battery pack tailored to its class: a 600kWh battery for heavy-duty battery electric vehicles, 350 kWh battery for medium-duty battery electric vehicles, and 240 kWh battery for electric buses. Source: SAFE and Roland Berger analysis based on NREL's 2022 Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis.

22 The 47 percent penetration rate is based on NREL's advanced electricity scenario. Source: SAFE and Roland Berger analysis based on NREL's 2022 Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis.

An accelerated transition to Class 4-8 ZEVs is not expected to have a significant impact on the readiness of the supply chain to provide the required critical minerals, components, and battery manufacturing capacity. However, as we speed up the transition, it will be even more important to ensure that the demand-pull we are creating is leading to the build-up of robust and reliable supply chains for critical minerals and EV batteries, especially in the upstream. [EPA-HQ-OAR-2022-0985-1558-A1, p. 8]

The battery is the most valuable component of an EV and battery manufacturing is the most labor-intensive step along the EV supply chain. Onshoring battery cell, module, and pack jobs, therefore, is key to minimizing job reductions with ZEV adoption. Under a 33 percent penetration rate, for example, battery manufacturing alone can replace about 80 percent of the jobs at risk. There is already a strong business case for domestic battery manufacturing, and both the manufacturing industry and the U.S. government have been taking steps to promote domestic battery manufacturing. Continued efforts in this space will be critical to replace jobs lost as transportation electrification accelerates. [EPA-HQ-OAR-2022-0985-1558-A1, p. 8]

Battery manufacturing on its own, however, is not enough to address the national security threats of this transition, especially with regard to critical minerals. The U.S. lags behind the rest of the world in critical mineral production, as well as the production of battery components. The U.S. States mines one percent of global nickel and lithium supply, and less than one percent of global cobalt supply.23 It does not produce graphite or manganese, two other critical minerals used in EV batteries.24 A similar case is true for processing. The U.S. processes only one percent of nickel and two percent of lithium used in EVs.25 Furthermore, despite accounting for six percent of global lithium-ion battery cell production capacity, the U.S. was home to less than one percent of cathode and anode production capacity in 2022.26 It is clear that more investment is needed to develop mining, processing, and battery component manufacturing capacity in the U.S.. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 8-9]

23 SAFE analysis based on data from U.S. Geological Survey.

24 Ibid.

25 SAFE analysis based on data from Benchmark Mineral Intelligence.

26 Ibid.

While the BIL and IRA provide opportunities to build out a U.S. supply chain, the U.S. government's ability to facilitate robust domestic processing and battery component manufacturing will largely depend on the manner in which BIL and IRA provisions are implemented. Furthermore, permitting delays will continue to inhibit our ability to increase domestic mine production. The proposed rule identifies the 21 U.S. lithium mine projects that can potentially help meet our growing lithium demand. These projects, however, cannot be brought online in a timely manner under our current permitting system. While efforts such as the inclusion of permitting reform provisions in the debt ceiling bill are commendable, a more comprehensive permitting reform bill will be necessary to truly expedite the federal permitting process. [EPA-HQ-OAR-2022-0985-1558-A1, p. 9]

Organization: Energy Vision

Battery electric trucks may have zero tailpipe emissions, but on a lifecycle basis, they actually do have significant emissions (and human rights concerns) from mining lithium and cobalt abroad – such as in the Democratic Republic of Congo and China – as well as from transportation and manufacturing; they also have troublesome battery disposal issues.

Organization: Environmental Defense Fund (EDF)

V. The supply chain for electric vehicle batteries and critical minerals is capable of safely and equitably meeting the demands of strong standards

Domestic production of batteries and battery components is growing rapidly. Analysis by EDF and WSP found that there has been over $79.7 billion in investment in U.S. battery and battery component production announced within the past 8 years, resulting in almost 70,000 new jobs.197 In 2026, these already announced investments will be capable of producing batteries sufficient to supply the equivalent of 11.2 million new passenger vehicles per year.198 [EPA-HQ-OAR-2022-0985-1644-A1, p. 76]

197 U.S. Electric Vehicle Manufacturing Investments and Jobs, Characterizing the Impacts of the Inflation Reduction Act after 6 Months, WSP for EDF, (March 2023). https://blogs.edf.org/climate411/files/2023/03/State-Electric-Vehicle-Policy-Landscape.pdf. (Attachment AA).

198 Ibid.

Much of this investment has occurred within the last year as a result of the IRA's incentives for domestic battery production, which will continue to spur production growth and reduce battery costs throughout the timeframe of this rule.199 The Advanced Manufacturing Production credit, for instance, provides up to $45 per kilowatt-hour for the production of battery cells and modules as well as up to 10% of the cost of critical minerals through 2032.200 Additionally, the IRA's amendments to the Clean Vehicle Credit includes provisions requiring that qualifying vehicles source an increasing percentage of their critical minerals and battery components domestically, which will further incentivize increased domestic production capacity.201 [EPA-HQ-OAR-2022-0985-1644-A1, p. 76]

199 Ibid.

200 Inflation Reduction Act of 2022, P.L. 117-1698, 136 Stat. 1971-81 (2022).

201 Inflation Reduction Act of 2022, P.L. 117-1698, 136 Stat. 1956-57 (2022).

The extraction, processing, and recycling of the critical minerals necessary to support rapid ZEV proliferation is also ramping up and supports the feasibility of protective emission standards. EDF has conducted a review of investments in the critical minerals supply chain, including new investments and expansion of existing capacities in raw minerals extraction (mining), materials separation and processing, and recycling efforts in the U.S, based on publicly available information from company websites and announcements issued by investors, government agencies, and news media on the operators, materials, locations, annual capacities, and timelines of the projects.202 The compilation of projects includes the scale and date of any announced investments in the projects, including OEM investments, as well as the details of partnership agreements. We have also compiled information on specific funding levels secured under the BIL. [EPA-HQ-OAR-2022-0985-1644-A1, p. 76-77]

202 The compilation is attached to this comment as an Excel file titled "Domestic Critical Minerals Projects." We are expanding the review to include countries with which the U.S. has free trade agreements. (Attachment HH)

The numerous projects and partnerships identified demonstrate a growing effort—that is supported by the BIL and motivated by the IRA—to develop a secure supply of the critical minerals. In October 2022, the White House announced $2.8 billion in funding under the BIL for projects to support "new, retrofitted, and expanded commercial-scale domestic facilities to produce battery materials, processing, and battery recycling and manufacturing demonstrations."203 The funding is the first phase of a total $7 billion investment by the federal government to develop domestic supply chains for electric vehicle battery production.204 According to project announcements, these investments in critical minerals projects have been spurred on by downstream consumer tax benefits under the IRA.205 [EPA-HQ-OAR-2022-0985-1644-A1, p. 77]

203 U.S. DOE Office of Manufacturing and Energy Supply Chain Bipartisan Infrastructure Law: Battery Materials Processing and Battery Manufacturing Recycling Selections, available at: https://www.energy.gov/mesc/bipartisan-infrastructure-law-battery-materials-processing-and-battery-manufacturing-recycling

204 U.S. DOE, October 19, 2022 Biden-Harris Administration Awards $2.8 Billion to Supercharge U.S. Manufacturing of Batteries for Electric Vehicles and Electric Grid, available at: https://www.energy.gov/articles/biden-harris-administration-awards-28-billion-supercharge-us-manufacturing-batteries

205 E.g., General Motors announced that, "[m]aterial sourced from Lithium Americas [Thacker Pass mine in Nevada] will help support EV eligibility for consumer incentives under the U.S. clean energy tax credits." Ford noted, in its announcement of a long-term agreement with Nemaska Lithium, that its lithium hydroxide should help qualify Ford vehicles for consumer tax benefits under the IRA. And Livent Corporation, in its announcement of the expansion of its largest lithium hydroxide production site in the U.S. said that its, "leading footprint in North America positions the company to take advantage of long-term growth opportunities and downstream incentives from the recently enacted Inflation Reduction Act (IRA), which encourages use of lithium produced or processed in North America."

In all, our review identified 74 domestic mining, processing, and recycling projects. Investment levels are not known for all projects but announced investments total over $25 billion, including $1 billion funded under the BIL. [EPA-HQ-OAR-2022-0985-1644-A1, p. 78]

It is vital that any increase in minerals mining and processing be undertaken in a way that does not increase pollution burdens on underserved communities, which have historically faced disproportionate harms from these processes. Projects undertaken must be carried out in a way that affirmatively prioritizes the needs of these communities. [EPA-HQ-OAR-2022-0985-1644-A1, p. 78]

Organization: Lynden Incorporated

Finally, batteries require significant amounts of lithium, cobalt, graphite and nickel, the vast majority of which comes from China, the Republic of Congo, and other areas with little concern for environmental impacts and human rights. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

Organization: International Council on Clean Transportation (ICCT)

BATTERY MINERAL AVAILABILITY Our analysis shows that the minerals required to produce batteries at the volume required during the period of this rule can be sourced domestically and from close trade partners. Battery supply chain capacity is expected to reach 1 terawatt-hour (TWh) by 2030. The U.S. has ten times more lithium reserves than needed to meet the 2030 EV production goals in its light-duty vehicle proposal. Friendly nations like Australia, Argentina, and Chile combined have two hundred times that amount. Australia and Canada also have one hundred times the amount of nickel, and fifty times the amount of cobalt needed in 2030, while Brazil, France, Indonesia, and the Philippines together have double again that amount. We expect truck manufacturers to favor lithium iron phosphate batteries for their safety and durability, reducing the need for nickel and cobalt supply on the zero-emission transition in the trucking sector. [EPA-HQ-OAR-2022-0985-1553-A1, p. 16]

Organization: MEMA

Supply Chain Challenges Will Continue Throughout Implementation In the supporting documents of the proposed rule, EPA catalogs all public statements of investment in and projections for future availability of critical minerals. This projected sum is then cited as evidence there will be sufficient materials for construction of the future fleet. We disagree with this optimism. To assume that all materials for advanced trucks, which are not available today, in the quantities needed to support the exponential growth in advanced technology vehicle adoption will become available creates significant, unnecessary risk. This risk will be borne by manufacturers and their suppliers. Furthermore, once a company has converted production to new technology lines that company cannot pivot its production capabilities or workforce skills back to the previous technology if EPA projections are not realized by the mid- to late-2020s. [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

We share the national goal of converting many MHDV platforms to electric and clean-fueled trucks, however where technology falls short due to physical limitations, there must be effective pathways to still serve the U.S. economy and the nation's demands. EPA cannot grant waivers post-2027 to allow greater production of ICE vehicles if electric vehicle technology fails to be adopted sufficiently fast enough. A rule which respects the pace and limitations of technological development is the appropriate pathway. [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

Recommendation: Battery recycling and disposal costs should be added to EPA's analysis as part of a sustainable BEV deployment to better address scarcity of critical minerals, provide a more resilient domestic supply chain, and over time reduce the added carbon impact of battery manufacturing and associated multi-national logistics. 7 [EPA-HQ-OAR-2022-0985-1570-A1, p. 7]

Recommendation: EPA revises and contains estimates of future (sufficient) materials availability through increased use of scaling factors, confidence levels and sensitivity analyses to prevent overoptimistic projections. [EPA-HQ-OAR-2022-0985-1570-A1, p. 8]

Lightweighting is well-recognized to increase trucking efficiency and there are three primary ways that this occurs:

- By allowing vehicles with equivalent range to use a smaller battery, leading to less consumption of critical raw materials like lithium, cobalt, nickel, and manganese. This helps reduce supply chain risk due to limited availability of critical minerals in the U.S. and reduced demand from mining for these materials, resulting in both environmental and human factors improvements. [EPA-HQ-OAR-2022-0985-1570-A1, pp. 12 - 13]

Organization: Moving Forward Network (MFN) et al.

11. EPA's Weak Proposal is Based on Flawed Assessments of Battery Technologies

11.1. There will be enough materials and battery supply chain production to electrify transportation

We agree with EPA's conclusion that vehicle electrification, including the electrification of heavy, medium, and light-duty fleets, will not lead to energy security risks or dependence on foreign imports in the U.S., but will instead provide the potential for a low impact and domestic energy supply. 88 Fed. Reg. at 25962. This section provides comments on the assessment of battery critical materials and battery production. [EPA-HQ-OAR-2022-0985-1608-A1, p. 85]

The lithium-ion batteries used to power electric vehicles include the following materials deemed critical by the United States Geological Survey: lithium, nickel, manganese, cobalt, graphite, and aluminum. 172 Of these materials, lithium is the only mineral that does not have a substitute currently on the market. Nickel, manganese, and cobalt are in the cathodes nickel-manganese-cobalt (NMC) and nickel-cobalt-aluminum (NCA). These are not the constraining materials because they are now substituted in a growing portion of EVs with the lithium-iron-phosphate cathode. 173 Graphite can also be substituted; synthetic graphite is a direct substitution for mined graphite, 174 and research has also demonstrated the use of silicon mixed with or to replace graphite as the anode. 175 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 85 - 86]

172 U.S. Geological Survey. United States Geological Survey Releases List of 2022 Critical Minerals. (2022). https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals

173 International Energy Agency. Global EV Outlook 2023. (2023). https://www.iea.org/reports/global-ev-outlook-2023/trends-in-batteries

174 Jinrui Zhang, Chao Liang, and Jennifer B. Dunn. Graphite Flows in the U.S.: Insights into a Key Ingredient of Energy Transition. Environmental Science & Technology. V. 57. No.8. (2023). p. 3402-3414. https://pubs.acs.org/doi/10.1021/acs.est.2c08655

175 Xiuxia Zuo, Jin Zhu, Peter Müller-Buschbaum, Ya-Jun Cheng. Silicon based lithium-ion battery anodes: A chronicle perspective review. Nano Energy. V. 31. No. 113-143. (2017). p. 2211-2855.h

Lithium is vital to manufacture lithium-ion batteries – the only type of EV battery used in all EVs purchased in the U.S.; therefore, the analysis correctly points to it as the constraining material for lithium-ion batteries. Yet, this is a slightly conservative estimation for future constraints because alternative battery types are beginning to be marketed globally. For example, sodium-ion batteries have recently been recognized as a potential lithium-ion battery substitute as Chinese automakers unveil their new technology. 176 This type of innovation is likely to reduce lithium demand globally and will be further discussed in the next section. [EPA-HQ-OAR-2022-0985-1608-A1, p. 86]

176 BYD & Huaihai planning Na-ion battery factory in China, Electrive. (June 12, 2023). https://www.electrive.com/2023/06/12/byd-huaihai-planning-na-ion-battery-factory-in-china/

Furthermore, we know advocating for zero-emissions within the Phase 3 GHG Rule, which is an essential step to reducing fossil fuel emissions and addressing the climate crisis, will potentially include mining impacts impacting EJ communities, in particular indigenous communities. Electric vehicles (EVs) also eliminate tailpipe emissions of harmful air pollutants that cause asthma and respiratory diseases, especially among Black, Indigenous, and other communities of color. However, without adequate protections for workers, communities, and environments near mining and processing sites, we risk replicating the harms of fossil fuel extraction. Besides the details below, which talk about opportunities for EV batteries that will not rely on lithium, there are measures that EPA can and should be taking to address potential mining impacts. [EPA-HQ-OAR-2022-0985-1608-A1, p. 86]

EPA points to findings by several sources that concur with its assessment that there will be material and production able to meet EV uptake in the LDV, MDV, and HDV sectors. 177 These include: 1) a report by Li-Bridge that there is expected to be sufficient supplies of cathode active production globally until the date forecasted, of 2035; 178 2) International Energy Agency (IEA) projections of global lithium carbonate until 2028; 179 and 3) Bloomberg New Energy Finance (BNEF) projection of lithium 2028. 180 The 2023 BNEF Electric Vehicle Outlook demonstrates the uptake in demand for minerals has incentivized continued expansion of the supply chain. 181 In addition, academic sources have demonstrated there are enough reserves and recycled content, such that demand for lithium will barely exceed a quarter of the available reserve by 2050 and about half by 2100. 182 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 86 - 87]

177 NPRM pages 123-126 and 128-132.

178 Slides 6 and 7 of presentation by Li-Bridge to Federal Consortium for Advanced Batteries (FCAB). (November 17, 2022).

179 International Energy Agency. Committed mine production and primary demand for lithium, 2020–2030. (October 26, 2022). https://www.iea.org/data-and-statistics/charts/committed-mine-production-and-primarydemand-for-lithium-2020-2030. (Last accessed: March 9, 2023).

180 Sui, Lang. Memorandum to docket EPA–HQ– OAR–2022–0985. Based on subscription data available to BNEF subscribers at https://www.bnef.com/interactive-datasets/2d5d59acd9000031?tab=DashboardDemand&view=8472b6c7-e8cc-467f-b4a4-fe85468fba3a

181 Bloomberg New Energy Finance. Electric Vehicle Outlook 2023. (2023). https://about.bnef.com/electric-vehicle-outlook/#download

182 V.V. Klimenko, S.V. Ratner, A.G. Tereshin. Constraints imposed by key-material resources on renewable energy development. Renewable and Sustainable Energy Reviews. V. 144. No.111011. (2021). p. 1364-0321. https://www.sciencedirect.com/science/article/pii/S1364032121003014

11.1.1. Federal investments have spurred private investments in domestic supply

Actions taken by the federal government have increased private investment in U.S. battery production. The impact of the Bipartisan Infrastructure Law and the Inflation Reduction Act on U.S.-based EV manufacturing, repurposing, and recycling growth demonstrates the influence US policy has on rapidly growing a domestically produced supply. Within six months of the Inflation Reduction Act's passage, automakers and battery manufacturers had announced a total of roughly $52 billion of planned investment in North America's EV supply chain with over 70 percent of those investments going towards battery supply chains and recycling. 183 [EPA-HQ-OAR-2022-0985-1608-A1, p. 87]

183 Cory Cantor. US Climate Law Fuels $52 Billion in New EV Investments. BloombergNEF. (March 13, 2023).

About 40% of global commercial vehicle sales are expected to contain LFP batteries in 2023, and LFP batteries are more common in certain vehicle segments like electric buses and in certain countries like China. 210 In the U.S., LFP batteries in heavy-duty BEVs are less common than nickel- and cobalt-based chemistries, and the use of LFP in commercial vehicles globally is expected to continue to decrease over time, reaching around 30% in 2032. 211 The relatively low pack-level specific energy in Table 2-41 of the DRIA shown in Table 10 below appears to only be taking into account the use of LFP, although this assumption cannot be checked because the cathode chemistry breakout/market share forecast was not provided. This is a conservative estimate of energy density considering nickel and cobalt containing cathodes are used in about a third of trucks, and recent advancements, such as the Blade Battery (10 Wh/kg increase), demonstrate density gains faster than historically seen. The EPA forecasts closely align with the lowest limit of specific energy forecasts by Bloomberg in Figure 27, although it would be more accurate to align with a medium forecast scenario considering the share of NMC chemistries used, especially in the U.S. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 96 - 97.] [See Table 10 Battery pack-level specific energy used by EPA in HD TRUCS located on p. 97 of docket number EPA-HQ-OAR-2022-0985-1608-A1 and Figure 28 Historic and Forecasted Specific Energy for Different Battery Chemistries located on p. 98 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

210 Colin McKerracher et al. Electric Vehicle Outlook 2023. BloombergNEF. (June 8, 2023).

211 Id.

212 Phase 3 DRIA at 169.

213 BloombergNEF Electric Vehicle Outlook 2022 (subscription required).

In BloombergNEF’s analysis, they used chemistry specific density and forecasted based on linear interpolation demonstrating that in 2027 the 95% confidence lower limit of specific energy is 198 Wh/kg, the same value used in the analysis shown above in Figure 28. 214 BloombergNEF’s lower limit values continue to closely align with the forecast used in EPAs analysis. As previously stated, this is likely an underestimation of the average specific energy we will see in the future, considering the share of nickel and cobalt containing chemistries used in the analysis compared to likely real-world scenarios as well as advancements in battery design. In addition, the linear interpretation forecast does not account for material substitution and large specific energy gains expected from quickly advancing technology. For example, the use of silicon in the anode can increase specific energy as shown in Figure 29 below, 215 and while it is not yet used widely, startups are progressing the technology and constructing commercial-scale manufacturing facilities. 216 [EPA-HQ-OAR-2022-0985-1608-A1, p. 98.] [See Figure 29 Specific energy and capacity for different anode and cathode compositions (silicon carbon composite anodes show higher metrics across the board than graphite alone)located on p. 99 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

214 Andy Leach. Lithium-Ion Batteries: State of the Industry. BloombergNEF. (September 9, 2022).This data includes historical and forecasted energy density rates from 2010 - 2035, subscription required for full report.

215 Placke, T., Kloepsch, R., Dühnen, S. et al. Lithium ion, lithium metal, and alternative rechargeable battery technologies: the odyssey for high energy density. J Solid State Electrochem. V. 21. (2017). 1939–1964. https://doi.org/10.1007/s10008-017-3610-7

216 Matt Blois. Silicon anode battery companies get a major boost. Chemical and Engineering News. (2022). https://cen.acs.org/energy/energy-storage-/Silicon-anode-battery-companies-major/100/web/2022/12; Group14. Group14 Begins Construction of World's Largest Commercial Factory for Advanced Silicon Battery Materials. (April 4, 2023). https://group14.technology/en/news/group14-technologies-begins-construction-of-the-worlds-largest-commercial-factory-for-advanced-silicon-battery-materials-

217 Placke et al.

Organization: National Association of Chemical Distributors (NACD)

Economic Analysis

NACD is concerned that the economic impacts resulting from the Environmental Protection Agency's (EPA) Phase 3 Greenhouse Gas (GHG) Emission Standards proposal will cause severe financial and supply chain burdens to the trucking industry and its stakeholders. [EPA-HQ-OAR-2022-0985-1564-A1, p. 2]

Supply Chain Implications

As this rule is being considered, our nation is still reeling from the massive tangling of its supply chains caused by the COVID-19 pandemic. While some of the disruptions have begun to ease, they exposed our supply chain's lack of resiliency. For several months, grocery stores had barren shelves; and shippers were paying record high prices to get products moved into and around the country. Without improved resiliency, this will occur again the next time there is a shock to the supply chain. [EPA-HQ-OAR-2022-0985-1564-A1, p. 3]

If this rule is finalized as proposed, the additional costs associated with acquiring heavy-duty vehicles will most likely price out drivers and businesses from the industry, as noted in the section above. This would have a disastrous impact on the supply chain given the truck driver shortage that has been affecting the industry for years. This proposal would create an additional roadblock in the form of higher upfront prices, preventing independent drivers from entering the industry, removing current ones, and adding financial strains on trucking businesses. In addition, this would increase the severe inflationary pressures that have been plaguing our nation. [EPA-HQ-OAR-2022-0985-1564-A1, p. 3]

Lastly, it is important to note that incorporating more ZEVs into the current heavy-duty trucking fleet will limit the amount of product that can be moved in commerce. A University of California study estimates electric trucks will weigh roughly 5,000 pounds more on average than their diesel counterparts by 2030,4 meaning the adoption of ZEVs will remove 5,000 pounds of potential cargo on each shipment. This requires either weight exemptions for ZEVs which may compromise safety, or more trucks to be on the road just to maintain current freight volume. In addition, the range for zero emission trucks is significantly less than their diesel counterparts, with the typical ZEV range being only about 200 to 240 miles,5 compared to ranges that can surpass 1,000 miles for diesel trucks. Range limitations require ZEVs to be sidelined more often and longer. These issues with range and weight limits will exacerbate congestion on our roads as well as our truck driver shortage. [EPA-HQ-OAR-2022-0985-1564-A1, pp. 3 - 4]

4 University of California Institute of Transportation Studies, "Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges," ucits.org, UCITS, https://escholarship.org/content/qt4z94w3xr/qt4z94w3xr_noSplash_952c8a5ed3d5eb4fda56294631b27227.pdf?t=qo95b9

5 Consumer News and Business Channel, "Where EV trucks are going to hit the road first," cnbc.com, CNBC, https://www.cnbc.com/2023/02/10/where-electric-trucks-are-going-to-hit-the-road-first.html

To improve supply chain resiliency, all modes of freight transport must work efficiently, especially trucking as it is responsible for moving over 70% of the nation's freight.6 Trucking is vital to the movement of goods before, after, and between other modes of freight transport. For example, trucks are often required to transport products between ports and railroads, well before they even begin their journeys to the customers. Without reliable truck movement, congestion will impact the entire American supply chain. NACD urges the EPA to impose more flexible standards to allow for the trucking industry to move towards lower emission vehicles without compromising supply chain resiliency. [EPA-HQ-OAR-2022-0985-1564-A1, p. 4]

6 American Trucking Associations, "Economics and Industry Data," trucking.org, ATA, https://www.trucking.org/economics-and-industry-data

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

Forcing the American automotive industry to shift reliance from domestically abundant and secure oil and gas to foreign-supplied critical minerals will have profound impacts on national security. These are only a few of the critical effects of the Proposed Rule that go well beyond EPA's expertise. [EPA-HQ-OAR-2022-0985-1603-A1, p. 11]

Organization: POET

BEVs will also require extracting certain metals at a far larger scale. That extraction can be energy-intensive and much of it occurs in countries where mining can severely degrade the environment, including by clear-cutting rainforests that store vast amounts of carbon.35

35 J. Emont, EV Makers Confront the 'Nickel Pickle,' Wall Street Journal (June 4, 2023), https://www.wsj.com/articles/electric-vehicles-batteries-nickel-pickle-indonesia-9152b1f (describing the EV makers shift from cobalt mining in the Democratic Republic of Congo to nickel mining by clear-cutting Indonesian rainforests).

Further, as described above, U.S. EPA's failure to perform an analysis of the whether or not it is even feasible for the industry to produce the number of HD ZEVs assumed by U.S. EPA in the assumed timeframe has to be added to the list of contradictions to use of the 'payback' analysis in forecasting adoption rates. Such an analysis would begin with an assessment of the ZEV technology supply chain and need to demonstrate, in light of worldwide demand for ZEV technology, that sufficient raw materials, finished batteries, electric motors, fuel cells, controllers, regenerative braking system components, will be available with sufficient lead time and at the costs assumed by U.S. EPA in its payback analysis. [EPA-HQ-OAR-2022-0985-1528-A1, p. 25]

Organization: South Dakota Department of Agriculture and Natural Resources (DANR)

National Security

EV batteries rely on lithium to operate, and recent reports indicate China could control as much as a third of the world's lithium by 2025. South Dakota does not support any regulatory effort making the United States more reliant on China. EPA should consider the potential national security implications of implementing the proposed rules as well as consider the need to, and impact of mining lithium and other battery components domestically. [EPA-HQ-OAR-2022-0985-1639-A1, p. 2]

Organization: State of California et al. (2)

3. Improvements are Expected in the Supply Chain of Critical Minerals

The States and Cities agree with EPA's assessment "that increased vehicle electrification in the United States will not lead to a critical long term dependence on foreign imports of minerals or components, nor that increased demand for these products will become a vulnerability to national security."210 Both Congress and the Biden Administration have taken proactive steps to increase domestic production capacity for the five critical minerals used in the production of rechargeable batteries used in EVs. For example, the Infrastructure Investment and Jobs Act (P.L. 117-58) directs the Secretary of Energy to award over $6 billion in grants related to the research, supply, processing, and recycling of battery critical materials and minerals; 211 the Inflation Reduction Act (IRA) provides for a tax credit designed to accelerate EV battery production in the United States;212 and the Biden Administration has committed to working with the European Union to "diversify[] critical mineral and battery supply chains."213 [EPA-HQ-OAR-2022-0985-1588-A1, p.29]

210 88 Fed. Reg. at 25,962.

211 Congressional Research Service, Critical Minerals in Electric Vehicle Batteries (Aug. 29, 2022), https://crsreports.congress.gov/product/pdf/R/R47227.

212 Public Law 117-169, 136 Stat. 1818 (Aug. 16, 2022).

213 The White House, Joint Statement by President Biden and President von der Leyen (March 10, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/03/10/joint-statement-by-president-biden-and-president-von-der-leyen-2/.

Spurred both by public incentives, and "business opportunity" presented by "the need for increased domestic production capacity," private industry is also taking steps to increase domestic supply of critical minerals.214 As of March 2023, "at least $45 billion in private-sector investment has been announced across the U.S. clean vehicle and battery supply chain."215 This includes "new and expanded commercial-scale domestic facilities to process lithium, graphite and other battery materials, manufacture components, and demonstrate new approaches, including manufacturing components from recycled materials."216 Companies, such as Volkswagen of America, Audi, and Toyota, have committed to developing recycling programs for end-of-life EV battery packs, which will recover more than 95 percent of the metals found in existing batteries.217 These efforts aim to "create a circular supply chain for EV batteries in the United States that will eventually reduce the cost of batteries and offset the need for mining precious metals."218 Particularly taking into consideration these investments in recycling programs, there are sufficient mineral resources to meet industry needs, both now and in the future.219 [EPA-HQ-OAR-2022-0985-1588-A1, p.30]

214 88 Fed. Reg. at 25,962.

215 U.S. Department of the Treasury, Treasury Releases Proposed Guidance on New Clean Vehicle Credit to Lower Costs for Consumers, Build U.S. Industrial Base, Strengthen Supply Chains (March 31, 2023), https://home.treasury.gov/news/press-releases/jy1379.

216 U.S. Department of Energy, Bipartisan Infrastructure Law Battery Materials Processing and Battery Manufacturing & Recycling Funding Opportunity Announcement (Oct. 19, 2022), https://www.energy.gov/sites/default/files/2022-10/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets%20-%201_2.pdf; Jason Hidalgo, Tesla to build $3.6 billion battery, electric semi truck manufacturing facility in Northern Nevada, Reno Gazette Journal (Jan. 24, 2023), https://www.rgj.com/story/news/money/business/2023/01/24/tesla-to-build-3-6b-battery-electric-nevada-semi-truck-manufacturing-facility/69837346007/; Press Release, Proterra Announces EV Battery Factory in South Carolina as Demand for Commercial Electric Vehicles Grows, Proterra (Dec. 14, 2021), https://www.proterra.com/press-release/proterra-sc-battery-factory/; Lion Electric, Lion Electric Inaugurates its Battery Manufacturing Factory for Medium and Heavy-Duty Vehicles, prnewswire.com (April 17, 2023), https://www.prnewswire.com/news-releases/lion-electric-inaugurates-its-battery-manufacturing-factory-for-medium-and-heavy-duty-vehicles-301799083.html.

217 Kirsten Korosec, Volkswagen, Audi tap Redwood Materials to recycle old EV batteries in US, TechCrunch.com (July 12, 2022), https://techcrunch.com/2022/07/12/redwood-materials-volkswagen-audi-ev-battery-recycling/; Rebecca Bellan, Redwood Materials partners with Toyota to recycle batteries in US, TechCrunch.com (June 21, 2022), https://techcrunch.com/2022/06/21/redwood-materials-partners-with-toyota-to-recycle-batteries-in-us/.

218 Id. (Redwood Materials).

219 Jessica Dunn, Are There Enough Materials to Manufacture All the Electric Vehicles Needed (Nov. 15, 2022), https://blog.ucsusa.org/jessica-dunn/are-there-enough-materials-to-manufacture-all-the-electric-vehicles-needed/.

Moreover, the States and Cities find EPA's conclusions well supported that the cost to manufacture lithium-ion batteries has dropped significantly over the past several years and will continue to fall over time.220 EPA correctly observed that costs for lithium-ion batteries will decrease as a result of manufacturers' announced plans to invest billions of dollars in battery electric vehicle ("BEV") technology and development, as well as federal incentives in the Bipartisan Infrastructure Law (BIL) and IRA.221 [EPA-HQ-OAR-2022-0985-1588-A1, pp.30-31]

220 88 Fed. Reg. at 25,930.

221 Id.

And similar patterns are observed in the supply chain for fuel-cell electric vehicles, an alternative vehicle technology that can be used to meet stringent GHG emission standards, especially for long-haul trucks.222 The technology for hydrogen-powered electric trucks is already available, with buy-in from industry,223 and costs associated with these vehicles are expected to fall.224 Moreover, businesses are investing in the manufacture of hydrogen to power these vehicles.225 [EPA-HQ-OAR-2022-0985-1588-A1, p.31]

222 Thomas Walker, Zero Emission Long-Haul Heavy-Duty Trucking, Clean Air Task Force (Mar. 13, 2023), Executive Summary, https://www.catf.us/resource/zero-emission-long-haul-heavy-duty-trucking/.

223 See, e.g., Press Release, Premiere: Volvo Trucks tests hydrogen-powered electric trucks on public roads, Volvo (May 8, 2023), https://www.volvotrucks.com/en-en/news-stories/press-releases/2023/may/volvo-trucks-tests-hydrogen-powered-electric-trucks-on-public-roads.html; Today's Trucking, AMTA orders Nikola Tre battery-electric, and hydrogen fuel cell trucks for demonstrations, AMTA (Apr. 25, 2023), https://www.trucknews.com/sustainability/amta-orders-nikola-tre-battery-electric-and-hydrogen-fuel-cell-trucks-for-demonstrations/1003174531/; Press Release, Amazon, Amazon adopts green hydrogen to help decarbonize its operations (Aug. 25, 2022), https://www.aboutamazon.com/news/sustainability/amazon-adopts-green-hydrogen-to-help-decarbonize-its-operations; Lewin Day, Toyota Gets OK From California to Sell Hydrogen-Electric Semi-Truck Powertrains (Apr. 24, 2023), https://www.thedrive.com/news/toyota-gets-ok-from-california-to-sell-hydrogen-electric-semi-truck-powertrains; Michelle Lewis, SEA Electric just added a hydrogen power option for electric trucks (April 28, 2023), https://electrek.co/2023/04/28/sea-electric-just-added-a-hydrogen-power-option-for-electric-trucks/.

224 IRENA, Making the breakthrough: Green hydrogen policies and technology costs, International Renewable Energy Agency (2021), Green hydrogen cost reduction (irena.org); Emily Beagle et al., Fueling the Transition: Accelerating Cost-Competitive Green Hydrogen, RMI.org (2021), https://rmi.org/insight/fueling-the-transition-accelerating-cost-competitive-green-hydrogen.

225 Rod Walton, Cummins starting up its first U.S. Hydrogen Electrolyzer Manufacturing site in the U.S., EnergyTech (Oct. 11, 2022), https://www.energytech.com/energy-efficiency/article/21252555/cummins-starting-up-first-us-hydrogen-electrolyzer-manfacturing-site-in-the-us; Airswift, 5 US Green hydrogen projects starting in 2023 (Feb. 7, 2023), https://www.airswift.com/blog/green-hydrogen-projects-usa; Kirsten Korosec, Bosch to invest $200M in US fuel cell production for electric commercial trucks, TechCrunch (Aug. 31, 2022); Press Release, Toyota to Assemble Fuel Cell Modules at Kentucky Plant in 2023, Toyota (Aug. 25, 2021), https://pressroom.toyota.com/toyota-to-assemble-fuel-cell-modules-at-kentucky-plant-in-2023/; U.S. National Clean Hydrogen Strategy and Roadmap, https://www.hydrogen.energy.gov/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.

Organization: TCW

Cobalt, Lithium, etc., required to manufacture batteries for BEV's are primarily sourced overseas, with poor environmental standards, mined with equipment with no emission standards and/or with child and slave labor. [EPA-HQ-OAR-2022-0985-1473, p. 1]

Organization: Tesla, Inc. (Tesla)

The Critical Mineral and the Battery Supply Chain Are Not Limiting Factors in Medium- and Heavy-Duty BEV Deployment

Similar to infrastructure, Clean Air Act Section 202 does not direct EPA to consider upstream resource availability in promulgating standards, and so this is factor that need not be given undue weight. More importantly, Tesla does not believe that the critical minerals and battery supply chains will constrain future U.S. manufacturing and deployment of BEVs in any vehicle class. Moreover, there are no fundamental materials constraints when evaluating against 2023 USGS estimated resources.220 Such assertions assume (wrongly) that reserves are fixed and declining. In fact, mineral resources and reserves have historically increased – that is, when a mineral is in demand, there is more incentive to look for it and more is discovered. In comparison, to extent that current critical minerals reserves are viewed as limiting, the agency should point to the long history of Peak Oil and how such predictions have never in themselves limited deployment of ICE vehicles.221 [EPA-HQ-OAR-2022-0985-1505-A1, p. 31]

220 See Tesla, Investor Day Presentation (March 1, 2023) at 28 available at https://digitalassets.tesla.com/teslacontents/image/upload/IR/Investor-Day-2023-Keynote

221 See e.g. Forbes, Peak Oil: The Perennial Prophecy That Went Wrong (Nov. 30, 2022) available at https://www.forbes.com/sites/arielcohen/2022/11/30/peak-oil-the-perennial-prophecy-that-wentwrong/?sh=c64aabb2bbe5

While appropriately assessing the critical minerals supply chain associated with BEVs, EPA should also note it has never undertaken the same assessment related to ICE vehicles. A sustainable energy economy actually involves a lower level of mineral extraction than a fossil fuel-based economy.222 For example, the U.S. oil and gas sector has long been dependent on critical minerals from China for use in oil and gas exploration and development drilling.223 The petroleum industry's reliance on barite has even been used as a case study on U.S. critical minerals dependence.224 Indeed, the American Petroleum Institute has been so concerned about dwindling global reserves that it altered the specifications for the type of barite used in oil and gas drilling.225 At no point has the EPA found that this supply chain constraint has impacted the fuel supply for ICE heavy-duty vehicles or impacted such vehicles' viability for deployment.226 Accordingly, to the extent such conditions are found in the battery supply chain, it should be anticipated that they neither diminish the viability of heavy-duty BEV technology nor will limit deployment volumes for the Phase 3 period of MY 2027-2032. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 31-32]

222 Tesla, Master Plan Part 3 at 31-36 available at https://www.tesla.com/blog/master-plan-part-3

223 See U.S. House of Representatives, Committee on Resources, Subcommittee on Energy and Mineral Resources, Oversight Hearing on ``U.S. Energy and Mineral Needs, Security and Policy: Impacts of Sustained Increases in Global Energy and Mineral Consumption by Emerging Economies Such as China And India' (March 16, 2005), Statement of W. David Menzie, Geologist, U.S. Geological Survey ('There are a significant source of a number of mineral commodities for which the U.S. is dependent for imports of its supplies, and these include things like antimony, barite, fluorspar, magnesium and there are things that are used in batteries, ceramics, electronic components, flame retardants, metallurgical processing and petroleum drilling.') available at https://www.govinfo.gov/content/pkg/CHRG-109hhrg20126/html/CHRG-109hhrg20126.htm

224 U.S. Geological Survey, 'Barite—A Case Study of Import Reliance on an Essential Material for Oil and Gas Exploration and Development Drilling' available at https://pubs.usgs.gov/sir/2014/5230/pdf/sir2014-5230.pdf; See also, U.S. Government Accountability Office, Hardrock Mining: Trends in U.S. Reliance on Imports for Selected Minerals (Apr. 30, 2019) at 3, available at https://www.gao.gov/products/gao-19-434r

225 U.S. Geological Survey, Mineral Commodity Summaries 2020 at 29 ('In response to concerns about dwindling global reserves of 4.2-specific-gravity barite used by the oil and gas drilling industry, the American Petroleum Institute issued an alternate specification for 4.1-specific-gravity barite in 2010.) available at https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf

226 It should be noted that the oil and gas industry's supply chain reliance and constraints have been exemplified by its continued lobbying for exemptions from the Section 301 tariffs for steel and other inputs said to be key to the industry. See e.g., Independent Petroleum Association of America, Steel and Aluminum Tariffs & Quotas available at https://www.ipaa.org/tariffs/ (highlighting supply chain dependence); Daily Energy Insider, API calls for oil, gas industry exemptions from steel tariffs (may 22, 2018) available at https://dailyenergyinsider.com/news/12579-api-calls-oil-gas-industry-exemptions-steel-tariffs/

Nevertheless, the significant and growing investment in the battery supply chain and manufacturing capacity and Tesla's own significant responsible sourcing efforts ensure that BEV deployment will not be limited during the MY 2027-2032 Phase 3 period. As the IEA recently found, the strong investment in BEV and energy storage will double in 2023 to $30 billion (from 2022) and has already led to a wave of new lithium-ion battery manufacturing projects around the world totaling an estimated 5.2 TWh of new capacity that could be available by 2030.227 This has already led overall investment in critical mineral development to increase 30% in 2022, including a 50% increase in lithium resource development followed by similar focuses on copper and nickel development.228 This expansion is occurring and is expanding so fast that battery manufacturing capacity is now on track to meet the 2030 milestones set out in the IEA's scenario for net zero CO2 emissions by 2050.229 [EPA-HQ-OAR-2022-0985-1505-A1, p. 32]

227 IEA, World Energy Investment 2023 (May 25, 2023) available at https://www.iea.org/reports/world-energy-investment- 2023

228 Id. at 104

229 Bloomberg, Solar, Battery Boom Puts Net Zero Path in Reach: Sparklines (May 25, 2023) available at https://www.bgov.com/next/news/RV7L4BT0G1KW

Similarly, the IRA's domestic critical mineral processing and battery manufacturing incentives have led to exponential levels of investment in the battery supply chain.230 In early 2023, it was already estimated that there were $210 billion of announced domestic BEV manufacturing investments.231 This expansion is also happening globally with over $300 billion of announced investment in new battery gigafactories since 2019.232 The U.S. expansion is occurring so rapidly it is already exceeding official government forecasts.233 An ongoing tally of this investment shows that these investments are happening throughout the U.S.234 [EPA-HQ-OAR-2022-0985-1505-A1, p. 32]

230 Infrastructure Investment and Jobs Act, P.L 117-58 (Nov. 15, 2021), Section 13502.

231 Atlas EV Hub, $210 Billion of Announced Investments in Electric Vehicle Manufacturing Headed for the U.S. (Jan. 12, 2023) available at https://www.atlasevhub.com/data_story/210-billion-of-announced-investments-in-electric-vehiclemanufacturing-headed-for-the-us/?utm_source=Center+for+Climate+and+Energy+Solutions+newsletter+list&utm_campaign=7093a6e673-EMAIL_CAMPAIGN_2022_04_29_03_23_COPY_01&utm_medium=email&utm_term=0_36e5120ca4-7093a6e673-303640237

232 Charged, Billions of bucks for US battery plants announced in 2022 (Jan. 12, 2023) available at https://chargedevs.com/newswire/billions-of-bucks-for-us-battery-plants-announced-in-2022/

233 See generally, Bloomberg, Goldman Sees Biden's Clean-Energy Law Costing US $1.2 Trillion (March 23, 2023) available at https://www.bloomberg.com/news/articles/2023-03-23/goldman-sees-biden-s-clean-energy-law-costing-us-1-2-trillion#xj4y7vzkg; See also, Semafor, How Washington underestimated Biden's big climate law (May 4, 2023) available at https://www.semafor.com/article/05/04/2023/biden-climate-ira-cost-inflation-reduction-act

234 See Charged, Update: U.S. Electric Vehicle Supply Chain IRA + 288 Days available at https://www.charged-thebook.com/na-ev-supply-chain-map (last visited May 31, 2023)

Tesla Development of a Robust, Secure Critical Minerals Supply Chain

As extensively detailed in Tesla's Impact Report 2022, Tesla's efforts to expand this supply chain are also accompanied with a commitment to ensuring that companies in our supply chain respect human rights and protect the environment.235 In every location touched by Tesla's supply chain, the company seeks to ensure local conditions for stakeholders are continuously improving as a result of the company's investment and sourcing decisions. This commitment is further detailed in our publicly available Responsible Sourcing Policy, Human Rights Policy, and Supplier Code of Conduct.236 These policies and our supply chain due diligence efforts are aligned with the United Nations Guiding Principles on Business and Human Rights237 and the Organization for Economic Cooperation and Development (OECD)'s Due Diligence Guidance for Responsible Business Conduct.238 [EPA-HQ-OAR-2022-0985-1505-A1, pp. 32-33]

235 Tesla, Impact Reports 2022: A Sustainable Future Is Within Reach at 139 -185 (describing Tesla's extensive responsible sourcing efforts) available at https://www.tesla.com/impact

236 Tesla, Responsible Sourcing Policies available at https://www.tesla.com/legal/additional-resources#responsiblesourcing-policies

237 United Nations, Office of the High Commissioner, Human Rights (2011) available at https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf

238 OECD, Due Diligence Guidance for Responsible Business Conduct available at https://www.oecd.org/investment/due-diligence-guidance-for-responsible-business-conduct.htm

To that end, Tesla has taken significant steps to establish and develop a robust supply chain that will support its future deployment of its Class 8 Semi consistent with the production and deployment estimates Tesla has previously shared with the agency. More specifically, this has included developing and expanding its vertical integration up the supply chain to include expanded cell production, build out of a new cathode production facility at Gigafactory Texas, and breaking ground on the most technologically advanced lithium processing facility in Corpus Christi.239 The blueprint for this activity was originally unveiled during Tesla's Battery Day announcement.240 [EPA-HQ-OAR-2022-0985-1505-A1, p. 33]

239 Tesla, Tesla Lithium Refinery Groundbreaking (May 8, 2023) available at https://www.tesla.com/blog/tesla-lithiumrefinery-groundbreaking

240 Tesla, Battery Day Presentation (Sept. 22, 2020) available at https://www.tesla.com/2020shareholdermeeting

Consistent with the Administration's focus on critical minerals, Tesla has continued to focus on creating a secure and sustainable supply chain anchored with domestic sources.241 To that end, following its Battery Day announcement, Tesla established an off-take agreement for a domestic source of lithium with plans to process the lithium hydroxide and manufacture cathode material in the U.S. – creating a first-ever wholly North American upstream advanced battery supply chain. 242 Additionally, Tesla continues to support partnerships for domestic mineral production, establishing supply agreements for North America production from Free Trade Agreement countries.243 Similarly, Tesla has worked to develop commercial relationships with companies onshoring critical mineral processing.244 [EPA-HQ-OAR-2022-0985-1505-A1, p. 33]

241 Tesla Impact Report 2022 at 139 -185.

242 Piedmont Lithium, Piedmont Lithium Amends Agreement with Tesla (Jan. 3, 2023) available at https://piedmontlithium.com/piedmont-lithium-amends-agreement-with-tesla/

243 See Bloomberg, Tesla Strikes Battery-Metal Deal in Push to Ensure Supply (Jan. 10, 2022) available at https://www.bloomberg.com/news/articles/2022-01-10/tesla-talon-enter-into-nickel-concentrate-supplyagreement#xj4y7vzkg; See e.g., BHP enters into nickel supply agreement with Tesla Inc (July 28. 2021) available at https://www.bhp.com/news/media-centre/releases/2021/07/bhp-enters-into-nickel-

supply-agreement-with-tesla-inc; Reuters, Australia’s Liontown signs 5-year lithium supply deal with Tesla (Feb. 15., 2022) available at https://www.reuters.com/business/australias-liontown-signs-5-year-lithium-supply-deal-with-tesla-2022-02-15/

244 See, Magnis, Magnis Signs Offtake Agreement for North American Anode Active Material Production (Feb. 20, 2023) available at https://magnis.com.au/asx-announcements/; Canary Media, DOE backs US battery materials production with $107M loan (April 18, 2022) (describing Tesla’s agreement with Syrah for domestic graphite production) available at https://www.canarymedia.com/articles/batteries/doe-backs-us-batterymaterials-production-with-107m-loan

EPA should also consider that recycling of battery material will play a vital role in alleviating some pressure on the need to develop new critical mineral resources. To that end, Tesla seeks to reduce its reliance on primary mined materials and contribute to a more positive environmental footprint through battery and cell recycling – including ensuring that none of our batteries (manufacturing scrap or fleet returns) go to landfills and deploying equipment to recycle 100% of on-site generated manufacturing scrap across manufacturing facilities. In comparison to BEV batteries, it should also be noted the energy source for ICE vehicles – fossil fuels used in combustion – is not recyclable. [EPA-HQ-OAR-2022-0985-1505-A1, pp. 33-34]

Finally, in furtherance of this effort, Tesla is also supporting other emerging domestic suppliers in the advanced battery supply chain as they seek developmental support through various DOE programs, including the Critical Minerals Mining Research and Development Program245 and the Advanced Technology Vehicle Manufacturing program.246 [EPA-HQ-OAR-2022-0985-1505-A1, p. 34]

Organization: Texas Public Policy Foundation (TPPF)

The LMD Tailpipe Rule and the market change it would engender will also make the federal government complicit in the often exploitative practices associated with rare-earth metal mining. The production and acquisition of rare-earth metals used in electric vehicle batteries is a dirty business. The extraction and processing of rare-earth metals can have serious environmental impacts, including soil and water contamination, deforestation, and habitat destruction, negatively affecting ecosystems and biodiversity. In certain areas, rare-earth metal mining has also been linked to labor rights violations, poor working conditions, low wages, child labor, and inadequate safety measures. The batteries that will power the green future the EPA seeks to create through the LMD Tailpipe Rule bear the stain of these violations of human dignity. [EPA-HQ-OAR-2022-0985-1488-A1, p. 6]

Overarching Issues Applicable to the HD and LMD Tailpipe Rules A transition to zero emission vehicles (‘ZEVs’) would expose Americans to supply chain vulnerabilities that are certainly beyond EPA’s authority. Wells Fargo projects a risk of shortages across virtually all of the key components of electric vehicle (‘EV’) batteries,1 and many of these rely on geopolitical rivals who control those supply chains.2 Accordingly, there is a sharp mismatch between the proposed rule and the availability of critical minerals essential to realizing its goals.3 Indeed, ‘mass electrification of the heavy-duty segment on top of the light-duty segment would substantially increase the lithium demand and impose further strain on the global lithium supply.’ 4 Specifically, ‘[t]he results suggest that global lithium resources will not be able to sustain simultaneous mass electrification of both the light duty vehicle (‘LDV’) and HDV segments.’5 It is therefore ‘recommended that both the government and vehicle manufacturers should carefully consider the ambitious promotion of vehicle electrification in the heavy-duty segment.'6 [EPA-HQ-OAR-2022-0985-1488-A1, p. 7]

1 Colin M. Langan, et al., BEV Teardown Series: The Untold Electric Vehicle Crisis, Part 1: Tesla Model Y–The Pace Car, WELLS FARGO (May 11, 2022).

2 IEA 2022 Global EV Outlook, at 154-58, 179, https://www.iea.org/reports/global-ev-outlook-2022.

3 IEA, World Energy Outlook Special Report – The Role of Critical Minerals in Clean Energy Transitions (Revised March 2022), https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.

4 Hao, H., Geng, Y., Tate, J.E. et al., Impact of transport electrification on critical metal sustainability with a focus on the heavy-duty segment, NAT COMMUN 10, 5398 (2019) https://www.nature.com/articles/s41467-019-13400-1

5 Id.

6 Id.

Organization: The Sulphur Institute (TSI)

Sulphur is a critical element to American manufacturing and is one of the key raw materials necessary for lithium extraction from mined aggregate. We believe in the advancement of domestic lithium battery production as outlined in the administration's "American Battery Materials Initiative" to Strengthen Critical Mineral Supply Chains with one of the goals being developing enough battery-grade lithium to supply approximately 2 million EVs annually. (3) The irony of this initiative is that sulphur, recovered from the oil refining process, is required for extraction of lithium, increasing the importance of a reliable and predictable sulphur supply chain in the future in what appears to be ever-decreasing supply situation in the United States. Mandating the systems by which sulphur is transported seems counterproductive with this goal. [EPA-HQ-OAR-2022-0985-1624-A1, p. 2]

(3) https://www.whitehouse.gov/briefing-room/statements-releases/2022/10/19/fact-sheet-biden-harris-administration-driving-u-s-battery-manufacturing-and-good-paying-jobs/

Organization: Transfer Flow, Inc.

V. ELECTRIC VEHICLE TECHNOLOGIES ARE THE OPPOSITE OF ENERGY INDEPENDENCE

Electric vehicle battery chemistry differs significantly from traditional internal combustion engine batteries. A conventional internal combustion engine uses a typical lead-acid battery. The most common battery chemistry used in an electric vehicle is nickel manganese cobalt. The mining of the raw minerals needed to manufacture the battery packs for electric vehicles is linked to many cases of horrific human rights abuses.4'5'6'7'8'9'10 [EPA-HQ-OAR-2022-0985-1534-A1, p. 3]

4 https://www.euronews.com/green/2022/10/28/south-americas-lithium-triangle-communities-are-being-sacrificed-to-save-the-planet

5 https://www.nytimes.com/2023/01/23/books/review/cobalt-red-siddharth-kara.html

6 https://www.washingtonpost.com/graphics/business/batteries/congo-cobalt-mining-for-lithium-ion-battery/

7 https://www.theguardian.com/environment/2021/jan/03/child-labour-toxic-leaks-the-price-we-could-pay-for-a-greener-future

8 https://www.nytimes.com/2021/05/06/business/lithium-mining-race.html

9 https://therevelator.org/ev-batteries-seabed-mining/

10 https://www.newyorker.com/magazine/2021/05/31/the-dark-side-of-congos-cobalt-rush

There are a limited number of locations around the world where the minerals needed to manufacture electric vehicle batteries are found. 70% of the cobalt used in electric vehicle batteries comes from a single country, the Democratic Republic of the Congo.11 80% of the battery supply chain is owned by China. The United States not owning the electric vehicle battery supply chain is especially concerning when we consider the possibility of a natural disaster or, heaven forbid, an international conflict. As we have seen recently in several local domestic terrorist attacks,12’13’14’15 an attack on the power grid could render electric vehicles located in affected regions useless. [EPA-HQ-OAR-2022-0985-1534-A1, p. 4]

11 https://www.nytimes.com/interactive/2023/05/16/business/china-ev-battery.html

12 https://www.cnn.com/2023/02/04/us/us-power-grid-attacks/index.html

13 https://lasvegassun.com/news/2023/feb/12/call-attacks-on-the-us-power-grid-what-they-are-do/

14 https://www.cbsnews.com/news/physical-attacks-on-power-grid-rose-by-71-last-year-compared-to-2021/

15 https://www.justice.gov/opa/pr/three-men-plead-guilty-conspiring-provide-material-support-plot-attack-power-grids-united

According to the United States Geological Survey, a major earthquake (M>=6.7) will likely strike California by 2032.16 We have recently seen in the wake of Hurricane Ian in Florida that electric vehicles are dangerous and ineffective and pose a public health risk in situations of natural disaster.17 [EPA-HQ-OAR-2022-0985-1534-A1, p. 4]

16 https://earthquake.usgs.gov/earthquakes/events/1906calif/18april/whenagain.php

17 https://abc7.com/hurricane-ian-ev-car-fires-electric-cars-damaged-florida-flood-damage/12356326/

Organization: Transportation Departments of Idaho, Montana, North Dakota, South Dakota and Wyoming

Before closing we also note that there are many other concerns with this proposal that may well be developed by others commenting to this docket. Those could include whether there is authority for the proposal and the dependence of EVs and their batteries on rare earth and other minerals that are largely sourced from and processed in China and other overseas locations. It raises implications for economic security and national security when a sector as important as car, truck and battery manufacturing becomes more dependent on foreign suppliers. [EPA-HQ-OAR-2022-0985-1487-A1, p. 2]

Organization: Truck and Engine Manufacturers Association (EMA)

In a similar vein, EPA generally assumes that, within the next few years, nearly all of the production of the required batteries and fuel cells, perhaps including the mining and processing of all of the critical minerals as well, will occur domestically in the U.S., so that nearly 100% of all of the potential incentives available under the IRA and BIL – down to the last dollar – will be fully utilized between now and 2032. The assumption that battery and fuel-cell manufacturing plants can be built, domestically sourced, and made operational at exponentially increased capacities within the next few years does not match any marketplace reality. Indeed, the expertise does not currently exist in this country to build and operate battery-manufacturing plants capable of producing at scale the size of batteries (with 4000+ cycles) necessary to power ZEV-trucks. It also is unrealistic to assume that battery manufacturers will pass on 100% of the IRA and BIL incentives that they might receive to OEMs in the form of one-to-one battery-cost reductions. Indeed, it can take well more than a year for a manufacturer to realize any net benefits from tax credits. Thus, to treat tax credits as a functional equivalent of dollar-for-dollar cost reductions, as EPA has done in its HD TRUCS model, is unreasonable. [EPA-HQ-OAR-2022-0985-2668-A1, p. 8]

OEMs, all of which have one or more BEV powertrains in production, provided EMA with their December 2022 cost for battery packs, along with the cost from approximately June 2022. The December 2022 average cost was $270/kWh hour, nearly double the cost estimated by ICCT. National labs and third-party expert consultants have consistently estimated that battery costs would fall substantially from 2019 through 2040. But, in fact, those costs have increased recently, rising from an average of $233 in June 2022, to $270 in December 2022. The critical elements for battery manufacturing have been in short supply, driving up prices. The pressure on the supply chain from LD ZEV growth, especially the volume increases from the growing regulatory mandates for more and more ZEVs, will continue to create supply and cost issues for the significantly smaller MHD market. Thus, the projections of falling costs are not accurate. [EPA-HQ-OAR-2022-0985-2668-A1, p. 25]

Organization: Truck Renting and Leasing Association (TRALA)

Critical Mineral Sourcing Remains Problematic

The country's mineral supply chains are not prepared for an abrupt transition to widespread BEV technologies. To produce the lithium-ion batteries that would power the hundreds of thousands of power units needed to meet the Administration's emissions goals, we need tens of millions of tons of cobalt, graphite, lithium, and nickel, and that amount could take as long as 35 years to acquire given current levels of global production.8 Expanding that capacity raises enormous sustainability and ethical questions and costs related to developing nations' exploitive child labor policies and the carbon reduction problem that battery production intends to resolve. [EPA-HQ-OAR-2022-0985-1577-A1, p. 6]

8 Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet, American Transportation Research Institute (December 2022).

If sourcing concerns are addressed, questions persist regarding disposal of used batteries and its environmental impact. Nearly all lead batteries are recycled.9 In contrast, the U.S. Department of Energy estimates that less than 5% of lithium-ion batteries are collected and recycled.10 This low rate of recycling furthers dependence on imported critical minerals and raises additional lifecycle impact concerns for our members who have comprehensive programs to divert waste from landfills and recycle/reuse most other vehicle waste streams. [EPA-HQ-OAR-2022-0985-1577-A1, p. 6]

9 Durable Goods: Product-Specific Data | US EPA.

10 112306-battery-recycling-brochure-June-20192-web150.pdf (energy.gov).

Organization: United Steelworkers Union (USW)

This proposed rule does not strike a balance between the ambition to reduce emissions and the practicality of the disruption in the supply chain. If EPA requires automakers to achieve far-reaching standards in an unreasonable time frame, they will rely on cheap, readily available components from countries, like the People's Republic of China (PRC), where a large amount of the current ZEV supply chain is located.6 Encouraging sourcing products from the PRC and similar countries does not advance best practices to reduce our environmental footprint as the use of coal to power manufacturing facilities in these countries is still prevalent.7 The potential offshoring of the automotive supply chain not only harms manufacturing workers and communities in the U.S., but it also allows automakers to cut their costs in pursuit of lower environmental and labor standards abroad. [EPA-HQ-OAR-2022-0985-1514-A1, p. 5]

6 Foley & Lardner LLP, "EPA Moves to Tighten Passenger and Heavy-Duty Vehicle Emissions Standards; Seeks to Drive Majority of New U.S. Car Sales to EVs by 2030", April 13, 2023.

7 National Public Radio, "China is building six times more new coal plants than other countries, report finds", March 2, 2023.

Organization: U.S. Chamber of Commerce

Another economic factor that EPA should consider in its regulatory impact analysis is not only the potentially high costs of critical minerals needed to meet these standards, but the forecasted surge in demand for critical minerals in other market segments such as renewable energy, light duty electric vehicles, energy storage, and semiconductors, among others. For example, IEA reports that 40 percent of global platinum demand is for catalytic converters, which also require large amounts of palladium and rhodium. Expected demand growth for these metals is high, and therefore an important factor in the rule's overall cost. Concurrent with this rulemaking, EPA is pursing more stringent NOx standards for the electric power sector that will also contribute to increased demand for these metals.2 [EPA-HQ-OAR-2022-0985-1583-A1, p. 2]

2 Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard, 87 Fed. Reg. 20036 (April 6, 2022).

An all of government strategy is needed to ensure the infrastructure needed to support zero-emission fleets in built in a timely manner. The current environmental permitting processes that is a prerequisite for building much of the charging infrastructure, grid interconnections, and other related Infrastructure takes significant time to complete. Currently, it takes 4.5 years to get a permit under the National Environmental Policy Act (NEPA) while some projects take longer, not only delaying but sometimes blocking these infrastructure projects altogether. [EPA-HQ-OAR-2022-0985-1583-A1, p. 3]

Other challenges remain for vehicle manufacturers as consumers and fleet owners may need to make significant investments in charging infrastructure necessary to support zero emitting vehicles. For smaller fleets, it raises more uncertainty as they will increasingly rely on infrastructure investments made at the federal and state levels. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

Organization: Valero Energy Corporation

A. EPA fails to adequately address critical minerals supply, availability, and geopolitics.

Citing to the IEA's Special Report dated March 2022, EPA mentions "risk to [the] availability [of critical minerals] may stem from geological scarcity, geopolitics, trade policy, or similar factors."125 But this acknowledgement does not give adequate attention to IEA's analysis. Specifically, IEA states that "[t]his World Energy Outlook special report on The Role of Critical Minerals in Clean Energy Transitions identifies risks to key minerals and metals that – left unaddressed – could make global progress towards a clean energy future slower or more costly, and therefore hamper international efforts to tackle climate change."126 The IEA Report further provides that EVs require significant mineral inputs compared with ICE vehicles.127 For example, the typical electric car contains six times the mineral resources of a kind susceptible to supply chain disruptions and volatility.128 Additionally, demand for EV minerals is growing rapidly and expected to outpace production in the coming years.129 Further, the long lead time for the development of new mines constrains industry's ability to respond to rapid increases in mineral demand.130 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 27 - 28]

125 EPA's HD Phase 3 GHG Proposal at 25963.

126 International Energy Agency, ''The Role of Critical Minerals in Clean Energy Transitions,'' World Energy Outlook Special Report, Revised version. March 2022. https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

127 Id.

128 Id.

129 Id.

130 Id.

In the proposed rulemaking, EPA states that Chile accounts for "20 percent" of global lithium mining131 and that "[a]ccording to the 100-day review under E.O. on America's Supply Chains (E.O. 14017), of the major actors in mineral refining, 60 percent of lithium refining occurred in China, with 30 percent in Chile and 10 percent in Argentina."132 However, recently Chile announced an intention to nationalize its lithium production.133 The announcement has led to questions regarding lithium supply volatility and security, specifically in the context of EV supply chains.134 Other examples of geopolitical and national security risk inherent to EV supply chains include, but are not limited to, as follows:

- "Amid growing demand for lithium in the race for electric vehicle batteries, Mexico last year nationalized the mineral and created the state-run LitioMx, or Litio Para Mexico."135 Recently, on February 18, 2023, Mexican President Andres Manuel Lopez Obrador signed a decree handing over responsibility for lithium reserves to Mexico's energy ministry, after nationalizing lithium deposits in April 2022.136
- "Indonesia is home to 22% of the world's nickel reserves, and its ban on nickel ore exports since 2020 has caused major shifts in the supply chains of strategic products such as electric vehicles and rocket engines."137 Nickel is a crucial material in the production

of EV battery cathodes.138 As stated in EPA's proposal, "in 2019 about 50 percent of global nickel production occurred in Indonesia, Philippines, and Russia".139 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 28 - 29]

131 EPA's HD Phase 3 GHG Proposal at 25963.

132 EPA's HD Phase 3 GHG Proposal at 25964.

133 Alexander Villegas & Ernest Scheyder, "Chile plans to nationalize its vast lithium industry",

134 See https://www.wsj.com/podcasts/the-journal/electric-cars-need-lithium-can-chile-provide-it/13ac5fc2-8f38-4d17-8888-2b02bfa2f0db; https://aheadoftheherd.com/chiles-lithium-nationalization-puts-the-squeeze-on-ev-makers-and-shines-a-spotlight-on-north-american-juniors-richard-mills/; https://www.reuters.com/markets/commodities/chiles-lithium-move-further-push-automakers-diversify-supply-chain-2023-04-24/.

135 https://www.reuters.com/markets/commodities/mexico-state-run-lithium-company-analyzing-geothermal-extraction-2023-04-20/.

136 https://www.reuters.com/world/americas/mexicos-lopez-obrador-orders-ministry-step-up-lithium-nationalization-2023-02-19/.

137 https://www.nbr.org/publication/indonesias-nickel-export-ban-impacts-on-supply-chains-and-the-energy-transition/. See also https://www.iea.org/policies/16084-prohibition-of-the-export-of-nickel-ore

138 https://www.iea.org/policies/16084-prohibition-of-the-export-of-nickel-ore

139 EPA's HD Phase 3 GHG Proposal at 25963.

EPA notes "[f]or example, in October 2022, the IEA projected that global Lithium Carbonate Equivalent (LCE) production from operating mines and those under construction may sufficiently meet primary demand until 2028 under the [IEA's] Stated Policies Scenario."140 But EPA ignores that IEA's 2022 Stated Policies Scenario is only "[a] scenario which reflects current policy settings" and does not contemplate any accelerated impacts resulting from EPA's current proposal or any regulatory activity within the current year.141 Moreover, even under the IEA's 2022 stated policies scenario (STEPS) "more conservative benchmark for the future"142, which does not anticipate EPA's HD Phase 3 GHG proposal, lithium supply is still ultimately projected to fall short of demand in 2028, as acknowledged by EPA.143 This is within the first model year of EPA's proposed standards under the HD Phase 3 GHG Rule. [EPA-HQ-OAR-2022-0985-1566-A2, p. 29]

140 EPA's HD Phase 3 GHG Proposal at 25965 (citing to International Energy Agency, ''Committed mine production and primary demand for lithium, 2020–2030,'' October 26, 2022. Accessed on March 9, 2023 at https://www.iea.org/data-and-statistics/charts/committed-mine-production-and-primarydemand-for-lithium-2020-2030).

141 https://www.iea.org/reports/global-energy-and-climate-model/understanding-gec-model-scenarios

142 https://www.iea.org/reports/global-energy-and-climate-model/stated-policies-scenario-steps

143 EPA's HD Phase 3 GHG Proposal at 25965 (citing to International Energy Agency, ''Committed mine production and primary demand for lithium, 2020–2030,'' October 26, 2022. Accessed on March 9, 2023 at https://www.iea.org/data-and-statistics/charts/committed-mine-production-and-primary-demand-for-lithium-2020-2030

EPA indicates that "[i]n addition, the European Union is seeking to promote rapid development of Europe's battery supply chains by considering targeted measures such as accelerating permitting processes and encouraging private investment. To these ends the European Parliament proposed a Critical Raw Materials Act on March 16, 2023, which includes these and other measures to encourage the development of new supplies of critical minerals not currently anticipated in market projections."144 In support of this statement, EPA cites to, in part, an EU Announcement regarding the European Battery Alliance as well as a New York Times article. Both sources, however, contain statements that undermine EPA's proposal. The European Battery Alliance announcement also states that:

However, Europe is still facing several structural challenges, such as the lack of 800,000 skilled workers by 2025, high energy, land, and permitting costs, as well as the fact that Europe is now home of only 1% of the production of key battery raw materials. The discussion took into account third countries' support schemes for green technologies, most notably in China, affecting the global level playing field. Moreover, while it is positive that the United States have decided to enter in full speed the fight against climate change through the Inflation Reduction Act, some of its provisions risk having a negative impact on the EU's competitiveness and attractiveness for new investments along the battery value chain.145 [EPA-HQ-OAR-2022-0985-1566-A2, pp. 29 - 30]

144 EPA's HD Phase 3 GHG Proposal at 25966.

145 European Union, ''7th High-Level Meeting of the European Battery Alliance: main takeaways by the Chair Maros Sefcovic and the Council Presidency,'' March 1, 2023. https://single-market-economy.ec.europa.eu/system/files/2023-03/Main%20takeaways_7th%20High-Level%20Meeting%20of%20EBA.pdf

The New York Times article cited to by EPA also clarifies that "despite the countries' [U.S. and EU's] deep cultural and historical ties, talks have been repeatedly bogged down by certain thorny issues, such as each government's treatment of its agricultural sector."146 The impacts are insufficiently addressed by EPA. [EPA-HQ-OAR-2022-0985-1566-A2, p. 30]

146 New York Times, ''U.S. Eyes Trade Deals With Allies to Ease Clash Over Electric Car Subsidies,'' February 24, 2023. https://www.nytimes.com/2023/02/24/business/us-europe-electric-car-subsidies-g20.html

EPA also maintains that "[d]espite recent short-term fluctuations in price, the price of lithium is expected to stabilize at or near its historical levels by the mid- to late-2020s."147 In support of this projection, EPA cites to an article148 that paints a more candid reality regarding battery metal price volatility:

"Contrary to anticipation, the global LIB supply chain is currently haunted by market fluctuations. From December 2020 to April 2022, the Chinese spot market has seen a price increase by 830% for lithium carbonate, 100% for cobalt sulfate, and 60% for nickel sulfate, with their per-ton prices rising to $73,000, $18,000, and $7,000, respectively. Skyrocketing costs were transmitted downstream as raw material suppliers were powerless over such huge surges. That made the cathode price increase by 140% for $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ (NCM-811) to $64,000/ton and 330% for $LiFePO_4$ (LFP) to $25,000/ton, and electrolyte price increased by 160% to $17,000/ton. The collective impact prompted an increase in LIB price in the second half of 2021, reversing its 30-year decline that began with the first-ever commercial product in 1991. In April 2022, prices of NCM and LFP prismatic electric vehicle (EV) battery cells reached $130/kWh and $120/kWh, respectively, 30% and 50% higher than their pre-surge levels. To respond, many

EV companies inflated retail prices, typically by 3%–5%, or even discontinued the sales of low-profit EV models, e.g., the Great Wall Ora.”149 [EPA-HQ-OAR-2022-0985-1566-A2, p. 30]

147 EPA’s HD Phase 3 GHG Proposal at 25966.

148 Sun et al., ‘‘Surging lithium price will not impede the electric vehicle boom,’’ Joule, doi:10.1016/j.joule. 2022.06.028

149 Id. (also available at https://www.belfercenter.org/publication/surging-lithium-price-will-not-impede-electric-vehicle-boom Balancing National Policy Considerations. In West Virginia, the Court found it significant that EPA’s rule would put the agency in the position of “balancing the many vital considerations of national policy implicated in the basic regulation of how Americans get their energy.” 142 S. Ct. at 2612. The Court was concerned that the agency would decide “how much of a switch from coal to gas” the grid could tolerate, and “how high energy prices [could] go” before becoming “exorbitant.” Id. Here, too, EPA’s rule puts it in the position of deciding “how much of a switch” to electrification the nation’s power grids can tolerate, and how high vehicle and electricity prices can climb without being “exorbitant.” [EPA-HQ-OAR-2022-0985-1566-A2, p. 55]

EPA’s asserted authority also implicates another key “consideration[] of national policy”: national security. NHTSA has acknowledged that the United States “has very little capacity in mining and refining any of the key raw materials” for electric vehicles. 86 Fed. Reg. 49,602, 49,797 (Sept. 3, 2021). And unlike biofuels and petroleum, most of the supply of critical components of batteries and motors for electric vehicles is controlled by hostile or unstable foreign powers, in particular China. Shifting to electric vehicles would thus make the American automotive industry critically dependent on one of the Nation’s primary geopolitical rivals. [EPA-HQ-OAR-2022-0985-1566-A2, p. 55]

Specifically, China is by far the largest source of graphite, which is used for lithium-ion batteries, and rare-earth elements like neodymium, which are used for permanent-magnet motors. By some estimates, a transition to electric vehicles would raise demand for graphite by 2500% and rare-earth elements by 1500%. International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions 97 (March 2022). Another key component of lithium batteries, cobalt, is controlled by the Democratic Republic of the Congo, which is implicated in significant human-rights concerns (including child labor), and Chinese state-owned enterprises have a controlling interest in 70% of Congo’s cobalt mines. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 55 - 56]

To be sure, with regard to this proposal on HDVs, as well as EPA’s related proposal for LDVs and MDVs, 151 members of the House submitted a letter247 to EPA urging the rescission of the proposals, citing such concerns as the proposal being “unworkable,” “impractical,” a ”deliberate market manipulation to prop up EVs,” a benefit to the Chinese Communist Party (“as China has a stranglehold on the critical minerals supply chain and manufacturing of EV batteries”), “not necessarily better for the environment in terms of emissions reductions,” and “worst of all,” a burden on Americans and their families, forcing them to pay “an excessive amount for a car they do not want and cannot afford.” Similarly, 26 senators issued a letter248 to EPA requesting withdrawal of the LDV, MDV, and HDV proposals, which “effectively mandate a costly transition to electric cars and trucks in the absence of congressional direction.” (emphasis added). The Senate letter further cited the proposal’s increased burden on the electric grid, the lack of supporting charging infrastructure, safety risks associated with EVs, roadway lifespan impacts and planning, consumer choice and affordability, domestic job losses, national security, and questionable cost metrics as concerns with, and flaws under, the proposal and also emphasized the application of the major questions doctrine and EPA's lack of clear authority:

Organization: Volvo Group

In addition to these governing and sectoral challenges, infrastructure development will also be strained by the lack of sufficient domestic production of minerals and materials including copper, aluminum, and electrical steel, the last of which currently has only one domestic supplier. The demand for these materials has surged, driven by the growth in renewable energy projects, the electrification of transportation, and the increasing use of digital technologies. At the same time, utilities and contractors are finding it difficult to secure these materials to complete projects on time and on budget due to supply chain disruptions1, trade tensions, and production limitations. This has led to shortages and price spikes2, thereby undermining the confidence of fleet customers in this new technology. [EPA-HQ-OAR-2022-0985-1606-A1, p. 7]

1 Onstad, E. (2022, March 25). European steel prices to extend rally as Ukraine conflict cuts supply. Reuters. Accessed on 14 June 2023 at https://www.reuters.com/world/europe/european-steel-prices-extend-rally-ukraine-conflict-cuts-supply-2022-03-25/

2 Spiller, B. (2023, May 3). Why Are Electric Truck Prices So High? Resources For the Future blogpost. Accessed on 14 June 2023 at https://www.resources.org/common-resources/why-are-electric-truck-prices-so-high/

b. Batteries

The U.S. battery manufacturing industry is quickly scaling to meet demand driven by transportation electrification. Since January 2021, the U.S. private sector has announced nearly $82 billion in battery manufacturing investments, translating to 96 new or expanded processing and manufacturing plants.91 According to Argonne National Lab, between 2010 and 2021, the private and public sector invested $95 billion in the U.S. battery manufacturing industry.92 This number represents 160 new or expanded critical materials processing and manufacturing facilities, with enough capacity to provide batteries for 10 million EVs each year and create 70,000 new jobs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 23]

91 New US Battery Manufacturing and Supply Chain Investments Announced Under President Biden, US Department of Energy, (February 13, 2023) https://www.energy.gov/sites/default/files/2023-02/Battery%20Supply%20Chains%20Investments%20Map.pdf

92 "A new look at the electric vehicle supply chain as battery-powered cars hit the roads en masse," Argonne National Laboratory, (May 4, 2023) https://www.anl.gov/article/a-new-look-at-the-electric-vehicle-supply-chain-as-batterypowered-cars-hit-the-roads-en-masse

The Bipartisan Infrastructure Law allocated $1.6 billion to the Department of Energy for the funding of "new commercial-scale domestic facilities to extract and process lithium, manufacture battery components, recycle batteries, and develop new technologies to increase U.S. lithium reserves."93 In 2022, the Inflation Reduction Act 45X Advanced Manufacturing Production and Advanced Energy Project Tax Credit provides $35 per kWh in each battery cell, $10 per kWh in each battery module, 10% of the costs of production of the applicable critical materials incurred by the taxpayer. The Advanced Energy Project Tax Credit also appropriated a $10,000,000 fund for tax credits to build clean technology manufacturing facilities, including those that process, refine, and recycle critical minerals.94 Through the 45X credit, the IRA cuts nearly one third of the cost of producing batteries in the United States.95 Together, these historic provisions will drive American battery innovation, ensuring that the sector is equipped to electrify all electric vehicle classes over the coming years. [EPA-HQ-OAR-2022-0985-2429-A1, p. 23]

93 Public Law 117-58

94 "Inflation Reduction Act: What it Is and What it Means for EV Adoption." Zero Emission Transportation Association, (2022) https://www.zeta2030.org/insights/the-inflation-reduction-act-what-it-is-and-what-it-means-for-ev-adoption

95 "U.S.-Made EVs Could Get Massively Cheaper, Thanks to Battery Provisions in New Law," Car and Driver, (February 3, 2023) https://www.caranddriver.com/news/a42749754/us-electric-cars-could-get-cheaper-inflation-reduction-act-section-45x/

i. Manufacturing

There is historic momentum around battery manufacturing as it ramps up to support transportation electrification. Over the past year, battery producers have rapidly invested in new battery capacity in anticipation of strong electric vehicle sales growth. Benchmark's Gigafactory Assessment suggests that a total of 1.4 terawatt hours of new battery capacity was announced in just the last six months and the number of Benchmark-tracked plants more than doubled—from 174 in November 2020 to 379 in April 2023.96 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 23 - 24]

96 "Battery gigafactory plans slow down in April after record 2022," Benchmark Minerals Intelligence, (April 26, 2023) https://source.benchmarkminerals.com/article/battery-gigafactory-plans-slow-down-in-april-after-record-2022?mc_cid=f82a9ac7a8&mc_eid=be723945d8

Below is a list of recently-announced investments in EV battery manufacturing, all of which will help support the transition to an electrified transportation sector:

- In March 2023, ZETA member LG announced a $5.5 billion investment to construct a battery manufacturing complex in Queen Creek, Arizona. The complex will consist of two manufacturing facilities.one for cylindrical batteries for EVs and another for lithium iron phosphate (LFP) pouch-type batteries for energy storage systems. LG plans to invest $3.2 billion in building a cylindrical battery manufacturing facility with a capacity of 27GWh, and $2.3 billion in LFP pouch-type battery facility with the capacity of 16GWh. Both facilities, totaling 43 GWh, plan to break ground this year and will begin production in 2025 and 2026, respectively.97 A more comprehensive list of LGs investments in domestic battery manufacturing can be found in Appendix Figure A.1.
- In April 2023, Hyundai Motor Co. announced it had finalized a $5 billion EV battery joint venture with SK On, a battery unit of SK Innovation Co Ltd. The plant will be located in Georgia and is expected to start manufacturing battery cells in the second half of 2025 with an annual production capacity of 35 GWh.98
- In April 2023, General Motors and Samsung announced they will invest over $3 billion to build a joint venture EV battery manufacturing plant in St. Joseph County, Indiana. Expected to start production in 2026, the plant aims to have an annual production capacity of 30 GWh.99 [EPA-HQ-OAR-2022-0985-2429-A1, p. 24.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 57, for Figure A.1]

97 “LG Energy Solution to Invest KRW 7.2 Trillion to Build Battery Manufacturing Complex in Arizona, Step Up EV and ESS Battery Production in North America,” LG, (March 24, 2023) https://news.lgensol.com/company-news/press-releases/1613/

98 “Hyundai Motor bolsters US presence with $5 bln EV battery venture,” Reuters, (April 25, 2023) https://www.reuters.com/business/autos-transportation/hyundai-motors-q1-net-profit-jumps-109-beating-expectations-2023-04-25/

99 “GM, Samsung SDI to invest more than $3 bln to build joint EV battery plant in US,” Reuters, (April 25, 2023) accessed May 17, 2023 https://www.reuters.com/business/autos-transportation/gm-samsung-sdi-plan-build-new-us-battery-plant-sources-2023-04-24/

Organization: Western States Trucking Association (WSTA)

Furthermore, Amnesty International and many other credible organizations have documented serious human rights violations linked to the extraction of the minerals used in lithium-ion batteries. The European Parliament adopted a ZEV Battery Directive Resolution on March 10, 2022, where battery-makers will face assessment of their supply chains to ensure any environmental or human rights abuses are identified and addressed. Carbon emissions caused by battery production should be disclosed, analyzed and used to create a responsible end-of-life recycling solution. [EPA-HQ-OAR-2022-0985-1533-A1, p. 1]

Organization: Zero Emission Transportation Association (ZETA)

6. The EV Supply Chain is Preparing to Support Increased Heavy-Duty Electrification

The widespread transition to electrified transportation is involving industries and companies that have not historically had a major role in supplying products to the transportation sector. Policies like EPA’s proposed Phase 3 GHG emissions standards for heavy-duty vehicles provide regulatory certainty for the entire supply chain supporting the transition to electrification. [EPA-HQ-OAR-2022-0985-2429-A1, p. 17]

As discussed further below, the supply chain is composed of discrete, yet interconnected segments that are continuing to scale up in capacity. Complementary policies in various stages of implementation today will lead to an even more robust and resilient supply chain over the MY 2027-2032 time frame covered by EPA’s proposed standards. [EPA-HQ-OAR-2022-0985-2429-A1, p. 17]

a. Critical Minerals Development

As projected demand for critical minerals (lithium, nickel, cobalt, manganese, copper, graphite, and rare earth elements) for use in EV batteries continues to grow—due in large part to policies such as EPA’s proposed Phase 3 HDV GHG emissions standards—the supply chain is preparing to meet that demand both through new extraction and processing and with additional support from recycling. [EPA-HQ-OAR-2022-0985-2429-A1, p. 17]

The section 30D New Clean Vehicle Tax Credit in the Inflation Reduction Act will ensure these critical minerals are sourced either in the United States or from free trade agreement countries. The credit is composed of two halves: qualifying vehicles will receive $3,750 for meeting each of the critical mineral and battery component sourcing requirements.70 The stringent ramp-up of the domestic sourcing requirements in the IRA over the coming years will lead to a robust supply chain capable of delivering domestically-sourced raw and refined materials. While the 30D credit is only available for eligible light-duty vehicles, the incentive to onshore EV supply chains will have additional effects for HDEVs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 17]

70 "Overview and Analysis: March Treasury Guidance for Clean Car Tax Credit (30D)," ZETA, (April 2023) https://www.zeta2030.org/insights/overview-and-analysis-march-treasury-guidance-for-clean-car-tax-credit-30d

A key element to the success of the supply chain's ability to deliver the critical minerals necessary to support the transition to electrified transportation will be reforming the permitting processes for new extraction and processing operations. The Biden-Harris Administration has placed a much-needed focus on this area71 and ZETA has consistently supported reforms72 that ensure development projects are constructed quickly while meeting the strongest environmental standards. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 17 - 18]

71 "FACT SHEET: Biden-Harris Administration Outlines Priorities for Building America's Energy Infrastructure Faster, Safer, and Cleaner," (May 2023) https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/10/fact-sheet-biden-harris-administration-outlines-priorities-for-building-americas-energy-infrastructure-faster-safer-and-cleaner/

72 "Critical Mineral Permitting Reform Framework," ZETA, (May 2023) https://www.zeta2030.org/insights/critical-mineral-permitting-reform-framework

i. Projected demand for critical minerals

Demand for critical minerals is expected to grow substantially in the coming years.73 Figure 2 shows IEA's projected demand scenarios by 2040 relative to a 2020 baseline. Figure [EPA-HQ-OAR-2022-0985-2429-A1, p. 18.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 18, for Figure 2]

73 "Mineral demand growth from new EV sales by scenario, 2040 compared to 2020," IEA, (October 26, 2022) https://www.iea.org/data-and-statistics/charts/mineral-demand-growth-from-new-ev-sales-by-scenario-2040-compared-to-2020

In a scenario that meets the goals of the Paris Climate Agreement, the share of total demand for critical minerals rises significantly over the next two decades to over 40% for copper and rare earth elements, 60-70% for nickel and cobalt, and almost 90% for lithium.74 EVs and battery storage have already displaced consumer electronics to become the largest consumer of lithium and are set to displace the stainless steel industry as the largest end user of nickel by 2040. [EPA-HQ-OAR-2022-0985-2429-A1, p. 18]

74 "The Role of Critical Minerals in Clean Energy Transitions," IEA, (May 2021) https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

ii. Meeting the forthcoming demand for critical minerals

As demand for critical minerals is expected to grow rapidly, it is first necessary to evaluate the current state of global production. For most minerals, production has grown in the past decade.75 However, while much of the production for certain minerals is concentrated in a handful of countries, the Carnegie Endowment for International Peace and Figure 3 below demonstrate that the demand for most virgin critical minerals can be met through extraction in democratic countries.76 [EPA-HQ-OAR-2022-0985-2429-A1, p. 19.] [See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 19, for Figure 3]

75 “bp Statistical Review of World Energy,” British Petroleum, (2022) https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bpstats-review-2022-full-report.pdf

76 Democratic countries include: Argentina, Armenia, Australia, Austria, Belgium, Bhutan, Bolivia, Brazil, Bulgaria, Canada, Chile, Finland, France, Georgia, Germany, Ghana, Iceland, Indonesia, Japan, Mexico, Mongolia, Nigeria, Norway, Peru, Poland, Portugal, Senegal, Sierra Leone, South Africa, South Korea, Spain, Sri Lanka, Sweden, Ukraine, and the United States.

77 “Friendshoring Critical Minerals: What Could the U.S. and Its Partners Produce?,” Carnegie Endowment for International Peace (May 3, 2023) https://carnegieendowment.org/2023/05/03/friendshoring-critical-minerals-what-could-u.s.-and-its-partners-produce-pub-89659

The Net Zero Industrial Policy Lab at Johns Hopkins University finds that partnerships among democratic countries would be able to produce enough minerals to enable the world to limit warming to 1.5 degrees Celsius, the more ambitious target in the Paris Climate Agreement.78 However, while producing enough metals to meet these targets would require extraordinary technological and financial cooperation, the substantial economic development opportunities create a strong incentive to do so. [EPA-HQ-OAR-2022-0985-2429-A1, p. 20]

78 Id.

In regards to lithium specifically, Benchmark Mineral Intelligence found that by the end of 2023, the world’s supply of lithium will be more than double 2021’s output and more than the total produced between 2015 and 2018.79 Such rapid growth provides cause for optimism that supply will be able to keep pace with demand in the coming years. Separately, given the national security implications of ensuring a stable supply of critical minerals, the Defense Advanced Research Projects Agency (DARPA) and the United States Geological Survey (USGS) have partnered to explore the potential of machine learning and artificial intelligence tools and techniques to enhance USGS domestic critical mineral assessments.80 [EPA-HQ-OAR-2022-0985-2429-A1, p. 20]

79 “Global lithium supply forecast to hit 1 million tonnes for first time,” Benchmark Mineral Intelligence, (April 28, 2023) https://source.benchmarkminerals.com/article/global-lithium-supply-forecast-to-hit-1-million-tonnes-for-first-time

80 “Artificial Intelligence for Critical Mineral Assessment Competition,” DARPA, https://criticalminerals.darpa.mil/

iii. ZETA members’ investments in critical mineral production

ZETA members are scaling up capacity to meet the projected demand in the coming years. For example, ioneer’s Rhyolite Ridge project—located in Esmeralda County, NV—holds the largest known lithium and boron deposit in North America.81 Ioneer recently announced a mineral resource update that found a 168% increase in estimated lithium at Rhyolite Ridge.82 [EPA-HQ-OAR-2022-0985-2429-A1, p. 20]

81 Ioneer - Rhyolite Ridge, accessed May 16, 2023 https://rhyolite-ridge.ioneer.com/

82 "New Ioneer Mineral Resource update finds 168% increase in estimated lithium at Rhyolite Ridge," BusinessWire, (April 26, 2023) https://www.businesswire.com/news/home/20230426005886/en/New-Ioneer-Mineral-Resource-update-finds-168-increase-in-estimated-lithium-at-Rhyolite-Ridge

Albemarle Corp. recently announced it is aiming to spend between $1.25 billion and $1.5 billion to double its lithium hydroxide output in Australia to a volume that it estimates could power more than 2 million electric cars a year.83 Albemarle plans to build two additional processing trains at its Kemerton plant south of Perth in Western Australia, which could boost its lithium hydroxide production by 50,000 tons annually. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 20 - 21]

83 "Lithium giant Albemarle eyes $1.5B Australian expansion," E&E News, (May 4, 2023) https://subscriber.politicopro.com/article/eenews/2023/05/04/lithium-giant-albemarle-eyes-1-5b-australian-expansion-00095141

Recently, Lithium Americas provided an update on the status of its various projects around the world.84 Lithium Americas' Caucharí-Olaroz project in Argentina is expected to begin producing lithium in June 2023. Production ramp up at the Caucharí-Olaroz project is expected to produce 40,000 tonnes of battery-quality lithium carbonate per year; the company expects to complete this expansion in Q1 2024. Domestically, Lithium Americas recently announced the start of construction activities at Thacker Pass in Nevada following receipt of notice to proceed from the Bureau of Land Management.85 [EPA-HQ-OAR-2022-0985-2429-A1, p. 21.]
[See Docket Number EPA-HQ-OAR-2022-0985-2429-A1, page 21, for Figure 4]

84 "Lithium Americas Reports First Quarter 2023 Results," Lithium Americas, (May 15, 2023) https://www.lithiumamericas.com/news/lithium-americas-reports-first-quarter-2023-results

85 Id.

With applications well beyond just EVs, ensuring a domestically-sourced supply of copper will be critical to ensuring a rapid transition to electrified transportation. In May 2023, the Department of Energy proposed to characterize copper as critical through its inclusion on the official DOE Critical Materials List.86 In particular, DOE is recommending a designation for copper of "near-critical" in the medium term (2025-2035). To meet the forthcoming increases in demand for copper, a pair of domestic projects are currently in various stages of development: [EPA-HQ-OAR-2022-0985-2429-A1, pp. 21 - 22]

86 "Critical Materials Assessment," U.S. Department of Energy, (May 2023) https://www.energy.gov/sites/default/files/2023-05/2023-critical-materials-assessment.pdf

Resolution Copper, Arizona: This project has the potential to supply up to 25% of the nation's copper demand to power America's clean energy transition with $1B annually into Arizona's economy. The project currently employs 300 people, 80% who live locally in rural communities within 40 miles of the project. When the mine is fully operational, Resolution Copper expects to directly employ about 1,500 workers, paying around $134 million per year in total compensation. In total, the project is expected to support 3,700 direct and indirect jobs, many of them local building trades and U.S. Steel Workers union jobs.87 [EPA-HQ-OAR-2022-0985-2429-A1, p. 22]

87 See: https://resolutioncopper.com/

NewRange Copper Nickel: This project is a 50:50 joint venture of Teck Resources Limited and PolyMet Mining Corp., holding the NorthMet and Mesaba deposits—two large, well defined resources in the established Iron Range mining region of Minnesota. The stand-alone company is creating a path to develop one of the world's largest and lowest cost copper-nickel-PGM producing districts, unlocking a new domestic supply of critical minerals for the low-carbon transition through responsible mining, and delivering significant, multi-generational economic and other benefits to the region and beyond.88 [EPA-HQ-OAR-2022-0985-2429-A1, p. 22]

88 See: https://newrangecoppernickel.com/

iv. Refining and processing

Beyond extraction, ZETA members have recently announced projects to process and refine raw critical minerals:

- In March 2023, Albemarle announced a new lithium processing facility in South Carolina.89 Albemarle expects the facility to annually produce approximately 50,000 metric tons of battery-grade lithium hydroxide from multiple sources, with the potential to expand up to 100,000 metric tons. Production at the facility would support the manufacturing of an estimated 2.4 million electric vehicles annually.
- In May 2023, Tesla announced a new lithium refinery in Southwest Texas which, when completed, is expected to produce enough lithium to build about 1 million EVs by 2025.90 [EPA-HQ-OAR-2022-0985-2429-A1, p. 22]

89 "Albemarle Corporation Announces New U.S. Lithium Mega-Flex Processing Facility in South Carolina," Albemarle Corporation, (March 22, 2023) https://www.albemarle.com/news/-albemarle-corporation-announces-new-us-lithium-megaflex-processing-facility-in-south-carolina–

90 "Elon Musk and Tesla break ground on massive Texas lithium refinery," Reuters, (May 8, 2023) https://www.reuters.com/business/autos-transportation/tesla-plans-produce-lithium-1-mln-vehicles-texas-refinery-elon-musk-2023-05-08/

EPA Summary and Response:

Summary:

There were many comments addressing issues pertaining to minerals critical to battery production. There was near consensus as to which minerals are at issue: lithium, cobalt, nickel, graphite, rare earths, copper, manganese, and (for some commenters) aluminum. AmFree stated that platinum is significant for FCEV production. The Sulphur Institute suggested that sulphur could be critical to the lithium mining process.

Some commenters questioned whether there was sufficient supply of some of these minerals, either in the rule's initial timeframe or thereafter. Commenter AVE quotes a World Bank estimate that "the global need for critical minerals will quadruple to over 3 billion tons by 2035, far exceeding the current supply." AmFree cites a DOE source as stating that global demand for "critical materials" will increase by 400-600% over the next decade. With respect to lithium, CFDC notes that worldwide demand in 2021 was 100,000 tons which is expected to grow to 30.3 million tons by 2050. Valero quotes the International Energy Agency (2022) as projecting demand shortfalls by 2028. Valero state that the same source projects 25 and 15 times increase in demand for graphite and rare earths, respectively. Arizona State Legislature postulates an increase of 42 times current critical mineral levels by 2040. AFPM projects a shortfall by 2030 based on current and anticipated production rates, challenging the finding of the Department of Energy's Li-Bridge that there will be no global shortage of cathode active material or lithium chemical supply through 2035 under current projections of global demand. Citing the same source[866], AFPM maintains that at current production rates, the world exhausts the minable reserves of copper, cobalt, and nickel in the 2030s, without accounting for demand of the proposed rule. The same commenter noted a Bloomberg (2022) projection that by 2030 copper demand is expected to rise by 53% when supply is expected to rise by only 16%, again not accounting for demand from the proposed rule.

Commenters also raised issues regarding extractability of these critical minerals. American Petroleum Inst. quotes BMI that 384 new mines will be needed by 2035 to meet worldwide demand for graphite, nickel, cobalt, and lithium (without regard to demand attributable to the proposed rule). Two commenters stated that mining anywhere in the world involves long lead times before they become operational, and then face the further issue of ore concentrates declining in quality as mining continues. (Valero, AmFree). With regard to domestic mining capability, commenters noted that at present there are no domestic graphite or manganese mines, one lithium mine, one nickel mine (slated to close in a few years), and one cobalt mine, none with capacity needed to support projected demand. (Electricity Coalition, AmFree). Commenters likewise noted the long time horizons and uncertainty of bringing new mining operation into production anywhere in the world (AmFree), and especially domestically (10-30 year estimate) (AmFree). A commenter stated that an additional two years of testing can be added to assure that lithium is of sufficient purity for cathode use. (AFPM). Another commenter stated that of the 275 rare earth extraction projects trying to start up worldwide in 2011, only 1.5% were operating as pilot projects or commercial entities 10 years later. (AmFree).

In these commenters' view, issues of limited supply are compounded by uncertainties due to the limited number of raw material sources, and, in some cases their potential political or geopolitical instability. Commenters stated that most of the world's cobalt comes from the Democratic Republic of the Congo. (e.g., Transfer Flow.) One commenter stated that Gabon is the source of most manganese. (AFPM.) That commenter also stated that fifty per cent of nickel comes from three countries: Indonesia, Philippines, and Russia. (AFPM.) Another commenter stated that sixty percent of graphite from China, and 90 per cent of lithium from Australia, Chile, and China (API). Commenters stated that with so few suppliers, supply shortages can arise due to natural disasters, or non-natural curtailment. Commenters noted the rise of 'resource nationalism' (AmFree), pointing to Indonesia curtailing nickel exports in 2020, and Mexico and Chile making moves to nationalize lithium extraction. (Valero.)

The commenters continue that these same issues arise, in even greater magnitude, due to constraints on refining (i.e., processing) capacity – in particular, that most of that capacity is Chinese. One commenter stated that China controls 60% of lithium refining capacity, 50% of graphite, 35% of nickel, 72% of cobalt, 40% of copper, and 90%of manganese. (AFPM.) Other commenters asserted estimates that are higher. (CATF, Delek, Arizona St. Legislature.). One commenter stated that domestic refining capacity, in contrast, is 1% of nickel, and 2% of lithium. (Electricity Coalition.) Some commenters stated that China likewise makes most battery components—73% of NMC cathodes and 99% of LFP cathodes—compared to 1% made domestically. (Delek, Electricity Coalition.)

[866] Lilly Lee, ENERGY INTELLIGENCE, Mining the Gap to a Net-Zero Future (May 15, 2023) available at https://www.energyintel.com/00000188-1e5f-d806-ad9f-5edfeb1d0000?utm_campaign=website&utm_source=sendgrid.com&utm_medium=email.

Putting this together, these commenters see an uncertain supply chain, that in their view raises significant issues as to whether there can be sufficient materials to support the degree of battery production which would be necessary under the projected potential compliance pathway. Commenters stated that the markets are inefficient and sclerotic (API, AFPM), vulnerable to squeezes in the form of unfair trade practices and outright supply reductions (AmFree, Chevron), as well as vulnerable to the aforementioned threats from resource nationalism and political instability.

Commenters noted the adverse geopolitical implications of these circumstances. Commenters stated that Chinese effective control of so many of these resources means that supply chains cannot exclude China. (e.g., AmFree, CFDC, AFPM.) Some of these commenters stated that this raises issues of critical mineral security, given that (in these commenters' views) at present the United States is essentially completely dependent on imports (with the exception of nickel and copper). (AFPM.) API analogized to the energy security issues raised by the 1970s oil embargo. These commenters found it ironic that the United States would prefer uncertain foreign sources of critical materials, with negative national security implications, when there are ample domestic energy resources. (CFDC, NACS, Delek, API.) CFDC took issue with EPA's statement that "mineral security is not a perfect analogy to energy security" because once the minerals are here they remain here as a recyclable resource (88 FR at 25962), noting the lack of recycling capacity, inability to recover any metal but lithium from batteries, the value of domestic oil exports, and, most important, the issue of dependence on China. The Arizona State Legislature stated that any energy security gains posited for the rule would be cancelled out by the negative mineral security issues.

Several commenters noted negative environmental and human rights implications, particularly those related to critical mineral extraction. Commenters stated that child labor abuses and environmental degradation issues from cobalt mining in the Congo are well documented. (e.g., AmFree, MFN, Lynden Inc.) Other commenters stated that lithium extraction can occur in high water stress areas, or otherwise in areas without environmental best practices. (AmFree, American Highway Users Alliance.) USW commented that "offshoring of the automotive supply chain not only harms manufacturing workers and communities in the U.S., but it also allows automakers to cut their costs in pursuit of lower environmental and labor standards abroad." As summarized and responded to in RTC section 17.1 above, some of these commenters maintained that EPA was required to account for pollutant emissions from these activities in its quantified emissions analysis.

Turning to the issue of cost, several commenters posited potential huge price increases and price volatility. One commented stated that since there are few suppliers and a Chinese-dominated supply chain, any of these entities possesses market power to control prices. (AFPM.) Other commenters stated that demand surges are bound to put upward pressure on prices. (AmFree, DTNA, Chamber of Commerce.) Some commenters stated that critical minerals are priced as specialty chemicals, not commodities, and hence are likely to remain priced high even if supply increases. (API, AFPM.) A commenter asserted that these concerns are not purely hypothetical, as between 2020 and 2021, the price of cobalt doubled. (AmFree.) Another commenter stated that lithium prices increased more than 7-fold between 2021 and 2022 (AFPM.) In response to findings in the proposed preamble that lithium prices had fallen and were likely to fall further as supplies increase, 88 FR at 25966/1-2, AFPM stated that most critical mineral contracts were futures, locking in current high prices. MEMA stated that EPA needed to consider the issue of battery disposal cost.

These commenters considered the question of battery production in light of all of these perceived constraints. Faced with the need to increase battery production by 600% by 2030 and 1500% by 2040 (CFDC, EMA), these commenters did not see how there could be sufficient domestic capacity (where EMA's estimate assumed batteries of 4,000 cycles.) Commenters believed this means that batteries will need to be imported, largely from China which currently dominates production, reinforcing national security concerns. (Arizona State Legis, Delek, CFDC.)

These commenters acknowledged that the IRA and BIL could have some positive effect on promoting domestic supply chains and domestic battery production, but viewed that effect as minimal. With respect to the Clean Vehicle Tax Credit (30D) (sic), these commenters doubted that the domestic content prerequisites and Chinese bar prescriptions can be satisfied, given China's dominance of processing and supply chains. (CFDC, AFPM.) They viewed the Advanced Battery Production Credit (45X) as of little consequence due to insufficient domestic production. (AFPM.) Commenters stated that the tax credit for Commercial Clean Vehicles (45W) is available but will be largely or entirely offset by federal and state excise taxes. (EMA, DTNA.)

These commenters concluded that domestic production of either the raw materials themselves, or battery production, would not be self-sufficient within the rule's initial timeline. These commenters stated that given permitting necessities, and inherent long delays between commencement and commercialization of mining projects, new mining capacity by 2032 is unrealistic, even for copper given the current importation of 45% of demand. (AFPM, Bradbury, Chamber of Commerce, Electrification Coalition ("[t]he proposed rule identifies the 21 U.S. lithium mine projects that can potentially help meet our growing lithium demand. These projects, however, cannot be brought online in a timely manner under our current permitting system"). One commenter stated that robust domestic supply chains likewise appear unrealistic in these timeframes. (Delek.) These commenters therefore took issue with EPA's ultimate conclusion that "increased vehicle electrification in the United States will not lead to a critical long term dependence on foreign imports of minerals or components." 88 FR at 25962. ((API, Ariz. St. Legislature.)

Conversely, other commenters were more optimistic. (CARB, Clean Air Task Force, EDF, ICCT, MFN, State of California, ZETA, Volvo, Tesla). These commenters echoed many of the points raised by EPA at proposal, and expanded on them. With regard to supply, domestic needs can be sourced from democratic foreign sources, or from domestic sources. (ZETA, ICCT ("The U.S. has ten times more lithium reserves than needed to meet the 2030 EV production goals in its light-duty vehicle proposal. Friendly nations like Australia, Argentina, and Chile combined have two hundred times that amount. Australia and Canada also have one hundred times the amount of nickel, and fifty times the amount of cobalt needed in 2030, while Brazil, France, Indonesia, and the Philippines together have double again that amount.") Commenters specifically noted enormous increases in lithium extraction in Australia and Argentina (ZETA), and large domestic reserves in Rhyolite Ridge (Nevada), and Imperial Valley (California) (ZETA, CARB.). ZETA stated that lithium extraction has in fact more than doubled worldwide since 2021. (ZETA). ZETA also pointed to expanded domestic copper and nickel mining (citing Resolution Copper, Arizona a project having the potential to supply up to 25% of the nation's copper demand, and NewRange Copper Nickel in the Mesabi range (a 50:50 joint venture of Teck Resources Limited and PolyMet Mining Corp., holding the NorthMet and Mesaba deposits).

With respect to supply chains, these commenters noted the increase in non-Chinese capacity, in particular, significantly expanded lithium processing capacity in Australia, Argentina, and domestically (Thacker Pass, Nevada, which has received a BLM permit, Albemarle, South Carolina (ZETA), plus Tesla's lithium processing startup in Southwest Texas (ZETA, Tesla)). Tesla noted in detail its steps to establish and develop a supply chain that will support its future deployment of its Class 8 Semi truck. Tesla stated that this vertically integrated operation includes expanded cell production, build out of a new cathode production facility at Gigafactory Texas, and breaking ground on the most technologically advanced lithium processing facility in Corpus Christi. Tesla has also established an off-take agreement for a domestic source of lithium with plans to process the lithium hydroxide and manufacture cathode material in the U.S. – creating a first-ever wholly North American upstream advanced battery supply chain. Tesla further notes its environmental stewardship and other benefits for all of the local communities associated with these projects. Tesla cites its own Responsible Sourcing Policy, Human Rights Policy, and Supplier Code of Conduct, which are aligned with the United Nation (UN) and the Organization for Economic Cooperation and Development (OECD)'s best practices for human rights and responsible business. Tesla also cites its development of an entirely North American battery supply chain. It cites the role that recycling will plan in reducing demand for new mineral resources for batteries, including its own efforts. This company maintained further that EPA has never done critical material assessments for fossil fuel-based standards, and maintains that Chinese control of barite, needed for petroleum extraction, raises issues of mineral security of the same type raised with respect to critical materials for battery production.

State of California et al. stated that "as of March 2023, at least $45 billion in private-sector investment has been announced across the U.S. clean vehicle and battery supply chain", citing the US Dept. of Treasury proposed guidance on new clean vehicle credits.[867] This commenter stated that this includes "new and expanded commercial-scale domestic facilities to process lithium, graphite and other battery materials, manufacture components, and demonstrate new approaches, including manufacturing components from recycled materials", citing to Dept. of Energy announcements. [868]

Like EPA, these commenters further pointed to enormous influx of federal, state, and private investment into domestic critical material extraction, processing, and, in particular, battery production. Commenters stated that the domestic mining operations mentioned above have billions of dollars of capitalization, as do the domestic supply chains. (ZETA, State of Cal.; see also similar comments of EDF, MFN, CATF). Volvo noted that since January 2021, the U.S.

[867] U.S. Department of the Treasury, Treasury Releases Proposed Guidance on New Clean Vehicle Credit to Lower Costs for Consumers, Build U.S. Industrial Base, Strengthen Supply Chains (March 31, 2023), https://home.treasury.gov/news/press-releases/jy1379.

[868]U.S. Department of Energy, Bipartisan Infrastructure Law Battery Materials Processing and Battery Manufacturing & Recycling Funding Opportunity Announcement (Oct. 19, 2022), https://www.energy.gov/sites/default/files/2022-10/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets%20-%201_2.pdf;

private sector has announced nearly $82 billion in battery manufacturing investments, translating to 96 new or expanded processing and manufacturing plants. (Volvo at n. 91.)

These commenters particularly focused on investments through the BIL and IRA. Volvo stated that "The Bipartisan Infrastructure Law allocated $1.6 billion to the Department of Energy for the funding of 'new commercial-scale domestic facilities to extract and process lithium, manufacture battery components, recycle batteries, and develop new technologies to increase U.S. lithium reserves.'" The same commenter stated further that "the Inflation Reduction Act 45X Advanced Manufacturing Production and Advanced Energy Project Tax Credit provides $35 per kWh in each battery cell, $10 per kWh in each battery module, 10% of the costs of production of the applicable critical materials incurred by the taxpayer. The Advanced Energy Project Tax Credit also appropriated a $10,000,000 fund for tax credits to build clean technology manufacturing facilities, including those that process, refine, and recycle critical minerals.94 Through the 45X credit, the IRA cuts nearly one third of the cost of producing batteries in the United States."

Commenters stated that this influx of capital is projected to lead to huge increases in domestic battery manufacturing, and lower costs reflecting this dramatic increase. (State of Cal., noting the decline in battery costs already). Volvo notes that a total of 1.4 terawatt hours of new battery capacity was announced in just the last six months and the number of Benchmark-tracked plants more than doubled—from 174 in November 2020 to 379 in April 2023 (citing Benchmark's Mineral intelligence, April 2023).

Volvo also lists a series of recent announcements of additional domestic battery manufacturing operations:

- In March 2023, ZETA member LG announced a $5.5 billion investment to construct a battery manufacturing complex in Queen Creek, Arizona. The complex will consist of two manufacturing facilities.one for cylindrical batteries for EVs and another for lithium iron phosphate (LFP) pouch-type batteries for energy storage systems. LG plans to invest $3.2 billion in building a cylindrical battery manufacturing facility with a capacity of 27GWh, and $2.3 billion in LFP pouch-type battery facility with the capacity of 16GWh. Both facilities, totaling 43 GWh, plan to break ground this year and will begin production in 2025 and 2026, respectively.

- In April 2023, Hyundai Motor Co. announced it had finalized a $5 billion EV battery joint venture with SK On, a battery unit of SK Innovation Co Ltd. The plant will be located in Georgia and is expected to start manufacturing battery cells in the second half of 2025 with an annual production capacity of 35 GWh.

- In April 2023, General Motors and Samsung announced they will invest over $3 billion to build a joint venture EV battery manufacturing plant in St. Joseph County, Indiana. Expected to start production in 2026, the plant aims to have an annual production capacity of 30 GWh.

Volvo also cited the May 2023 report of Argonne National Laboratory, which concluded "[i]n total, domestic EV battery manufacturing capacity will increase by almost 20-fold between 2021 and 2030."

Several commenters posited that there could be less demand for critical materials due to substitution with more plentiful minerals. These commenters stated that innovations and improvements in battery chemistry, which include sodium-ion and solid state batteries, improvements in the commonly used nickel-manganese-cobalt (NMC cathode), and the use of the alternative lithium-ion-phosphate (LFP), can shift or reduce minerals used in batteries, potentially lowering costs and easing supply chain constraints (MFN, CARB). Although one commenter stated that not all of these battery substitutes are suitable for HDVs (AFPM), another commenter stated that lithium-iron-phosphate batteries could be. (EDF.) Another commenter stated that synthetic graphite is a possible substitute for mined natural graphite, and there is research showing that silicon can replace all or some graphite in the anode. (MFN.) The Electricity Coalition noted that Class 4-8 HDVs are a relatively small part of demand in any case.

Response: Availability of the critical minerals lithium, cobalt, nickel, manganese, and graphite

In response to comments about the availability of critical minerals and the need for development of the supply chain supporting the manufacture of HD BEVs, as well as the uncertainties and risks associated with the same, EPA appreciates the additional information provided by commenters citing recent growth in the global and domestic supply chain. This information is consistent with our continued observation that development of the supply chain for ZEV manufacturing inputs is receiving broad attention in the industry and is progressing in response to market forces and governmental incentives. EPA also acknowledges the arguments relating to risk and uncertainty cited by adverse commenters. Regarding these comments, EPA notes that the presence of uncertainty and risk is a common element in virtually any forward-looking or predictive type of analysis. In general, in establishing appropriateness of standards, neither the Clean Air Act nor general principles of administrative law require that EPA must prove that every potential uncertainty associated with compliance with the standards must be eliminated a priori. It is well-established in case law that "[i]n the absence of theoretical objections to the technology, the agency need only identify the major steps necessary for development of the device, and give plausible reasons for its belief that the industry will be able to solve those problems in the time remaining. Thus, EPA is not required to rebut all speculation that unspecified factors may hinder 'real world' emission control." *NRDC v. EPA*, 655 F.2d 318, 333–34 (D.C. Cir. 1981). Thus, it is not required, nor would it be reasonable to expect, that EPA prove sufficient production capacity already exists today for technologies or inputs that are likely to be required to comply with standards in the future, nor that all potential uncertainties that can be identified regarding the development of that capacity must be eliminated. In fact, past EPA rulemakings have been technology-forcing, and so have required industry to develop and increase production of technologies for which critical inputs and production capacity were not fully developed and proven at the time.

While commenters have presented information to further demonstrate the well-understood concept that currently operating supply capacity must grow in order to meet projected future demand, and have recited many of the uncertainties commonly associated with predicting this or any future response of supply to future demand, they have failed to provide specific evidence to support the implication that the demand resulting from the standards will not or cannot be met by industry in the time available. Commenters question whether market forces and government initiatives and incentives that are already underway will lead to sufficient supply to meet the standards, but do not show specifically why these activities should reasonably be expected to fail. Indeed, EPA has shown that the industry is working actively and effectively to increase supply and secure supply chains for needed materials; that government incentives and initiatives have been defined and are moving forward with intended effect; and that current price forecasts and investment outlooks for the time frame of the rule do not suggest that industry at large foresees a looming inability to meet the standards.

EPA does not agree with the comments projecting shortfalls in the supply of the critical mineral lithium, cobalt, nickel, manganese, and graphite during the time frame of the Phase 3 rule. We also do not agree that there will be insufficient refining capacity for these minerals. See Preamble Section II.D.2.ii.c. Nor do we see indications that the United States will be dependent on adversarial countries for imports or refining capacity of critical minerals during the phase 3 rule's timeframe.

Since the proposal, the Department of Energy (DOE) worked with Argonne National Laboratory (ANL) to provide an independent analysis of the outlook for critical minerals used in BEVs[869] including nickel, cobalt, graphite, lithium, and manganese. DOE consulted the latest available announcements and forecasts to develop an up-to-date assessment of activity in advancing the availability of these minerals on a global and domestic basis. Key findings from this work are discussed in Section II.D.2.ii.c. of the preamble to this final rule and are discussed here. EPA has evaluated this study carefully, and considers it to be important support for our findings of adequate availability of critical minerals and battery supply during the timeframe of the Phase 3 rule. See also additional analyses and sources cited in Preamble section II.D.2.ii.c. and RIA Chapters 1.5 and 1.6 supporting that conclusion.

<u>Lithium</u>

Regarding lithium, DOE finds that there are significant efforts to scale lithium supply both domestically and in Free Trade Agreement (FTA) countries. Both in the near-term and the medium-term DOE projects that lithium production domestically, potentially supplemented by trade and recycling, will be enough to meet domestic demand. Global lithium mining supply is anticipated to more than double in the next five years. In fact, if lithium demand does not match this supply, it could lead to oversupply and create downward price pressure. Globally, the majority of current early stage and exploration projects are in Australia, Canada, and the U.S. Several other FTA and MSP partners, such as Portugal, the Czech Republic, and Germany, are likely to add capacity over the medium term, further strengthening U.S lithium availability. DOE assesses that the U.S is well positioned in securing lithium materials domestically, particularly if all projects underway (particularly later stage projects) are successfully brought online at capacity. Several U.S. projects are in the construction stage, including those at Fort Cady, Thacker Pass, Rhyolite Ridge, and King Mountains cited by commenters.[870] See the more comprehensive list of U.S. lithium projects in development in Preamble section II.D.2.ii.

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[869] FCEVs also use batteries, albeit smaller batteries than an HD BEV, and so use the same minerals. The discussion in the text is written in terms of BEVs since these are the predominant source of demand.
[870] Argonne National Laboratory, "Securing Critical Minerals for the U.S. Electric Vehicle Industry (ANL-24/06) (March 2024) ("ANL") at 34 .

projects) are successful. Through such projects the U.S lithium supply is expected to more than double by 2025, and the U.S is poised to become a global key player in the lithium industry by 2030 if all ongoing projects come to fruition. The majority of U.S lithium production is likely to come from brines, which are relatively cheaper to produce compared to lithium from spodumene deposits. Both in the near term and the medium term a significant portion of lithium will be available domestically and in FTA countries, likely enough to meet domestic demand. Several FTA and MSP partners, such as Canada, Portugal, the Czech Republic, and Germany, are likely to add capacity over the medium term, further strengthening U.S lithium availability. DOE assesses that the U.S largely has sufficient lithium supply to meet domestic demand of battery manufacturers under a number of reasonable demand scenarios and that trade with FTA countries can supplement any shortfall. In addition, ANL notes that recycling may provide an additional source of lithium in the Phase 3 rule's timeframe.[871] See Preamble Section II.D.2.ii which includes source citations documenting all of these points.

There are thus multiple projections of adequate supply well into the 2030s, and, as noted in the succeeding paragraph of this response, corresponding price stability. Moreover, significant lithium deposits do exist in the U.S. in Nevada and California as well as several other locations,[872,873] and are currently attracting development interest from suppliers and automakers.[874] Since the proposal, several large U.S. lithium resources have continued to be announced and explored for development, including what could be the largest known lithium resource in the world.[875,876,877] The recent discovery of such sources and increased interest in development of known but unutilized sources suggests that resources of lithium, which previously was used only in a limited number of applications, may be underexplored and underdeveloped, and suggests that additional discoveries and developments may continue to modify our understanding of lithium availability.[878] See the further discussion of these points in preamble section II.D.2.ii.

Certain commenters expressed concern that lithium prices would rise to levels rendering the Phase 3 rule infeasible on grounds of cost. In fact, recent drops in lithium prices beginning in

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871 ANL at 33, 36-37..

872 U.S. Geological Survey, "Mineral Commodity Summaries 2022 - Lithium", January 2022. Available at *https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-lithium.pdf*.

873 U.S. Geological Survey, "Lithium Deposits in the United States," June 1, 2020. Available at *https://www.usgs.gov/data/lithium-deposits-united-states*.

874 Investing News, "Which Lithium Juniors Have Supply Deals With EV Makers?," February 8, 2023. Accessed on March 24, 2023 at *https://investingnews.com/lithium-juniors-ev-supply-deals/*.

875 Yirka, B., "New evidence suggests McDermitt Caldera may be among the largest known lithium reserves in the world," August 31, 2023. Accessed on October 18, 2023 at https://phys.org/news/2023-08-evidence-mcdermitt-caldera-largest-lithium.html

876 ExxonMobil, "ExxonMobil drilling first lithium well in Arkansas, aims to be a leading supplier for electric vehicles by 2030," Press release, November 13, 2023. Accessed on December 16, 2023 at https://corporate.exxonmobil.com/news/news-releases/2023/1113_exxonmobil-drilling-first-lithium-well-in-arkansas

877 Reuters, "Exxon to start lithium production for EVs in the US by 2027," November 13, 2023. Accessed on December 16, 2023 at https://www.reuters.com/markets/commodities/exxon-start-producing-lithium-by-2027-2023-11-13/

878 Washington Post, "A Huge Lithium Discovery That Economists Were Expecting," September 11, 2023. Accessed on December 16, 2023 at https://www.washingtonpost.com/business/energy/2023/09/11/discovery-of-vast-new-lithium-deposit-in-us-shows-power-of-market/baad25be-50d2-11ee-accf-88c266213aac_story.html

early 2023[879] and persisting to the present[880] reflect the robust growth in lithium supply discussed above. They also lend further support to EPA's expectation that mineral prices will not continually rise as some commenters have suggested but will find an equilibrium within a reasonable range of prices as the rapidly growing supply chain continues to mature. See the further discussion in Preamble Section II.D.2.ii.a and c, and see also Comments of CARB noting the drop in price of lithium carbonate.[881]

We thus reiterate our conclusion from the proposal that the lithium market is responding robustly to demand and that global supply will be adequate at least through 2035, and that lithium prices are unlikely to spike high, but rather are likely to stabilize within this decade at or near historic levels, which does not constrain the projected need under the modeled potential compliance pathway supporting the Phase 3 standards. See 88 FR at 25965-66 and Preamble section II.D.2.ii.a, for more detailed information on projections of lithium prices.

Nickel

In the near- and medium-term, there is sufficient capacity in FTA and MSP countries to meet demand for nickel, although the U.S. will likely need to rely on non-FTA countries given expected competition for these mineral from other countries' decarbonization goals. DOE noted that there are significant efforts to scale nickel supply in FTA countries, with a number of early-stage exploration projects in Australia and Canada. While the ability of these projects to reach full production by 2035 is uncertain, they indicate global efforts are taking place to scale nickel availability to meet global demand. Exploration efforts for nickel in the U.S are currently limited, reflecting current geological sources and technology. Currently, about 50% of global nickel mining is in Indonesia, and Indonesia is expected to remain a major producer of nickel for the next decade, along with the Philippines, Australia, and Canada.[882]

DOE identifies several U.S policy levers that could support build out of nickel battery grade refining and recycling capabilities, for example, the DOE Loan Programs Office (LPO), and funding under the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA). Sufficient nickel supply is available, some from free trade agreement (FTA) and Minerals Security Partnership (MSP) partners (Canada, Australia, Finland, Norway), and other countries with whom the United States has bilateral or other types of trade agreements (Indonesia, Philippines and other non – Chinese allies). DOE thus concludes that international trade is likely to be important to strengthening U.S. supply of nickel. DOE outlines substantial efforts already underway with FTA, MSP, and other allies to secure nickel, including among other things, a Trade Investment Framework Agreement with Indonesia. ANL at 24. See the further discussion

[879] New York Times, "Falling Lithium Prices Are Making Electric Cars More Affordable," March 20, 2023. Accessed on March 23, 2023 at *https://www.nytimes.com/2023/03/20/business/lithium-prices-falling-electric-vehicles.html*. "

[880] See The Economist, January 6, 2024 at 54: "[m]ined supply of lithium and nickel is also booming; that of cobalt, a by-product of copper and nickel production, remains robust, dampening green-metal prices."

[881] We consequently disagree with the comment of POET (at p. 6 of Attachment A to its comments, a report by Trinity Consultants) that demand from the light duty sector in combination with the demand from the Phase 3 standards will necessarily result in battery price increases. We are simply not seeing that posited inexorable price increase notwithstanding increasing demand.

[882] ANL at 39.

in Preamble Section II.D.2.ii.a and c. In addition, there are active efforts to develop substitutes for nickel in batteries.[883]

Cobalt

Like nickel, there are significant efforts to scale cobalt supply in the FTA countries and globally. Cobalt and nickel tend to be co-located and co-produced, so the same projects that produce nickel often also produce cobalt. Exploration efforts for cobalt in the U.S. is limited. While the Democratic Republic of Congo (DRC) is and will continue to be a key global source of cobalt mining supply (currently about 70 percent of global cobalt mining supply), other promising sources outside DRC include Canada and Australia.[884] The majority of global mined cobalt is currently refined in China. Cobalt production in the U.S. is very limited and there is no cobalt refinery, but several efforts exist to support build out of domestic cobalt refining.[885] DOE concludes that FTA and MSP partners are unlikely to add sufficient cobalt mining supply to support U.S. and other western nations' decarbonization goals, and trade with trade agreement partners will be key in securing cobalt supply and (as discussed further below) identifies similar policy levers to build domestic production.

This supply is projected to be sufficient to meet demand. BloombergNEF now similarly projects that cobalt and nickel reserves "are now enough to supply both our Economic Transition and Net Zero scenarios," the latter of which is an aggressive global decarbonization scenario.[886] It is also significant that the U.S. cobalt spot price dropped by nearly 42% in the past year (2023-2024), indicating ample current supply.[887] We thus do not accept those comments (e.g. from API and AmFree, among others) postulating unacceptable price increases of these critical minerals due to outstripped demand.

Graphite

In the near-term, meeting U.S. demand with natural graphite supply from domestic, FTA and MSP sources is unlikely; however, in the medium-term, there is potential for new capacity in both FTA and Non-FTA countries, and for synthetic graphite production to scale. Trade and partnership with Non-FTA countries such as Tanzania, Mozambique, Madagascar, Malawi, Brazil, Guinea, and Uganda, given their potential to increase natural graphite production capacity, will likely be crucial. FTA countries (Canada and Australia) are likely to add natural graphite capacity over the medium term.[888] Currently, the major U.S source of imports other

[883] See The Economist (Feb. 10, 2024) ("Cullen Hendrix of the Peterson Institute for International Economics, a think-tank, notes that lithium-iron phsophate batteries, which contain no nickel are becoming more popular, Sodium-ion batteries, which need neither nickel nor lithium, could surpass both types. Last month, JAC Motors, a Chinese carmaker backed by Volkswagen… delivered that first commercial vehicles powered by sodium-ion batteries to customers.").
[884] ANL at 47.
[885] ANL at 48.
[886] BloombergNEF, "Electric Vehicle Outlook 2023," Executive Summary, p. 5. See also The Economist, January 6, 2024 at 54: "[m]ined supply of lithium and nickel is also booming; that of cobalt, a by-product of copper and nickel production, remains robust, dampening green-metal prices."
[887] https://ycharts.com/indicators/us/cobalt/spot/price (last accessed January 23, 2024)
[888] ANL at 52.

than China include Canada, Mexico, Madagascar, Brazil and Mozambique, and these sources are likely to continue to be major sources of import for U.S manufacturers.[889]

There is no current U.S. production of graphite from mine sources, though exploration efforts are ongoing. The earliest U.S. production of natural graphite is anticipated in 2025 from Coosa with capacity of 7,500 metric tons per year, with the biggest project anticipated to come online in 2028 from Graphite Creek with capacity of 51,000 tons per year.[890] In addition to natural graphite from mine sources, synthetic graphite shows promising opportunities with the earliest project anticipated to come online in 2024.

ANL also indicates that synthetic graphite scaling has potential to mitigate graphite risk in the medium term.[891] Another concern, as noted above, is that in 2023, China imposed an export permit requirement on graphite, which will temporarily reduce graphite exports due to a 45-day application period for permits, and suggests that graphite exports from China may be controlled in the future. However, at this time it is not clear that this requirement will meaningfully impact exports over the long term, as similar permit requirements have existed on other exports, including those necessary in ICE vehicle production[892]; Wood Mackenzie reports that a change to material flows is unlikely, and that a graphite supply chain outside of China is rapidly developing.[893] See further discussion in response below concerning mineral security regarding potential mitigative measures with respect to graphite and the more detailed response in preamble section II.D.2.ii.c.

The United States has international initiatives in place to secure nickel, cobalt, and graphite, critical battery minerals from partners and allies around the world. These initiatives and agreements serve to secure supply chain availability, and to balance and counteract influence of potential threats to those supply chains, including Chinese dominance. See Preamble section II.D.2.ii.c for specifics.

Manganese

Manganese is not considered to be a critical mineral. DOE assesses that both in the near term and medium term, a significant portion of manganese will be available domestically from non-FTA countries. While capacity in FTA and MSP partners is concentrated in a few countries such as Australia, Canada and India, it is likely to be sufficient to meet U.S. demand in both the near and medium term. Conversely, because there is limited outlook for manganese production in the U.S. due to the poor quality of ore prospects, the U.S. is likely to depend on FTA-imported mining supply to meet domestic demand for the foreseeable future. See Preamble Section II.D.2.ii and sources there cited.

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889 ANL at 52.

890 ANL at 53.

891 Reuters, "China's graphite curbs will accelerate plans around alternatives," October 23, 2023. Accessed on December 16, 2023 at https://www.reuters.com/business/autos-transportation/chinas-graphite-curbs-will-accelerate-plans-around-alternatives-2023-10-20/

892 Rare earths, necessary for catalytic converters and magnet motors are presently subject to Chinese export license restrictions for example. https://www.fastmarkets.com/insights/chinas-commerce-ministry-to-add-rare-earths-to-export-report-directory/.

893 Wood Mackenzie, "How will China's graphite export controls impact electric vehicle supply chain?" subscriber material presentation, November 2, 2023.

Further Considerations

In its assessment, DOE notes that a number of uncertainties affect every forward-looking assessment of mineral and manufacturing trends, and EPA has considered this inherent layer of uncertainty which could act to cause these projections to prove either optimistic or pessimistic.[894] It is well known in the forecasting of cyclical commodities industries that price volatility can be driven by demand or supply, or both. While oversupply is positive for battery cost in the short term, it can lead investors to consider some development projects uneconomic. Slow demand growth can be a factor in lower than expected prices. In a near term perspective, something as simple as a temporary drop in consumer demand due to changes in economic fundamentals can contribute to such a situation. Over the medium to long term, the same impact can result from changes in policy, or technology disruption (e.g., substitution of one mineral for another, or alternative chemistries that eliminate the mineral). Another uncertainty, particularly in the U.S., is permitting for new mining projects, which can take several years. Financing is also subject to uncertainty, as mining is considered to be a relatively high risk investment that pays off over a long time frame, subject to the uncertain factors above. We note, however, that large amounts of private domestic capital continues to flow into the domestic and North American critical mineral and battery production sectors. See Preamble Section II.D.2.ii. Political and social risks, for example war, changes in trade policy, and labor disputes are another factor. In some cases, the location of a mine may be remote, leading to potential difficulties in attracting qualified labor.

While all of these uncertainties can have an impact on future projection of progress in mineral production, it is also true that all mineral production currently in operation has transcended these risks, often in periods of far less rapid growth in demand of the minerals involved. With the importance of battery minerals in sectors that are relevant to reducing pollution, including GHG emissions, demand for these minerals is rapidly growing. As these uncertainties are well understood to accompany most if not all mining investments, EPA does not consider these factors to be uniquely restrictive of the ability of the global industry to develop mineral production capacity in response to what is widely understood to be an era of robust demand.

The remainder of this part of the response provides additional detailed evidence of recent developments in the growth of the critical mineral supply chain, and other specific topics relevant to this topic. Citations for all of the examples listed in this section may be found in a Memo to the Docket titled "DOE Communication to EPA Regarding Critical Mineral Projects". See also RIA Chapter 1.5.1.3 describing a number of these on-going efforts.

A number of additional U.S. government efforts are underway to accelerate lithium and critical minerals production and secure the supply chain both domestically and abroad:

- In February 2023, President Biden signed a presidential waiver of some statutory requirements (Waiver) authorizing the use of the Defense Production Act (DPA) to allow the Department of Defense (DoD) to more aggressively build the resiliency of America's defense industrial base and secure its supply chains including for critical minerals and energy storage. Since many of the investments needed in areas like mining and processing of critical minerals can be very costly and take several years, the Waiver permits the DoD to leverage DPA Title III incentives against critical vulnerabilities, and removes the statutory spending limitation for aggregate action against a single shortfall

[894] ANL at 65-68.

exceeding $50 million. This in turn allows the DoD to make more substantial, longer-term investments.

- In December 2022, the Blue Ribbon Commission on Lithium Extraction in California issued a report detailing actions to support the further develop geothermal power with the potential co-benefit lithium recovery from existing and new geothermal facilities in the Salton Sea geothermal resource area. The three owners developing projects in California may produce 600 kt/y LCE from geothermal brines around 2030.
- In June 2022, the United States formed the Minerals Security Partnership, whose goal is to ensure that critical minerals are produced, processed, and recycled in a manner that supports the ability of countries to realize the full economic development benefit of their geological endowments. The MSP will help catalyze investment from governments and the private sector for strategic opportunities —across the full value chain —that adhere to the highest environmental, social, and governance standards.

Preamble Section II.D.2.ii.c discusses the $3.4 billion in DOE Loan Program projects that were recently awarded to aid in the extraction, processing and recycling of lithium and other critical minerals to support continued market growth. Details on these projects are provided below.

- A $50M BIL grant to Lilac plans to build out domestic manufacturing capacity for the company's patented ion-exchange technology to increase production of lithium from brine resources with minimal environmental impact and streamlined project development timelines, and develop domestic lithium projects.
- A $141.7M BIL grant to Piedmont Lithium plans to accelerate the construction of the Tennessee Lithium project in McMinn County as a world-class lithium hydroxide operation, which is expected to more than double the domestic production of battery-grade lithium hydroxide. The project is being designed to produce lithium hydroxide from spodumene concentrate using the innovative Metso:Outotec process flow sheet, enabling lower emissions and carbon intensity as well as improved capital and operating costs relative to incumbent operations.
- A $150M BIL grant to Albemarle plans to support a portion of the cost to construct a new, commercial-scale U.S.-based lithium concentrator facility at Albemarle's Kings Mountain North Carolina location. Albemarle's "mega-flex" conversion facility would be capable of accommodating multiple feedstocks, including spodumene from the proposed reopening of the company's hard rock mine in Kings Mountain; its existing lithium brine resources in Silver Peak, Nevada, and other global resources; as well as potential recycled lithium materials from existing batteries. The facility is expected to eventually produce up to 100,000 metric tons of battery-grade lithium per year to support domestic manufacturing of up to 1.6 million EVs per year.
- A $700 million DOE loan to Ioneer Rhyolite Ridge LLC plans to help develop domestic processing capabilities of lithium carbonate for nearly 400,000 EV batteries from the Rhyolite Ridge Lithium-Boron Project in Esmeralda County, Nevada.
- A $2 billion DOE loan to Redwood Materials plans to construct and expand its battery materials recycling campus in McCarran, Nevada. It would be the first U.S. facility to support production of anode copper foil and cathode active materials in a fully closed-loop lithium-ion battery manufacturing process by recycling end-of-life battery and production scrap and remanufacturing that feedstock into critical materials, supporting

EV production of more than 1 million per year. Redwood Materials will use both new and recycled feedstocks—comprised of critical materials like lithium, nickel, and cobalt—to produce approximately 36,000 metric tons per year of ultra-thin battery-grade copper foil for use as the anode current collector, and approximately 100,000 metric tons per year of cathode active materials.

- A $375 million DOE loan to Li-Cycle plans to help finance a high efficiency, low-emission resource recovery facility for batteries in Rochester, New York. The Li-Cycle project will use hydrometallurgical recycling to efficiently recover battery-grade lithium carbonate, cobalt sulfate, nickel sulfate, and other critical materials from manufacturing scrap materials and used batteries to enable a circular economy.

We note further that several alternatives are under development that may provide an alternative to use of lithium in batteries, either in vehicle batteries, or in non-vehicle applications whose use of these alternatives would reduce competition for lithium in vehicle applications. Citations for these examples may be found in a Memo to the Docket titled "DOE Communication to EPA Regarding Critical Mineral Projects."

- BNEF estimates that sodium-ion batteries are scaling for use in applications that do not require the high-performance capabilities of large EV batteries, including stationary energy storage and 2- and 3-wheeled vehicles. Substitution from lithium to alternative chemistries could alleviate price pressures as soon as 2026.
- A new PNNL molten salt battery design, which uses Earth-abundant and low-cost materials, has demonstrated superior charge/discharge capabilities at lower operating temperatures while maintaining high energy storage capacity compared to conventional sodium batteries.
- NASA's Solid-state Architecture Batteries for Enhanced Rechargeability and Safety (SABERS) research for aerospace applications will likely have spin-off benefits for the automotive sector. As lithium-ion based liquid electrolytes are not suitable for aircraft, the development of a scalable, solid-state battery that is safer, more energy dense, and capable of faster charging has high commercialization potential in on-road vehicles applications, and can reduce lithium demand.

Finally, a large amount of research and development is taking place to increase circularity and effective use of lithium and critical minerals. Beyond commercial technologies, continued research and development with industry and academia through the US Automotive Battery Consortium (USABC), Critical Minerals Institute (CMI), and ARPA-E[895] will expand the recycling and recovery of lithium to help expand the use of unconventional supplies to help pace the growing demand for EVs:

- A $2M USABC grant to American Battery Technology Company (ABTC) in Fernley, Nevada will help develop a recycling development program to demonstrate a scaled, fully-domestic, integrated processing cycle for the universal recycling of large format Li-ion batteries in coordination with partners in the battery supply chain.
- The CMI's EC-LEACH project successfully demonstrated a 10x scale-up of electrochemical leaching for lithium-ion batteries black mass, e-waste comprised of crushed and shredded battery cells, with a capacity up to 500 g/day, achieving over 96%

[895] See also ANL at 30 n. 76.

leaching efficiency for all metals. The scale up demonstrated leaching under higher voltage while maintaining lower currents and used conventional power electronics.

- $39 million in ARPA-E funding for the Mining Innovations for Negative Emissions Resource Recovery (MINER) program will help develop market-ready technologies that will increase domestic supplies of critical elements, including copper, nickel, lithium, cobalt, rare earth elements, that are required for the clean energy transition. The MINER program will fund research that increases the mineral yield while decreasing the required energy, and subsequent emissions, to mine and extract energy-relevant minerals.

In examining mineral supply and demand, the ANL study also pays close attention to the primary uncertainties relevant to increasing mineral production and availability, as well as a number of enabling approaches that U.S. government and industrial actors are pursuing as part of a broad strategy to further increase domestic critical mineral supply. These efforts are generally important to understanding how minerals and related products can be accessed reliably through a combination of domestic sources and through global partners including our FTA partners, MSP partners, and allies. Here we provide a further summary of some of the approaches specifically identified in the ANL study, to provide a sense of some of the enabling activities that are currently being pursued by the U.S. government. Citations, additional detail and further examples of current activities are available in the ANL study.[896]

- Collaboration with trading partners is a major focus of attention. This involves diversifying supply chains beyond existing free trade agreements by strengthening trade with potential countries that have or could have significant capacity, as well as joint efforts with MSP partners to ensure the success of mineral projects in member countries through coordinated financial assistance, mobilizing both government and private capital, providing technical expertise, and streamlining ESG standards to include traceability standards. Collaboration could extend to financing promising projects within non-FTA countries by approaches such as leveraging existing and new interagency efforts across various agencies and departments such as State, Commerce, DOE, USAID, US DFC, USTDA and EXIM, in collaboration with the private financing sector.
- Improving the permitting process for critical minerals projects is another thrust of activity. The Biden-Harris Permitting Action Plan (May 2022) and subsequent implementation guidance (March 2023) identifies key steps including: acceleration of permitting through early cross-agency coordination, establishing clear timeline goals and tracking, engaging in early and meaningful outreach and communication with Tribal Nations, States, territories, and local communities, improving agency responsiveness, technical assistance, and support, and adequately resourcing agencies and using the environmental review process to improve environmental and community outcomes.
- Stockpiling and supply chain readiness is another focus. Strategic stockpiles can serve as a buffer against potential disruptions. This approach could also protect domestic projects to develop mining and recycling from intentional oversupply (product dumping) by actors aimed at reducing global competition. Efforts around stockpiling are already in progress. For example, DOD, DOE, and the State Department are laying the foundation for a new interagency process for stockpiling minerals. Other efforts to stabilize supply

[896] ANL at 70-73.

chain volatility and uncertainty include better data tracking and sharing, alert systems, and international partnerships to respond to supply chain disruptions.

- Increasing domestic recycling capacity can be a strong factor in reducing future need for new critical minerals. The Federal Consortium for Advanced Batteries (FCAB) developed a National Blueprint for Lithium Batteries, outlining near-term objectives to achieve the goal of scaling end-of-life reuse and recycling for minerals. The DOE has also announced $37 million in available funding to improve the economics and industrial ecosystem for battery recycling.
- Advanced recycling techniques such as direct recycling can offer lower costs when, commercialized and scaled. The BIL funds research and development for advanced recycling; DOE has already announced more than $45 million for advanced recycling projects, including direct recycling.
- Identifying non-traditional sources of critical materials that are available domestically, such as industrial by-products and mining waste streams, can also help meet minerals demand over time. The U.S. government is supporting efforts to fund research into non-traditional sources of minerals: for example, in February 2024, DOE announced it would invest $17 million into projects to recover minerals from coal-based resources, and in November 2023 USGS announced $2 million to 14 states to study critical minerals in mine waste. Research suggests that resource recovery from coal and mining waste may also help remediate abandoned mines.
- Workforce development can be promoted by coordination and collaboration with academic institutions and training centers to develop the next-generation workforce to serve the potentially growing domestic mining sector. For example: DOE, in collaboration with DOL, AFL-CIO, and other partners, launched the Battery Workforce Initiative through the National Energy Technology Laboratory (NETL) to develop training up and down the battery supply chain. Talon Metals and the United Steelworkers have also announced a joint workforce development partnership for the Tamarack Nickel Project. The FY24 NDAA directs that the Defense Department study the feasibility for and plan for the creation of a University Affiliated Research Center for Critical Minerals which would assess institutional capabilities and investments needed for workforce development to support needs related to critical materials. The Department of Commerce, through the CHIPS Act is funding workforce development across the battery supply chain in Missouri, New York, and Nevada.
- Strengthening environmental, social and governance (ESG) implementation can be key to reducing risk for mining projects to improve chance of production and reduce impact. Strategies include pursuing robust consultation with communities near where mining resources are located, and adherence to strong labor, human rights and environmental practices. Internationally, some USG efforts already exist to advance ESG compliance and to improve environmental and social outcomes of minerals development. DOE's Advanced Research Projects Agency-Energy (ARPA-E) is funding 16 projects across 12 states that aim to increase mineral yield while decreasing energy and emissions from mineral extraction. The U.S. Department of Labor (DOL) offers resources to companies looking to mitigate risks related to labor violations and programs to raise awareness and address international ESG. Through the IPEF Supply Chain Agreement, the U.S. is also engaged in a Labor Rights Advisory Board to promote worker rights across supply chains. The "Presidential Memorandum on Advancing Worker Empowerment, Rights,

and High Labor Standards Globally" directs the Secretaries of State, Labor, Energy, Treasury, Homeland Security, and Commerce along with the Administrator of USAID and the U.S. trade representative to address labor rights across global supply chains.

- Community and tribal engagement is also important to addressing potential conflict between communities and mining interests, which increase risk and uncertainty to all stakeholders when mineral resources are identified for development. Many grants and loans provided by the Department of Energy under BIL and IRA require applicants to submit a Community Benefit Plan, which is evaluated at 20 percent of the overall application; community agreements such as Community Benefit Agreements (CBAs) and other community and workforce agreements are strongly encouraged by these programs, which may provide funding to mining and materials processing initiatives. The DOE also sponsors programs that incentivize the transition of defunct mines into clean energy sites, including the Biden Administration's $500 Million Program to Transform Mines Into New Clean Energy Hubs and the Qualifying Advanced Energy Project Credit (48C) Program.

We now provide responses to certain additional issues raised in the public comments.

<u>Response: Sufficiency of Battery Production</u>

A number of commenters maintained that there was insufficient North American battery manufacturing capacity to accommodate the Phase 3 standards, so that batteries would have to be imported. We disagree. Based on announced investments in battery cell production, companies have announced over 1,300 GWh/year in battery production in North America by 2030.[897] This is already a significant increase over the estimates discussed in the proposal of 1,000 GWh/year commencing in 2030. 88 FR at 25967/2. EPA estimates that 11 GWh will be required for HDV BEVs in 2027 and 58 GWh in 2032 under the modeled potential compliance pathway. See RIA Chapter 2.10.2. Consequently, although most of this announced capacity is currently intended for light duty vehicles (and some for stationary sources),[898] EPA finds that there is sufficient North American battery production capacity for HDVs within the rule's timeframe, and ANL projects at least 45 GWh of announced cell production will be dedicated to HDV BEVs by 2030. Moreover, end use for some battery cell manufacturing facilities has not been announced, and it is likely that North American capacity can service HDV applications in greater than announced amounts: this North American capacity can service HDV applications in greater than announced amounts if needed (it is the same battery packs whether or not ultimate use is in light- or heavy-duty vehicles). Importantly, in addition to the 13 new domestic battery plants we projected to become operational in the four years from proposal, 88 FR at 25986, the new work performed by ANL indicates that even more battery production capacity has been announced since the release of those previous reports. In addition, capacity from trade allies is another source of supply: the sum of announced battery cell production capacity in MSP countries (outside North America) exceeds the sum in North America, with both reaching 1,300 GWh/year by 2030. See Preamble Section II.D.2.ii, and see also Volvo's comment that "Benchmark's Gigafactory Assessment suggests that a total of 1.4 terawatt hours of new battery capacity was announced in just the last six months and the number of Benchmark-tracked plants more than doubled—from 174 in

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[897] Planned Battery Supply at 23.
[898] Planned Battery Supply at 22-23.

November 2020 to 379 in April 2023."[899] This final rule also sends a signal to add more dedicated HD BEV battery capacity as needed. This additional announced production capacity adds to EPA's assurance of adequacy of battery cell supply in the rule's timeframe.

In response to comments regarding insufficient ramp-up time, the latest ANL projections estimate the period from announcement to beginning of production for each individual plant based on numerous factors, and uses a baseline estimate of three years from beginning of production to full scale operation, based on historical cell plants.[900] ANL describes this as "a modestly conservative estimate,"[901] acknowledging that plants could reach nominal capacity more quickly or more slowly. This estimate is consistent with the projections of significant increases in domestic production by the commencement of the Phase 3 program. We also continue to see evidence that global lithium-ion battery and cell production is growing rapidly and is likely to keep pace with increasing global demand. In the proposal we noted a 2021 report from Argonne National Laboratory (ANL)[902] that examined the state of the global supply chain for electrified vehicles and included a comparison of recent projections of future global battery manufacturing capacity and projections of future global battery demand from various analysis firms out to 2030. The three most recent projections of capacity (from BNEF, Roland Berger, and S&P Global in 2020-2021) that were collected by ANL at that time exceeded the corresponding projections of demand by a significant margin in every year for which they were projected, suggesting that global battery manufacturing capacity is responding strongly to increasing demand. Since the proposal, we have not seen evidence that this trend is changing.

More recent projections have become available that indicate that projections of future capacity have grown dramatically in only a short time. For example, in May 2023 the International Energy Agency (IEA) projected a global capacity of 3.97 TWh in 2025,[903] more than twice the highest projection of about 1.75 TWh for 2025 made by BNEF in 2020. IEA also projected 6.8 TWh for 2030,[904] which is about triple the highest projection made for 2029 by Roland Berger in 2020. In December 2023, BNEF indicated that its projection of North American lithium-ion cell manufacturing nameplate capacity for 2030 was 76 percent higher than its projection for the same year in 2022, and attributed the increase in part to industry's response to IRA incentives including the 45X production tax credit. The same report indicated that global capacity could increase to as much as 7.4 TWh in 2025 if all project announcements that were public at the time were to be completed.[905] The rate of increase of projections such as these strongly indicate that the capacity of both domestic and global battery production is increasing at a rapid pace that is much greater than anticipated only two to three years ago.

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899 Comments of Volvo at 23-24, citing "Battery gigafactory plans slow down in April after record 2022," Benchmark Minerals Intelligence, (April 26, 2023) https://source.benchmarkminerals.com/article/battery-gigafactory-plans-slow-down-in-april-after-record-2022?mc_cid=f82a9ac7a8&mc_eid=be723945d8

900 Planned Battery Supply Appendices A and B .

901 Planned Battery Supply at 57.

902 Argonne National Laboratory, "Lithium-Ion Battery Supply Chain for E-Drive Vehicles in the United States: 2010-2020," ANL/ESD-21/3, March 2021.

903 International Energy Agency, "Lithium-ion battery manufacturing capacity, 2022-2030," May 22, 2023. Accessed on February 22, 2024 at https://www.iea.org/data-and-statistics/charts/lithium-ion-battery-manufacturing-capacity-2022-2030.

904 International Energy Agency, "Global EV Outlook 2023," p. 112, May 2023. Accessed on November 28, 2023 at https://iea.blob.core.windows.net/assets/dacf14d2-eabc-498a-8263-9f97fd5dc327/GEVO2023.pdf.

905 BloombergNEF, "Zero-Emission Vehicles Factbook: A BloombergNEF special report prepared for COP28, December 2023, p. 30 and 40.

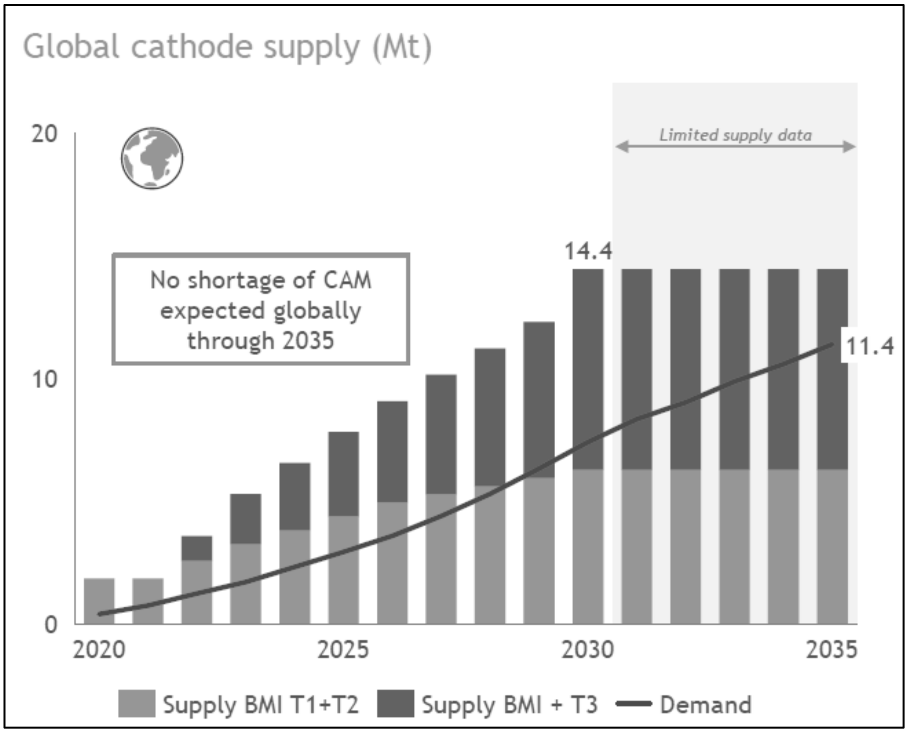
Further, the IEA indicates that the 6.8 TWh global capacity projected for 2030 would be enough to cover global battery demand under its "Net Zero" scenario, and would cover nearly twice the demand implied by currently announced pledges across the world.[906]

Moving beyond battery and cell manufacturing, we also consider manufacturing of battery components including cathode and anode powders and electrolyte, for which raw critical minerals and precursor chemicals are important manufacturing inputs.

As discussed in Preamble Section II.D.2.ii we note that, overall, ANL finds that approximately half of the demand for lithium-ion battery production for CAM and AAM can be met by North American sources by 2030, with electrolyte production reaching approximately 100% of the North American market.[907] We also note there that this estimated capacity is likely understated, because it does not account for capacity which is co-located with battery manufacture, which is a common arrangement.[908] In fact, rumored and conditional plants for AAM would add enough capacity to meet projected cell production. While AAM production is subject materials availability and therefore retains some uncertainty, noted above in discussing graphite availability, synthetic graphite and graphite substitutes are available as well.[909] See also Comments of MFN at nn. 174 and 175 documenting information relating to synthetic graphite and graphite substitutes.

Globally, the outlook for CAM and AAM production is positive. The following Figure repeats the chart that was shown in the proposal, showing preliminary projections of global cathode supply versus global cathode demand prepared by Li-Bridge for DOE,[910] and presented to the Federal Consortium for Advanced Batteries (FCAB)[911] in November 2022. These projections were largely derived by DOE from projections by BMI, and indicate that global supplies of cathode active material (CAM) are expected to be sufficient through 2035.

[906] International Energy Agency, "Global EV Outlook 2023," p. 122, May 2023. Accessed on November 28, 2023 at https://iea.blob.core.windows.net/assets/dacf14d2-eabc-498a-8263-9f97fd5dc327/GEVO2023.pdf.
[907] See also Planned Battery Capacity at 36-38 regarding availability of electrolyte.
[908] Planned Battery Component Supply at 31, 34..
[909] Planned Battery Capacity at 30, 31; see also ANL at 52 (58% of the world's graphite os already synthetic)..
[910] Slides 6 and 7 of presentation by Li-Bridge to Federal Consortium for Advanced Batteries (FCAB), November 17, 2022.
[911] *https://www.energy.gov/eere/vehicles/federal-consortium-advanced-batteries-fcab*.



DOE Li-Bridge assessment of global CAM supply and demand.

In the figure, the labels T1 and T2 represent supplies that BMI considers as having a track record supplying these materials outside of China and within China, respectively. The label T3 represents supplies that BMI assessed as not having an established track record of production, and thus represent earlier stage efforts, such as for example, new entrants to the market that intend to supply anticipated demand but which may not have established offtake agreements.

To the degree that the Li-Bridge assessment of global demand begins to enter T3 supply in 2029, it is important to note that cathode powder production can generally be constructed or expanded with less lead time than mining or cell production plants and announcements of new capacity may be encountered closer to the time of their construction. That is, in the period between now and 2029 it is likely that increases in demand will motivate increases in supply that would not be announced until much closer to 2029. The ability of production capacity for many cell materials and components to adjust relatively quickly to changes in anticipated demand suggests that these materials do not represent a constraint to ZEV production in the global context any more than in the domestic context. Further, allies and partners outside of North America are likely to contribute to meeting electrode active material demand. Ally nations Japan and South Korea, for example, are the second and third largest producers of electrode active materials and as such are in a better position to increase production via relatively short lead-time actions such as plant expansion.[912]

[912] Argonne National Laboratory, “Quantification of Commercially Planned Battery Component Supply in North America through 2035,” ANL-24/14, February 2024 (“Quantification of Planned Battery Component Supply”)..

ANL does project that some domestic anode and cathode demand will need to be satisfied through imports. See Preamble section II.D.2.ii.b documenting means by which both AAM and CAM can be supplied during the timeframe of the Phase 3 rule..

As described in Section II.D.2.ii.c, the development of mining and processing capacity in the United States is a primary focus of efforts on the part of both industry and the U.S. government toward building a robust domestic supply chain for electrified vehicle production and will be greatly facilitated by the provisions of the BIL and the IRA as well as large private business investments that are already underway and continuing. The IRA and BIL continue to provide significant support to accelerate these efforts to build out a U.S. supply chain for component, cell, and battery production. Specifically, a large amount of funding for battery production is being offered by the federal government through IRA tax credits, loans through the DOE Loans Program Office, and DOE Office of Manufacturing and Energy Supply Chains (MESC), as seen in the following table:[913]

Table 17-1 Summary of Funding Programs for U.S. Battery Production

Program	Funding Allocated*	Total Available**	Period of Availability	Project Examples
Battery Materials Processing Grants & Battery Manufacturing and Recycling Grants (MESC)	~$1.9B	~$4.1B	2022-2026; Until Expended***	CAM and AAM production, separator production, precursor materials production, battery cell production.
Domestic Manufacturing Conversion Grants (MESC)	$0	$2B	To remain available through 9/30/2031	Eligible projects include facilities to produce components for electric vehicles.
ATVM (LPO)	~$15.9B	~$49.8B	No restriction	Battery cell production, lithium carbonate production, AAM production, foil production, CAM production.
Title 17 (LPO)	$398.6M	$60B	No restriction	Zinc bromine battery energy storage systems.
48C Qualifying Advanced Energy Tax Credit (IRS, MESC)	$0	$10B	Until expended	Eligible projects include production and recycling of clean energy technologies, critical minerals processing and recycling.
45X Advanced Manufacturing Production Tax Credit (IRS)	--	No limitation	For critical minerals: permanent; For other items: full credit available between 2023-29 with phase down from 2030-32	Eligible projects include battery components, critical minerals, inverters, components for solar and wind energy technology.

*Funding announced since 2021, as of February 2024, for projects related to the scope of the cited ANL study (cells, packs, CAM, AAM, electrolyte, foil, separator, precursor materials). Includes conditional commitments (LPO only)
**For grants, the total available is the total allocated subtracted from the allocation, and indicates how much grant funding is left. For LPO, this number represents approximate loan authority available as of January 2024, reported by LPO.
***For the purposes of this table, the Battery Materials Processing Grants & Battery Manufacturing and Recycling Grants are combined. These two programs are authorized separately in the IIJA. Their periods of availability are listed respectively.

A substantial portion of this supporting industrial policy is still unfolding. This includes final rulemaking and Treasury guidance for various details of the IRA tax credits; the submission, selection, and award of second round of funding from the Battery Materials Processing and Manufacturing Grants program by January 2025 (IIJA section 40207) and the 48C tax credit

[913] Planned Battery Component Supply Table 1.

(Qualifying Advanced Energy Project Credit), and, respectively, final interpretive guidance and rulemaking from the Department of Energy and the Department of the Treasury on Foreign Entities of Concern (FEOC) and Excluded Entities for the 30D tax credit (Clean Vehicle Credit).

Future battery supply chain funding opportunities from IRA and BIL are described in more detail in the Preamble at section II.D.2.ii and ANL at 2-4.In consideration of this updated information on battery and cell manufacturing, it continues to be our assessment that the industry is well positioned to support the battery and cell demand that is projected under the Phase 3 final standards, and therefore EPA concludes that battery and cell production capacity are unlikely to pose a limitation on manufacturers' ability to comply with the standards under the modeled potential compliance pathway.

Response: Critical Mineral Security

Commenters noted that China is both a source of graphite, and controls a majority of refining capacity of others of the critical minerals, raising a question of the security of the source of supply of these minerals (Comments of, e.g., AFPM and CFDC), or even resulting in critical mineral long-term dependence on China (API, Arizona State legislature). It is our assessment that increased electrification in the U.S. transportation sector projected as a potential compliance pathway for this final rule does not constitute a vulnerability to mineral security. See generally Preamble section II.D.2.ii.c and RIA Chapter 1.5.1.2. which provide additional detail to the response presented here.

Mineral security refers to potential national security risks posed by reliance on sourcing of critical minerals from other countries, and in particular from countries with which the U.S. has fragile trade relations or significant policy differences. Concern for U.S. mineral security relates to the global distribution of established supply chains for critical minerals and the fact that, at present, not all domestic demand can be supplied by domestic production. Currently, the U.S. is trailing much of the rest of the world in critical mineral production, although substantial production occurs in countries that are not "covered nations"[914] for purposes of the IRA.

In light of this information provided in the public comments and additional information that EPA has collected through continued research, it continues to be our assessment that the increase in BEV production projected under the modeled potential compliance pathway is not expected to adversely impact mineral security or national security, and is projected to result in national security benefits by reducing the need for imported petroleum and may result in national security benefits by providing regulatory and market certainty for the continued development of a domestic supply chain for critical minerals. EPA has carefully considered the substantive and detailed comments offered by the various commenters. Taken together, the totality of information in the public record continues to indicate that development of the critical mineral supply chain is proceeding both domestically and globally in a manner that supports manufacturers' compliance with the final standards. More recent information is corroborative. ANL has performed a review of international and domestic critical minerals availability as of February 2024, which EPA considers to be both thorough and up to date. The analysis finds that while the U.S. will need imports to bolster supply for most key minerals, these imports can come

[914] Defined in 10 U.S. Code 2533(c)(d)(2) as the Democratic People's Republic of North Korea, the People's Republic of China, the Russian Federation, and the Islamic Republic of Iran. These countries are also Foreign Entities of Concern (FEOC).

from friendly nations, and can be bolstered by growing domestic supply, especially for lithium. The analysis also finds that, with the appropriate policies and enabling approaches in place, the U.S. can secure the minerals it needs by relying on domestic production as well as trade relationships with allies and partners. See in particular the comprehensive Figure 11 in ANL showing U.S. government initiatives to secure battery minerals and materials. United States government initiatives aimed at shifting the trade landscape can reduce risk in internation supply chains and enhance the resilience of the rapidly growing domestic battery industry, while simultaneously supporting the economies of its partners and allies. The United States possesses a significant and growing portfolio of international engagements to secure minerals supplies including FTAs, Mineral Security Partnerships, Trade Investment Framework Agreements (TIFAs) and other bilateral and multilateral agreements including the Partnership for Global Infrastructure and Investment (PGI). In addition, USGS is engaged in activities that, while not yet quantifiable, are enabling the U.S. to expand a secure supply chain for critical minerals among United States allies and partner nations. There are substantial efforts to scale mining supply domestically and in partner countries underway, further described in Preamble section II.D.2.ii.c.

We also note that the issue of dependence on imported materials and minerals is not unique to battery-critical minerals, but also affects conventional vehicles, which use an array of imported and strategic materials, such as platinum and palladium for catalysts, computer chips for engine control and entertainment systems, and other parts and materials that are sourced from other countries. Materials like these were imported for use in other industries long before the recent growth in their use in electrification. The same issue comes up outside the automotive sector as well. As Tesla noted in its public comments, the U.S. oil and gas sector has long been dependent on barite from China for use in oil and gas exploration and development drilling.[915]

We now expand upon these points in the following discussion, and see generally Preamble section II.D.2.ii.c.

In the response above relating to critical mineral availability, we discussed availability of lithium, cobalt, nickel, manganese, and graphite. With respect to lithium, we documented that there is significant evidence that supplies in the short-, medium- and long-term are adequate, and indeed, that the United States may become a major global producer of lithium during the Phase 3 rule's time frame. This largely alleviates security concerns related to lithium.

We do find, based on DOE's and ANL's updated analysis, that domestic needs for nickel, cobalt, and graphite will not be supplied entirely from domestic sources during the Phase 3 rule's time frame (Preamble section II.D.2.ii.c).

As shown in Preamble section II.D.2.ii.c, in 2019 about 50 percent of global nickel production occurred in Indonesia, Philippines, and Russia, with the rest distributed around the world. Nearly 70 percent of cobalt originated from the Democratic Republic of Congo, with some significant production in Russia and Australia, and about 20 percent in the rest of the world. More than 60 percent of graphite production occurred in China, with significant contribution from Mozambique and Brazil for another 20 percent.

[915] Comments of Tesla at 31. See also "Barite—A Case Study of Import Reliance on an Essential Material for Oil and Gas Exploration and Development Drilling" pubs.usgs.gov/sir2014-5230

According to the Administration's 100-day review under E.O. 14017, of the major actors in mineral refining, 72 percent of cobalt refining occurred in China, with another 17 percent distributed among Finland, Canada, and Norway. 21 percent of Class 1 nickel refining occurred in Russia, with 16 percent in China, 15 percent in Japan, and 13 percent in Canada.[916]

Although the U.S. has nickel reserves, and opportunity also exists to recover significant nickel from mine waste remediation and similar activities, at present it is more convenient to import it from established producers in other countries, with 68 percent coming from Canada, Norway, Australia, and Finland, MSP countries with which the U.S. has good trade relations.[917] According to the USGS, ample reserves of nickel exist in the U.S. and globally, potentially constrained only by processing capacity.[918] ANL notes that currently, there is no Class I (battery grade) nickel production or refining in the U.S, and that there has been an influx of investment by China in Indonesia, a major global producer of nickel.

The U.S. has numerous cobalt deposits, but few are developed, although some have produced cobalt in the past; about 72 percent of U.S. cobalt consumption is currently imported.[919] ANL notes that China controls about 50 percent of cobalt production in the Democratic Republic of Congo (DRC), a major global producer of cobalt, that much of this output is owned by China, and that most refining capacity is presently Chinese. While some battery chemistries include cobalt which carries environmental and other impacts depending on how it is sourced, cobalt content is being rapidly reduced and can be eliminated entirely by use of other chemistries that are already gaining market acceptance. See Preamble section II.D.2.ii.

Similar observations may be made about graphite. The U.S. has significant deposits of natural graphite, but graphite has not been produced in the U.S. since the 1950s and significant known resources remain largely undeveloped.[920] ANL notes that China dominates natural graphite production and has been a major source of U.S imports. ANL also indicates that meeting U.S. demand with natural supply from free trade agreement (FTA) and minerals security partnership (MSP)[921] countries is unlikely in the near term, but medium term synthetic graphite scaling has potential to mitigate graphite risk.[922] Another concern, as noted above, is that in 2023, China imposed an export permit requirement on graphite, which will temporarily reduce graphite exports due to a 45-day application period for permits, and suggests that graphite exports from China may be controlled in the future. However, as noted above, at this time it is not clear that

[916] The White House, "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth," 100-Day Reviews under Executive Order 14017, June 2021 (p. 121).
[917] The White House, "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth," 100-Day Reviews under Executive Order 14017, June 2021.
[918] The White House, "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth," 100-Day Reviews under Executive Order 14017, June 2021.
[919] U.S. Geological Survey, "Cobalt Deposits in the United States," June 1, 2020. Available at *https://www.usgs.gov/data/cobalt-deposits-united-states*.
[920] U.S. Geological Survey, "USGS Updates Mineral Database with Graphite Deposits in the United States," February 28, 2022.
[921] U.S. Department of State, "The Minerals Security Partnership Continues to Expand with Norway, Italy, and India," Media Note, September 16, 2023.
[922] ANL at 58; see also Reuters, "China's graphite curbs will accelerate plans around alternatives," October 23, 2023. Accessed on December 16, 2023 at https://www.reuters.com/business/autos-transportation/chinas-graphite-curbs-will-accelerate-plans-around-alternatives-2023-10-20/. See also response above noting the comments of MFN describing opportunities for synthetic graphite production and graphite substitutes.

this requirement will meaningfully impact exports over the long term, as similar permit requirements have existed on other exports, including those necessary in ICE vehicle production[923]; Wood Mackenzie reports that a change to material flows is unlikely, and that a graphite supply chain outside of China is rapidly developing.[924] As discussed in the Preamble, synthetic graphite already is filling a significant percentage of market demand, can and is being produced domestically, and is available for further market penetration.

With regard to nickel, cobalt and graphite, ANL also identifies potential enabling approaches to mitigate the potential risks that they identify. For all of the critical minerals, there are prospects for growth among secure sources of supply such that there are adequate supplies of these minerals in the Phase 3 rule's timeframe. For nickel, continued economic partnership and trade with non-FTA, non-MSP countries with significant capacity, such as Indonesia, Philippines, Botswana, South Africa, Papua New Guinea, Madagascar, Tanzania, and Zambia provide an avenue to securing supply.[925] In November 2023, the United States entered a Comprehensive Strategic Partnership with Indonesia, announcing the intention to partner on a roadmap to encourage the creation of a clean nickel supply chain. In addition, the Defense Department signed a Defense Cooperation Agreement to uphold a free and open Indo-Pacific that ensures regional stability.[926] Efforts to strengthen battery recycling in the U.S and ally nations is also identified by ANL, as well as collaborative efforts with FTA and MSP partners to ensure mining project success (for example, financing promising projects in FTA and non-FTA countries). In the longer term, ANL also identifies use of battery chemistries that use less or no nickel.

With regard to cobalt, the same approaches are identified, including economic partnership and trade with non-FTA countries including the Democratic Republic of Congo, Indonesia, Philippines, Zambia, Papua New Guinea and Madagascar. The Democratic Republic of Congo (DRC) is the world's largest source of cobalt, with 70% of current world production and 48% of reserves.[927] The U.S. is partnering with DRC to secure cobalt supply to close the gap between projected domestic demand and projected domestic supply. Through PGI, the United States is supporting the development of the Lobito Corridor, which connects the Democratic Republic of the Congo and Zambia with global markets through Angola, with an initial investment of $250 million in a rail expansion that intends to reduce transport time and lower costs for metals exports from the region.[928] Child and forced labor has been a particular concern for DRC, given the known presence of child workers at artisanal mines across the region, despite these mines making up a minority of cobalt mining operations. The U.S. and allies are partnering with the DRC to combat child and forced labor in the cobalt supply chain. A notable example is the

[923] Rare earths, necessary for catalytic converters and magnet motors are presently subject to Chinese export license restrictions for example. https://www.fastmarkets.com/insights/chinas-commerce-ministry-to-add-rare-earths-to-export-report-directory/.
[924] Wood Mackenzie, "How will China's graphite export controls impact electric vehicle supply chain?" subscriber material presentation, November 2, 2023.
[925] ANL notes, for example, that the U.S. has entered a Comprehensive Strategic Partnership with Indonesia, announcing its intention to partner on a roadmap to encourage creation of a clean nickel supply chain. See ANL at 44 and further discussion in Preamble section II.D.2.ii.c.
[926] ANL at 44-45.
[927] ANL at 46.
[928] https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/20/fact-sheet-partnership-for-global-infrastructure-and-investment-at-the-g7-summit.

Department of Labor (DOL)-funded Combatting Child Labor in the Democratic Republic of the Congo's Cobalt Industry (COTECCO) project discussed further below in the following response dealing with issues of human rights in mining operations.[929]

For graphite, ANL identifies similar economic partnership and trade objectives, as well as strengthening synthetic graphite production capacity in the U.S. and ally nations. See Preamble section II.D.2.ii.c for details.

The development of mining and processing capacity in the U.S. is a primary focus of efforts on the part of both industry and the federal government toward building a robust domestic supply chain for electrified vehicle production, and will be greatly facilitated by the provisions of the BIL and the IRA as well as large private business investments that are already underway and continuing. The Inflation Reduction Act and the Bipartisan Infrastructure Law are continuing to be a highly effective means by which Congress and the Administration are supporting the building of a robust supply chain, and accelerating this activity to ensure that it forms as rapidly as possible. An example is the work of Li-Bridge, a public-private alliance committed to accelerating the development of a robust and secure domestic supply chain for lithium-based batteries. It has set forth a goal that by 2030 the United States should capture 60 percent of the economic value associated with the U.S. domestic demand for lithium batteries. Achieving this target would double the economic value expected in the U.S. under "business as usual" growth.[930] More evidence of recent growth in the supply chain is found in a February 2023 report by Pacific Northwest National Laboratory (PNNL), which documents robust growth in the North American lithium battery industry.[931] Since the proposal, the general trend of continued activity to build the domestic supply chain for critical minerals indicates that vehicle manufacturers, suppliers, and investors are taking advantage of the business opportunities that this need presents, and that the U.S. manufacturing industry is well positioned to create a robust supply chain for these products.

As noted above, the United States also has entered into various economic, trade, defense, and other agreements with non-FTA, non-MSP countries providing critical mineral mining and refining capacity. These agreements are another means of assuring secure critical mineral supply chains.

Recycling is also a part of the solution to issues of mineral security and critical mineral availability. 88 FR at 25969; ANL section IV. Over the long term, lithium-ion battery recycling will be a critical component of the ZEV supply chain and will contribute to mineral security and sustainability, effectively acting as a domestically produced mineral source that reduces overall reliance on foreign-sourced products. While growth in the return of end-of-life ZEV batteries will lag the market penetration of ZEVs, it is important to consider the development of a battery recycling supply chain during the time frame of the rule and beyond. We document in Preamble section II.D.2.ii.c and RTC section 4.7 that lithium battery recycling is attracting large amounts of private capital, as well as capital through the BIL and IRA, and is already recovering critical

[929] https://www.dol.gov/agencies/ilab/comply-chain; https://www.dol.gov/agencies/ilab/combatting-child-labor-democratic-republic-congos-cobalt-industry-cotecco. See also the further discussion in RTC section 17.2.
[930] Department of Energy, Li-Bridge, "Building a Robust and Resilient U.S. Lithium Battery Supply Chain," February 2023.
[931] Pacific Northwest National Laboratory, "North American Lithium Battery Materials V 1.2," February 2023. Available at *https://www.pnnl.gov/projects/north-american-lithium-battery-materials-industry-report*.

minerals at commercial scale (albeit almost exclusively from manufacturing scrap; not many vehicular lithium ion batteries have worn out to date). ANL estimates that recycled materials can become a significant source of supply during the timeframe of the Phase 3 rule, for graphite in particular.[932] The report further documents research and funding for an ultimate circular use of critical minerals further offsetting the need for newly mined minerals.[933] The Federal Consortium for Advanced Batteries National Blueprint for Lithium Batteries outlines several near term objectives to achieve the goal of scaling end-of-use and recycling for minerals. The DOE announced the availability of $37 million in funding to improve the economies and industrial ecosystem for battery recycling, and another $30 million to enable a circular economy for EV batteries, to be awarded in 2024.[934] So, we see recycling as contributing to critical mineral availability, and as a source of mitigation of mineral security issues, during the time frame of the Phase 3 rule.

We thus reiterate our conclusion from proposal that there are short-term, medium-term, and long-term means of successfully dealing with issues of mineral security—both mineral availability and supply chains for these minerals' deployment. Many of these are already being implemented. We consequently regard issues of mineral security to be surmountable and not an impediment to feasibility of the Phase 3 standards.

Response regarding Human Rights Abuses Associated with Mineral Extraction:

Several commenters discussed human rights and environmental degradation concerns associated with the extraction and mining of critical minerals used in battery manufacturing, such as lithium, cobalt, and other metals (Valero, AFPM, Tesla, API, MFN, Energy Vision, Transfer Flow). Several commenters suggest that standards that promote vehicle electrification would worsen human rights situations in nations that may be part of ZEV future supply chains such as the Democratic Republic of Congo.

EPA acknowledges the concerns about current and historical impacts of mining, including minerals used in the manufacturing of batteries for hybrids and ZEVs. However, EPA does not agree with commenters' claims that EPA should account for these concerns in setting HD vehicle emission standards, for several reasons.

First, commenters' assumption that these standards require ZEVs is not aligned with the form of the proposed or final standards. The performance-based standards can be met through many different compliance strategies. Although EPA modeled one potential compliance pathway to support the feasibility of these standards and for rulemaking purposes, EPA also assessed additional example potential compliance pathways that also support the feasibility of the final standards and which further show that manufacturers are free to use any combination of vehicle technologies they can successfully deploy that meet the final standards, including ones that do not require additional production of ZEVs to comply with this rule. Preamble section II.F.

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932 ANL at 31, and see generally ANL section IV.

933 ANL at 31 and Advanced Research Projects Agency for Energy, U.S. Department of Energy Announces $30 million to Develop Technologies to Enable Circular Electric Vehicle Battery Supply Chain, January 31, 2024. Available at https://arpa-e.energy.gov/news-and-media/press-releases/us-department-energy-announces-30-million-develop-technologies-enable

934 ANL at 72. See also ANL at 36-37, 43-44, 49-50 and 56-57 discussing recycling opportunities for lithium, nickel, cobalt, and graphite, respectively

Second, commenters' claim that EPA should take account of international human rights and EJ concerns associated with new supply chains for ZEVs is inconsistent with EPA's longstanding practice in setting vehicle emissions standards under Clean Air Act section 202; EPA has not analyzed every component of vehicles or refining technologies potentially used to meet its standards to the beginning of their manufacturing or extraction lifecycle. It is well-recognized that petroleum fuels, electronic components, plastics, catalytic metals, additives to lubricants or fuels, and other chemical and physical ingredients of vehicles, fuels, and their manufacturing all have lifecycles upstream of vehicle operations, with potential environmental impacts and human rights concerns. It is inappropriate for EPA to only account for international human rights and lifecycle environmental impacts related to ZEVs; see also our response regarding life cycle assessment in RTC section 17.1.

Third, Tesla's and ZETA's comments about their attempts to ensure that their supply chains support human rights and democratic values provide support that relying on adverse assumptions about ZEV supply chains may be unwarranted. Additional commenters note progress in recycling of lithium and other metals (e.g., ZETA).

Fourth, through the Partnership for Global Infrastructure and the JET Green Minerals Challenge, the United States (along with allies and private sector) is both investing in Democratic Republic of Congo infrastructure and partnering with the Democratic Republic of Congo to combat child and forced labor in cobalt supply.[935] In addition, on November 1, 2023, the U.S. Department of State announced the Minerals Investment Network for Vital Energy Security and Transition (MINVEST), a new public private partnership with the nonprofit SAFE's Center for Critical Minerals Strategy. The MINVEST Partnership will promote public-private dialogue and spur investment in strategic mining, processing, and recycling opportunities that adhere to high environmental, social, and governance (ESG) standards. These activities are central to the United States' critical minerals strategic goals, including the Department of State's commitment to the Minerals Security Partnership (MSP), of which the United States is a founding member.[936] See the further discussion of these points in Preamble section II.2.D.c.ii.

Fifth, commenters suggesting that these non-air environmental impacts should deter EPA from setting more stringent vehicle emission standards overlook the clear distinction made by the Clean Air Act and other laws in differentiating emission standards for mobile sources from those from other air sources or other environmental problems (e.g., Resource Conservation and Recovery Act, Clean Water Act). EPA has long interpreted the Clean Air Act as generally requiring EPA to base regulations from each sector on the statutory requirements specific to that sector. In setting these Phase 3 standards, EPA considered statutory and relevant factors under Sections 202(a)(1) and (2).

Regarding comments alluding to child labor or other abuses said to take place in the supply chain for batteries, which appear to primarily refer to cobalt production in the Democratic Republic of Congo (DRC), EPA reiterates that manufacturers are continuing to reduce cobalt content, and proven battery chemistries that do not use cobalt such as lithium-iron phosphate are already in widespread use globally and are increasing their market share in the U.S. Further, although the DRC supplies about 70 percent of global cobalt production, only a relatively small

[935] ANL at 51.
[936] https://www.state.gov/announcement-of-new-partnership-between-state-department-and-safes-minerals-center-to-promote-investment-in-critical-minerals-supply-chains/.

portion of cobalt produced in the DRC (estimated variously at between 10 to 30 percent) is produced in artisanal and small-scale mines (ASM) that are associated with use of child labor.[937] Overall, the global share of cobalt believed to come from ASM sources is approximately 10 percent and is largely exported to China.[938] According to BMI, the share of ASM supply increases when prices are high, and in a May 2023 report stated that recent declines in cobalt prices had caused ASM supply to fall by "more than 50% from the peak."[939] Although business practices and standards for ethical conduct of suppliers in other countries are out of scope for this rulemaking, EPA notes that the Department of Labor operates the COTECCO project[940] which "works to address child labor in the Democratic Republic of the Congo's (DRC) cobalt supply chain, with a focus on artisanal and small-scale mining," supporting the development and implementation of "strategies to reduce child labor and improve working conditions in artisanal and small-scale mines, as well as in the broader cobalt supply chain." Finally, we note that in other parts of the CAA, Congress has acted to require EPA to strengthen standard stringency even if it involved obtaining needed critical materials from foreign sources whose values did not accord with those of the United States. In enacting the CAA Amendments of 1990, Congress recognized the need for the critical mineral rhodium for the production of catalytic converters (a ubiquitous motor vehicle pollution control technology) and that South Africa possessed the vast majority of the world's then-known rhodium deposits.[941] While Congress acknowledged concerns with South Africa's human rights record, it nonetheless proceeded to significantly strengthen the motor vehicle emissions standards, such that the production of the necessary technologies could require dependence on South African rhodium supplies . Thus, Congress understood that the nation may need to look to other countries for critical materials where necessary to improve motor vehicle emissions control technology, but mandated emissions reductions regardless. At the same time, Congress also mandated that EPA study the

[937]] Council on Foreign Relations, "Why Cobalt Mining in the DRC Needs Urgent Attention," October 29, 2020. Accessed on March 10, 2024 at https://www.cfr.org/blog/why-cobalt-mining-drc-needs-urgent-attention; Cobalt Institute, "Cobalt Sourcing Responsibility," web page. Accessed on March 10, 2024 at https://www.cobaltinstitute.org/cobalt-sourcing-responsability/; Umicore, "Responsible sourcing of cobalt," web page. Accessed on March 10, 2024 at https://www.umicore.com/en/newsroom/topics-of-interest/cobalt-sourcing/; BMW Group, "Greater Transparency in Cobalt Mining," January 20, 2020. Accessed on March 10, 2024 at https://www.bmwgroup.com/en/news/general/2020/cobalt-mining.html

[938] Gulley, A.L., "China, the Democratic Republic of the Congo, and artisanal cobalt mining from 2000 through 2020," PNAS Sustainability Science, v120 n6, June 20, 2023. https://doi.org/10.1073/pnas.2212037120. This source further states that "[a]rtisanal production's share of world and DRC cobalt mine production peaked around 2008 at 18 to 23% and 40 to 53%, respectively, before trending down to 6 to 8% and 9 to 11% in 2020, respectively. Artisanal production was chiefly exported to China or processed within the DRC by Chinese firms."

[939] Cobalt Institute, "Cobalt Market Report 2022," p. 24, May 2023. Accessed on March 10, 2024 at https://www.cobaltinstitute.org/wp-content/uploads/2023/05/Cobalt-Market-Report-2022_final.pdf

[940]] U.S. Department of Labor, "Combatting Child Labor in the Democratic Republic of the Congo's Cobalt Industry (COTECCO)," web page. Accessed on March 10, 2024 at https://www.dol.gov/agencies/ilab/combatting-child-labor-democratic-republic-congos-cobalt-industry-cotecco

[941] See 136 Cong. Rec. 5102-04 (1990). The 1990 CAA Amendment are not the first time that Congress wrestled with potential dependence on South Africa for rhodium. Congress also recognized this issue when developing the 1977 CAA Amendments. See 123 Cong. Rec. 18173-74 (1977).

appropriateness of even stronger standards and expressly reserved the agency's authority to promulgate such standards.[942]

See RTC sections 18.3 and 17.1 for additional responsive information, as well as Preamble section II.D.2.ii c.

Response: Availability of copper

Commenters AFPM and AmFree posited a potential shortage of copper from secure sources during the Phase 3 rule's time frame. We do not agree. Presently, the majority of copper for domestic use is imported from Chile and Peru. Preamble section II, Figure II-6. Neither country is a "covered nation" for purposes of the IRA, and so we do not regard either country as an insecure source of supply. Moreover, as documented in the comments of ZETA, the currently operating Resolution Copper, Arizona project has the potential to supply up to 25% of the nation's copper demand. The NewRange Copper Nickel project, a 50:50 joint venture of Teck Resources Limited and PolyMet Mining Corp., holding the NorthMet and Mesaba deposits—is creating a path to develop one of the world's largest and lowest cost copper-nickel-PGM producing districts, unlocking a new domestic supply of critical minerals.

Response: Availability of platinum

As noted in RIA 1.7.1, platinum is utilized in fuel cell catalysts. Commenter AmFree suggests in n. 4 of its comments that there could be a shortage and that current sources of supply are insecure. The great majority of platinum comes from South Africa, with additional supply available from Russia and Zimbabwe. See Preamble Figure II-6. Neither South Africa nor Zimbabwe is a "covered nation" under the IRA, and EPA consequently does not agree that these are insecure sources of platinum. See ANL at 18 documenting the various bilateral and other trade agreements the United States has with each of these countries.

In 2022, DOE completed a Supply Chain Deep Dive assessment of platinum group metal catalysts in response to Executive Order 14017 on "America's Supply Chains" to identify vulnerabilities and opportunities.[943] The authors identified low volume of end-of life PEM electrolyzers and fuel cells as a barrier to establishing a domestic market for recycling and recovering platinum group metals (PGMs), for example, but it could be possible to leverage existing infrastructure for collecting and recycling catalytic converters (which also contain platinum) in the future.[944] Moreover, efforts are underway to minimize or eliminate the use of platinum in catalysts.[945] For example, DOE issued a Funding Opportunity Announcement (FOA) in 2023 in anticipation of growth in hydrogen and fuel cell technologies and systems. A portion of the FOA is designed to enable improvements in recovery and recycling, and applicants are encouraged to find ways to reduce or eliminate PGMs from catalysts in both PEM fuel cells and electrolyzers to reduce reliance on virgin feedstocks.[946]

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[942] See CAA section 202(i), (i)(3)(B).
[943] https://www.osti.gov/servlets/purl/1871583
[944] https://www.osti.gov/servlets/purl/1871583
[945] Berkeley Lab Strategies for Reducing Platinum Waste in Fuel Cells. November 2021. Available online: https://als.lbl.gov/strategies-for-reducing-platinum-waste-in-fuel-cells/.

[946] U.S. Department of Energy, Hydrogen and Fuel Cell Technologies Office. "Bipartisan Infrastructure Law: Clean Hydrogen Electrolysis, Manufacturjng, and Recycling: Funding Opportunity Announcement Number DE-FOA-

Response: IRA

Commenters stated that the section 30D and 45X tax credits set out in the IRA would be of little effect due to insufficient domestic content. As explained in responses in RTC section 2.7, the 30D credit applies to a small fraction of the heavy-duty market, and we did not include this credit in our analysis.

For EPA's assessment of utilization of the section 45X tax credit, see RTC 2.7 and Preamble Section II.E.4.

Response: Use of sulfur

The Sulfur Institute notes that sulfur is used in extraction of lithium, and appears to criticize the proposal for "[m]andating the systems by which sulphur is transported". The final standards mandate nothing except meeting the performance-based numerical standards by whatever compliance strategy the manufacturer employs. The standards do not mandate means of transporting sulfur either directly or indirectly.

Response: Aluminum

A number of commenters suggested a potential shortage of aluminum due to rising demand due to electrification in the transportation sector. (See, e.g., Comments of AFPM.) None of these comments offered specifics or references. EPA sees no evidence of such a shortage. The price of aluminum has been in more or less continual decline since it reached its peak in April of 2022. "The reason for this is simple: The available supply of primary aluminum is shrinking, but the demand for that aluminum is shrinking faster, leading to a relative oversupply in the market."[947] The closing price of aluminum at the end of February 2024 continued this downward trend .[948] The United States itself produces aluminum from both primary and secondary sources, and Canada is one of the largest aluminum exporters to the United States -- a secure source of supply via trade. A large majority of Canada's primary aluminum is exported to the United States.[949] EPA therefore does not accept the unsupported assertions in these comments.

0002922". March 15, 2023 (Last Updated: March 31, 2023). Available online: https://eere-exchange.energy.gov/Default.aspx#FoaIda9a89bda-618a-4f13-83f4-9b9b418c04dc.

[947] https://industrialmetalservice.com/resources/aluminum-shortage-2023/#:~:text=The%20price%20of%20aluminum%20has,relative%20oversupply%20in%20the%20market.

[948] https://markets.businessinsider.com/commodities/aluminum-price (last accessed March 3, 2024).

[949] https://www.statista.com/statistics/209327/us-aluminum-imports-for-consumption/#:~:text=Canada%20is%20one%20of%20the,the%20United%20States'%20manufacturing%20industries.

18 Environmental Justice

Comments by Organizations

Organization: California Air Resources Board (CARB)

H. EJ Impact

Affected pages: NPRM 26064-26069 and DRIA 391-398

1. Overall Comments on EJ Impact

Both NPRM and DRIA documents state that they use U.S. EPA's 2016 ''Technical Guidance for Assessing Environmental Justice in Regulatory Analysis" for their method. This guidance specifically addresses the following:

a. Is there evidence of potential EJ concerns in the baseline (the state of the world absent the regulatory action)?

b. Is there evidence of potential EJ concerns for the regulatory option(s) under consideration?

c. Do the regulatory option(s) under consideration exacerbate or mitigate EJ concerns relative to the baseline? [EPA-HQ-OAR-2022-0985-1591-A1, pp.65-66]

Overall, the NPRM and DRIA lay out the argument that GHG, criteria pollutants, and toxic emissions disproportionately affect EJ communities; however, questions b and c above were not addressed in the EJ sections or Benefits of the Proposed Program section of the NPRM and DRIA. U.S. EPA's proposed rulemaking would be stronger if that lens was also used as an overlay for all other related topics subsequently discussed in the NPRM and DRIA, resulting in clear application of those principles in the ultimately proposed program structure and the standard setting. [EPA-HQ-OAR-2022-0985-1591-A1, p.66]

CARB staff recommends the NPRM to outline the ways in which the regulatory structure addresses the different facets of disparate impact. These ideas need to be tied to the rest of the NPRM. Specifically, a discussion of how the regulatory standards were designed using data and literature reviews to limit or reverse possible disparate impacts in communities of concern. The NPRM is clear in identifying "EJ issues" but does not discuss or provide specific examples to clearly illustrate how the EJ section connects back to things like the requirement and analysis to "estimate the benefits and costs of major new pollution control regulations."222 [EPA-HQ-OAR-2022-0985-1591-A1, p.67]Consider the executive summary as an opportunity to highlight how EJ was considered in all major aspects of the proposed GHG standards ("GHG emissions from HD vehicles continue to impact public health, welfare, and the environment" "(DRIA) …estimates the benefits and costs of major new pollution control regulations"). Overall, the EJ analysis should inform the rest of the NPRM by characterizing health, environmental, economic impacts with one of the focuses being communities of concern and outlining the strategies used to prevent or mitigate disparate impacts that could exacerbate pre-existing disparity. [EPA-HQ-OAR-2022-0985-1591-A1, p.67]

Organization: CleanAirNow

The Kansas City, Missouri, public health data demonstrates that the life expectancy difference is between 15 and 18 years. According to the CDC, neighborhoods like Armourdale and Argentine in Kansas City, Kansas, have a shorter life expectancy of 22 years. Kansas City, like many other parts of the nation, experiences high-risk zip codes where asthma, heart disease, and cancer are above the national average and are the same areas sliced by highways, rail, and neighbors to chemical facilities. [EPA-HQ-OAR-2022-0985-1579-A1, p. 2]

In the context of the freight system in the United States, the facilities, corridors, and neighborhoods that are most heavily trafficked by heavy-duty trucks are often located in communities of color that are experiencing cumulative impacts from multiple sources of pollution and compounding socioeconomic factors. This pattern of development is the result of racist redlining practices that have systematically burdened people of color with disproportionate exposure to pollution. [EPA-HQ-OAR-2022-0985-1579-A1, p. 2]

People who live near freight hubs or ‘diesel death zones’—including ports, highways, warehouses, rail and intermodal yards—are disproportionately exposed to high concentrations of pollution from the combined activity of diesel-fueled heavy-duty trucks, equipment, rail, and vessels. Diesel exhaust contains carcinogens and toxic air pollutants that significantly affect the health of communities living in close proximity to truck tailpipe pollution. [EPA-HQ-OAR-2022-0985-1579-A1, p. 2]

On top of disproportionate exposure to air pollution, freight-impacted communities suffer from several additional harms from the freight sector: the paved areas and large, low buildings dominating freight facilities contribute to urban heat island effects, stormwater issues, and other environmental impacts. Other industrial sources are often clustered near freight facilities, which means that communities impacted by diesel trucks are also impacted by other sources of air and water contamination and toxic releases. [EPA-HQ-OAR-2022-0985-1579-A1, pp. 2-3]

Our report Environmental Racism in the Heartland, Fighting for Equity and Health in Kansas City, in collaboration with the Union of Concerned Scientists, exposes how concentrated freight transportation and industrial facilities, and a history of racist redlining practices, have combined to create disproportionate pollution exposures for environmental justice communities living in and around Kansas City. The report discusses community efforts to establish an air monitoring network and recommends policies to advance environmental justice solutions, including a shift to zero-emission trucks. [EPA-HQ-OAR-2022-0985-1579-A1, p. 3]

Organization: Evergreen Action

The transition to zero emissions medium and heavy duty vehicles is feasible and necessary to address long standing public health disparities. For decades the brunt of the pollution burden from heavy duty vehicles has fallen on communities of color and low income populations who suffer greater rates of lung and heart diseases, and even premature death as a result. These communities deserve the same quality of life as their white and wealthier counterparts. The burdens these communities experience have never been acceptable, or consistent with EPA’s or local authorities’ civil rights obligations. Now that there is viable technology available that would eliminate tailpipe pollution from trucks, it would be even more irresponsible and unjust not to compel the most expansive application of this technology to rectify the pollution impacts imposed on people of color and low income communities. [EPA-HQ-OAR-2022-0985-1595-A1, p. 2]

Organization: GreenLatinos et al.

Evidence makes clear how instrumental the swift adoption of stringent HDV and L/MDV standards are for the future of Latino/e communities. The 2023 American Lung Association State of the Air Report finds that more than one-third (36%) of people in the U.S. live in areas with failing grades for ozone or particulate pollution. This is concerning, especially considering the same report found that people of color are 3.7 times more likely than white people to live in a county with failing national air quality standards, putting our communities at even greater risk to severe health impacts and premature death. [EPA-HQ-OAR-2022-0985-2665-A1, p. 1]

Pollution from vehicles makes us sick and kills us. The data shows this over and over again. We need long-term protective regulation now.

For example, Latino/e children are three times more likely than white children to live in counties with low air quality. About 10% of Latino/e children suffer from asthma, and Latino/e children are 40% more likely to die from asthma than non-Latino white children. These disparities have only increased over time relative to the air quality standards set by the U.S. EPA. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Transportation is the largest source of pollution that fuels the climate crisis in the US. Latino/e communities disproportionately suffer harm from tailpipe emissions. While Latino/es are less likely to have access to a car and Latino/e workers commute by public transit nearly three times the rate of white commuters, our community can face up to 75% higher rates of exposure to harmful pollutants. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Today, we are at a critical nexus for clean transportation policy: We must drastically and permanently reduce air pollution from vehicles and transform our transportation landscape.

It is critical that the Biden administration pass regulations to reduce vehicle pollution and accelerate the shift to EVs. This action is crucial to achieving environmental justice. By implementing stringent HDV and L/MDV standards, the U.S. EPA will act on the Biden Administration's stated commitment to environmental justice, which the White House reaffirmed in April 2023 with a new Executive Order, Revitalizing Our Nation's Commitment to Environmental Justice for All. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

The Biden administration's leadership in setting strong HDV and L/MDV standards is instrumental to mitigate the inequitable tailpipe pollution experienced by Latino/e and other frontline communities, which triggers asthma and other sometimes fatal respiratory illnesses. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Organization: Moving Forward Network (MFN) et al.

For decades, communities across the country have been fighting for the right to breathe clean air. Environmental racism and a lack of strong and protective regulations result in these frontline/fenceline communities and workers being forced to hold their breath. [EPA-HQ-OAR-2022-0985-1608-A1, p. 3]

The Administration and EPA often note their commitment to placing environmental justice at the center of policies and programs, including the recent Executive Orders 14037 & 14096. Time and time again, these efforts have come up unacceptably short. Nevertheless, MFN continues to remind EPA of the importance of having a justice framework within the regulatory process and advocate for the strongest and most protective standards. We expect EPA to remain faithful to their commitment to quarterly updates with MFN and continue to advocate for greater inclusion. [EPA-HQ-OAR-2022-0985-1608-A1, p. 3]

Advances in this technology are outpacing even the best estimates from just a few years ago—cost and technology assessments of battery-electric trucks from 2018 are already becoming obsolete. The barriers that once relegated ZEVs to a niche solution are shrinking, allowing zero-emission trucks to become a real solution in our battle against air and climate pollution. At every regulatory opportunity, EPA must include policies that center environmental justice solutions and rapidly advance ZEVs not just in specific market segments but for the entire truck sector. MFN members also submitted a detailed letter on the urgency and necessity for the EPA to address the largely unregulated rail and locomotive industry. [EPA-HQ-OAR-2022-0985-1608-A1, p. 4]

4. MFN Demands Zero-Emission Solutions for the Heavy-Duty Truck Sector to Finally Address the Freight System's Impacts on Environmental Justice Communities

MFN and its members have long pressed the federal government to acknowledge the multiple and cumulative harms that environmental justice communities face and their heightened vulnerability to those threats. Cumulative impact analyses recognize that some individuals and communities face more pollution than others and that the same amount of pollution can result in more harm to people facing additional and compounded stressors than to people who do not face such stressors. It also recognizes that these multiple stressors are too often interrelated in their origins. The results are clear— people of color and people with low incomes face some of the highest levels of pollution and are least equipped to ward off the consequences of this pollution. 11 [EPA-HQ-OAR-2022-0985-1608-A1, p. 10]

11 Yukyan Lam, Kim Wasserman, Juliana Pino, Olga Bautista, Peggy Salazar and Maria Lopez-Nunez. Seeing the Whole: Using Cumulative Impacts to Advance Environmental Justice. (February 2022). p. 9-16. https://static1.squarespace.com/static/634ec24de312bd652b110530/t/63d9652fdaa29811a5a498d8/1675191601636/seeing-whole-cumulative-impacts-analysis-ej-report.pdf

On top of disproportionate exposure to air pollution, freight-impacted communities suffer from several additional harms from the freight sector: the paved areas and large, low buildings dominating freight facilities contribute to urban heat island effects, stormwater issues, and other environmental impacts. Other industrial sources are often clustered near freight facilities, which means that communities impacted by diesel trucks are also impacted by other sources of air and water pollution and toxic releases. These communities also face racism and other forms of discrimination that increase their vulnerability to environmental threats. In fact, freight-impacted communities are even more vulnerable to the impacts of air and other pollution because of socio-demographic stressors—including racial segregation, high rates of poverty, lack of access to affordable foods, and lack of access to healthcare—compared to communities that do not face these stressors. 27 [EPA-HQ-OAR-2022-0985-1608-A1, p. 13]

27 Environmental Justice Health Alliance for Chemical Policy Reform. Coming Clean, and Campaign for Healthier Solutions, Life at the Fenceline: Understanding Cumulative Health Hazards in Environmental

Justice Communities (September 2018). https://new.comingcleaninc.org/assets/media/documents/Life%20at%20the%20Fenceline%20-%20English%20-%20Public.pdf; Rachel Morello-Frosch et al., Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy. Health Affairs 30. No. 5 (2011). p.879-998.

The COVID-19 pandemic has escalated the negative consequences of living in a “diesel death zone” or a region with poor air quality. Numerous studies now show that long-term exposure to air pollution makes people more vulnerable to complications and death from COVID-19. 31 That neighborhoods with high proportions of Black and Latinx residents experience disproportionately high levels of air pollution may help explain why these groups have suffered disproportionately from the COVID-19 pandemic. 32 Indeed, one study found that Los Angeles neighborhoods with the worst air pollution have experienced a 60 percent increase in mortality from COVID-19 compared to Los Angeles neighborhoods with the best air quality. 33 COVID-19 infections have been known to be more severe for people who are already diagnosed with asthma. A study from Harvard University found that a small increase in long-term exposure to PM2.5 leads to a large increase in the COVID-19 death rate. 34 One of the reasons that BIPOC communities are dying at higher rates from COVID-19 is because of underlying health conditions like diabetes, heart disease, and asthma, all of which are diseases that are more prevalent for communities of color and low-income communities and are also linked to the disproportionately high levels of air pollution in these communities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 14]

31 Xiao Wu et al. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Science Advances. Vol 6. N. 45 (2020). https://projects.iq.harvard.edu/covid-pm.

32 Jonah Lipsitt et al. Spatial analysis of COVID-19 and traffic-related air pollution in Los Angeles. Env’t Int’l. Vol. 153. N. 106531 (Aug. 2021), https://doi.org/10.1016/j.envint.2021.106531.

33 Id.

34 Xiao Wu et al. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Science Advances. Vol 6. N. 45 (2020). https://projects.iq.harvard.edu/covid-pm.

Many studies have demonstrated the importance of race as a component of cumulative impacts, and the science behind this field is growing. 35 For example, a study released in March 2022 examined the link between port-related traffic and hospital visits for respiratory, heart-related, and psychiatric issues and concluded that people of color are more vulnerable to health impacts as a result of increased goods movement operations. 36 Adding just one vessel or increasing overall vessel tonnage in a nearby port leads to more than three additional hospital visits per year per thousand Black residents, compared to about one visit per thousand for white residents in the same area. 37 Relatedly, the study also found that reducing fossil fuel use in ports would significantly reduce air pollution concentration and have an acute and positive benefit to local Black residents. [EPA-HQ-OAR-2022-0985-1608-A1, p. 15]

35 Yukyan Lam, Kim Wasserman, Juliana Pino, Olga Bautista, Peggy Salazar and Maria Lopez-Nunez. Seeing the Whole: Using Cumulative Impacts to Advance Environmental Justice. (February 2022). p. 9-16. https://static1.squarespace.com/static/634ec24de312bd652b110530/t/63d9652fdaa29811a5a498d8/1675191601636/seeing-whole-cumulative-impacts-analysis-ej-report.pdf

36 Kenneth Gillingham and Pei Huang. Racial Disparities in the Health Effects from Air Pollution: Evidence from Ports (March 15, 2022). https://resources.environment.yale.edu/gillingham/RacialDisparitiesAirPollution.pdf.

37 Id. p. 32

MFN, its members, and allied organizations have published and contributed to numerous reports highlighting the cumulative impacts of freight transportation on frontline communities and workers. These reports include:

- MFN's May 2021 report, Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice provides an overview of the health impacts associated with goods movement and the disproportionate burdens felt by residents that live on the frontlines of polluting ports, warehouses, railyards, and highways, who are largely people of color. 38 The report features frontline voices who are calling for an end to diesel truck pollution and a full transition to zero-emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 15]

  38 Moving Forward Network. Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice. (2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-theCase_Report_May2021.pdf.

- Environmental Racism in the Heartland, Fighting for Equity and Health in Kansas City, a report by MFN members Clean Air Now and Union of Concerned Scientists, exposes how concentrated freight transportation and industrial facilities, and a history of racist redlining practices, have combined to create disproportionate pollution exposures for environmental justice communities living in and around Kansas City. 39 The report discusses community efforts to establish an air monitoring network and recommends policies to advance environmental justice solutions, including a shift to zero-emission trucks. [EPA-HQ-OAR-2022-0985-1608-A1, p. 15-16]

  39 Genna Reed, Beto Lugo-Martinez, and Casey Kalman. Environmental Racism in the Heartland: Fighting for Equity and Health in Kansas City. (2021). Cambridge, MA: Union of Concerned Scientists. https://doi.org/10.47923/2021.14322.

- Newark Community Impacts of Mobile Source Emissions, a community-based participatory research study developed with contributions from the New Jersey Environmental Justice Alliance, members of the Coalition for Healthy Ports including Greenfaith, Ironbound Community Corporation, New Jersey Clean Water Action, and the Natural Resources Defense Council, found that the worst pollution hot spots occurred where freight facilities are concentrated, and along truck routes. 40 The study found that electrifying vehicles can lead to significant local benefits but urged that electrification must coincide with reductions in power plant pollution, as these facilities are often located in the same areas that are disproportionately impacted by freight. [EPA-HQ-OAR-2022-0985-1608-A1, p. 16]

  40 M.J. Bradley & Associates. Newark Community Impacts of Mobile Source Emissions, A Community-Based Participatory Research Analysis (November 2020). p. 12-13. https://www.njeja.org/wpcontent/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf.

- For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing, published by Warehouse Workers for Justice, describes the heavy toll that a build-out of warehouse distribution centers is having on Will County, Illinois. The report describes how pollution burdens fall disproportionately on Black and Latinx residents and warehouse workers, who are on the frontlines of truck pollution. 41 The report also provides community air monitoring results, finding unhealthy spikes in PM2.5 pollution. [EPA-HQ-OAR-2022-0985-1608-A1, p. 16]

41 Madison Lisle and Yana Kalmyka. Warehouse Workers for Justice, For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing. (Nd). p. 13, https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

- Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California, authored by People's Collective for Environmental Justice and the University of Redlands, analyzed over 3,300 warehouses over 100,000 sq ft in Southern California. 42 The report analyzes the expansion of the e-commerce industry compared to the location of existing pollution sources and sociodemographic data, demonstrating a correlation with health, economics, and racial disparities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 16]

42 Ivette Torres and Anthony Victor. People's Collective for Environmental Justice, and Dan Klooster. Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California. University of Redlands. (April 2021). https://earthjustice.org/wp-content/uploads/warehouse_research_report_4.15.2021.pdf.

As the Agency works to finalize this and similar rules, EPA should communicate regularly with environmental justice groups to learn from the experience of these impacted communities. Doing this will ensure that environmental justice considerations and solutions are appropriately discussed, evaluated, and adopted, with expert input from those on the frontlines of truck impacts. EPA should also use the comments (or letters or other calls to action) the Agency has received from environmental justice groups on this rule (and on other rules) and appropriately evaluate the concerns raised by these groups and the requested solutions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 22]

EPA should consider the robust recommendations contained in the December 2022 Science Advisory Board report assessing EPA's proposed regulation for NOx emissions from heavy-duty trucks, which also supports conducting this analysis. 59 The SAB report found that "current methods used in EPA's Draft Regulatory Impact Analyses (RIAs) are not sufficient to capture community-scale benefits." 60 The SAB concluded and "strongly" recommended that "EPA

develop a strategy for systematic, quantitative evaluation of the environmental justice (EJ) impacts of air pollution regulations." 61 SAB's recommendation included consideration of race-specific health analyses and cumulative impacts, among other specific recommendations for improving regulatory analyses for air quality and greenhouse gas related rulemaking.

Specifically, SAB urged EPA to consider "cumulative exposure to multiple risk factors, including exposure to other air pollutants, heat, and lead" in future rulemaking. 62

[…]

EPA's draft rule qualitatively describes some connections between this rulemaking and cumulative impacts facing truck-impacted communities in the EJ analysis and even goes so far as to include a quantitative analysis of the demographics of households living within 300 feet of roadways. 64 This analysis reveals (unsurprisingly) that more often, communities of color and low-income communities are those impacted by truck routes. 65 EPA should build on this demographic data, conduct air modeling, and develop a racially-stratified health benefits analysis to more accurately quantify the benefits of the rule to EJ communities. If it is not feasible to conduct this analysis for the entire rule, EPA should do this for targeted geographic areas that are high in truck traffic. 66 Moreover, EPA should explicitly acknowledge the practice of redlining and how that has created disparities for communities of color being disproportionately exposed to near-roadway pollution. 67

[…]

As discussed above, environmental racism shows up in multiple ways in the impacts from heavy-duty truck pollution —including, but no not limited to, disproportionately high exposure to pollution, already elevated incidence rates of health risks such as asthma and premature mortality, and amplified effects of environmental exposures from social vulnerabilities such as cumulative physiological "wear and tear" and stress. 71 We recommend that EPA further consider the disparate impacts of the rule and alternatives by analyzing race/ethnicity-stratified health benefits. This analysis would more accurately capture the distribution of health impacts to environmental justice communities and result in a more accurate total health and climate benefits as well.

Third, EPA should consider additional measures to ensure that overburdened EJ communities will receive the benefits of transitioning to cleaner trucks. It is critical that, in this rulemaking, EPA sends a strong signal to the market and regulators that longstanding burdens to communities and increasing disparities in burdens from heavy-duty trucks cannot continue. EPA has obligations under the Clean Air Act and Title VI of the Civil Rights Act to ensure that state agencies receiving funds for their air programs address disparities in burdens from heavy-duty trucks through their State Implementation Plans (SIPs). 73 EPA can and should help support states by setting a standard under Section 202 that ensures robust availability of the cleanest trucks across the country in states, cities, and other municipalities facing the heavy and disparate toll of the logistics industry. [EPA-HQ-OAR-2022-0985-1608-A1, p.32]

> 73 U.S. EPA also may have civil rights obligations to ensure that localities receiving federal funds similarly do not create or perpetuate disparities in pollution and/or cumulative impacts from the logistics sector, as does its federal counterpart the Department of Housing and Urban Development. See 42 U.S.C. § 2000d-1 and 40 C.F.R. 7.15 ("This part applies to all applicants for, and recipients of, EPA assistance in the operation of programs or activities receiving such assistance" (emphasis added).)

Organization: National Association of Mutual Insurance Companies (NAMIC)

Specifically, the EPA, in submissions to the Federal Register, appears to assert that individuals within referenced Environmental Justice populations (defined as people of color and low-income populations in at least some EPA Federal Register notices) have less or limited access to homeowner insurance. [EPA-HQ-OAR-2022-0985-1478-A1, p. 1]

In its posted online EJ 2020 Glossary, the EPA defines 'Environmental Justice' (EJ) as follows: 'The fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies.' [EPA-HQ-OAR-2022-0985-1478-A1, p. 2]

By presenting statements about homeowners' insurance in the above referenced publications which feature discussions of Environmental Justice, the EPA seems to imply that potential insurance availability or affordability issues may be linked to EJ. Yet, the EPA does not offer specific references or 'scientific assessments' on insurance coverage in such areas to support the implication that homeowner insurance is not being made available in some way based on race, color, culture, national origin. [EPA-HQ-OAR-2022-0985-1478-A1, p. 2]

Respectfully, NAMIC asks the EPA to refrain from such charges regarding homeowners' insurance in its publications moving forward. NAMIC is greatly concerned that an agency of the federal government with minimal expertise in homeowners' insurance would infer such morally repugnant allegations. The Administration's requirement of a 'whole of government' focus on climate and equity does not empower federal agencies to broadly impute blame, particularly in the absence of legal authority in an industry that is highly regulated at the state level. [EPA-HQ-OAR-2022-0985-1478-A1, p. 2]

The Information Quality Act passed through Section 515 of the Consolidated Appropriations Act, 2001 requires that each federal agency disseminating information ensure and maximize the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by the agency, and to allow affected persons to seek and obtain correction of information disseminated by the agency. If the EPA has rigorous scientific assessments to support these statements, NAMIC would greatly appreciate the EPA sharing that information with us. However, if the EPA does not have such scientific assessments, we would respectfully request that the EPA discontinue the inclusion of such statements is support of proposed rules of a federal regulatory agency. [EPA-HQ-OAR-2022-0985-1478-A1, p. 2]

Organization: Our Children's Trust

Our children and future generations are already suffering injury with long-lasting and potentially irreversible consequences at present levels of heating. Moreover, all young people seeking environmental and climate justice, especially youth from frontline and environmental justice communities that have contributed the least to emissions and have long suffered from systemic environmental racism and social and economic injustices, must not only have their voices heard, but have their rights protected. [EPA-HQ-OAR-2022-0985-1633-A1, p. 5]

Organization: Valero Energy Corporation

[These comments also appear in RTC 18.3 and 19.1]

For these reasons, the EJ analysis in the proposal is incomplete per EPA's own EJ assessment criteria. Specifically, when assessing the potential for disproportionately high and adverse health or environmental impacts of regulatory actions on minority populations, low-income populations, tribes, and/or indigenous peoples, EPA should answer three broad questions:

1. Is there evidence of potential EJ concerns in the baseline (the state of the world absent the regulatory action)?

2. Is there evidence of potential EJ concerns for the regulatory option(s) under consideration?

3. Do the regulatory option(s) under consideration exacerbate or mitigate EJ concerns relative to the baseline?

EPA fails to perform this full assessment for its proposal. Consequently, EPA ignores EJ concerns both inherent to the baseline and exacerbated by the proposal. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

Organization: World Resources Institute (WRI)

Electric school buses, which produce zero tailpipe emissions, are the healthiest solution for all students, bus drivers, and the communities they travel through. Black students, children with disabilities and low-income students, ride diesel school buses more than others. Because students from low-income communities are more likely to ride a school bus - 60% of students from low-income families ride the bus to school, compared to 45% of students from families with higher incomes - a more stringent rule will advance the transition to an electric school bus fleet and simultaneously help address this transportation inequity. [EPA-HQ-OAR-2022-0985-1601-A1, p. 3]

EPA Summary and Response:

Summary:

Many commenters note that people of color and lower socioeconomic status face disproportionate and adverse effects of truck-emitted air pollutants (CARB, CleanAirNow, Evergreen Action, GreenLatinos et al., MFN, Our Children's Trust). Comments point to both higher exposure and worse health problems in people of color and lower-income people, noting both higher levels of air pollution in those communities and higher rates of health problems, including greater lung and heart disease rates and lower life expectancies compared to non-Hispanic white and wealthier populations.

Many commenters supported the proposals, while others urged EPA to take more aggressive action. Many references to studies were provided, including many citing the CleanAirNow/UCS report "Environmental Racism in the Heartland, Fighting for Equity and Health in Kansas City." Several comments described how historical government policies such as redlining created modern disparities in exposures to air pollutants, including from traffic (e.g., CleanAirNow, MFN, State of California et al. cited below in 18.1, SELC cited in 18.3).

Commenters shared information about environmental justice issues from other types of transportation infrastructure, not just roads, that can cause health problems: warehouses, ports, rail, and intermodal yards, for example (CleanAirNow, State of CA, ZETA).

Several commenters claim that EPA must base its emission standards on environmental justice. MFN says that EPA must "at every regulatory opportunity… include policies that center environmental justice solutions." Evergreen Action asserted that standards that do not "rectify the pollution impacts imposed on people of color and low income communities" by "compel[ling] the most expansive application zero emission technology would be "irresponsible and unjust." In addition, CARB claims that the "proposed rulemaking would be stronger" if EPA applied an EJ lens to its standards. GreenLatinos et al. claim that accelerating the shift to EV is required to achieve EJ and strong standards are needed to meet President Biden's commitment to mitigate the problems experienced by Latino/e and other frontline communities.

CARB and Valero Energy Corporation asserted that EPA did not consider important elements of EJ analysis as described in the 2016 Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, including determining potential EJ concerns in the regulatory option(s) under consideration and whether regulatory options might exacerbate or mitigate EJ concerns relative to the "baseline" scenario. MFN asserts that EPA should have followed the advice of the 2022 report by the Science Advisory Board (SAB)'s *Regulatory Review of Science Supporting EPA Decisions for the Proposed Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards*.

NAMIC requested that EPA refrain from stating that people of color or low-income populations have less or limited access to homeowner insurance.

Response:

In this response, the EPA is focusing on addressing general comments related to environmental justice and environmental justice issues associated with HD vehicles. Comments related to environmental justice and climate change are addressed in Section 18.1 and comments related to environmental justice and non-GHG pollutants are addressed in Section 18.2. Comments related to environmental justice issues associated with lifecycle assessment and cumulative emissions are addressed in Section 18.3. To the extent that these commenters raise other issues, those issues are addressed elsewhere in this RTC or in the final notice for this action.

EPA acknowledges and agrees with commenters' statements that actions to control emissions from heavy-duty vehicles are necessary to improve public health and welfare, including to those who live, work, or attend school close to major roadways and in communities with EJ concerns, as well as in those using buses for travel. After consideration of comments, EPA updated our review of the literature, while maintaining our general approach to considering environmental justice. We have included references that meet our peer review requirements in our citations, and we have updated our description of the scientific literature on environmental justice for populations near major roads to ensure its representativeness of the state of published literature. In Section VI.D.2 of the preamble, we discuss the EJ impacts of this final rule's GHG emission standards from the anticipated reduction of GHGs. We also discuss in Section VI.D.3 of the preamble the potential additional EJ impacts from the non-GHG (criteria pollutant and air toxic) emissions changes we estimate would result from compliance with the CO_2 emission standards, including impacts near roadways and from upstream sources. EPA did not consider potential adverse disproportionate impacts of vehicle emissions in selecting the CO_2 emission standards, but we provide information about adverse impacts of vehicle emissions for the public's understanding of this rulemaking, which addresses the need to protect public health consistent with CAA section 202(a)(1)-(2).

Regarding assertions from CARB, MFN, and Valero Energy Corporation that consideration of EJ or cumulative impacts from multiple air pollution sources or other factors would have resulted in a different regulatory program, EPA is promulgating these standards under our authority in CAA section 202(a)(1)-(2) and has appropriately assessed the statutory factors specified in that section, including consideration of costs and lead time. See preamble sections I and II.G for further discussion. EPA's assessment of the relevant statutory factors in CAA section 202(a)(1)-(2) justify the final standards. We also performed analysis of additional factors, consistent with Executive Orders 12866, 12898, 14096 and others; our assessment of these factors lend further evidentiary support to the final rule.

In addition, independent information cited in the preamble and published since provides strong evidence that emission standards provide benefits that accrue disproportionately to communities with EJ concerns. Demetillo et al. (2021) and Kerr et al. (2021) use “natural experiments” to demonstrate how reductions in heavy-duty truck emissions reduce disparities in exposures to traffic-generated pollution.[950,951]

MFN’s comments that EPA should have followed SAB’s recommendations in conducting high-resolution health and EJ analyses in support of this rule overlook several important considerations. First, SAB called for a “strategy for systematic, quantitative evaluation of the environmental justice” in its final report published in December 2022. Given the timing of this rulemaking process, even a plan that met these objectives and been subject to appropriate public and/or peer review would have been infeasible. As SAB noted in its report, the computational and information requirements for conducting this type of analysis are high. As such, it was not feasible for EPA to conduct such analyses for this rule, even for a subset of targeted geographic areas as suggested by MFN. EPA’s EJ and health benefit assessments are based on all appropriate data available at the time this rule was conducted, as well as a systematic review of the published literature about EJ for people living near major roads. Our assessment is in keeping with EPA’s 2016 Technical Guidance on EJ, which notes the potential suitability of “a suite of methods that can be applied depending on the type of available data, availability of resources, and time needed to conduct the analysis.” EPA continues to work to improve its EJ and benefits analyses to have higher levels of spatial resolution and ability to analyze larger areas. We note that a new draft of EPA’s EJ Technical Guidance has been submitted for public review (88 FR 78358; https://www.epa.gov/environmental-economics/epa-draft-revision-technical-guidance-assessing-environmental-justice).

In response to commenters who cited the three broad EJ-related questions posed in EPA’s EJ Technical Guidance, and who suggest we failed to address each question, we note that the questions are posed as guiding questions when analyzing potential EJ concerns for regulatory actions. EJ concerns related to any given rulemaking are unique and are analyzed on a case-by-case basis. We are not always able to provide quantitative answers to these questions.

NAMIC’s comment and request that we remove mention of limited access to homeowners’ insurance overlooks considerable evidence. The text in the preamble is intended to indicate that individuals who commonly and collectively may be perceived as being “vulnerable” or “sensitive,” and who frequently comprise communities facing environmental justice concerns, often live in locations that face the greatest risks from climate change effects and have fewer resources available to adapt. Environmental justice issues extend beyond issues related to discrimination on the basis of any particular demographic factor; in fact, in many respects, socioeconomic status has a significant effect on environmental justice considerations and resilience with regards to insurance access and homeownership or lack thereof (Gamble et al., 2016; EPA, 2021).[952] As is well documented, areas that experience greater threats of natural

[950] Demetillo, M.A.; Harkins, C.; McDonald, B.C.; et al. (2021) Space-based observational constraints on NO2 air pollution inequality from diesel traffic in major US cities. Geophys Res Lett 48, e2021GL094333. *https://doi.org/10.1029/2021GL094333*.
[951] Kerr, G.H.; Goldberg, D.L.; Anenberg, S.C. (2021) COVID-19 pandemic reveals persistent disparities in nitrogen dioxide pollution. PNAS 118. *https://doi.org/10.1073/pnas.2022409118*.
[952] Auer MR, Hexamer BE. Income and Insurability as Factors in Wildfire Risk. Forests. 2022; 13(7):1130. https://doi.org/10.3390/f13071130

hazards, such as wildfires, hurricanes, or coastal inundation, face higher rates for homeowners' and flood insurances, which may price out individuals from accessing more comprehensive coverage, leave them uninsurable, or may prevent them from being able to rebuild in areas where home values and construction costs have exceeded historic amounts (Gotham 2014; Keenan et al., 2018; Fleming et al., 2018; Wilson et al. 2021; Brown, 2022).[953,954,955,956,957] Low-income and Black, Indigenous, and People of Color (BIPOC) individuals often are more likely to inhabit areas facing greater vulnerability to climate change hazards that can affect home displacement or loss, such as wildfires, sea level rise, or extreme weather events (Gamble et al., 2016; EPA, 2021).[958,959]

There are clear examples of how this is translating into real-time effects. The costs of the National Flood Insurance Program have gone up considerably in recent years, and rates are expected to continue to increase, thus pricing out low-income homeowners (Fleming et al., 2018).[960] We have seen that homeowners' insurance providers are cancelling coverage or failing to insure homes at greater risk of wildfire damage, the greatest burdens of which are being, and will be, borne by low-income individuals (Auer & Hexamer, 2022).[961] This all is irrespective of concerns regarding rising housing costs across the United States (Brooks, 2022), let alone the influence of gentrification and general disparities in socioeconomic and racial demographics

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[953] Gotham, K.F., 2014: Reinforcing inequalities: The impact of the CDBG Program on post-Katrina rebuilding. *Housing Policy Debate*, 24 (1), 192-212. http://dx.doi.org/10.1080/10511482.2013.840666

[954] Brown, A.R. (2022), "Driving Down a Road and Not Knowing Where You're At": Navigating the Loss of Physical and Social Infrastructure After the Camp Fire. *Rural Sociology*, 87: 3-25. https://doi.org/10.1111/ruso.12411

[955] Keenan, J.M., T. Hill, and A. Gumber, 2018: Climate gentrification: From theory to empiricism in Miami-Dade County, Florida. Environmental Research Letters, 13, 054001. DOI 10.1088/1748-9326/aabb32

[956] Wilson, B., E. Tate, and C.T. Emrich, 2021: Flood Recovery Outcomes and Disaster Assistance Barriers for Vulnerable Populations. Frontiers in Water, 3, 752307. http://dx.doi.org/10.3389/frwa.2021.752307

[957] Brown, A.R. (2022), "Driving Down a Road and Not Knowing Where You're At": Navigating the Loss of Physical and Social Infrastructure After the Camp Fire. Rural Sociology, 87: 3-25. https://doi.org/10.1111/ruso.12411

[958] EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003.

[959] Gamble, J.L., J. Balbus, M. Berger, K. Bouye, V. Campbell, K. Chief, K. Conlon, A. Crimmins, B. Flanagan, C. Gonzalez-Maddux, E. Hallisey, S. Hutchins, L. Jantarasami, S. Khoury, M. Kiefer, J. Kolling, K. Lynn, A. Manangan, M. McDonald, R. Morello-Frosch, M.H. Redsteer, P. Sheffield, K. Thigpen Tart, J. Watson, K.P. Whyte, and A.F. Wolkin, 2016: Ch. 9: Populations of Concern. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. U.S. Global Change Research Program, Washington, DC, 247–286. http://dx.doi.org/10.7930/J0Q81B0T

[960] Fleming, E., J. Payne, W. Sweet, M. Craghan, J. Haines, J.F. Hart, H. Stiller, and A. Sutton-Grier, 2018: Coastal Effects. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 322–352. doi: 10.7930/NCA4.2018.CH8

[961] Auer MR, Hexamer BE. Income and Insurability as Factors in Wildfire Risk. Forests. 2022; 13(7):1130. https://doi.org/10.3390/f13071130

between renters versus homeownership (Kuebler & Rugh, 2013; Tedesco et al., 2022).[962,963,964] Homeownership in desirable areas that are less at risk of climate hazards increasingly is becoming less available to, or less populated by, low-income or BIPOC households (Keenan et al., 2018; Ruhks-Ahidiana, 2021; Tedesco et al., 2022). [13,965,966]In response to commenters who identify potential environmental justices concerns from the effects of criteria and GHG pollutants from heavy-duty vehicles, or additional scientific information, views, or analyses that were not specifically addressed in the proposed or final action, the EPA notes that the evidence regarding the environmental justice impacts of the proposed and final rulemakings is adequately described in Section VI.D of the preamble.

The EPA does not interpret supportive comments related to the environmental justice impacts associated with the proposal as indicating disagreement with the evidence on environmental justice information that was presented in the proposal, but rather understands these comments to suggest that the additional information they provide adds support for finalizing the rulemaking. To the extent that the information introduced by commenters was intended to advocate for more stringent standards, we refer the reader to Section 2 of this RTC document. See Sections 3 and 4 of this RTC document for responses relating to our updated cost and technology assessments for the final rule. For responses related to GHGs and the social cost of GHGs, see Section 20.GHG Impacts on Environmental Justice and Vulnerable or Overburdened Populations

Comments by Organizations

Organization: California Air Resources Board (CARB)

3. GHG and Climate Change as it Relates to EJ

Overall, both EJ sections in the NPRM and DRIA do a good job of highlighting how climate change impacts are disproportionally felt by certain communities and individuals (characteristics and/or circumstance), and by inference, that reducing CO2 equivalent will benefit to those same communities. CARB staff recommends that the NPRM also point out that slowing down climate change is therefore of increased importance for those same frontline communities experiencing disparate impacts to their health, environment, and lived experiences. [EPA-HQ-OAR-2022-0985-1591-A1, pp.66-67]

While regulatory standards benefit everyone, disproportionally burdened communities still encounter unique barriers to accessing regulatory benefits. As such, no discussion of climate change and EJ is complete without considering the disproportionate ways that resources are allocated to mitigate climate impacts, for example: resources to deal with sea level rise

[962] Brooks, M.M., 2022: The changing landscape of affordable housing in the rural and urban United States, 1990-2016. *Rural Sociology*, 87, 2, 511-546. https://doi.org/10.1111/ruso.12427
[963] Kuebler, M., and J.S. Rugh, 2013: New evidence on racial and ethnic disparities in homeownership in the United States from 2001 to 2010. Social Science Research, 42, 5, 1357-1374. https://doi.org/10.1016/j.ssresearch.2013.06.004
[964] Tedesco, M., J.M. Keenan, and C. Hultquist, 2022: Measuring, mapping, and anticipating climate gentrification in Florida: Miami and Tampa case studies. Cities, 131, 103991. https://doi.org/10.1016/j.cities.2022.103991
[965] Keenan, J.M., T. Hill, and A. Gumber, 2018: Climate gentrification: From theory to empiricism in Miami-Dade County, Florida. Environmental Research Letters, 13, 054001. DOI 10.1088/1748-9326/aabb32
[966] Rucks-Ahidiana, Z, 2021; Racial composition and trajectories of gentrification in the United States. Urban Studies, 58, 13, 2721–2741. https://doi.org/10.1177/0042098020963853

(advantaged communities) vs. resources for heat mitigation programs in local communities (disadvantaged communities). [EPA-HQ-OAR-2022-0985-1591-A1, p.67]

222 U.S. EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3 Draft Regulatory Impact Analysis, April 2023. Page xii. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf

Organization: Evergreen Action

As this administration addresses the climate crisis, the policies and solutions must be grounded in the reality that these same communities who are exposed to greater rates of pollution will also be most vulnerable to climate change impacts, or are already experiencing them. Sharply curbing greenhouse gas emissions from the transportation sector on the fastest timeline possible will reduce harm for pollution burdened communities now, and reduce future impacts. This administration must move at the speed the climate crisis demands, using all available tools and technologies to reduce emissions to the greatest extent at every opportunity, which this proposed rule does not accomplish. [EPA-HQ-OAR-2022-0985-1595-A1, p. 2]

Organization: Moving Forward Network (MFN) et al.

In recent years, the findings have added evidence that a changing climate is making it harder to protect human health—the three years covered by the referenced report ranked among the seven hottest years on record globally. High ozone days and spikes in particle pollution related to heat, drought, and wildfires are putting millions of people at risk and adding challenges to the work that states and cities are doing across the nation to clean up air pollution. [EPA-HQ-OAR-2022-0985-1608-A1, p. 11]Add to all of this the reality that these same communities are also most at risk from the coming climate disaster. The effects of a growing climate crisis are already being felt by port-adjacent communities in deadly and dangerous ways. These effects range from deadly heat waves, to flooding, to superstorms and hurricanes. 28 Indeed, storm surges and hurricane events have significantly increased in severity and frequency in recent years. These superstorms, like Superstorm Sandy, have forced port-adjacent communities to confront new issues that are a direct result of an under-regulated freight transportation system. The increasing frequency and severity of natural disasters hit these communities hardest, and they receive lower levels of reinvestment after these events. Moreover, they are more likely to have inadequate infrastructure and insurance and are "more likely to live near industrial facilities and are therefore at a higher risk for chemical spills and toxic leaks resulting from toxic storms." 29 In total, low-income communities and communities of color "are found to be particularly more vulnerable to heatwaves, extreme weather events, environmental degradation, and subsequent labor market dislocations." 30 [EPA-HQ-OAR-2022-0985-1608-A1, p. 13-14]

28 Nicky Sheats. Stakeholder Engagement Report: Environmental Justice. Climate Change Preparedness in New Jersey. New Jersey Climate Adaptation Alliance (NJCAA). (2014). https://njadapt.rutgers.edu/docman-lister/resource-pdfs/116-environmental-justice-stakeholder/file.

29 Princeton University. Racial Disparities and Climate Change. (August 15, 2020). https://psci.princeton.edu/tips/2020/8/15/racial-disparities-and-climate-change.

30 Id

Organization: State of California et al. (2)

C. The Impacts of Climate Change and Poor Air Quality Disproportionately Harm Environmental Justice Communities

1. Environmental Justice Communities Disproportionately Bear the Burden of Climate Change Impacts

The climate change impacts discussed above will continue to disproportionately fall on environmental justice communities.87 Indeed, environmental justice communities already experience more severe climate impacts and are more vulnerable as the climate crisis worsens. [EPA-HQ-OAR-2022-0985-1588-A1, p.11]

87 Environmental justice is defined by EPA as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to development, implementation, and enforcement of environmental laws, regulations and policies." EPA, EPA-300-B-1-6004, EJ 2020 Action Agenda: The U.S. EPA's Environmental Justice Strategic Plan for 2016-2020, at 1 (Oct. 2016). For the purpose of this comment, the term "environmental justice community" refers to a community of color or community experiencing high rates of poverty that due to past and or current unfair and inequitable treatment is overburdened by environmental pollution, and the accompanying harms and risks from exposure to that pollution, because of past or current unfair treatment.

Severe harms from rising temperatures are already a reality for many environmental justice communities. The last nine years have been the nine hottest on record, and that trend is only expected to continue.88 Members of environmental justice communities tend to work in occupations with increased exposure to extreme heat, such as the agricultural, construction, and delivery industries.89 Farmworkers die of heat-related causes at 20 times the rate of the rest of the U.S. civilian workforce.90 Since 2005, the first year California began tracking the number of heat-related fatalities, 36 percent of California's heat-related worker deaths have been of farmworkers.91 Similarly, although construction workers comprise only 6 percent of the national workforce, they account for 36 percent of heat-related deaths.92

88 Press Release, Nat'l Aeronautics & Space Admin., NASA Says 2022 Fifth Warmest Year on Record, Warming Trend Continues (Jan. 12, 2023), https://www.nasa.gov/press-release/nasa-says-2022-fifth-warmest-year-on-record-warming-trend-continues; Valérie Masson-Delmotte et al., Intergovernmental Panel on Climate Change, AR6 Climate Change 2021: The Physical Science Basis, SPM-10 (2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf.

89 See, e.g., Juley Fulcher, Boiling Point: OSHA Must Act Immediately to Protect Workers From Deadly Temperatures, Public Citizen (Jun. 28, 2022), https://www.citizen.org/article/boiling-point/; Union of Concerned Scientists, Too Hot to Work: Assessing the Threats Climate Change Poses to Outdoor Workers (2021), https://www.ucsusa.org/sites/default/files/2021-09/Too-Hot-to-Work_9-7.pdf, at 3; Ariel Wittenberg, OSHA Targets Heat Threats Heightened by Climate Change, E&E News: Greenwire (Oct. 26, 2021), https://www.eenews.net/articles/osha-targets-heaththreats-heightened-by-climate-change/.

90 See Union of Concerned Scientists, Farmworkers at Risk: The Growing Dangers of Pesticides and Heat (2019), https://www.ucsusa.org/sites/default/files/2019-12/farmworkers-at-risk-report-2019-web.pdf, at 4 (citing Centers for Disease Control and Prevention, Heat-Related Deaths Among Crop Workers—United States, 1992–2006, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5724a1.htm (last updated June 19, 2008)).

91 Teniope Adewumi-Gunn & Juanita Constible, Feeling the Heat: How California's Workplace Heat Standards Can Inform Stronger Protections Nationwide, Natural Resources Defense Council (2022), https://www.nrdc.org/sites/default/files/feeling-heat-ca-workplace-heat-standards-report.pdf.

92 Xiuwen Sue Don et al., Heat-Related Deaths Among Construction Workers in the United States, 62 Am. J. Indus. Med. 1047-57 (2019).

At home, environmental justice communities suffer disproportionate impacts from extreme heat because they are more likely to lack air conditioning, tree canopy, and greenspace. Environmental justice communities have less access to air conditioning to cool down, and are less able to pay the utility bills required to run air conditioning units or fans.93 In urbanized environments, pavement, cement, and other non-vegetated areas contribute to the heat island effect, in which built environments retain heat, causing daytime temperatures to be 1° to 6° F hotter than rural areas and nighttime temperatures to be as much as 22° F hotter.94 The heat island effect is inequitably distributed—it is most extreme in lower-income communities and communities of color.95 Contributing to this effect is the lack of tree canopy and greenspace in environmental justice communities, often due to lower historical and ongoing investment in these communities. Indeed, tree canopy and greenspace is highly correlated with historical redlining practices, in which federal housing policy directed investment away from "risky" lower-income communities and especially communities of color.96 Moreover, an EPA report found that individuals with lower incomes and individuals of color are 11 to 16 percent and 8 to 14 percent, respectively, more likely to live in areas with the highest projected increases in premature mortality from extreme heat.97 [EPA-HQ-OAR-2022-0985-1588-A1, p.12]

93 State of California, Fourth Climate Change Assessment, Climate Justice Report (2018), https://resourceslegacyfund.org/wp-content/uploads/2018/09/Climate-Justice-Report-4CCCA-v.4-00455673xA1C15.pdf ("California Climate Justice Report"), at 39-40, 45; Allison Crimmins, et al., The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment, U.S. Global Change Research Program (2016), https://health2016.globalchange.gov/low/ClimateHealth2016_FullReport_small.pdf ("USGCRP Study"), at 252.

94 See EPA, Heat Island Effect, https://www.epa.gov/heatislands (last updated May 1, 2023); California Environmental Protection Agency, Understanding the Urban Heat Island Index, https://calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index/ (last visited May 24, 2023).

95 EPA, Heat Islands and Equity, https://www.epa.gov/heatislands/heat-islands-and-equity (last updated Dec. 12, 2022); USGCRP Study, supra n.93, at 252.

96 Dexter Locke et al., Residential Housing Segregation and Urban Tree Canopy in 37 US Cities, 1 npj Urban Sustainability 15, 3-4 (2020); Ian Leahy & Yaryna Serkez, Since When Have Trees Existed Only for Rich Americans?, N.Y. Times: Op. (July 4, 2021), https://www.nytimes.com/interactive/2021/06/30/opinion/environmental-inequity-trees-critical-infrastructure.html.

97 EPA, Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts (2021), https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf, at 36.

In addition, flooding and drought from extreme weather events already disproportionately affect environmental justice communities, and the inequity will only grow as climate impacts worsen. Due to disinvestment, environmental justice communities often lack sufficient infrastructure to control flooding or ensure steady clean water supplies.98 They also suffer from more severe impacts, such as contaminated water from pollutant flows during floods and increased concentration of contaminants during droughts.99 EPA has also determined that individuals with lower incomes are more likely to live in areas with the highest projected land losses from sea level rise inundation and are more likely to face substantial traffic delays due to climate-driven changes in high-tide flooding.100 These individuals are less able to afford flood insurance and less likely to qualify for emergency relief and other safety net programs.101 [EPA-HQ-OAR-2022-0985-1588-A1, pp.12-13]

98 Lily Katz, A Racist Past, a Flooded Future: Formerly Redlined Areas Have $107 Billion Worth of Homes Facing High Flood Risk—25% More Than Non-Redlined Areas, Redfin (2021), https://www.redfin.com/news/redlining-flood-risk/; California Climate Justice Report, supra n.93, at 41-42; USGCRP Study, supra n.93, at 253-54.

99 USGCRP Study, supra n.93, at 158-74.

100 Climate Change and Social Vulnerability in the United States, supra n.97, at 49, 59.

101 See, e.g., University of California – Merced, Community and Labor Center, Disaster Response: The Planada Flood, Federal Policy Gaps, and Unmet Community Needs (2023), https://clc.ucmerced.edu/sites/clc.ucmerced.edu/files/page/documents/disaster_response_0.pdf.

The above impacts especially apply to tribal communities. Due to land dispossession and forced migration, tribal communities are more exposed to extreme heat and more likely to rely on local water sources that are less resilient to drought and are more contaminated.102 Beyond those impacts, tribal communities also suffer cultural harms from the decimation or alteration of local ecosystems and species of particular meaning to cultural practices.103 These cultural resources have intrinsic value, and they are also critical to tribal community identity and group cohesion, which translates into direct health benefits.104 Moreover, degradation of these cultural resources threatens traditional ecological knowledge, such as particularized understanding of local ecosystems, agriculture, and sustainable practices, that can help limit the impacts of climate change.105 Tribal communities with sovereign land holdings are also more vulnerable to climate impacts because they are unable to relocate.106 [EPA-HQ-OAR-2022-0985-1588-A1, p.13]

102 Justin Farnell, et al., Effects of land dispossession and forced migration on Indigenous peoples in North America, Science 374 (2021); USGCRP Study, supra n.93, at 254.

103 State of California, Fourth Climate Change Assessment, Summary Report from Tribal and Indigenous Communities within California (2018), https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-010_TribalCommunitySummary_ADA.pdf, at 19.

104 Id. at 19.

105 Id. at 13-16.

106 Farnell, Effects of land dispossession and forced migration on Indigenous peoples in North America, supra n.102.

EPA Summary and Response:

Summary:

Commenters stated that the climate change impacts (discussed in section 14 of this RTC document) will disproportionately fall on environmental justice communities. Commenters stated that members of environmental justice communities tend to work in occupations with increased exposure to extreme heat, such as agricultural, construction, and delivery industries. Commenters stated that environmental justice communities suffer disproportionate impacts from extreme heat because they are more likely to lack air conditioning, tree canopy, and greenspace. Commenters stated that flooding and drought from extreme weather events already disproportionately affect environmental justice communities and that the inequity will only grow as climate impacts worsen. Commenters stated that individuals with lower incomes are more likely to live in areas with the highest projected land losses from sea level rise inundation and are more likely to face substantial traffic delays due to climate-driven changes in high tide flooding. Commenters stated that impacts especially apply to tribal communities.

Response:

As discussed in preamble Section VI.D.2, EPA acknowledges and agrees with comments in this RTC section stating that communities with environmental justice concerns are disproportionately impacted by climate change, and that reductions in future warming due to this rule will benefit these communities. Please also refer to our response to comments in Section 2.4 of this RTC document regarding the stringency of the final standards.

18.1 EJ, Non-GHG Impacts

Comments by Organizations

Organization: Allergy & Asthma Network et al.

The impacts of pollution from heavy-duty vehicles are not shared equally. According to EPA, seventy-two million people are estimated to live near truck freight routes.2 They are more likely to be people of color and those with lower incomes. These overburdened communities are directly exposed to pollution that causes respiratory and cardiovascular problems, among other serious and costly health effects. [EPA-HQ-OAR-2022-0985-1532-A1, p. 2]

2 United States Environmental Protection Agency. Fact Sheet: Transportation Pollution and Environmental Justice. March 2022. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10144Y3.pdf

This disproportionate impact is echoed in the broader share of those most burdened by poor air quality. According to the American Lung Association's 2023 "State of the Air" report, more than 1 in 3 Americans are living in communities with unhealthy air. People of color are over three times more likely to be breathing the most polluted air than white people.3 [EPA-HQ-OAR-2022-0985-1532-A1, p. 2]

3 American Lung Association. State of the Air 2023: Key Findings. April 2023. https://www.lung.org/research/sota/key-findings

Organization: American Thoracic Society (ATS)

Greenhouse gas and traffic-related air pollutant emissions have significant adverse human health effects, especially for low-income, minoritized, and vulnerable groups.

As outlined in the proposed rule, GHG reductions will improve the cardiopulmonary health of the nation, including individuals from minoritized and excluded communities who typically shoulder the greatest burden of health effects from air pollution. As highlighted by the EPA and others, Black, Hispanic, and poor communities are more likely to live near roadways and therefore have more exposure to the heavy duty truck pollution.7,8 Further, 6.4 million U.S. children attend schools within 250 meters of a major roadway, disproportionately burdening Black and low income children.9 Children are particularly vulnerable as respiratory insults during this critical stage of lung development can leave long lasting impacts into adulthood, including increasing the likelihood of development of adult chronic respiratory diseases such as COPD.10 [EPA-HQ-OAR-2022-0985-1517-A1, p. 2]

7. US Environmental Protection Agency. Estimation of Population Size and Demographic Characteristics among People Living Near Truck Routes in the Coterminous United States. Regulations.gov 1–44 (2022).

8. TK, B. et al. Health insurance coverage - United States, 2008 and 2010. MMWR 62 Suppl 3, 61–64 (2013).

9. Kingsley, S. L. et al. Proximity of US schools to major roadways: a nationwide assessment. J Expo Sci Env. Epidemiol 24, 253–259 (2014).

10. Lu, Z., Coll, P., Maitre, B., Epaud, R. & Lanone, S. Air pollution as an early determinant of COPD. Eur Respir Rev 31, 1–13 (2022).

Criteria and other hazardous air pollutants, including PM2.5, NOx, ultrafine particulates, and VOCs, are more abundant the closer proximity one is to major roadways. These traffic-related pollutants can induce greater and differing inflammatory impacts compared to ambient air pollution,11,12 and may not be adequately captured by typical air quality monitors, particularly for vulnerable populations.13 Numerous studies have demonstrated the health harms of living near a major-roadways including increased asthma prevalence,14,15 worsened childhood asthma symptoms and control,16,17 reduced lung function,12 childhood asthma exacerbations,18 cardiovascular morbidity,19,20 and lung cancer.21 [EPA-HQ-OAR-2022-0985-1517-A1, p. 3]

11. Wu, W. et al. Inflammatory response of monocytes to ambient particles varies by highway proximity. Am J Respir Cell Mol Biol 51, 802–809 (2014).

12. Urman, R. et al. Associations of children’s lung function with ambient air pollution: Joint effects of regional and near-roadway pollutants. Thorax 69, 540–547 (2014).

13. Stuart, A. L., Mudhasakul, S. & Sriwatanapongse, W. The social distribution of neighborhood-scale air pollution and monitoring protection. J Air Waste Manag Assoc 59, 591–602 (2009).

14. McConnell, R. et al. Traffic, susceptibility, and childhood asthma. Env. Heal. Perspect 114, 766–772 (2006).

15. Gauderman, W. J. et al. Childhood asthma and exposure to traffic and nitrogen dioxide. Epidemiology 16, 737–743 (2005).

16. Brown, M. S. et al. Residential proximity to a major roadway is associated with features of asthma control in children. PLoS One 7, 1–9 (2012).

17. Hauptman, M. et al. Proximity to major roadways and asthma symptoms in the School Inner-City Asthma Study. J Allergy Clin Immunol 145, 119-126.e4 (2020).

18. Rosser, F. J. et al. Proximity to a Major Road, Vitamin D Insufficiency, and Severe Asthma Exacerbations in Puerto Rican Children. Am J Respir Crit Care Med 190, 1190–1193 (2014).

19. Jhun, I. et al. Synthesis of Harvard EPA Center Studies on Traffic-Related Particulate Pollution and Cardiovascular Outcomes in the Greater Boston Area. J Air Waste Manag Assoc 69, 900–917 (2019).

20. Kulick, E. R., Wellenius, G. A., Boehme, A. K., Sacco, R. L. & Elkind, M. S. Residential proximity to major roadways and risk of incident ischemic stroke in NOMAS (The Northern Manhattan Study). Stroke 49, 835–841 (2018).

21. Brugge, D., Durant, J. L. & Rioux, C. Near-highway pollutants in motor vehicle exhaust: A review of epidemiologic evidence of cardiac and pulmonary health risks. Env. Heal. Aug 9, 23 (2007).

Organization: California Air Resources Board (CARB)

2. Non-GHG Impacts (i.e., Criteria Pollutants and Toxics)

The largest EJ-related concern with the NPRM pertains to the benefit analysis of non- GHG emissions. Even more significantly, the NPRM recognizes that EJ communities are disproportionately affected by ICE emissions, and it then erroneously implies that a transition to ZEVs will therefore disproportionally benefit those communities. CARB staff understand the argument that air quality will likely improve for all communities, but the benefit will not necessarily be proportional. Without active management, the newest and cleanest vehicles will come into the fleet to fill the need of lighter duty "vocational" work (delivery vehicles, trash trucks, buses, etc.) while dirtier ICE vehicles will continue to be used for line-haul trucking, around ports, and for heavy industrial (see NPRM Table ES-3). In addition, those new and cleanest HDVs will likely start out life in affluent neighborhoods and will then "trickle down" into EJ communities that are disproportionally burdened by dirty air and need the emissions reduction the most. Such concerns drove CARB and the Section 177s states to adopt ZEV sales requirements that guarantee production of ZE tractor trailers, the largest polluters on the road, and similarly adopt sector specific fleet requirements such as for drayage trucks. U.S. EPA's NPRM has an unrealized opportunity to include the means to assure entire sectors are not unduly delayed, especially those sectors with outsized emissions impact on our communities from the largest engines and significant total fuel usage. [EPA-HQ-OAR-2022-0985-1591-A1, p.66]

Organization: Environmental Defense Fund (EDF)

In addition to the research presented in our previous comments, EDF has since conducted additional analyses that further demonstrate the impact of diesel emissions on vulnerable populations and the need for and benefits of zero-emitting solutions, especially in pollution hot spots. In particular, we highlight two recent analyses that we submit along with these comments. [EPA-HQ-OAR-2022-0985-1644-A1, p. 7-8]

Warehouse Pollution and Proximity Mapping. New research from EDF looks at U.S. warehouse proliferation and the exposure to air pollution from warehouse trucks. EDF researchers analyzed 10 states and combined warehouse industry data with a Geospatial Information System (GIS) application known as Proximity Mapping, which applies areal apportionment to estimate the characteristics of populations living near specific facilities and pollution sources, using the U.S. Census Bureau's American Community Survey 5-Year estimates.7 The analysis found an estimated 15 million people live within a half-mile of a warehouse in 10 states across the country and more than 1 million children under the age of 5 live within a half-mile of a warehouse. Exposure to air pollution from the trucks that frequent warehouses is linked to a range of health issues, including the risk of developing childhood asthma, heart disease, adverse birth outcomes like premature birth and low birth weight, cognitive decline, and stroke. Each warehouse generates hundreds, if not thousands, of truck trips every day, and trucks can emit more pollution while idling or traveling at slow speeds than while driving at faster speeds. [EPA-HQ-OAR-2022-0985-1644-A1, p. 8]

7 Aileen Nowlan. 2023. Making the Invisible Visible, EDF. https://globalcleanair.org/files/2023/04/EDF-Proximity-Mapping-2023.pdf (Attachment B)

The results also show that warehouse proliferation does not distribute the pollution risk evenly. In some states like Illinois, Massachusetts and Colorado, the concentration of Black and Latino residents around warehouses is nearly double the state average. The study notes that zero-emission options already exist for delivery vans, yard trucks and regional haul trucks and manufacturers are investing billions to expand zero-emission technology for long-haul trucking. Increasing deployment of ZEVs would significantly reduce the harmful diesel pollution around warehouses and help protect nearby communities. [EPA-HQ-OAR-2022-0985-1644-A1, p. 8]

Students from low-income families are particularly exposed to the dangers of diesel exhaust because 60% ride the bus to school, compared to 45% of students from families with higher incomes.108 EPA also finds that, of the 10 million students who attend schools within 200 meters of major roadways, "students of color were overrepresented at schools within 200 meters of primary roadways, and schools within 200 meters of primary roadways had a disproportionate population of students eligible for free or reduced-price lunches. Black students represent 22 percent of students at schools located within 200 meters of a primary road, compared to 17 percent of students in all U.S. schools. Hispanic students represent 30 percent of students at schools located within 200 meters of a primary road, compared to 22 percent of students in all U.S. schools."109 [EPA-HQ-OAR-2022-0985-1644-A1, p. 48]

108 Bureau of Transportation Statistics, The Longer Route to School (Jan. 12, 2021), https://www.bts.gov/topics/passenger-travel/back-school-2019.

109 88 Fed. Reg. 26067.

NYC and Atlanta ZEV Case Studies.8 In comments on EPA's March 28, 2022 proposed rule, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards,9 EDF submitted preliminary results of a case study on the health and air quality benefits of deploying heavy-duty ZEVs in New York City; for which we now have finalized results. Compared to traditional transportation air quality health benefit tools, our data and methods represent a significant improvement in the ability to ascertain disparities. Conducted by researchers at EDF, Boston University, and the University of North Carolina, we conducted a full chain air pollution health impact assessment to model two electrification scenarios for New York City and Atlanta. [EPA-HQ-OAR-2022-0985-1644-A1, p. 9]

8 Presentation by Jonathan Buonocore, Chet France, Rick Rykowski, Brian Naess, Komal Shukla, Catherine Seppanen, Dylan Morgan, Frederica Perera, Katie Coomes, Ananya Roy, Sarav Arunachalam. 2022. "Distribution of Air Quality Health Benefits of MHEV policies: New York and Atlanta," University of North Carolina, Boston University, Columbia University Mailman School of Public Health and Environmental Defense Fund. (Attachment C)

9 EDF's comments on the Proposed Rule, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 87 Fed. Reg. 17414 (Mar. 28, 2022) dated May 16, 2022.

Our two medium- and heavy-duty electrification policy scenarios differ in how rapidly on-road electrification occurs, and consequently, how quickly the current medium- and heavy-duty fleet turns over. Scenario 1 assumes 100% sales for zero emission transit and school buses by 2030, with a phased-in approach for other medium- and heavy-duty sales (30% by 2030 and 100% by 2040). Scenario 2 does not phase in ZEV sales, but simply requires 100% on-road zero emission medium- and heavy-duty ZEVs by 2040. We find that full electrification (Scenario 2) would prevent $2.4 billion in health damages every year by 2040 (248 deaths, 173 childhood asthma emergency department (ED) visits) in the New York area. In Atlanta, full electrification

(Scenario 2) in 2040 would prevent $4.14 billion in health damages (428 deaths and 88 childhood asthma ED visits). [EPA-HQ-OAR-2022-0985-1644-A1, p. 9]

Our research in Atlanta and New York also demonstrates that many communities of color and low-income communities with high baseline asthma ED visits also have elevated diesel truck and bus traffic and pollution and therefore face disproportionate impacts. In New York City, census-tracts with 97 percent persons of color bear greater than 35 percent of total childhood asthma ED visits attributable to medium- and heavy-duty vehicles, despite being only 19 percent of the population. Similarly in Atlanta, persons of color make up 36 percent of the population, but account for 46 percent of NO2-attributable deaths, and 40 percent of NO2-attributable asthma ED visits. [EPA-HQ-OAR-2022-0985-1644-A1, p. 9-10]

These recent studies align with and reinforce EPA's conclusions in the proposal regarding the disparate impacts of truck pollution10 and highlight the urgent need for EPA to rigorously consider the health and equity benefits of more protective standards. [EPA-HQ-OAR-2022-0985-1644-A1, p. 10]

Organization: Environmental Protection Network (EPN)

The proposed standards would reduce air pollution near roads. Near-roadway communities are often low income or communities of color, and children who attend school near major roads are disproportionately represented by children of color and children from low-income households. These populations would benefit most directly from the projected emission reductions. Reducing these emissions would also provide cleaner air for communities across the country, prevent health issues like asthma, and ultimately save money, lives, and trips to the hospital. [EPA-HQ-OAR-2022-0985-1523-A1, p. 2]

Organization: GreenLatinos et al.

Evidence makes clear how instrumental the swift adoption of stringent HDV and L/MDV standards are for the future of Latino/e communities. The 2023 American Lung Association State of the Air Report finds that more than one-third (36%) of people in the U.S. live in areas with failing grades for ozone or particulate pollution. This is concerning, especially considering the same report found that people of color are 3.7 times more likely than white people to live in a county with failing national air quality standards, putting our communities at even greater risk to severe health impacts and premature death. [EPA-HQ-OAR-2022-0985-2665-A1, p. 1]

Pollution from vehicles makes us sick and kills us. The data shows this over and over again. We need long-term protective regulation now.

For example, Latino/e children are three times more likely than white children to live in counties with low air quality. About 10% of Latino/e children suffer from asthma, and Latino/e children are 40% more likely to die from asthma than non-Latino white children. These disparities have only increased over time relative to the air quality standards set by the U.S. EPA. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Transportation is the largest source of pollution that fuels the climate crisis in the US. Latino/e communities disproportionately suffer harm from tailpipe emissions. While Latino/es are less likely to have access to a car and Latino/e workers commute by public transit nearly three times the rate of white commuters, our community can face up to 75% higher rates of exposure to harmful pollutants. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Today, we are at a critical nexus for clean transportation policy: We must drastically and permanently reduce air pollution from vehicles and transform our transportation landscape.

It is critical that the Biden administration pass regulations to reduce vehicle pollution and accelerate the shift to EVs. This action is crucial to achieving environmental justice. By implementing stringent HDV and L/MDV standards, the U.S. EPA will act on the Biden Administration's stated commitment to environmental justice, which the White House reaffirmed in April 2023 with a new Executive Order, Revitalizing Our Nation's Commitment to Environmental Justice for All. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

The Biden administration's leadership in setting strong HDV and L/MDV standards is instrumental to mitigate the inequitable tailpipe pollution experienced by Latino/e and other frontline communities, which triggers asthma and other sometimes fatal respiratory illnesses. [EPA-HQ-OAR-2022-0985-2665-A1, p. 2]

Organization: Lion Electric, Co. USA

There is $485 billion in health and environmental benefits if there is a MHDV transition by 2040 HD_ZEV_White_Paper.pdf (edf.org), with underserved communities impacted the most by poor air quality. Implementing stringent heavy-duty GHG standards that encourage electrification will help eliminate harmful impacts from emissions on these communities. [EPA-HQ-OAR-2022-0985-1506-A1, p. 2]

As noted by research, disadvantaged students are particularly vulnerable to the impacts of diesel pollution: 70% of all children from low-income families take the bus to school, compared to 50% of children from families with higher incomes. The $150 Billion Road Electric School Buses Can Ride To Create American Jobs And Protect Kids' Health (forbes.com). [EPA-HQ-OAR-2022-0985-1506-A1, p. 2]

Organization: Moving Forward Network (MFN) et al.

Heavy-duty vehicles generate 25% of the total global warming emissions from the transportation sector in the entire country — outsized emissions contribute to the sector that's already contributing the largest share of global warming emissions. 12 In 2020, heavy-duty vehicles represented approximately 6% of the on-road fleet but generated 59% of ozone- and particle-forming NOx emissions and 55% of the particle pollution (including brake and tire particles). 13 With the e-commerce industry rapidly expanding, the US is seeing increases in the overall emissions of the sector. 14 Most heavy-duty trucks on the road today are powered by diesel engines, the exhaust from which poses a direct threat to human health and the environment. Diesel engines emit a mixture of pollutants, including NOx, VOCs, and PM2.5, all of which have been directly linked to severe health consequences, including neurological, cardiovascular, respiratory, reproductive, and/or immune system damage. 15 [EPA-HQ-OAR-2022-0985-1608-A1, p. 10-11]

12 U.S. EPA, OAR. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2020. (April 2022). https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020

13 American Lung Association. Zeroing in on Healthy Air. (March 2022). p. 7. https://www.lung.org/getmedia/13248145-06f0-4e35-b79b-6dfacfd29a71/zeroing-in-on-healthy-air-report-2022.pdf.

14 Alfredo Rivera, Ben King, John Larsen, and Kate Larsen, Rhodium Group, Preliminary US Greenhouse Gas Emissions Estimates for 2022 (Jan. 10, 2023), https://rhg.com/research/us-greenhouse-gas-emissions-2022/.

15 US EPA, Research on Health Effects, Exposure, & Risk from Mobile Source Pollution. (Feb. 21, 2022). https://www.epa.gov/mobile-source-pollution/research-health-effects-exposure-risk-mobile-source-pollution.

Heavy-duty trucking contributes massively to the air pollution being inhaled across the country. Nearly 36% of Americans—119.6 million people—still live in places with failing grades for unhealthy levels of ozone or particle pollution. 16 Despite improvements from previous years, the number of people living in counties with failing grades for daily spikes in deadly particle pollution was 63.7 million, the most ever reported under the current national standard. 17

16 American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023).

17 Id.

It is well understood that diesel exhaust is "carcinogenic to humans," as determined by the World Health Organization, and leads to tens of thousands of premature deaths each year. 18 Diesel exhaust contains smog precursors, fine particulate matter—which can be inhaled and lodged in the lungs—and more than 40 known cancer-causing compounds. 19 Exposure to pollution from diesel-powered vehicles has also been linked to low birth rate, premature birth, lower IQ, diabetes, stroke, congestive heart failure, heart disease, obesity, asthma, and allergies. 20 [EPA-HQ-OAR-2022-0985-1608-A1, p. 11]

18 Clean Air Task Force. Diesel pollution is a deadly problem in the United States. (January 20, 2022), https://www.catf.us/2022/01/diesel-pollution-deadly-problem-united-states/; Phys.org, Nearly 50% of transport pollution deaths linked to diesel: study. (Feb. 27, 2019). https://phys.org/news/2019-02-pollution-deaths-linked-diesel.html; International Agency for Research on Cancer, World Health Organization. Diesel Engine Exhaust Carcinogenic. (June 12, 2012). www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf; see also Kristina W. Whitworth, Elaine Symanski, and Ann L. Coker, Childhood Lymphohematopoietic Cancer Incidence and Hazardous Air Pollutants in Southeast Texas, 1995-2004, Envtl. Health Perspectives, Vol. 116 No. 11 (November 2008), 1576-1580.

19 California Air Resources Board. Summary: Diesel Particulate Matter Health Impacts. https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts. (last accessed: May 4, 2022)

20 Wilhelm, Michelle, et al. Traffic-Related Air Toxics and Term Low Birth Weight in Los Angeles County, California. Environmental Health Perspectives. Vol. 120. No. 1. (August 2011). doi:10.3897/bdj.4.e7720.figure2f; Christopher S. Malley, Johan C.I. Kuylenstierna, Harry W. Vallack, Daven K. Henze, Hannah Blencowe, Mike R. Ashmore. Preterm birth associated with maternal fine particulate matter exposure: A global, regional and national assessment. Environment International. (2017); Perera, Frederica, et al. Prenatal Airborne Polycyclic Aromatic Hydrocarbon Exposure and Child IQ at Age 5 Years. Pediatrics. Vol. 124. No. 2. (Aug. 2009). p. 195–203. doi:10.1542/peds.2008-3506; ZJ, Andersen, et al. Diabetes incidence and long-term exposure to air pollution: a cohort study. Diabetes Care. Vol. 35. No. 1. (January 2012). p. 92-98. doi: 10.2337/dc11-1155; T., To et al. Chronic disease prevalence in women and air pollution--A 30-year longitudinal cohort study. Environmental International. Vol. 80.(July 2015). p. 26-32, doi: 10.1016/j.envint.2015.03.017; Dong, Guang-Hui, et al. Ambient Air Pollution and the

Prevalence of Obesity in Chinese Children: The Seven Northeastern Cities Study. Obesity. Vol. 22. p. 795-800, doi: doi:10.1002/oby.20198; Finkelman, Fred. Diesel exhaust particle exposure during pregnancy promotes development of asthma and atopy. The Journal of Allergy and Clinical Immunology. Vol. 134, issue 1. p. 73-74, doi: 10.1016/j.jaci.2014.04.002.

In the context of the freight system in the United States, the facilities, corridors, and neighborhoods that are most heavily trafficked by heavy-duty trucks are often located in communities of color that are experiencing cumulative impacts from multiple sources of pollution and compounding socioeconomic factors. This pattern of development is the result of racist redlining practices that have systematically burdened people of color with disproportionate exposure to pollution. [EPA-HQ-OAR-2022-0985-1608-A1, p. 12]

Although people of color are 41% of the overall population of the U.S., they are 54% of the nearly 120 million people living in counties with at least one failing grade. 21 A person's zip code remains the most significant predictor of health and well-being. In fact, low-income neighborhoods and communities of color breathe an average of 28% more NOx pollution than higher-income and majority white neighborhoods. 22 For residents of environmental justice communities, this means that their lives can be 10 to 20 years shorter because of environmental pollution compared to residents in wealthy white communities. 23 In the counties with the worst air quality, 72% of the 18 million residents are people of color, compared to the 28% who are white. 24 In Kansas City, MO, neighborhoods East of Troost are above the 90th percentile for respiratory health disease. The Kansas City, Missouri, public health data demonstrates that the life expectancy difference is between 15 and 18 years. According to the CDC, neighborhoods like Armourdale and Argentine in Kansas City, Kansas, have a shorter life expectancy of 22 years. 25 Kansas City, like many other parts of the nation, experiences high-risk zip codes where asthma, heart disease, and cancer are above the national average and are the same areas sliced by highways, rail systems in the nation, and neighbors to chemical facilities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 12-13]

21 Id.

22 Mary Angelique G. Demetillo et al. Space-Based Observational Constraints on NO2 Air Pollution Inequality from Diesel Traffic in Major US Cities. Geophys. Research Letters. Vol. 48. No. 17 (August 25, 2021) https://doi.org/10.1029/2021GL094333

23 Genna Reed, Beto Lugo-Martinez, and Casey Kalman. Environmental Racism in the Heartland: Fighting for Equity and Health in Kansas City. (2021). Cambridge, MA: Union of Concerned Scientists. https://doi.org/10.47923/2021.14322.

24 American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023); Wyandotte, Kansas. County Health Rankings & Roadmaps. (n.d.). https://www.countyhealthrankings.org/explore-health-rankings/kansas/wyandotte?year=2023 (last accessed: June 7, 2023)

25 American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023)

People who live near freight hubs or "diesel death zones"—including ports, highways, warehouses, and rail and intermodal yards—are disproportionately exposed to high concentrations of pollution from the combined activity of diesel-fueled heavy-duty trucks, equipment, rail, and vessels. Diesel exhaust contains carcinogens and toxic air pollutants that significantly affect the health of communities living in close proximity to truck tailpipe pollution. Additionally, as many as 40 percent of U.S. ports and many other freight facilities are in areas that are not achieving federal clean air standards for ozone and particulate matter pollution, and freight operations have been identified as significant contributors to nonattainment issues. 26 [EPA-HQ-OAR-2022-0985-1608-A1, p. 13]

26 Clean Air Act Advisory Committee. Ports Initiative Workgroup Report: Recommendations for the U.S. EPA. US EPA. (September 2016) https://www.epa.gov/sites/default/files/2016-09/documents/ports_workgroup_report_for_epa_9_15_16.pdf; see, e.g., South Coast Air Quality Mgmt. Dist., Proposed Rule 2304 Indirect Source Rule for Commercial Marine Ports Working Group Meeting #1, PowerPoint (Feb. 25, 2022). p. 2 https://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/pr-2304-wgm-no-1_2022-02-25.pdf?sfvrsn=8

The COVID-19 pandemic has escalated the negative consequences of living in a “diesel death zone” or a region with poor air quality. Numerous studies now show that long-term exposure to air pollution makes people more vulnerable to complications and death from COVID-19. 31 That neighborhoods with high proportions of Black and Latinx residents experience disproportionately high levels of air pollution may help explain why these groups have suffered disproportionately from the COVID-19 pandemic. 32 Indeed, one study found that Los Angeles neighborhoods with the worst air pollution have experienced a 60 percent increase in mortality from COVID-19 compared to Los Angeles neighborhoods with the best air quality. 33 COVID-19 infections have been known to be more severe for people who are already diagnosed with asthma. A study from Harvard University found that a small increase in long-term exposure to PM2.5 leads to a large increase in the COVID-19 death rate. 34 One of the reasons that BIPOC communities are dying at higher rates from COVID-19 is because of underlying health conditions like diabetes, heart disease, and asthma, all of which are diseases that are more prevalent for communities of color and low-income communities and are also linked to the disproportionately high levels of air pollution in these communities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 14]

31 Xiao Wu et al. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Science Advances. Vol 6. N. 45 (2020). https://projects.iq.harvard.edu/covid-pm.

32 Jonah Lipsitt et al. Spatial analysis of COVID-19 and traffic-related air pollution in Los Angeles. Env’t Int’l. Vol. 153. N. 106531 (Aug. 2021), https://doi.org/10.1016/j.envint.2021.106531.

33 Id.

34 Xiao Wu et al. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Science Advances. Vol 6. N. 45 (2020). https://projects.iq.harvard.edu/covid-pm.

Many studies have demonstrated the importance of race as a component of cumulative impacts, and the science behind this field is growing. 35 For example, a study released in March 2022 examined the link between port-related traffic and hospital visits for respiratory, heart-related, and psychiatric issues and concluded that people of color are more vulnerable to health impacts as a result of increased goods movement operations. 36 Adding just one vessel or increasing overall vessel tonnage in a nearby port leads to more than three additional hospital visits per year per thousand Black residents, compared to about one visit per thousand for white residents in the same area. 37 Relatedly, the study also found that reducing fossil fuel use in ports would significantly reduce air pollution concentration and have an acute and positive benefit to local Black residents. [EPA-HQ-OAR-2022-0985-1608-A1, p. 15]

35 Yukyan Lam, Kim Wasserman, Juliana Pino, Olga Bautista, Peggy Salazar and Maria Lopez-Nunez. Seeing the Whole: Using Cumulative Impacts to Advance Environmental Justice. (February 2022). p. 9-16. https://static1.squarespace.com/static/634ec24de312bd652b110530/t/63d9652fdaa29811a5a498d8/1675191601636/seeing-whole-cumulative-impacts-analysis-ej-report.pdf

36 Kenneth Gillingham and Pei Huang. Racial Disparities in the Health Effects from Air Pollution: Evidence from Ports (March 15, 2022). https://resources.environment.yale.edu/gillingham/RacialDisparitiesAirPollution.pdf.

37 Id. p. 32

MFN, its members, and allied organizations have published and contributed to numerous reports highlighting the cumulative impacts of freight transportation on frontline communities and workers. These reports include:

- MFN's May 2021 report, Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice provides an overview of the health impacts associated with goods movement and the disproportionate burdens felt by residents that live on the frontlines of polluting ports, warehouses, railyards, and highways, who are largely people of color. 38 The report features frontline voices who are calling for an end to diesel truck pollution and a full transition to zero-emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 15]

  38 Moving Forward Network. Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice. (2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-theCase_Report_May2021.pdf.

- Environmental Racism in the Heartland, Fighting for Equity and Health in Kansas City, a report by MFN members Clean Air Now and Union of Concerned Scientists, exposes how concentrated freight transportation and industrial facilities, and a history of racist redlining practices, have combined to create disproportionate pollution exposures for environmental justice communities living in and around Kansas City. 39 The report discusses community efforts to establish an air monitoring network and recommends policies to advance environmental justice solutions, including a shift to zero-emission trucks. [EPA-HQ-OAR-2022-0985-1608-A1, p. 15-16]

  39 Genna Reed, Beto Lugo-Martinez, and Casey Kalman. Environmental Racism in the Heartland: Fighting for Equity and Health in Kansas City. (2021). Cambridge, MA: Union of Concerned Scientists. https://doi.org/10.47923/2021.14322.

- Newark Community Impacts of Mobile Source Emissions, a community-based participatory research study developed with contributions from the New Jersey Environmental Justice Alliance, members of the Coalition for Healthy Ports including Greenfaith, Ironbound Community Corporation, New Jersey Clean Water Action, and the Natural Resources Defense Council, found that the worst pollution hot spots occurred where freight facilities are concentrated, and along truck routes. 40 The study found that electrifying vehicles can lead to significant local benefits but urged that electrification must coincide with reductions in power plant pollution, as these facilities are often located in the same areas that are disproportionately impacted by freight. [EPA-HQ-OAR-2022-0985-1608-A1, p. 16]

40 M.J. Bradley & Associates. Newark Community Impacts of Mobile Source Emissions, A Community-Based Participatory Research Analysis (November 2020). p. 12-13. https://www.njeja.org/wpcontent/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf.

- For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing, published by Warehouse Workers for Justice, describes the heavy toll that a build-out of warehouse distribution centers is having on Will County, Illinois. The report describes how pollution burdens fall disproportionately on Black and Latinx residents and warehouse workers, who are on the frontlines of truck pollution. 41 The report also provides community air monitoring results, finding unhealthy spikes in PM2.5 pollution. [EPA-HQ-OAR-2022-0985-1608-A1, p. 16]

41 Madison Lisle and Yana Kalmyka. Warehouse Workers for Justice, For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing. (Nd). p. 13, https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

- Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California, authored by People's Collective for Environmental Justice and the University of Redlands, analyzed over 3,300 warehouses over 100,000 sq ft in Southern California. 42 The report analyzes the expansion of the e-commerce industry compared to the location of existing pollution sources and sociodemographic data, demonstrating a correlation with health, economics, and racial disparities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 16]

42 Ivette Torres and Anthony Victor. People's Collective for Environmental Justice, and Dan Klooster. Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California. University of Redlands. (April 2021). https://earthjustice.org/wp-content/uploads/warehouse_research_report_4.15.2021.pdf.

Organization: RMI

Climate, Health, and Quality of Life Benefits

RMI supports EPA's strong claims about the benefits of combatting heavy-duty emissions. Transportation is the leading source of greenhouse gas emissions in America, and pollution from medium- and heavy-duty trucks is a significant contributor to poor air quality. Disadvantaged communities often house a disproportionate number of trucking facilities and experience higher levels of vehicle related air pollution health risks. E-trucks may begin benefiting urban disadvantaged communities as soon as 2023, since urban and regional trucking is most financially and operationally suited to electrification.24 [EPA-HQ-OAR-2022-0985-1529-A1, p. 9]

24 Kahn et al., The Inflation Reduction Act Will Help Electrify Heavy-Duty Trucking, RMI, August 25, 2022, https://rmi.org/inflation-reduction-act-will-help-electrify-heavy-duty-trucking/

Analysis from the REPEAT Project at Princeton University found the Inflation Reduction Act and Bipartisan Infrastructure Law could save 35,000 premature deaths by 2032 from reduced exposure to fine particulate matter from energy activities, with light-, medium-, and heavy-duty trucks and buses comprising over 50 percent of the cause.25 Strategic truck electrification an impactful environmental justice opportunity. [EPA-HQ-OAR-2022-0985-1529-A1, p. 9]

25 Jenkins et al., Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022, REPEAT Project, Zero Lab Princeton University, https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-08-12.pdf

Organization: Southern Environmental Law Center (SELC)

Exposure to this type of pollution is also an environmental justice issue; "[r]elative to the rest of the population, people of color and those with lower incomes are more likely to live near [] truck routes."43 This is in part due to zoning practices and land use decisions, including in the South, that have consistently sited highways and commercial and industrial facilities that often rely on frequent truck deliveries in communities of color and low wealth areas. In Virginia, for example, diesel pollution hotspots are concentrated around high-traffic corridors such as Interstate 95 and overlap with low wealth communities and communities of color already overburdened by other socioeconomic vulnerabilities.44 [EPA-HQ-OAR-2022-0985-1554-A1, p. 5]

43 Id. at 198.

44 Kevin X. Shen, Exposure to Diesel Particulate Pollution in VA, UNION OF CONCERNED SCIENTISTS (Aug. 29, 2022), https://www.ucsusa.org/resources/diesel-pollution-va#top.

Organization: State of California et al. (2)

Furthermore, environmental justice communities, including tribal communities, are already environmentally overburdened due to greater existing pollution exposure.107 This disadvantage manifests in higher rates of chronic disease, premature death, and other adverse public health outcomes.108 Compounding the problem, residents of environmental justice communities also have less access to health care, as they are less likely to have health insurance and less likely to be able to afford necessary tests and procedures, and local health care facilities are poorly staffed and equipped.109 Consequently, residents of environmental justice communities are less able to withstand climate impacts that further damage their health, such as increased local smog conditions.110 [EPA-HQ-OAR-2022-0985-1588-A1, pp.13-14]

107 California Climate Justice Report, supra n.93, at 40-41.

108 Id.; USGCRP Study, supra n.93, at 253.

109 Samantha Artiga et al., Health Coverage by Race and Ethnicity, 2010-2021, Kaiser Family Foundation (2022), https://www.kff.org/racial-equity-and-health-policy/issue-brief/health-coverage-by-race-and-ethnicity/; Benjamin Sommers, et al., Beyond Health Insurance: Remaining Disparities in US Health Care in the Post-ACA Era, 95 The Milbank Quarterly 1 (2017).

110 California Climate Justice Report, supra n.93, at 40-43

In addition to being more vulnerable to the impacts of climate change, environmental justice communities endure structural disadvantages that blunt their ability to adapt to a changing climate. Environmental justice communities have less access to financial resources, such as income and wealth, which are critical to climate resilience.111 More financial resources equate to more mobility, more ability to spend (on utilities, health care, home adaptation, etc.) to reduce climate harms, and more safeguards (such as insurance) in the event of extreme climate events.112 Environmental justice communities also have higher rates of limited English proficiency, which can reduce access to climate resilience programs and increase vulnerability in extreme climate events due to an inability to understand public health information.113 [EPA-HQ-OAR-2022-0985-1588-A1, p.14]

111 Id. at 39.

112 Id.

113 Id. at 43; USGCRP Study, supra n.93, at 106.

2. Air Pollutant Emissions from Heavy-Duty Vehicles Disproportionately Impact Environmental Justice Communities

Air pollutant emissions from heavy-duty trucks also disproportionately endanger residents of environmental justice communities by exposing them to harmful air pollution that causes significant health impacts. Heavy-duty trucks concentrate their emissions along transportation corridors and near ports and warehouses.114 Communities located near this infrastructure are disproportionately lower-income and communities of color and typically face industrial pollution cumulatively with truck emissions.115 For example, EPA modeling has shown that race and income are significantly associated with living near truck routes nationally, even when controlling for other factors.116 EPA research has also indicated that people of color are more likely to live within 300 feet of major transportation facilities and go to school within 200 meters of the largest roadways.117 Likewise, a comprehensive study by the South Coast Air Quality Management District—which covers Los Angeles and the Inland Empire, the largest logistics hub nationwide—found that communities located near large warehouses scored far higher on California's environmental justice screening tool, which measures overall pollution and demographic vulnerability.118 That study concluded that, compared to the South Coast basin averages, communities in the South Coast basin near large warehouses had a substantially higher proportion of people of color; were exposed to more diesel particulate matter; had higher rates of asthma, cardiovascular disease, and low birth weights; and had higher poverty and unemployment rates.119 [EPA-HQ-OAR-2022-0985-1588-A1, pp.14-15]

114 87 Fed. Reg. at 17,452; see also Anastasia Montgomery et al., Simulation of Neighborhood-Scale Air Quality With Two-Way Coupled WRF-CMAQ Over Southern Lake Michigan-Chicago Region, Advancing Earth Space and Science (2023), https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022JD037942.

115 EPA Memorandum, Estimation of Population Size and Demographic Characteristics among People Living Near Truck Routes in the Coterminous United States (Feb. 16, 2022), EPA-HQ-OAR-2019-0055-0982, at 11-12, Fig. 3, 17-19, Fig. 9 (finding that individuals living near major truck routes are more likely to be people of color and lower-income); see also Michelle Meyer and Tim Dallmann, The Real Urban Emissions Initiative, Air quality and health impacts of diesel truck emissions in New York City and policy implications (2022), at 7 Fig. 5 (concluding that Black and Latino individuals in New York City are disproportionately exposed to PM2.5 along freight corridors); South Coast Air Quality Management District, Final Socioeconomic Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305 (May 2021), at 3-7 (determining that individuals living near warehouses in the logistics-heavy South Coast Air Quality Management District are more likely to be people of color, lower-income, and exposed to high pollution levels).

116 EPA-HQ-OAR-2019-0055-0982, supra n.115, at 20-24.

117 Chad Bailey, Demographic and Social Patterns in Housing Units Near Large Highways and other Transportation Sources (2011), EPA-HQ-OAR-2019-0055-0126, at 3.

118 South Coast Air Quality Management District, supra n.115, at 4-5.

119 Id. at 5-7.

As the South Coast Air Quality Management District study demonstrates, and as many others corroborate,120 residents of environmental justice communities near warehouses, transportation hubs, and other logistics infrastructure suffer from health effects due to exposure to NOx and associated heavy-duty truck emissions. These issues are particularly acute in our States, which proudly generate a majority of the nation's economic activity associated with the logistics industry, yet also bear its detrimental environmental impacts. Major ports in some of our States handled 57 percent of all container traffic nationwide in 2020, including the three mega-ports of Los Angeles, Long Beach, and New York and New Jersey, which together accounted for 43 percent of all container traffic.121 Additionally, Chicago's central location makes it a national leader in intermodal transit.122 Reflecting historical redlining,123 the communities near these ports are overwhelmingly comprised of residents with lower-incomes and people of color who disproportionately suffer exposures and health impacts from pollution from heavy-duty truck engine emissions. Data from the census tracts surrounding the Ports of Los Angeles and Long Beach exemplify these inequalities: [EPA-HQ-OAR-2022-0985-1588-A1, pp.15-16] [[See Docket Number EPA-HQ-OAR-2022-0985-1588-A1, pages16-17, for referenced census data]]

120 See, e.g., Gaige Hunter Kerr, et al., COVID-19 Pandemic Reveals Persistent Disparities in Nitrogen Dioxide Pollution 118 Proc. Nat'l Acad. Sciences 30 (2021); Mary Angelique G. Demetillo, et al., Space-Based Observational Constraints on NO2 Air Pollution Inequality from Diesel Traffic in Major US Cities, Geophysical Research Letters 48 (2021); Paul Allen, et al., Newark Community Impacts of Mobile Source Emissions: A Community-Based Participatory Research Analysis (2020); Maria Cecilia Pinto de Moura, et al., Union of Concerned Scientists, Inequitable Exposure to Air Pollution from Vehicles in Massachusetts (2019); Iyad Kheirbek, et al., The Contribution of Motor Vehicle Emissions to Ambient Fine Particulate Matter Public Health Impacts in New York City: a Health Burden Assessment, 15 Env't Health 89 (2016).

121 Data from the Bureau of Transportation Statistics, Container TEUs (Twenty-foot Equivalent Units) (2020), https://data.bts.gov/stories/s/Container-TEU/x3fb-aeda/ (ports of Baltimore, Boston, Long Beach, Los Angeles, New York and New Jersey, Oakland, Seattle, and Tacoma combined for 23.493 million TEUs, 57% of 41.24 million TEUs total nationwide; ports of Long Beach, Los Angeles, and New York and New Jersey combined for 17.62 million TEUs, 43% of 41.24 million TEUs).

122 Chicago Metropolitan Agency for Planning, The Freight System: Leading the Way (2017), at 16.

123 Beginning in the 1930s, federal housing policy directed investment away from "risky" communities of color. Nearly all of the communities adjacent to the three megaports (the Ports of Los Angeles, Long Beach, and New York and New Jersey) and the intermodal terminals in Chicago were coded red, signifying the least desirable areas where investment was to be avoided. See University of Richmond Digital Scholarship Lab, Mapping Inequality, https://dsl.richmond.edu/panorama/redlining/#loc=12/33.748/-118.272&city=los-angeles-ca (Los Angeles, CA), https://dsl.richmond.edu/panorama/redlining/#loc=14/40.678/-74.004&city=brooklyn-ny (Brooklyn, NY), https://dsl.richmond.edu/panorama/redlining/#loc=13/40.704/-74.068&city=hudson-co.-nj (Hudson County, NJ), https://dsl.richmond.edu/panorama/redlining/#loc=13/40.627/-74.233&city=union-co.-nj (Union County, NJ), https://dsl.richmond.edu/panorama/redlining/#loc=12/41.854/-87.772&city=chicago-il (Chicago, IL).

124 Data from CalEnviroScreen 4.0, California Office of Environmental Health Hazard Assessment, https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40. Metrics for diesel particulate matter exposure, asthma rates, and poverty are the census tract's percentile ranking as compared to all census tracts in California, demonstrating that these census tracts are among those with the greatest pollution exposure, detrimental health impacts, and lowest incomes statewide. The raw data for these percentile rankings are available on the CalEnviroScreen 4.0 website.

125 Several of the census tracts in Long Beach also have substantial Asian populations: 6037572900 (18%), 6037573003 (20.8%), 6037575803 (7.6%), 6037575901 (7.5%), 6037575902 (6.9%), 6037576001 (20.2%).

Logistics hubs demand extensive networks of highways and warehouses to move and store cargo via millions of truck trips annually. Aggravating historical injustices, highways and warehouses are disproportionately sited in environmental justice communities whose residents, like those of port communities, suffer higher levels of pollution exposure from heavy-duty trucks than do whiter and higher-income communities. Data demonstrate that the census tracts in California with the highest levels of ozone, PM2.5, and DPM exposure are communities of color bordering such logistics thoroughfares—Highway 99 in the San Joaquin Valley and Highways 10 and 60 in the Inland Empire: [EPA-HQ-OAR-2022-0985-1588-A1, p.17] [[See Docket Number EPA-HQ-OAR-2022-0985-1588-A1, page 17, for referenced census data]]

126 Data from CalEnviroScreen 4.0, see supra n.137. The eight census tracts shown here are examples of the 29 census tracts in California that rank above the 90th percentile statewide for exposure to ozone, fine particulate matter, and diesel particulate matter, all of which are communities in Bakersfield or the Inland Empire near major logistics thoroughfares.

Organization: Valero Energy Corporation

By incentivizing electricity generation through an unsynchronized deployment of HD ZEVs, EPA's proposal directly impacts EJ communities by contributing to additional, local emissions to meet HD electric vehicle charging demand. Consequently, EJ communities might incur an incremental burden in exchange for the subsidization of HD ZEVs for commercial trucking companies. And EPA's EV policy occurs at expense of our most vulnerable communities burdened by emissions as a direct result of the proposal, with no corresponding benefit. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 48 - 49.]

Organization: World Resources Institute (WRI)

Electric school buses, which produce zero tailpipe emissions, are the healthiest solution for all students, bus drivers, and the communities they travel through. Black students, children with disabilities and low-income students, ride diesel school buses more than others. Because students from low-income communities are more likely to ride a school bus - 60% of students from low-income families ride the bus to school, compared to 45% of students from families with higher incomes - a more stringent rule will advance the transition to an electric school bus fleet and simultaneously help address this transportation inequity. [EPA-HQ-OAR-2022-0985-1601-A1, p. 3]

Organization: Zero Emission Transportation Association (ZETA)

Frontline communities will benefit the most from heavy-duty vehicle (HDV) electrification. Members of these communities are disproportionately likely to live near highways, airports, and ports, and suffer from poor air quality as a result. Stringent heavy-duty GHG standards will promote HDV electrification and help protect these communities from harmful emissions. Stringent standards will also align with the environmental justice goals that the Biden-Harris Administration has placed a much-needed spotlight on. [EPA-HQ-OAR-2022-0985-2429-A1, p. 2]

c. HDV Emissions Disproportionately Impact Historically Underserved Communities

The positive health impacts associated with increased HDV electrification will be most significant among frontline communities, whose members are disproportionately likely to live near highways, warehouses, ports, and airports and suffer from poor air quality as a result.21 This higher exposure burdens historically underserved residents and communities of color with negative health outcomes and higher healthcare costs.22 Electrifying the HDV sector is also consistent with the goals of Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All.23 [EPA-HQ-OAR-2022-0985-2429-A1, p. 7]

21 Park YM, Kwan MP. 'Understanding Racial Disparities in Exposure to Traffic-Related Air Pollution: Considering the Spatiotemporal Dynamics of Population Distribution.' Int J Environ Res Public Health. 2020 Feb 1;17(3):908. doi: 10.3390/ijerph17030908. PMID: 32024171; PMCID: PMC7037907. Accessed may 24, 2023

22 "Black children are more likely to have asthma. A lot comes down to where they live," Associated Press, (May 24, 2023) https://apnews.com/article/black-children-asthma-investigation-8892ec059a4b192b93eb38ccb613fcb9

23 See 88 FR 25251

A recent report from the Environmental Defense Fund on U.S. warehouse proliferation shows that some 15 million people live within a half-mile of a warehouse in ten states across the country.24 The report concludes that in many states, Black, Latino, Asian, and American Indian communities and areas of low wealth are disproportionately exposed to this pollution. Strong Phase 3 GHG standards that promote HDEVs are a key step in addressing the historic inequities in how communities are affected by air pollution emitted by HDVs. [EPA-HQ-OAR-2022-0985-2429-A1, p. 7]

24 Aileen Nowlan, "Making the Invisible Visible - Shining a Light on Warehouse Truck Air Pollution," (April 2023) https://globalcleanair.org/files/2023/04/EDF-Proximity-Mapping-2023.pdf

EPA Summary and Response:

Summary:

Many general comments provided information and concerns about air pollution exposure inequities, disproportionate exposure to HD truck-related pollutants, redlining, and related issues. The commenters also referred to studies about how pollution affects health problems for people near major roads and other environmental sources [Allergy & Asthma Network et al.; ATS; EDF; EPN; GreenLatinos et al.; Lion Electric Co. USA; MFN; RMI; State of California et al.]

Several commenters provided evidence that children from low-income families, children of color, and children with disabilities are more likely to ride a bus to school compared to other families. (WRI, Lion Electric Co.) CARB urged EPA to mandate percentages of electrified HDVs rather than adopting a technology-neutral, numerical standard. CARB asserts that vocational vehicles will transition to cleaner vehicles, while "dirtier" ICE vehicles will remain in line-haul trucking, near ports, and for heavy industry. CARB asserts that without active management in policy, newest and cleanest HDVs are likely to reach affluent communities first, only later "trickling down" into EJ communities that need emission reductions most. CARB stated that CARB and Section 177 states required ZEV tractor trailers and dray trucks, and EPA has failed to realize opportunities to reduce impacts on these sectors. The State of California stated that the census tracts in California with the highest levels of ozone, $PM_{2.5}$, and diesel particulate matter are communities of color bordering such logistics thoroughfares—Highway 99 in the San Joaquin Valley and Highways 10 and 60 in the Inland Empire.

Valero Energy asserted that the Phase 3 rule will result in increased emissions from the EGU sector and that these emissions will have an adverse effect on communities proximate to those facilities, which are likely to be disadvantaged communities.

Numerous commenters discussed how communities near warehousing, ports, rail yards, transportation hubs, and other logistics infrastructure also are more likely to face EJ concerns associated with exposures to diesel engine emissions and other sources. [EDF; MFN; State of California et al.; ZETA]

Several commenters refer to historical policies that have created systematic problems for people of color including disproportionately high exposure to air pollution, such as exclusionary zoning, redlining, and the concentration of freight and industrial facilities [MFN; SELC; State of California et al.]

<u>Response:</u>

EPA acknowledges and agrees with commenters' statements that actions to control emissions from heavy-duty vehicles are necessary to improve public health and welfare, including to those who live, work, or attend school close to major roadways and in communities with EJ concerns, including locations near warehouses, rail yards, ports, and other logistics infrastructure.

EPA acknowledges the long history of discriminatory law and policy, including redlining and exclusionary zoning, that supported segregation and contributes to contemporary disparities in exposure to air pollution from traffic and other sources, as well as in health.

EPA disagrees for several reasons with CARB's assertion that EPA's lack of explicit mandate for ZEV tractors and dray trucks will leave higher-emitting ICE vehicles in EJ communities needing emission reductions. First, CARB overlooks other programs EPA has or is developing to target emission reductions in those sectors. For example, Section 60104 of the Inflation Reduction Act appropriates funds to EPA for reducing diesel emissions in low-income and disadvantaged communities through September 2031. Section 60102 of the Inflation Reduction Act provides EPA with $3 billion to fund zero-emission port equipment and infrastructure as well as climate and air quality planning at U.S. ports.

CARB also fails to acknowledge private sector investments. There are several examples of such investment, which we expect to continue and expand. Mobility announced a $400 million investment for 1,000 or more DCFCs for BEV trucks that are planned for operation at the San Pedro and Oakland ports.[967,968] Logistics and supply chain corporation NFI Industries is partnering with Electrify America to install 34 DCFC ports (150 kW and 350kW) to support their BEV drayage[969] fleet that will service the ports of LA and Long Beach. With funding from

[967] As noted by the Joint Office of Energy and Transportation in a summary of recent private sector investments in charging infrastructure.
[968] Joint Office of Energy and Transportation. "Private Sector Continues to Play Key Part in Accelerating Buildout of EV Charging Networks." February 15, 2023. https://driveelectric.gov/news/#private-investment.
[969] Drayage trucks typically transport containers or goods a short distance from ports to distribution centers, rail facilities, or other nearby locations.

California, Volvo is partnering with Shell Recharge Solutions and others to deploy five publicly accessible charging stations by 2023 that will serve medium- and heavy-duty BEVs in southern California between ports and industrial centers.[970]

A variety of solutions are being offered for, or explored by, fleets. For example, WattEV is planning a network of public charging depots connecting ports to warehouses and distribution centers as part of its "Truck-as-a-Service" model, in which customers pay a per mile rate for use of, and charging for, a HD electric truck. [971] The first station under construction in Bakersfield, CA,[972] is planned to have integrated solar and eventually be capable of charging 200 trucks each day; additional stations are under development in San Bernardino and near the Port of Long Beach. Zeem Solutions also offers charging to fleets along with a lease for one of its medium- or heavy-duty BEVs (via its "Transportation-as-a-Service" model). Zeem's first depot station opened last year in the Los Angeles area and will support the charging of vans, trucks, airport shuttles, and tour buses (among other vehicles) with its 77 DCFC ports and 53 L2 Forum ports.[973]

In response to the comment of the State of California that freight corridors, including certain such corridors in southern California, have a disproportionate amount of HDV traffic and consequent impact on air quality, EPA agrees. As discussed in section 7.1 of this RTC, under the modeled potential compliance pathway we in fact project that ten such corridors would be the initial targets for HDV electrification utilization, and any needed supporting infrastructure. The fact that infrastructure needs will be relatively discrete in the Phase 3 program's initial years is one reason EPA can project that those infrastructure needs can be met. A corollary of that analysis is that HDV emissions in those areas will improve as ZEVs take the place of ICE vehicles in those freight corridors under the modeled potential compliance pathway. Consequently, proximate communities, including disadvantaged communities, are expected to benefit from the air quality improvements resulting from ZEV penetration into the HDV fleet. The Los Angeles, San Diego, San Bernadino, and Riverside corridors in southern California are among those projected corridors.

Second, EPA has a longstanding technology-neutral approach in setting section 202 emission standards. EPA is promulgating these standards under our authority in CAA section 202(a)(1)-(2) and has appropriately assessed the statutory factors specified in that section, including consideration of costs and lead time. See preamble section I and RTC section 2.1 and 2.4. We project that the Phase 3 standards will achieve very substantial reductions of GHGs and most non-GHG pollutants. See RIA Chapters 4.3.3 and 4.3.4.

[970] Borras, Jo. "Volvo Trucks Building an Electric Semi Charging Corridor". *CleanTechnica*. July 16, 2022. Available online: https://cleantechnica.com/2022/07/16/volvo-trucks-building-an-electric-semi-charging-corridor/.
[971] WattEV. "WattEV Orders 50 Volvo VNR Electric Trucks". May 23, 2022. Available online: https://www.wattev.com/post/wattev-orders-50-volvo-vnr-electric-trucks.
[972] WattEV. "WattEV Breaks Ground on 21st Century Truck Stop". December 16, 2021. Available online: https://www.wattev.com/post/wattev-breaks-ground-on-21st-century-truck-stop
[973] Zeem. "Zeem Solutions Launches First Electric Vehicle Transportation-As-A-Service Depot". March 30, 2022. Available online: https://zeemsolutions.com/zeem-solutions-launches-first-electric-vehicle-transportation-as-a-service-depot/

Third, EPA's technology-neutral approach provides flexibility and leaves room for innovation in technologies, while maintaining that the standards achieve emission reductions consistent with the requirements of section 202(a)(1)-(2).

We respond to Valero's comment in the following RTC section 18.3.

18.2 EJ, Lifecyle Analysis/Cumulative Impacts

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

AVE supports the Proposal's efforts on environmental justice. Accounting for upstream emissions and their impact on at-risk communities is the best way to achieve these objectives. [EPA-HQ-OAR-2022-0985-1571-A1, p. 7]

Organization: California Air Resources Board (CARB)

2. Non-GHG Impacts (i.e., Criteria Pollutants and Toxics)

The largest EJ-related concern with the NPRM pertains to the benefit analysis of non- GHG emissions. The analysis of upstream emissions (decreased refinery emissions vs. increased powerplant emissions) appears incomplete and does not address the fact that those communities around power plants may see an increase in emissions.

Organization: EDF

By a single BPT approach, EPA does not account for variation in benefits of the Proposed Rule and therefore fails to fully identify the areas and neighborhoods that would most benefit from this rulemaking. [EPA-HQ-OAR-2022-0985-1644-A1, p. 90]

Organization: Moving Forward Network

6.2. EPA's EJ Analysis Is Insufficient and Should Be Updated to Fully Address Cumulative Impacts

President Biden's recent April 2023 Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All explicitly recognizes the role that cumulative impacts play in EJ communities and repeatedly directs federal agencies to evaluate and address the potential cumulative impacts associated with federal actions. 55 In addition, both EPA's Environmental Justice Strategy and Executive Order 12898 make clear the necessity for distributional analyses to ensure EPA policies and programs do not exacerbate environmental injustices. [EPA-HQ-OAR-2022-0985-1608-A1, p. 28]

55 The White House. Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All (April 21, 2023). https://www.whitehouse.gov/briefing-room/presidential-actions/2023/04/21/executive-order-on-revitalizing-our-nations-commitment-to-environmental-justice-for-all/.

The proposed rule fails to meet these directives. While EPA's analysis briefly acknowledges some of the cumulative impacts facing communities that are overburdened by truck traffic, EPA fails to quantify any of the distributional benefits or harms to EJ communities that could result from the proposed rule. EPA states in the proposal that the Agency "did not consider any potential disproportionate impacts of vehicle emissions in selecting the proposed CO2 emissions standards," despite acknowledging that the Agency "view[s] mitigation of disproportionate impacts of vehicle GHG emissions as one element of protecting public health consistent with [their authority under] CAA section 202." 56 [EPA-HQ-OAR-2022-0985-1608-A1, p. 28]

56 U.S. EPA. Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3. 88 Fed. Reg. 25926, 26063. (April 27, 2023). https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

The failure to consider disproportionate and cumulative impacts on EJ communities in the rulemaking is unacceptable and must be revised. The current analysis fails to accurately consider the potential health impacts for EJ communities that are facing multiple stressors. The analysis also fails to address the potential harms that transitioning to new technologies may have on EJ communities under the rule. Had EPA considered the potential disproportionate and cumulative impacts of vehicle emissions in developing this proposal, the Agency would have structured the rule so that only the cleanest vehicles would be incentivized and so that reductions of other health-harming pollutants (like the non-GHG criteria pollutants and air toxics the rule indirectly affects) are guaranteed. Additionally, the Agency would have structured the rule in a manner that provides enough certainty that manufacturers would deploy ZEVs at the levels needed to result in clean air benefits to frontline and fence line communities. [EPA-HQ-OAR-2022-0985-1608-A1, p. 28-29]

As an initial matter, we reiterate our request that EPA address cumulative impacts and apply a multipollutant standard in this rule that would account for multiple pollutant impacts from diesel trucks, better account for cumulative impacts, and ensure that no false solution fuel sources would be considered zero emissions. Short of promulgating a multi-pollutant standard, EPA should revise the draft by (1) analyzing race-specific health impacts of the rule; (2) conducting a full analysis of the "cradle-to-grave" impacts of the rule that could impact communities upstream or downstream of where trucks are placed; and (3) considering measures to address distributional impacts of the rule, and ensure that in implementation, overburdened communities will realize emission reductions benefits. Conducting these analyses is vital to effectuating President Biden's Executive Order and accurately evaluating the costs and benefits of the rule in protecting public health in line with EPA's authority under CAA section 202. [EPA-HQ-OAR-2022-0985-1608-A1, p. 29]

First, EPA should conduct race-specific health analysis to assess the total health benefits of the rule more accurately. Spiller et al. (2021) have shown that including race/ethnicity-specific mortality incidence rates or health impact functions (HIFs) can both change the distribution of health benefits as well as increase total premature mortality estimates by 9%. 57 A stratified health benefit analysis provides a view on how exposure reductions are ultimately felt by different groups. These disparities in health impacts are often magnified when compared to disparities in exposure reductions, given the overlay of elevated incidence rates of health risks and the amplified health effects due to other vulnerabilities in communities of color (i.e., "cumulative impacts"). Lastly, stratified health risk analyses can help communicate the impacts of the rule to stakeholders and promote meaningful involvement. 58 [EPA-HQ-OAR-2022-0985-1608-A1, p. 29]

57 Spiller, Elisheba, Jeremy Proville, Ananya Roy, and Nicholas Z. Muller. Mortality Risk from PM2.5: A Comparison of Modeling Approaches to Identify Disparities across Racial/Ethnic Groups in Policy Outcomes. Environmental Health Perspectives. V. 129. N. 12. (December 2021). 127004. https://doi.org/10.1289/EHP9001.

58 U.S. EPA. Guidance on Considering Environmental Justice During the Development of a Regulatory Action. (Nd).

EPA should consider the robust recommendations contained in the December 2022 Science Advisory Board report assessing EPA's proposed regulation for NOx emissions from heavy-duty trucks, which also supports conducting this analysis. 59 The SAB report found that "current methods used in EPA's Draft Regulatory Impact Analyses (RIAs) are not sufficient to capture community-scale benefits." 60 The SAB concluded and "strongly" recommended that "EPA develop a strategy for systematic, quantitative evaluation of the environmental justice (EJ) impacts of air pollution regulations." 61 SAB's recommendation included consideration of race-specific health analyses and cumulative impacts, among other specific recommendations for improving regulatory analyses for air quality and greenhouse gas related rulemaking. [EPA-HQ-OAR-2022-0985-1608-A1, p. 29-30]

59 SAB Review of Heavy Duty Truck Rule.

60 Id. at p. viii.

61 Id.

Specifically, SAB urged EPA to consider "cumulative exposure to multiple risk factors, including exposure to other air pollutants, heat, and lead" in future rulemaking. 62 In the context of truck pollution, SAB stated:

The SAB finds that information on the effect of heavy-duty vehicles on local air pollution would be informative for this rule, both generally and considering concerns for equity across differentially exposed communities. Plausibly causal estimates in the economics literature show that exposure to vehicle emissions near major roadways increases premature adult mortality (Anderson 2020), infant mortality (Currie and Walker 2011, Knittel et al. 2016), childhood asthma (Marcus 2017), and other important negative outcomes such as violent crime (Herrnstadt et al. 2021). Evidence also suggests that the negative effects of vehicle emissions from roadways on infant health are greater for low-income than for high-income households (Long et al. 2021) and greater for more vulnerable (i.e., lower birthweight) infants (Knittel et al. 2016). The impacts of heavy-duty vehicle emissions, in isolation, are not as well-studied, but some evidence suggests that reducing diesel emissions from heavy trucks (even if replaced by a similar flow of light-duty gasoline vehicles) reduces cardiovascular and respiratory hospitalizations and deaths (He et al. 2018). Taken together, these papers suggest that households in close proximity to major roadways suffer differential health effects from transportation emissions and that those effects may raise significant environmental justice concerns given the typical demographic composition of neighborhoods near highways (Rowangould 2013), especially truck freight routes (U.S. EPA 2021). 63 [EPA-HQ-OAR-2022-0985-1608-A1, p. 30]

62 Id. at p. 3.

63 Id.

EPA's draft rule qualitatively describes some connections between this rulemaking and cumulative impacts facing truck-impacted communities in the EJ analysis and even goes so far as to include a quantitative analysis of the demographics of households living within 300 feet of roadways. 64 This analysis reveals (unsurprisingly) that more often, communities of color and low-income communities are those impacted by truck routes. 65 EPA should build on this demographic data, conduct air modeling, and develop a racially-stratified health benefits analysis to more accurately quantify the benefits of the rule to EJ communities. If it is not feasible to conduct this analysis for the entire rule, EPA should do this for targeted geographic areas that are high in truck traffic. 66 Moreover, EPA should explicitly acknowledge the practice of redlining and how that has created disparities for communities of color being disproportionately exposed to near-roadway pollution. 67 [EPA-HQ-OAR-2022-0985-1608-A1, p. 30-31]

64 U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3. EPA-420-D-23-004. (April 2023). p. 396-398. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

65 Id.

66 SAB Review of Heavy-Duty Truck Rule. p. 16.

67 Id. p. 9.

The SAB urged that in future analyses, EPA should estimate impacts within a small distance of large roads/highways (perhaps in urban areas most likely to be affected) to describe better differential impacts by race, income, and other characteristics of exposed populations. Aggregation impairs the Agency's ability to analyze local impacts. 68 Here, EPA is basing its health benefit analysis on the national-average benefit-per-ton (BPT) of PM reductions. 69 This aggregated approach masks the localized impacts of the rule. 70 More localized data is available for EPA to consider. For example, the American Lung Association's recent State of the Air Report specifically hones in on heavy-trucking corridors and routes and issues projected health benefits at the county level (although county-level is still too aggregated for community-scale impacts, and even finer-level data should be examined). Additionally, other existing data from the California Air Resources Board (CARB) should be carefully considered, including all final data associated with CARB's Heavy-Duty Low NOx Omnibus rule. [EPA-HQ-OAR-2022-0985-1608-A1, p. 31]

68 Id. p. 15.

69 U.S. EPA, Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3. EPA-420-D-23-004. (April 2023). p. 452. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

70 Id. p. 468.

As discussed above, environmental racism shows up in multiple ways in the impacts from heavy-duty truck pollution —including, but no not limited to, disproportionately high exposure to pollution, already elevated incidence rates of health risks such as asthma and premature mortality, and amplified effects of environmental exposures from social vulnerabilities such as cumulative physiological "wear and tear" and stress. 71 We recommend that EPA further consider the disparate impacts of the rule and alternatives by analyzing race/ethnicity-stratified health benefits. This analysis would more accurately capture the distribution of health impacts to environmental justice communities and result in a more accurate total health and climate benefits as well. [EPA-HQ-OAR-2022-0985-1608-A1, p. 31]

71 Morello-Frosch, Rachel, Miriam Zuk, Michael Jerrett, Bhavna Shamasunder, and Amy D. Kyle. Understanding The Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy. Health Affairs. V. 30. No. 5. (May 2011). p. 879– 87. https://doi.org/10.1377/hlthaff.2011.0153.; Payne-Sturges, Devon C., Gilbert C. Gee, and Deborah A. Cory-Slechta. Confronting Racism in Environmental Health Sciences: Moving the Science Forward for Eliminating Racial Inequities. Environmental Health Perspectives. V. 129. No. 5. (May 2021). EHP8186, 055002. https://doi.org/10.1289/EHP8186.; Spiller, Elisheba, Jeremy Proville, Ananya Roy, and Nicholas Z. Muller. Mortality Risk from PM2.5: A Comparison of Modeling Approaches to Identify Disparities across Racial/Ethnic Groups in Policy Outcomes. Environmental Health Perspectives. V. 129. No. 12. (December 2021). 127004. https://doi.org/10.1289/EHP9001.

Second, EPA should update the EJ analysis to thoroughly analyze the “cradle to grave” impacts of the proposal and the potential disproportionate and cumulative impacts that EJ communities may face as a consequence of the rule. For example, the EJ analysis acknowledges that electricity generating units disproportionately impact communities of color and may experience some disbenefits where fossil fuel is burned for electricity generation. 72 However, EPA failed to fully consider the upstream and downstream impacts associated with energy generation, especially the disproportionate impacts and potential harms to EJ communities. This is critical to analyze, and EPA should quantify and evaluate these impacts in detail and include measures to avoid and mitigate these effects. [EPA-HQ-OAR-2022-0985-1608-A1, p. 31-32]

72 U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3, EPA-420-D-23-004. (April 2023). p. 398. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

The proposed rule fails to consider the full lifecycle impacts associated with technologies that will be used to comply with the rule. This includes a full life cycle analysis of the battery supply chain; a life cycle analysis of hydrogen (including grey, blue, green, and any other forms of hydrogen) that could fuel trucks and assessing the emissions associated with hydrogen combustion; and life cycle analysis of diesel and natural gas fuels that could comply with the rule. Conducting these “cradle to grave” analyses is necessary to consider the localized environmental justice harms that could result from technology choices. [EPA-HQ-OAR-2022-0985-1608-A1, p.32]

A cumulative impact framing is critical because it demonstrates the need to move away from fragmented, limited approaches as “solutions” and towards a more holistic, big-picture approach that will be able to address the real-world harms environmental justice communities face. As Dr. Sacoby Wilson says, “Context matters. Place matters.” 74 For EJ communities, place matters, and EPA should only propose regulations that guarantee health benefits and emission reductions for overburdened communities. [EPA-HQ-OAR-2022-0985-1608-A1, p.32]

74 Katherine Bagley. Connecting the Dots Between Environmental Injustice and the Coronavirus. (May 7, 2020). https://e360.yale.edu/features/connecting-the-dots-between-environmental-injustice-and-the-coronavirus.

7. Proper Consideration of Life-Cycle Emissions Shows that EPA’s Weak Proposal Could Provide No Benefits and that A Strong Zero-Emission Rule Is Necessary

Given the impacts of freight pollution on local communities, the elimination of tailpipe emissions by replacing diesel trucks with zero-emission trucks is an opportunity for significant improvements in air quality. However, those benefits come from not just eliminating greenhouse gas emissions, which EPA's proposed Phase 3 directly regulates, but from eliminating the direct emissions of other pollutants like particulate matter (PM2.5) and nitrogen oxides (NOX). Moreover, reducing greenhouse gas emissions from trucks will have specific benefits for EJ communities living in the country's most polluted air basins. GHGs also contribute to ozone pollution through a warming climate. [EPA-HQ-OAR-2022-0985-1608-A1. p. 40]

A recent report from the American Lung Association (ALA) shows the tremendous benefits that could be achieved through 2050 by accelerating the deployment of electric trucks. 95 ALA's analysis shows that electric trucks could result in $735 billion in public health benefits over the next 30 years and a more equitable future. 96 It also found that in U.S. counties with major trucking routes, this transition would result in up to 66,800 avoided deaths, 1.75 million avoided asthma attacks, and 8.5 million avoided lost workdays. 97 ALA's analysis predates EPA's recent NOX rule, and it assumes that all of these electric trucks will be powered by a renewable grid; however, even with more conservative assumptions, electric trucks provide significant benefits compared to other technology options considered by the Agency in the proposed rule. [EPA-HQ-OAR-2022-0985-1608-A1. p. 40-41]

95 American Lung Association. Delivering Clean Air: Health Benefits of Zero Emission Trucks and Electricity. (October 2022). https://www.lung.org/clean-air/electric-vehicle-report.

96 Id. p. 1.

97 Id.

Below is a detailed comparative analysis of different technologies based on different assumptions about the current and future emissions from trucks and the electric grid. While many of the key assumptions are detailed in the text, the attached appendix provides a full methodological explanation of the assumptions. [EPA-HQ-OAR-2022-0985-1608-A1. p. 41]

7.1. Summary of Methodology for Assessing the Impact of Different Technologies

As noted throughout this comment, tailpipe emissions from trucks are not their only impact—communities are also impacted by the direct emissions of PM 2.5 associated with tire and brake wear as well as indirect emissions associated with the source of energy powering the trucks, including the extraction of oil and gas, refining of liquid and gaseous fuels, and emissions from the electricity sector. As in the case of truck traffic, which the Agency's near-roadway analysis makes clear is inequitably distributed, the siting of fossil fuel extraction and refining, as well as the siting of combustion power plants, all disproportionately impact communities of color and low-income communities. It is critical to consider impacts beyond the tailpipe when assessing the full impact of any technological solution to the current harm of diesel trucks. 98 [EPA-HQ-OAR-2022-0985-1608-A1. p. 41]

98 Cushing, L.J., et al. Historical red-lining is associated with fossil fuel power plant siting and present-day inequalities in air pollutant emissions. Nat. Energy. V. 8. (2023). p. 52-61. https://doi.org/10.1038/s41560-022-01162-y; Gonzalez, J.X., et al. Historic redlining and the siting of oil and gas wells in the United States. J. Exp. Sci. & Env. Epi. V. 33. (2023). p. 76-83. https://doi.org/10.1038/s41370-022-00434-9; Carpenter, A., and M. Wagner. Environmental justice in

the oil refinery industry: A panel analysis across United States counties. J. Ecol. Econ. V. 159 (2019). p.101-109. https://doi.org/10.1016/j.ecolecon.2019.01.020; Mohai, P., et al. Racial and socioeconomic disparities in residential proximity to polluting industrial facilities: Evidence from the Americans' Changing Lives study. Am. J. Pub. Health. V. 99. (2009). p. S649-S656. https://doi.org/10.2105/AJPH.2007.131383.

This analysis considers upstream as well as tailpipe emissions, not just of greenhouse gases but also of nitrogen oxides (NOX), particulate matter (PM2.5), sulfur dioxide (SO2), and volatile organic compounds (VOCs), all of which are criteria pollutants or precursors regulated by EPA under the Clean Air Act. To aggregate the total public health impacts from a given technology based on all of these emissions, we have used EPA's COBRA model, aggregated at the grid subregion level to assign different mortality/ton values to the given pollutants based on their source (e.g., diesel trucks, power plants, oil refineries, fossil fuel extraction). This approach means that the health impacts may not be felt by precisely the same groups of people; however, because inequity is at play across all these industries, it is important not to simply shift the burdens from one community to another but to reduce the harms for all. [EPA-HQ-OAR-2022-0985-1608-A1. p. 41]To summarize the health impacts, we have aggregated the total premature mortality caused by each truck over its lifetime. We have then scaled this to an effective PM2.5 concentration, with today's diesel trucks representing 103 mg/m 3, a level corresponding to the middle of the "Unhealthy" range in the air quality index (AQI = 175). While these "Public Health Scores" are correlated with air quality, they do not directly represent the AQI associated with pollution from trucks: 1) trucks are generally not the only component in a community's air quality; 2) to the extent they are, that impact is dependent upon the relative volume of trucks in a given community; 3) generally, the concentration of pollutants is dependent upon complex mixing of air and location relative to any pollutant source. However, we have scored it in a parallel system to AQI because, unfortunately, AQI levels are something that many communities dealing with truck pollution have developed an intuitive understanding of, and so assessing the proportional differences in pollution compared to the "unhealthy" diesel trucks currently inundating those communities allows for a more intuitive understanding of the relative public health benefits provided. The scale and relative impacts of this public health score are shown in Table 1. [EPA-HQ-OAR-2022-0985-1608-A1. p. 42] [Refer to Table 1, Public health score, lifetime mortality, and relative impact compared to today's diesel trucks, on p. 42 of docket number EPA-HQ-OAR-202-1608-A1.]

Organization: Valero Energy Corporation

G. EPA fails to adequately consider the environmental justice impacts of the proposed rule.

EPA's assessment of environmental justice (EJ) in the proposed rulemaking is inappropriately limited to tailpipe emissions. Other lifecycle emissions like power generation and proximity to battery production and recycling facilities lack an equivalent EJ analysis. EPA implicitly defends this decision in its rulemaking analysis by estimating that that "[t]he [electricity generating unit] EGU impacts decrease over time because of projected changes in the power generation mix." Additionally, EPA's EJ analysis fails to address impacts to electricity rates when utilities seek to pass costs incurred under the proposal onto consumers and/or balance load requirements during peak hours. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 47 - 48.]

For these reasons, the EJ analysis in the proposal is incomplete per EPA's own EJ assessment criteria. Specifically, when assessing the potential for disproportionately high and adverse health or environmental impacts of regulatory actions on minority populations, low-income populations, tribes, and/or indigenous peoples, EPA should answer three broad question

1. Is there evidence of potential EJ concerns in the baseline (the state of the world absent the regulatory action)?

2. Is there evidence of potential EJ concerns for the regulatory option(s) under consideration?

3. Do the regulatory option(s) under consideration exacerbate or mitigate EJ concerns relative to the baseline?

EPA fails to perform this full assessment for its proposal. Consequently, EPA ignores EJ concerns both inherent to the baseline and exacerbated by the proposal. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

Moreover, EPA's proposed rule exposes EJ communities to greater direct emissions associated with increased local electricity generation. This is because EPA's proposal disassociates and discounts environmental attributes from emissions-intensive electricity generation. Supporting electricity generation is predominantly located in more remote, rural regions that are geographically isolated from urban centers. EPA ignores the fact that increased electrical demand, such as demand from electric vehicles, will be satisfied by increasing ready, local, and on-demand power generation in response to demand spikes, and thus increased emissions associated with the same. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

Further, EPA has previously acknowledged the environmental impacts of electricity delivery, but has failed to mention them in its analysis. These impacts include: line loss ("the longer the distance the electricity must travel from generation to consumer, the larger the line loss"); the loss of trees and other plants near power lines to keep vegetation from touching the wires; the placement of powerlines and their access roads in undeveloped areas, which "can disturb forests, wetlands, and other natural areas"; and sulfur hexafluoride ("[m]any high-voltage circuit breakers, switches, and other pieces of equipment used in the transmission and distribution system are insulated with sulfur hexafluoride, which is a potent greenhouse gas. This gas can leak into the atmosphere from aging equipment or during maintenance and servicing.") The environmental impacts of electricity delivery should be disclosed in the proposed rulemaking and further evaluated as related to EJ concerns. [EPA-HQ-OAR-2022-0985-1566-A2, p. 48.]

By incentivizing electricity generation through an unsynchronized deployment of HD ZEVs, EPA's proposal directly impacts EJ communities by contributing to additional, local emissions to meet HD electric vehicle charging demand. Consequently, EJ communities might incur an incremental burden in exchange for the subsidization of HD ZEVs for commercial trucking companies. And EPA's EV policy occurs at expense of our most vulnerable communities burdened by emissions as a direct result of the proposal, with no corresponding benefit. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 48 - 49.]

Similarly, EPA overlooks the EJ impacts of increased production, recycling, and disposal associated with lithium-ion batteries. On May 24, 2023, EPA issued a memo clarifying that used vehicle batteries are to be regulated under EPA's Universal Waste standards and are subject to RCRA requirements for recycling.231 As EPA maintains, hazardous waste management facilities are disproportionately located near EJ communities. Yet EPA has not considered the volume of hazardous waste that will be generated under the proposed rule, nor has it identified the location of facilities currently permitted to handle these materials, much less performed a siting analysis to identify the locations of facilities most likely to be expanded to handle the increased volume of battery waste, a necessary precursor to analyzing likely impacts on overburdened communities. [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

231 https://insideepa.com/sites/insideepa.com/files/documents/2023/jun/epa2023_1003.pdf

EPA's EJ analysis must be thorough and inclusive of factors that may impact the price of freight goods, such as HD ZEV affordability, the availability of public and depot charging as well as refueling infrastructure, reasonable charging practices, and a lifecycle analysis of electric vehicles and power generation emissions. Without doing so, EPA runs the risk of intensifying price disparities relative to the baseline for EJ communities. [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

Executive Order (EO) 12898 establishes federal executive policy on EJ. It directs federal agencies, "to the greatest extent practicable and permitted by law," to make "achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on communities with environmental justice concerns in the United States."232 If EJ is truly a commitment for EPA, it should carefully consider criticisms like those leveled by The Two Hundred for Housing Equity, who point out the disproportionate impacts to working and minority communities as a result of both California's and EPA's climate approach regarding electrified transport; those impacts and concerns remain true, and indeed are magnified under the proposed HD rule.233 [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

232 59 FR 7629, February 16, 1994.

233 See, e.g., Brief of Amicus Curiae, The Two Hundred for Housing Equity in State of Texas et al. v. EPA, Case No. 22-1031, D.C. Circuit.

Accordingly, EPA should provide for a transparent and reasoned impact analysis. The Agency falls short in communicating challenges associated with electrified HD transport with the absence of any substantive EJ assessment regarding its proposal. EJ stakeholders should have an opportunity to evaluate the data, costs, and assumptions underlying the proposal and any alternative analysis before EPA finalizes its proposed rulemaking. It is critical from the outset to minimize the potential for price shocks and supply disruptions. As written, EPA's proposal is not fit for the purposes of EJ communities. At minimum, EPA should perform a thorough EJ assessment specific to its HD proposal that is comprehensive of both transport challenges and impacts faced by EJ stakeholders and the government-wide Justice40 Initiative.234 [EPA-HQ-OAR-2022-0985-1566-A2, p. 49.]

234 https://www.whitehouse.gov/environmentaljustice/justice40/.

EPA Summary and Response:

Summary:

Several commenters asserted that EPA inadequately accounted for potential adverse impacts on communities near upstream sources such as EGUs and lifecycle impacts associated with supply chains, manufacturing, and disposal of ZEVs and related components in its EJ and/or benefits analyses. These commenters included parts suppliers, refiner and biofuel producers, EJ organizations, and state agencies (AVE, Valero Energy, MFN, CARB). Commenters point to the need for lifecycle or "cradle-to-grave" analysis of changes in the vehicle fleet associated with this rule.

Commenters also assert that EPA's use of a single benefit-per-ton (BPT) approach to estimating benefits of this rule fail to satisfy the need to understand existing disparities and impacts on EJ communities (EDF, MFN).

Commenters also assert that, had explicit EJ considerations and data been accounted for in the standard setting process and in determining compliance with the standards, EPA would have proposed more stringent or differently-designed standards, including (1) standards that could only be met by ZEV-only future fleets (MFN), (2) enable this final rule to mitigate potential risks associated with upstream emissions or impacts (AVE, MFN), or (3) standards that would slow ZEV adoption in favor of alternative emission reduction pathways to avoid impacts on populations near upstream sources (Valero).

Valero asserted that a lack of coordinated deployment of HD ZEVs would disproportionately harm the most vulnerable communities via incremental localized emissions for HD electric vehicle charging.

Response:

EPA acknowledges EJ concerns associated with populations near upstream sources such as EGUs and refineries, as well as potential EJ concerns regarding ZEV lifecycle impacts. The final rule summarizes results of EJ studies for populations near EGUs and refineries, noting the potential for impacts on communities near such facilities. As part of regulatory programs affecting emissions from EGUs and refineries, EPA has also published EJ analyses, which are summarized in part in the preamble of this final rule. In RTC section 13, we also discuss the emission inventory modeling we performed, including discussion of the upstream sources we estimated in our modeling. While our modeling is at the national level and therefore is not directly applicable to communities with EJ concerns, we note that our modeling reasonably includes the three most significant sectors in terms of understanding the impact of the standards on overall GHG and CAP/HAP emissions (downstream, EGUs, and refineries).

Regarding the upstream power sector, we note that the agency has broad authority to regulate emissions from the power sector (e.g., the mercury and air toxics standards, and new source performance standards), as do the States and EPA through cooperative federalism programs (e.g., in response to PM NAAQS implementation requirements, interstate transport, emission guidelines, and regional haze),[974] and that EPA reasonably may address air pollution incrementally across multiple rulemakings, particularly across multiple industry sectors. For example, EPA has separately proposed new source performance standards and emission guidelines for greenhouse gas emissions from fossil fuel-fired power plants, which would also reduce emissions of criteria air pollutants such as PM2.5 and SO2 (88 FR 33240, May 23, 2023).[975] Regarding comments about potential for impacts on nearby populations from battery production and recycling, the commenters overlook existing EPA and other regulatory programs that cover them. See 40 CFR Part 273 for battery management under the Resource Conservation

[974] See also CAA 116.

[975] https://www.epa.gov/stationary-sources-air-pollution/nsps-ghg-emissions-new-modified-and-reconstructed-electric-utility

and Recovery Act, and Department of Transportation Hazardous Material Safety Standards for Transport of Lithium Cells and batteries at 49 CFR section 173.185. See RTC sections 13 and 17.1 for a fuller response.

Comments, including those of MFN, that are critical of using a benefit-per-ton (BPT) approach for examining the EJ impacts of the rule overlook that EPA did not use this approach, or reference it, in its EJ analysis at proposal, and is not doing so in the final rule. While the agency's Science Advisory Board called for a longer-term plan to conduct benefit-type analyses at spatial resolutions capable of estimating health impacts in near-road or other "frontline" communities, as noted elsewhere in this RTC section 18, such a plan and analyses that implement such a plan were not feasible to implement in support of this rule. EPA appropriately considered all factors to fulfill obligations under E.O. 12866 for doing benefit-cost analyses. In addition, as noted elsewhere, EPA relied on a range of factors to address EJ requirements, including a systematic review of EJ-related studies addressing populations living near major roads as part of a qualitative summary of evidence and a summary of quantitative analyses of populations living near major roads and upstream sources (i.e., EGUs and refineries).

Regarding the comments that the standards in the proposal would have been different and/or more stringent had EPA accounted for upstream or lifecycle emission impacts on communities near sources other than vehicles, see RTC section 17.1 for our response. Regarding Valero Energy Corporation's comment that price impacts will disproportionately and adversely fall on EJ communities, see RTC section 7.1 for EPA's response about the adequacy of electricity supply for projected demands from HD vehicles.

Valero's assertion that unsynchronized ZEV deployment may adversely occur at the expense of the most vulnerable communities assumes without evidence that the locations of activity of ZEVs correspond to locations where upstream emissions associated with their fueling or charging have the greatest impact. This assertion is unsupported by evidence. A review of recent studies conducted in response to this comment illustrates that in nearly all regions, ZEV adoption results in net benefits to all communities, including EJ communities. While there are some areas where higher concentrations of air pollution may occur, these are likely to be largely mitigated by programs to reduce EGU emissions.[976] See also RIA Chapter 4.3.4, finding that "from 2027 through the 2030s, EGU emission increases are expected to start small and grow as HD ZEV adoption drives greater increases in energy demand. All four criteria pollutants see their largest increase in EGU emissions in 2035. But through the 2030s and 2040s, a substantial increase in the use of renewable energy sources is expected to take place in the national power generation mix, driven in part by the IRA. This is expected to lead to decreases in EGU emissions at a national level, including a decrease in EGU emissions attributable to HD ZEVs and the final standards." Refinery criteria pollutant emissions are projected to decrease year over year, as shown in RIA Chapter 4.4.2.

[976] Bailey, Chad R. (2024) Review of recent modeling studies on lifecycle air quality impacts of ZEV truck adoption. Memorandum to docket, March 13, 2024.

19 Economic Impacts

<u>Comments by Organizations</u>

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

EPA's failure to quantify any of these costs—which EPA itself calls "economic" costs—is especially problematic in light of the agency's repeated willingness, elsewhere in the same proposed rule, to assign a dollar value to the abstract benefit of reducing GHG emissions. See 88 Fed. Reg. at 26,082 (concluding that benefits of reducing emissions reach $87 billion). To do so, the agency had to evaluate and assign monetary values to a variety of inscrutable, amorphous public goods and ills: "the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk and natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services." Id. at 26,074. EPA's readiness to assign a value to the effect of reducing GHG emissions based on this nebulous balancing test, but not to the much more concrete (and estimable) effects of rebound driving, changes in vehicle sales, and employment is still another mark of the agency's inconsistent and arbitrary reasoning. See Dist. Hosp. Partners, L.P. v. Burwell, 786 F.3d 46, 59 (D.C. Cir. 2015) ("We have often declined to affirm an agency decision if there are unexplained inconsistencies in the final rule."); cf. Gen. Chem. Corp. v. United States, 817 F.2d 844, 846 (D.C. Cir. 1987) (per curiam) (agency action was arbitrary and capricious because its analysis was "internally inconsistent and inadequately explained"). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 63 - 64]

Second, EPA concluded that the costs of the proposed rule would be offset by $250 billion in "operational savings" that heavy-duty operators would experience by shifting to electric vehicles. 88 Fed. Reg. at 26,082. This conclusion is doubly erroneous. As an initial matter, as explained above, the bulk of these purported savings come from $200 billion saved in repair-and-maintenance costs—an enormous sum that EPA bases on a single study that itself undercuts EPA's calculation. And the remainder of the operational savings that EPA estimates, including from pre-tax fuel savings and diesel exhaust fluid savings, are also unreliable for the reasons already stated. [EPA-HQ-OAR-2022-0985-1660-A1, p. 64]

Organization: American Highway Users Alliance

This last consideration is highly important because if the potential customers of heavy-duty EVs do not become actual customers to a sufficient extent, the manufacturers are unlikely to produce the vehicles in the quantities EPA has estimated, in turn greatly reducing the benefits of the proposal as EPA estimated. [EPA-HQ-OAR-2022-0985-1550-A1, p. 2]

Organization: American Trucking Associations (ATA)

Given the uncertainty around factors such as energy prices, uptime, and residual value, the MSRP must be significantly reduced to make the TCO comparable to existing equipment. Fleets understand this new technology will cost more in the near term and want to see a clear trend of incremental technology improvements translating into incremental reductions in MSRP to make a TCO investment that pays off. If fleets do not see the expected TCO benefit, they will likely hold onto their existing equipment longer resulting in an older fleet with higher emissions profile. Robust and stable federal and state incentives above currently funded levels could be one way to do this. Unfortunately, generous state incentives and the federal commercial clean vehicle credit are only starting points. [EPA-HQ-OAR-2022-0985-1535-A1, p. 11]

In 2016, EPA adopted, and ATA supported, Phase 2 GHG standards for medium- and heavy-duty trucks. Although regulations that increase the upfront cost of a vehicle are always a concern, fleets' ability to recoup these investments over a reasonable payback period helps mitigate these concerns. As shown in Table 4, EPA's Phase 2 rule projected a reasonable payback period of two to four years for tractors and vocational vehicles, respectively. [EPA-HQ-OAR-2022-0985-1535-A1, p. 12]

The additional cost of meeting the 2027 Phase 2 GHG standards was projected to add at least $10,240 to the price of a day cab and as much as $13,750 to the price of a sleeper cab tractor. Vocational trucks were projected to experience cost increases ranging from $1,490 to $5,670. These projected costs will be introduced into the marketplace beginning in 2027. [EPA-HQ-OAR-2022-0985-1535-A1, p. 12]

Under the proposed Phase 3 program, EPA adds to the upcoming Phase 2 costs, extending the payback period for new vehicles. For example, EPA estimates the upfront per-vehicle cost of a ZEV daycab will be an additional $61,803 more than a comparable Phase 2 daycab tractor. Similarly, the upfront cost of ZEV vocational vehicles is estimated to be $8,828 to $14,711 mainly due to the cost of ZEV infrastructure. It is important to note that these costs have been reduced by the federal vehicle tax credits contained in the Inflation Reduction Act (IRA). As shown, these credits significantly impact the financial feasibility of ZEVs. For example, in 2027, a ZEV daycab tractor is expected to have an 8-year payback period when accounting for the IRA vehicle tax credits, which sunset in 2032. Absent these credits, the payback period would be 14 years. [EPA-HQ-OAR-2022-0985-1535-A1, p. 13]

The learning process in transitioning to electric trucks highlights the direct and indirect costs for fleet owners. Direct costs must be accurately factored into expenses when calculating ROI. Still, BEV drayage fleets report increased costs they would never have previously accounted for, like the administrative work related to obtaining city permits. Electric vehicle supply equipment (EVSE) may need more physical space, but real estate is limited near ports, and land prices continue to rise in many parts of the country. [EPA-HQ-OAR-2022-0985-1535-A1, p. 13]

Ensuring drivers can maintain or improve efficiency is also a consideration that is tied to compensation. In conversations with fleets, several have indicated BEVs are not able to perform the same function as their conventional trucks due to range limitations and charging times and indicate that two trucks are needed to do the same amount of work as one. These factors can potentially worsen the driver shortage and congestion issues by necessitating more trucks and drivers handle the same workload. Compensation may also be affected if limited range and extended charging times reduce available driving time. To tackle these challenges, ATA encourages EPA to broaden its analyses and quantify the impacts of regulations on driver operational and occupational efficiency. [EPA-HQ-OAR-2022-0985-1535-A1, p. 20]

Organization: Bradbury, Steven G.

(Text giving the following bullet points context: Some of the most consequential burdens and negative ramifications of the proposed rules that EPA hides, disregards, or minimizes include the following:)

- Increasing the purchase price of all new vehicles. Notwithstanding EPA's gaming of the numbers, the true costs of the industrial transformation forced by the EPA's proposed rules will be spread across the automakers' fleets, resulting in a significant increase in the prices of all new vehicles, with greater price increases concentrated on those vehicles for which the demand is highest relative to supply. All Americans will be harmed by these price increases, but the biggest losers will be lower-income Americans who cannot afford to buy an EV or to pay more for a gas-powered vehicle at the dealership, as well as those who live in rural areas and need to drive longer distances and for whom EVs are impractical. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 15-16]

- Causing more deaths and serious injuries on America's highways. As new vehicle models become unaffordable or unappealing, many American families will be left driving older and older used cars, and the age of the nation's auto fleet will rise dramatically. Already, the average age of a car on the road in the United States is approaching 13 years, and many cars are on their fifth or sixth owners. The aging of the American fleet has very negative safety consequences, as NHTSA statistics show that older vehicles are much less safe than newer models in an accident.43 [EPA-HQ-OAR-2022-0985-2427-A2, p. 16]

43 See https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/newer-cars-safer-cars_fact-sheet_010320-tag.pdf.

In the current rulemaking, EPA is downplaying and minimizing the loss of lives on U.S. highways that its proposals will cause by estimating them on a per-distance traveled basis, and is ignoring altogether the many more serious injuries that will be attributable to these regulations.44 In contrast, NHTSA was more candid in acknowledging these negative safety effects just last year when it promulgated stringent fuel economy standards through model year 2026 in lockstep with EPA's 2021 emissions rule.45 Meanwhile, EPA is playing up and magnifying the economic value of the lives it claims will be saved in the long run from the reduction of toxic pollutants.46 EPA's starkly different accounting treatment for the lives lost from less safe vehicles versus those saved by improved air quality is telling. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 16-17]

44 See 88 FR at 29345, 29386.

45 See 87 FR 25710, 25895, https://www.govinfo.gov/content/pkg/FR-2022-05-02/pdf/2022-07200.pdf.

46 See 88 FR at 29345, 29379-82.

- Requiring massive expenditures in electric charging infrastructure. If finalized as proposed, the EPA's emissions rules will hold America's automotive freedom hostage to the need for huge new investments in electric infrastructure throughout the U.S. Again, EPA largely minimizes the portion of these infrastructure costs that would appropriately be attributable to its regulatory actions and downplays the impact. [EPA-HQ-OAR-2022-0985-2427-A2, p. 18]

- Straining America's power grid and raising the price of electricity. EPA pretends that its rules will not put a colossal additional strain on our already vulnerable national power grid. But that is fantasy, if the forecasted EV sales actually were to materialize. To accommodate EPA's future fleet of EVs, our national electric grid capacity would need to grow 60 percent or so by 2030 and much more over the long term,52 and that is growth in infrastructure alone, not in power generation. This buildout is simply not practicable in the timeframe EPA is contemplating.53 Even if it could happen, it will have to be paid for, and those costs will inevitably be reflected in higher electricity rates for all users of electricity across the U.S. and higher EV charging fees in particular. EPA says not to worry about grid reliability—utilities and the government will be able to manage the EV charging draw on the grid by rationing the hours for charging.54 American drivers will not tolerate that. [EPA-HQ-OAR-2022-0985-2427-A2, p. 18]

52 See https://www.energy.gov/policy/queued-need-transmission.

53 See Robert Bryce, "47,300 Gigawatt-Miles from Nowhere," May 26, 2023, https://robertbryce.substack.com/p/47300-gigawatt-miles-from-nowhere.

54 See 88 FR at 29312.

At the same time that EPA is proposing to force the electrification of the American auto fleet, it has just proposed separate rules under the Clean Air Act aimed at forcing power generators to phase out 90 percent of America's fossil-fuel-powered electric generating capacity.55 Conveniently for the Agency's cost accounting estimates, EPA's newly proposed power plan ignores the extra electricity draw that would be required by EPA's proposed vehicle rules, and the vehicle rules, in turn, fail to account for the electricity supply crunch that would be caused by EPA's own power plan—a perfect concert of coordinated regulatory analysis, orchestrated to make the costs on Americans appear lower. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 18-19]

55 See https://www.epa.gov/newsreleases/epa-proposes-new-carbon-pollution-standards-fossil-fuel-fired-power-plants-tackle.

Organization: National Association of Chemical Distributors (NACD)

Economic Analysis

NACD is concerned that the economic impacts resulting from the Environmental Protection Agency's (EPA) Phase 3 Greenhouse Gas (GHG) Emission Standards proposal will cause severe financial and supply chain burdens to the trucking industry and its stakeholders. [EPA-HQ-OAR-2022-0985-1564-A1, p. 2]

This proposed rule would add significant costs to the manufacture of trucks, costs that would be passed on to those purchasing or leasing the vehicles, including chemical distributors. [EPA-HQ-OAR-2022-0985-1564-A2, p. 1]

According to the EPA's own Regulatory Impact Analysis (RIA)2 the rules would increase the manufacturing costs for trucks by about $10 billion over a 30-year period.3 This assumes that a total of 10,160,433 straight trucks, and 2,925,210 tractors operating over the nation's roads.4 The RIA does not appear to differentiate between the truck types in its overall cost estimate, so the $10 billion figure is divided by the total number of trucks in service to come up with a cost per truck figure. This amounts to $764.20 per truck already in service over the 30-year period. [EPA-HQ-OAR-2022-0985-1564-A2, p. 1]

2 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3, Draft Regulatory Impact Analysis, U.S. Environmental Protection Agency, April 2023

3 Discounted to 2021 dollars at a 7% discount rate.

4 Data used were from 2019.

Based on data from the Federal Motor Carrier Safety Administration (FMCSA), there are currently 329,697 tractor trailers, and 976,274 straight trucks registered to carry chemicals in interstate commerce. These are operated by 21,916 distinct firms.5 Straight trucks have a 5-year service life according to IRS depreciation schedules, while tractor-trailers have a 6-year service life. This would mean that over 30 years, a total of 7,506,129 trucks would need to be purchased. [EPA-HQ-OAR-2022-0985-1564-A2, p. 1.] [See Docket Number EPA-HQ-OAR-2022-0985-1564-A2, page 1, for referenced numbers.]

5 Motor Carrier Census, Federal Motor Carrier Safety Administration, 2020 Data, sourced directly from the FMCSA.

The $764.20 figure provided in the RIA is a manufacturing cost. Using data from the Bureau of Economic Analysis, the weighted wholesale markup for trucks is 1.36 percent, and the retail markup is 3.00 percent. Adding these markups makes the cost of the rule per new truck purchased $797.80. [EPA-HQ-OAR-2022-0985-1564-A2, p. 1]

Based on the FMCSA data, an average of 342.5 trucks would be purchased by each firm over the 30-year period (all else being equal). Based on the most recent economic impact analysis of the chemical distribution industry, there are 3,248 chemical distribution firms. Multiplying this by 342.5 trucks means that chemical distributors would purchase 1,112,425 trucks over 30-years. At a cost of $797.80 per truck, this would equal an increase in costs of $887,492,717 in 2021 dollars. [EPA-HQ-OAR-2022-0985-1564-A2, pp. 1 - 2]

On top of the higher cost for trucks, the EPA recognized that the nation does not have an adequate infrastructure to support more electric or hydrogen fueled vehicles. According to the RIA, the EPA expects that it would cost $29.0 billion over 30 years in 2021 dollars to provide such an infrastructure. Again, putting this into a per-truck basis during the study period, providing infrastructure would cost $2,216 per vehicle, with $2.5 billion in 2021 dollars allocated just to the chemical distribution industry. [EPA-HQ-OAR-2022-0985-1564-A2, p. 2]

A third component of the EPA's RIA is an examination of operating costs for low emission vehicles. According to the EPA, there are 3 components to the expected cost savings. The first would be an elimination of the requirement to purchase diesel exhaust fluid (DEF), the second would be a differential between existing and proposed fuels, and the third would be a reduction in maintenance costs. [EPA-HQ-OAR-2022-0985-1564-A2, p. 2]

Examining each of these potential savings independently, it is easy to understand why trucks would no longer require the use of expensieve DEF. Taking the figures from the RIA, this would result in a savings of $11 billion over 30 years, or $841 per vehicle, and a savings of $935.1 million allocated across the chemical distribution sector. [EPA-HQ-OAR-2022-0985-1564-A2, p. 2]

The other potential cost savings are at best speculative, particularly savings on fuel. Of course, the elimination of diesel and gasoline vehicles would lead to savings on petroleum, but electricity does not come out of a wall for free. It must be generated and additional regulations stemming from the administration are certain to make electricity much more expensive over time. In addition, significantly higher demand for electricity in an environment where adding significant additional load to the system will be nearly impossible will lead to dramatically increased electricity prices. Since the cost savings calculated in the RIA are at best speculative, and could actually be cost increases, these potential savings are removed from this analysis. [EPA-HQ-OAR-2022-0985-1564-A2, p. 2]

Taken together, these four components would lead to a cost for the chemical distribution industry of $1.2 billion, or about $1,108 per truck purchased and operated by the industry over the 30-year period. [EPA-HQ-OAR-2022-0985-1564-A2, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1564-A2, page 3, for referenced numbers.]

Based on a model developed for the NACD by John Dunham & Associates (JDA), the annualized cost of the rule on the chemical dicosstribution industry alone would be equal to $18.03 per ton, resulting in a 5.1 percent increase to the cost of chemicals.8 [EPA-HQ-OAR-2022-0985-1564-A2, p. 3.]

8 This is based on the tonnage of all chemicals, with the costs spread out across the entire market.

Demand Model Methodology

JDA's Regulatory Assessment Model (RAM) is an updated version of a multi-market demand model first developed by the American Economics Group (AEG) under contract with Philip Morris. It was completely rebuilt by Dr. Hyeyeon Park in 2001, and its structure was updated by JDA in 2019. The model was presented to the National Conference of State Legislatures, Senior Fiscal Analysts Seminar in Portland Maine, on September 4, 1999, where it was well received. In fact, at that time many state fiscal analysts asked if the model could be made available to them as a forecasting tool. The results from the model were also presented to the Tax Foundation Excise Tax Seminar, held in Jacksonville, Florida, on January 12, 2001, as part of a larger discussion on the economic impact of tobacco taxes. [EPA-HQ-OAR-2022-0985-1564-A2, p. 4]

Since then, the RAM model has been modified to work with nearly any product or market. It is designed to measure product sales in a multi-state market structure with differential pricing. The general methodology is a two-stage estimation of the demand equation linked to a non-linear programming model of import and export patterns. Data for the model comes from the 2021 Economic Impact Model of the Chemical Distribution Industry, as well as from the US Census Bureau, the Bureau of Economic Analysis, the Bureau of Transportation Statistics Commodity Flow Survey and JDA research. Caliper Corporation was used to estimate distances between states. [EPA-HQ-OAR-2022-0985-1564-A2, p. 4]

Estimates on what sales should be in each state are developed first. In this case, both demand and prices come directly from the Impact model. If cross-border sales were observable, the calculations would be complete; however, since they are not, the model must estimate them through non-linear programming techniques that solve the 51 demand functions simultaneously. The model adjusts the cross-price elasticities between states to balance the actual sales with expected demand. [EPA-HQ-OAR-2022-0985-1564-A2, p. 4]

Demand elasticities are calculated using a logarithmic demand curve with a base of -0.805 which is an average for chemical products.11 [EPA-HQ-OAR-2022-0985-1564-A2, p. 4]

11 See: Gallaway, Michael, et. al., Short-run and long-run industry-level estimates of US Armington elasticites, North American Journal of Economics and Finance, March 2003.

Once the linear program model balances, the model can be shocked with either new prices or demand values. By rebalancing the model following the shock, it is possible to calculate demand response estimates across all states (as well as cross-border sales changes). [EPA-HQ-OAR-2022-0985-1564-A2, p. 4]

Revenue and job impacts can then be estimated through linear extrapolation. [EPA-HQ-OAR-2022-0985-1564-A2, p. 4]

Organization: National Automobile Dealers Association (NADA)

B. Real life emission reductions require that EPA set standards designed to maximize, and not undermine, fleet turnover.

The Phase 3 GHG proposal appears to require, at least indirectly, that HDV manufacturers design, build, and sell more ZEV HDVs, and as such departs significantly from previous rules as the success of doing so will depend on 1) the build out and scaling of a national infrastructure system to enable operation of such HDVs and 2) customer purchase incentives sufficient enough to drive a demand for ZEV HDVs which currently cost three-five times more than their ICE-counterparts. Appropriately structured HDV standards must involve a national, wholistic approach to reducing GHGs. Specifically, EPA must only adopt new HDV emission standards that will enhance (and not inhibit) fleet turnover. If EPA instead moves too far, too fast, necessary infrastructure will not be available and the cost of new HDVs will increase dramatically, resulting in a decline in the otherwise applicable rate of fleet turnover and GHG reductions. Prospective HDV customers almost always have the option to keep existing vehicles on the road longer, opting for enhanced maintenance and repair strategies that may even include engine and/or vehicle re-building. Alternatively, HDV customers may meet their needs with used vehicles, often at costs significantly lower than that of new federally compliant HDVs. [EPA-HQ-OAR-2022-0985-1592-A1, p. 5]

The trucking industry learned this firsthand with HDEs subject to EPA's 2002-10 NOx standards. A study conducted in-house by ATD details the dramatic impact those standards had because they proved costly to comply with and they led to degraded vehicle performance.10 The study found that EPA underestimated control strategy and technology compliance costs by a factor of 2-5, resulting in dramatically higher prices for new HDVs. It also found that EPA's mandates resulted in significantly higher operating costs, due to increased maintenance requirements, reduced reliability, and lower fuel economy. Together, the higher HDV prices and operating costs that directly stemmed from EPA's 2002-10 HDE NOx standards resulted in a significant disruption of the new HDV marketplace, leading to lost employment, lost profits, and even the shuttering of some businesses. New HDV customers acted rationally and predictably to avoid higher prices and performance compromises. Many opted to pre-buy new HDVs. Others opted to hold onto their existing equipment for longer than they otherwise had planned to. Still others met their business needs by seeking out late model used HDVs. Employees suffered, the industry suffered, and the environment suffered as fleet turnover ground to a halt. This history must not be repeated. EPA must ensure that the Phase 3 GHG mandates will be supported by adequate infrastructure, will be technologically feasible, and will be cost effective, both up front and over the useful life of the HDVs they will apply to. [EPA-HQ-OAR-2022-0985-1592-A1, pp. 5 - 6]

10 See Appendix C: A Look Back at EPA's Cost and Other Impact Projections for My 2004-2010 Heavy-Duty Truck Emissions Standards. See also Jack Roberts, Is the Largest Truck Prebuy Ever on the Horizon?, Fleet Management, (Sept. 1, 2022). [See Docket Number EPA-HQ-OAR-2022-0985-1592-A1, pages 21-37, for Appendix C.]

Organization: South Dakota Department of Agriculture and Natural Resources (DANR)

Cost

EPA acknowledges the cost of an electrical vehicle will be greater than a gasoline powered vehicle but justifies the additional expense by stating the "purchase price could be reduced by any state and federal purchase incentives available to consumers. Under the Inflation Reduction Act, consumers are eligible for up to $7,500 for the purchase of an electric vehicle." DANR disagrees with EPAs efforts to use the proposed emissions standards and incentives to force consumers into purchasing vehicles that may not meet their actual driving needs or budget. In fact, EPA' s approach along with the cost of EV s may encourage South Dakota car owners to hold on to their older, less efficient vehicles in perpetuity to avoid purchasing a vehicle that will not meet their driving needs. The proposed rules may also encourage a person to own more than one vehicle to meet their actual needs. [EPA-HQ-OAR-2022-0985-1639-A2, pp. 2 - 3]

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

We think that willingness to pay is the correct question to ask regarding PHEVs. As long as there is consumer demand, some truck makers will target this market. Some parties claim that Strong PHEVs cost too much. We believe this is a complex question as PHEVs result in significant savings to society due to reduced infrastructure investment. Models such as the new Toyota tool show that PHEVs can be very good at dollars per GHG reduced.11 Also, from a fleet owner's perspective, total cost of ownership is an important way to look at cost. Finally, our coalition's research community believes there are several methods not yet adopted by automakers that can reduce the cost of Strong PHEVs. (See appendix D in this letter for a partial discussion on this topic). [EPA-HQ-OAR-2022-0985-1647-A2, p. 12]

11 GitHub - khamza075/PVC: A software for assessing the efficacy of various vehicle powertrains at mitigation of greenhouse gas emissions. Also see https://app.carghg.org/

Regarding PHEVs not plugging in, this August 2020 paper from UC Davis is one of the best analyses and uses data loggers from actual drivers and shows that PHEVs with longer AERs do not have a substantial issue with not plugging in (e.g., about 3-5%).12 Also, there are many factors that could see this decrease in the future. At this stage, we do not believe extreme measures are needed but that EPA should have more data collection on plugging from either smog check/on-board diagnostics or from truck makers. [EPA-HQ-OAR-2022-0985-1647-A2, p. 12] [Refer to the table on p. 12 of docket number EPA-HQ-OAR-2022-0985-1647-A2.]

12 https://iopscience.iop.org/article/10.1088/1748-9326/ab8ca5/meta

Organization: Truck Renting and Leasing Association (TRALA)

Strong Likelihood ZEV Pathways Will Alter Fleet Plans

Every fleet business operation is unique. Some trucking companies may be comprised of a single truck where the President and CEO is also the chief mechanic, the accountant, and the driver. Other trucking operations are global in nature and control thousands of power units. Decisions as to whether, how, and/or when to integrate ZEVs into a fleet mix will be dependent on a variety of factors including financial ability, length of haul, shipper or shareholder pressure, infrastructure cost and availability, and regulatory requirements among others. TRALA's rental and leasing customers specify the types and numbers of vehicles they will need, when they will need such vehicles, and where they will operate their equipment. Any significant uncertainty in 1:1 productivity compared to ICE technologies will be a Total Cost of Ownership (TCO) consideration factored in fleet business cases and capital planning that will impact the speed and willingness for end-users to transition to ZEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 9]

TRALA believes trucking companies will primarily pursue one of four pathways regarding their decision on adding lower carbon vehicles into their fleet operations including:

(1) holding onto ICE vehicles longer; (2) maintaining current, established fleet turnover cycles; (3) purchasing new ICE vehicles so long as they are available; and (4) other combinations of the aforementioned approaches. Be assured that equipment providers and trucking companies will make a pivot under their current business models if necessary to maintain competitiveness and survival. [EPA-HQ-OAR-2022-0985-1577-A1, p. 9]

EPA's MY 2027 and MY 2032 ZEV purchase costs and payback periods shown in Tables II-32 and II-33 in the proposed rule remain questionable in the eyes of trucking companies. The agency's major assumptions include the guaranteed existence of full federal incentives through 2032, high ZEV adoption rates, low charging infrastructure costs, and lower maintenance costs. Incidentally, EPA has a well-documented history of underestimating technology costs and payback periods on major emissions rules for our industry. TRALA members and the rest of the trucking industry will not know if this latest round of economic predictions will in fact be accurate or be a replication of past underestimations. Though almost a decade away from now, TRALA is also leery as to what new ZEV costs will be come 2033 when current tax credits sunset. [EPA-HQ-OAR-2022-0985-1577-A1, p. 11]

TRALA also wants assurances that all cost factors were considered under the proposal such as the need for back-up battery power units and components for all ZEV maintenance and repair; charging infrastructure maintenance; on-going technician training; repair shop modifications; back-up generators and energy storage; route redesigns to better align with fueling needs; higher driver costs attributed to HOS impacts involving refueling; higher operational costs attributed to more expensive back-up truck inventory; and the likely need to rent or lease more power units for routine hauling due to weight, range, and fueling time penalties. [EPA-HQ-OAR-2022-0985-1577-A1, p. 11]

Residual Resale Values of Early Generation BEVs and FCEVs Will be Non-Existent

Residual values are essential when fleets determine their expected TCO on new vehicles. Residual equipment values affect buying, financing, and leasing decisions for fleets. For ZEVs, it is becoming a prevalent issue for their wide-scale adoption both in the initial and aftermarket applications. [EPA-HQ-OAR-2022-0985-1577-A1, p. 17]

Historically, TRALA members have seen residual values of at least 20% of original truck retail values. These percentages vary depending on the state of the economy, engine hours, vehicle condition, interest rates, class of vehicle, and MY performance. With ZEV purchase prices being exceedingly high, and residual values expected to be extremely low with early generation trucks, a rather reliable TCO consideration for TRALA members and fleets alike will be thrown to the wind. [EPA-HQ-OAR-2022-0985-1577-A1, p. 17]

ZEV residual values will hinge on battery degradation rates and demand for used ZEVs – factors that are both currently unknown. There is no current aftermarket for ZEV vehicles. Any market valuation forecasts are nothing more than pure speculation and lower residual or minimal residual value estimates will significantly drive up the financing and lease costs of ZEVs. [EPA-HQ-OAR-2022-0985-1577-A1, p. 17]

The first generations of any technology will be much less mature than future production series. The trucking industry experienced this first-hand with used MY 2007 tractors given their poor performance records. The challenge with ZEVs is no different in that few are willing to underwrite residual risk. Customers are not willing to take it on even when offered a lower interest rate. [EPA-HQ-OAR-2022-0985-1577-A1, p. 17]

ZEVs Will Create an Uneven Economic Playing Field

Since the trucking industry is so highly competitive and up-front costs of ZEVs are so exorbitant, fleets renting, leasing, or purchasing ZEVs during earlier implementation years will not likely be able to pass such higher associated costs along to customers. Fleets running older ICE equipment will be able to charge lower rates and gain favor with supplier customers for the foreseeable future until such time as ZEV markets become much more mature. [EPA-HQ-OAR-2022-0985-1577-A1, p. 17]

Given that the vast majority of TRALA member customers are small businesses, they are already at a competitive disadvantage in that they operate on razor-thin profit margins and they do not have economies of scale to negotiate fuel, insurance, equipment, infrastructure, and other costs. The additional expenses incurred from ZEV rentals, leases, or purchases by small trucking companies will not be able to be passed through onto consumers as they would diesel fuel surcharges in that it would be cost prohibitive to do so. Therein lies the predicament for a small trucking company – either pass along the increased cost of ZEVs to end users or get buried in business debt. [EPA-HQ-OAR-2022-0985-1577-A1, pp. 17-18]

Technology limitations and capabilities of ZEV vehicles could also potentially not give TRALA customers or fleets the necessary range as envisioned due to geographic, driver, or temperature variables putting operation of such vehicles at a disadvantage with their ICE vehicle competition. [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

TRALA members who rent ZEV trucks are already feeling an economic pinch. For example, truck rental companies are experiencing little or no demand for their limited BEVs given the uncertainty surrounding charging infrastructure. These companies will eventually be forced to rent ZEVs at the same rates as ICE vehicles and absorb the financial losses. If not for the rental cost offset, many of these ZEV rentals would be characterized as stranded assets. [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

Linear rulemaking pathways such as proposed under Phase 3 do not pair up well with a non-linear industry such as trucking where business models are so widely varied. [EPA-HQ-OAR-2022-0985-1577-A1, p. 18]

Organization: U.S. Chamber of Commerce

Cost Effective and Technologically Feasible Standards

First, it should be recognized that trucking is enormously important to the economy—it moves 72 percent of goods in America and is the foundation of a wellfunctioning supply chain.1 When trucking costs go up, the cost of nearly all goods rise. [EPA-HQ-OAR-2022-0985-1583-A1, p. 2]

1 Economics and Industry Data, American Trucking Association, https://www.trucking.org/economics-and-industry-data

Moreover, long haul trucking in particular is overwhelmingly comprised of small businesses that are disproportionately vulnerable to changing economic circumstances. According to the Truck and Engine Manufacturers Association, 98 percent of U.S. fleet owners are small businesses operating 20 or fewer commercial vehicles. These small businesses operate on tight margins and typically do not have the financial resources necessary to absorb significant regulatory cost increases, which therefore must be passed on to American consumers in the form of higher costs for shipped goods. [EPA-HQ-OAR-2022-0985-1583-A1, p. 2]

Organization: Zero Emission Transportation Association (ZETA)

3. The Economic Benefits of Electrifying HDVs

Beyond health improvements, HDV electrification will help ensure the United States maintains its economic competitiveness with the rest of the world. As discussed further below, governments around the world are establishing more ambitious electrification goals to align with recent announcements from global manufacturers. Ensuring U.S. regulations match or exceed these ambitions is vital to encouraging domestic investment in the industry. [EPA-HQ-OAR-2022-0985-2429-A1, p. 7]

Beyond the EV industry itself, electrification could encourage growth in the trucking industry. With the boom in e-commerce, the demand for heavy-duty trucks to transport goods across the country is steadily increasing. In 2020, U.S. e-commerce sales were up 32.4% from the previous year,33 and estimates project the total VMT by MHDVs will grow 29% by 2050.34 To meet the growing demand of goods being shipped across the country, fleet managers are deploying a greater number of commercial vehicles. With this VMT growth, electrification provides an efficiency and cost savings potential that can help meet this increased demand, while avoiding the emissions increases resulting from more trucks on the road. [EPA-HQ-OAR-2022-0985-2429-A1, p. 9]

33 Fareeha Ali and Jessica Young, "US Ecommerce Grows 32.4% in 2020," Digital Commerce 360, (January 29, 2021) https://www.digitalcommerce360.com/article/usecommerce-sales/

34 Dana Lowell and J. Culkin, "Medium- and Heavy-Duty Vehicles: Market Structure, Environmental impact, and EV readiness," Environmental Defense Fund, (July 2021) https://www.edf.org/sites/default/files/documents/EDFMHDVEVFeasibilityReport22jul21.pdf

i. Fuel and maintenance costs

A key consideration for the cost savings of HDEVs is that electricity is considerably cheaper than diesel and gasoline. As of 2022, electricity was three to six times cheaper than diesel.46 Electricity prices tend to be less volatile and subject to fewer supply shocks than oil prices.47 In addition, most states and regional operators implement price controls on changes to electricity prices. Electricity can also be sourced from a wider array of resources, such as renewables like solar, wind, hydropower, and geothermal. This fuel source diversification further reduces electricity rate volatility and creates more predictability for HDEV fleet operators. [EPA-HQ-OAR-2022-0985-2429-A1, p. 12]

46 Fred Lambert, "Electric cars are now three to six times cheaper to drive in the US as gas prices rise," Electrek, (March 22, 2022) https://electrek.co/2022/03/22/electric-cars-3-to-6-times-cheaper-to-drive-us-high-gas-prices/

47 Melodia, Lauren; Karlsson, Kristina. 2022. 'Energy Price Stability: The Peril of Fossil Fuels and the Promise of Renewables.' Roosevelt Institute. Accessed May 24, 2023. https://rooseveltinstitute.org/wpcontent/uploads/2022/05/RI_EnergyPriceStability_IssueBrief_202205.pdf

c. HDV Electrification Promotes American Economic Competitiveness

Governments around the world are setting more stringent emissions standards to align with recent announcements from global manufacturers. Ensuring U.S. regulations match or exceed these ambitions is vital to creating certainty and encouraging investment in the industry. If the U.S. does not move more aggressively on HDEV deployment, it risks ceding market share to other countries who are moving faster on EV deployment. [EPA-HQ-OAR-2022-0985-2429-A1, p. 13]

Complimentary incentives embedded in the IRA will facilitate onshoring of the EV supply chain but robust EPA emission standards will help ensure the United States becomes and remains a leader in EV technology development and manufacturing. While more work remains to craft supportive policies in other areas of the supply chain—most notably on critical minerals permitting reform—EPA emissions standards are crucial drivers of domestic EV supply. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 13 - 14]

Many countries have made commitments to accelerate HDEV development and deployment in their borders. China accounted for nearly 90% of global electric truck registrations in 2021.54 In 2021, China also recorded 86,000 electric bus registrations, compared to 3,000 in Europe and 1,000 in the U.S.55 With its own emissions targets, countries in Europe are sending strong signals about its future electric HDV fleet. With robust Phase 3 GHG standards, the U.S. would be encouraging quicker adoption of HDEV technology to ensure the country remains at the forefront of this global transition. Below is a list of regional and national goals for HD zero-emission vehicle deployment that further underscores the need for the United States to maintain pace with the rest of the world:

- Austria, Canada, Chile, Denmark, Finland, Luxembourg, Netherlands, New Zealand, Norway, Scotland, Switzerland, Turkey, United Kingdom, Uruguay, and Wales signed a Memorandum of Understanding (MOU) in 2021.56 The MOU sets a target for ZEVs to account for 30% of new truck and bus sales by 2030, and 100% by 2040.
- In 2023, the European Union (EU) proposed more stringent standards for HDVs to reduce emissions by 45% by 2030, 65% by 2035 and 90% by 2040 from 2019 levels. The EU also proposed to make all new city buses zero-emission by 2030.57
- The EU's Clean Vehicles Directive sets national targets for ZEV public procurement by national governments, ranging from 15-65% depending on the vehicle segment.58
- Chile has a target for 100% of new public transportation to be ZEVs by 2035, and 100% by 2045 for freight transport and buses.59
- In July 2023, China will introduce more stringent emissions standards for heavy-duty vehicles.60
- In March 2022, Canada set zero emissions targets for ZEV models to account for 35% of MHDVs by 2030 and 100% by 2040.61
- New Zealand has a goal to fully decarbonize its public bus fleet by 2035.62
- Pakistan aims for 90% of new heavy-duty truck sales to be electric by 2040.63
- Austria, Cape Verde, Chile, Colombia, Denmark, New Zealand, and the Netherlands have committed to a target of 100% ZEV buses in cities by 2030.64
- Austria also has a goal for 100% of smaller HDVs (<18 tonnes) to be ZEVs in 2030 and larger HDVs in 2035.65
- France plans to ban the sale of new HDVs that use fossil-fuels by 2040.66
- Norway is targeting 100% of new HDVs, 75% of buses and 50% of new trucks to be ZEVs by 2030.67
- The United Kingdom is phasing out large ICE truck sales (>26 tonnes) by 2040.68 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 14 - 15]

54 "Trends in electric heavy-duty vehicles," IEA, (2022) https://www.iea.org/reports/global-ev-outlook-2022/trends-in-electric-heavy-duty-vehicles

55 Id.

56 "Decarbonizing Bus Fleets: Global Overview of Targets for Phasing Out Combustion Engine Vehicles," ICCT, (December 9, 2021) https://theicct.org/decarbonizing-bus-fleets-global-overview-of-targets-for-phasing-out-combustion-engine-vehicles/

57 "Reducing COâ, emissions from heavy-duty vehicles," European Commission, accessed May 20, 2023 https://climate.ec.europa.eu/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/reducingco2-emissions-heavy-duty-vehicles_en

58 "Clean Vehicles Directive," European Commission, accessed May 20, 2023 https://transport.ec.europa.eu/transport-themes/clean-transport-urban-transport/clean-and-energy-efficient-vehicles/clean-vehiclesdirective_en#:~:text=The%20revised%20Clean%20Vehicles%20Directive,targets%20for%20their%20public%20procurement

59 “Global EV Outlook 2022 - Securing supplies for an electric future,” IEA, (2022) https://iea.blob.core.windows.net/assets/e0d2081d-487d-4818-8c59-69b638969f9e/GlobalElectricVehicleOutlook2022.pdf

60 Id.

61 Id.

62 “Decarbonisation of bus fleets for a healthier Aotearoa.” New Zealand Government, accessed May 24, 2023. https://www.nzta.govt.nz/media-releases/decarbonisation-of-bus-fleets-for-a-healthier-aotearoa/#:~:text=In%20January%202021%2C%20the%20Government,transport%20bus%20fleet%20by%202035.

63 Id.

64 Id.

65 “Global Overview of Government Targets for Phasing Out Internal Combustion Engine Medium and Heavy Trucks,” ICCT, (August 26, 2021) https://theicct.org/global-overview-of-government-targets-for-phasing-out-internal-combustion-engine-medium-andheavy-trucks/

66 Id.

67 Id. at Page 15

68 Id.

Stringent Phase 3 GHG emission standards will encourage more domestic investment and innovation to position the United States as a global leader in the heavy-duty electric vehicle space. The regulatory certainty of these standards will allow for increased investment and the continued build-out of a domestic supply chain. Without stringent Phase 3 GHG standards, the U.S. risks ceding this vast economic opportunity to other countries, disadvantaging American businesses and workers. [EPA-HQ-OAR-2022-0985-2429-A1, p. 15]

EPA Summary and Response:

Summary:

AmFree took exception to EPA assigning of a dollar value to the “abstract benefit of reducing GHG emissions” while simultaneously ignoring the much more concrete and estimable effects of rebound driving and changes in vehicle sales and employment. AmFree also took exception to EPA’s estimated operating savings, suggesting that the source material for the estimated maintenance and repair savings undercuts EPA’s analysis and that the fuel and DEF savings are unreliable.

The American Highway Users Alliance argued that if truck buyers do not purchase EVs, then the benefits will not be as high as estimated by EPA.

ATA commented that fleets need to see a TCO benefit otherwise they will hold onto their existing equipment longer, resulting in an older fleet with higher emissions. ATA also argued that the costs under the proposal Phase 3 rule result in much longer payback periods than estimated by the Phase 2 rule which ATA supported. ATA also expressed concerns regarding costs incurred during a transition to electric vehicles and the space needed for EVSE. Lastly, ATA suggested that EPA’s analysis consider driver compensation impacts that could result from reduced EV driving range and charging downtime.

Steven Bradbury provided comments pertaining to GHG standards on light- and medium-duty vehicles which are out-of-scope for the HD Phase 3 rule. Within the scope of the HD Phase 3 rule, Mr. Bradbury commented on the straining of America's power grid and the rising price of electricity.

NACD expressed concern over the added costs to manufacture trucks and provided an analysis of the costs to the chemical distribution industry, with a conclusion that the cost would be equal to $18.03 per ton.

NADA encouraged EPA to set standards that maximize fleet turnover rather than undermining it.

The South Dakota DANR and the Strong PHEV Coalition provided comments pertaining to GHG standards on light- and medium-duty vehicles which are out-of-scope for the HD Phase 3 rule.

TRALA argued that fleets will choose their own path, one that maintains competitiveness and survival. TRALA expressed concerns regarding EPA's purchase cost and payback analysis and stated that they want assurances that all cost factors were considered such as the need for back-up battery power units, higher driver costs and the likely need to rent or lease more power units. They also requested assurance that EPA had included costs for charging maintenance. TRALA also commented with respect to residual values and argued that the residual value of early BEVs will be non-existent.

The U.S. Chamber of Commerce argued that fleet owners will have to pass on increased costs to American consumers.

ZETA commented favorably about the proposed rule and the ability of electrification to encourage growth in the trucking industry and to encourage more domestic investment and innovation to position the United States as a global leader in the heavy-duty electric vehicle space. ZETA also commented on the lower cost of electricity versus diesel fuel and the less volatile nature of electricity prices relative to oil prices.

<u>Response:</u>

Regarding the comments from AmFree on assigning values to reduced GHG emissions but not on the effect of rebound driving or change in vehicles sales and employment, we disagree that assigning a value to reduced GHG emissions represents an abstract benefit. We respond to comments related to our SC-GHG values in Section 20 of this document. Regarding rebound driving, see our response to comments in RTC Section 19.2. Given that vehicles in the heavy-duty industry are generally driven an amount commensurate with the job at hand, it is very unclear that rebound driving would occur akin to rebound driving in the light-duty sector which, to some extent, is satisfying voluntary mobility due to the lower cost of that mobility. As described in Section 19.4 of this RTC, we qualitatively discuss potential sales impacts of this rule, noting there, and in RIA Chapter 6.1, our reasons for not presenting a quantitative analysis of pre-buy and low-buy.. Our response in 19.6 of this RTC, as well as Chapter 6.4 of the RIA, explains our qualitative analysis on employment effects.

Regarding the comment from AmFree that the operational and repair and maintenance savings estimated in the proposed rule were erroneous, we respond to such comments in Section 3.7 of this RTC.

In response to the American Highway Users Alliance assertion that if truck buyers do not purchase EVs, benefits will not be as high as estimated by EPA, EPA notes that manufacturers can achieve compliance with the performance-based GHG standards even if they sell fewer EVs. Preamble II.F.3 identifies multiple additional potential compliance pathways that manufacturers may choose to use for compliance; individual manufacturers may choose whatever technology or mix of technologies to meet the standards that best suits their business circumstances. We note that, regardless of the technologies used to meet the standards, all manufacturers must meet the same performance-based GHG standards, resulting in the same level of downstream GHG reduction benefits.

In response to ATA's comments that an older fleet with a higher emissions profile will likely result if fleets do not see expected TCO benefits, see Section 3.6 of the RTC where we talk about operations cost savings. Regarding ATAs comments that the proposed rule results in much longer payback periods than those estimated in the Phase 2 rule, we disagree. As discussed in Sections II.F.2.ii and II.G of the preamble, our analysis estimates similar payback periods for both rules. Regarding the comments from ATA on costs incurred during the transition of electric trucks, as well as concerns of space needed for EVSE equipment, we refer the read to Chapter 6.3 of the RTC. Regarding the comments that BEVs are less efficient and might lead to driver shortages and congestion issues, we point to our discussion on BEV functionality within the HD TRUCS tool Chapter 2.8 of the RIA and Section 3 in the RTC. We also point to RTC Section 19.5, where evidence is provided that shows ZEVs appeal to HD vehicle drivers due to quieter operations, better visibility, smoother ride, and faster acceleration. We do not directly account for driver compensation in our analysis, however, as described in Section II.D.3 of the preamble, the analysis in HD TRUCS accounts for differences in vehicle use and payload capacity. In additon, there are multiple pathways to compliance for this final rule, including pathways with reduced ZEV penetration compared to the modeled potential compliance pathway.

Regarding Steven Bradbury's concerns over straining the power grid and rising electricity prices, we discuss this at length in Chapter 5 of the RIA, RTC Section 7.2, and Section IV of the preamble. In addition, the power plant rule referred to in Steven Bradbury's comment is a separate proposed rule. As such, EPA generally did not account for that rule in this analysis. If and when we finalize a separate proposed rule, EPA will account for the costs of that rule in that separate proceeding.

Regarding the comments from NACD and the detailed analysis of their estimated costs per truck, we focus on the conclusion to that analysis that the rule would cost $18.03 per ton. NACD does not make clear what the denominator is in that number. In addition, we disagree with the cost assumptions laid out in their comment. The analysis in HD TRUCS differentiates over 100 types of trucks, as discussed in RIA Chapter 2. In addition, the cost impacts estimated for this rule include markups that reflect retail price impacts (see RTC 12.2 for our responses to comments concerning RPE). With respect to the comments that the nation does not have adequate infrastructure to support more electric or hydrogen fueled vehicles, as discussed in RIA Chapters 1.6 and 2.6, there is a difference in the current infrastructure support, and future infrastructure expectations. In addition, the cost of the infrastructure is included in the analysis for this rule. With respect to the comments on fuel cost savings, we do not agree that these costs are speculative. We note that we estimate the cost of liquid fuel, as well as hydrogen or electric recharging, estimating a net cost savings from the lower cost of recharging a ZEV compared to refueling a comparable ICE vehicle.

Regarding the portion of their comment on burdens to the supply chain, we refer to RTC Section 17.2. Regarding the portion of their comments on infrastructure cost and availability, we refer to RTC Section 7.1, and RIA Chapters 1.6 and 2.6, where we discuss infrastructure availability and build out extensively. RIA Chapter 3.4 provides information on refueling cost savings, including how they were estimated and how electricity prices factor in.

Regarding the NADA comments, EPA has conducted an analysis focused on payback periods. See Section II.E, F and G in the preamble for our rationale for the final standards, and for more information on our approach to using payback as a basis for our analysis.

Regarding the comments from TRALA that fleets will choose their own path or that companies will be forced to rent ZEVs, EPA sets standards that can be met under many different pathways, allowing manufacturers to choose the mix of technologies that best meet their need. As explained in Section IX of the preamble, EPA projects many possible compliance pathways, all of which allow for a variety of HD vehicle options for fleet owners to choose from. We also point to Section C of the Executive Summary to the preamble, where we explain the phase-in for these final standards.

In regard to TRALA's comments on EPA's analysis of costs and payback, we point to the discussion in Chapter 2 of the RIA, where we discuss the factors included in our analysis. In response to TRALA's inquiry, EPA did include costs for maintenance and repair of all depot and public charging infrastructure. See RIA Chapter 2.4.4.2. With respect to comments on lack of information on residual value for ZEVs, as well as the comments about competitive disadvantage for small businesses, we first reiterate that there are many alternative pathways to compliance, and ICE vehicles will still be available for purchase. In addition, as noted in RIA Chapter 2.9, the penetration of HD ZEVs increases slowly over time, which will allow for more information on topics such as residual value being available to consumers who are unwilling to purchase HD ZEVs in the early years of the program. Even if, hypothetically, the resale value of the BEV powertrain is $0 (which is obviously not a reasonable assumption for a ZEV during the timeframe of the Phase 3 standards), we project that ZEVs will pay back within their first ownership period (and so the purchaser will have recovered the equivalent of their upfront cost before taking into account any resale value). Also, as required by the Regulatory Flexibility Act (RFA), we appropriately consider potential impacts on small business manufacturers. More information on the RFA can be found in RTC Section 26. Regarding comments made by the U.S. Chamber of Commerce, we again point to the consideration we gave small businesses during our analysis for this rule, as required under the RFA (see RTC Section 26).

With respect to TRALA's comments on the need for additional and back-up vehicles which in turn increases driver costs, we have not included a cost for additional ZEVs because, in general, we expect that our component sizing methodology (see RTC Section 3.3.1) describes ZEVs that can perform in full the work of a comparable ICE vehicle. As further explained in our response in RTC section 2.4, we acknowledge that there are some uses cases, including those with extreme daily VMT demands, for which ICE vehicles may be better suited during the timeframe of this rule. Our modeled potential compliance pathway accounts for this and includes ICE vehicles.

Regarding the comments provided by ZETA, EPA agrees that that this rule supports the U.S.'s global leadership in clean HD vehicle technologies, as well as supports public health and welfare. For a response to comments that EPA standards and other supporting policies are a crucial driver of domestic EV deployment, see RTC Section 2. As described in RIA Chapter 3.4.6, we show that the cost of refueling a HD ZEVs is projected to be less than that of an ICE vehicle.

19.1 Energy Efficiency Gap

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al

More broadly, EPA's conclusion that these operational savings exist defies common sense. As EPA acknowledges, if abandoning internal-combustion-engine vehicles in favor of electric vehicles could actually be expected to result in huge operational savings, rational users of heavy-duty vehicles would likely already be switching. See 88 Fed. Reg. at 26,071; Draft RIA at 417 (noting that a "normally functioning competitive market" would "lead buyers to purchase [electric vehicles] willingly"). The fact that they are not doing so is a strong indication that EPA's asserted operational savings do not in reality outweigh the costs of switching to electric vehicles. [EPA-HQ-OAR-2022-0985-1660-A1, p. 64]

EPA attempts to sidestep this problem by invoking a supposed "energy efficiency gap," positing a market failure that is responsible for skewing consumers' decisions away from purchasing electric vehicles. 88 Fed. Reg. at 26,071. But EPA provides no evidence demonstrating that low adoption of heavy-duty electric vehicles is actually the result of any such market failure, as opposed to well-founded concerns about the drawbacks of the technology. Indeed, EPA concedes that "[p]urchaser acceptance of [electric vehicles] is difficult to estimate" and that the "data and research" in this area "is limited." Draft RIA at 420. In light of the gap between the data and consumer behavior on the one hand, and EPA's rosy savings estimates on the other, any final rule must explain why EPA's operational-savings figure is realistic and why it is an appropriate offset for the rule's costs. See Am. Pub. Gas Ass'n v. DOE, 22 F.4th 1018, 1027–28 (D.C. Cir. 2022). EPA cannot justify an economy-altering rule by invoking an ill-defined, unsubstantiated market failure of its own imagining. [EPA-HQ-OAR-2022-0985-1660-A1, p. 65]

EPA Summary and Response:

Summary:

AmFree disagrees with EPA that there are operational savings of driving an electric vehicle compared to driving an ICE vehicle, and it argues that if there are realized operational savings that outweigh the increased up-front cost of EVs compared to ICE vehicles, users would already be driving electric vehicles. AmFree comments that EPA does not provide evidence for the explanation that an ill-defined, unsubstantiated energy efficiency gap is responsible for low electric vehicle adoption levels in the HD market, and it comments that the low adoption rate is due to concerns about the technology. The commenter goes on to say that EPA must explain why the estimated operational savings are realistic and why it is appropriate to consider them an offset for the cost of the rule.

Response:

Our analysis indicates that there are operational cost savings of driving a ZEV compared to an ICE vehicle. For more information on our analysis on operational cost savings, and total per vehicle technology costs, see Chapter 3.5 of the RIA, and Section 12 of this RTC document. With respect to AmFree's comments that low adoption rates of ZEVs in the HD market are due to technology concerns, we include that reasoning in our discussion of ZEV adoption in RIA Chapter 6.2. However, the possible existence of technology concerns does not preclude the possible existence of an energy efficiency gap. As discussed in Chapter 6.2 of the RIA, we recognize that there may be many factors that influence adoption (or non-adoption) of new technology, even under circumstances where the cost of the new technology is favorable compared to the previously existing technology that buyers have experience with. These factors include knowledge of the new technology (including the cost savings associated with it), and uncertainty related to the durability, use, infrastructure, and more.

AmFree's invocation of the D.C. Circuit's decision in Am. Pub. Gas Ass'n v. United States Dep't of Energy, 22 F.4th 1018, 1027-28 (D.C. Cir. 2022) is misplaced for numerous reasons. In that decision, the court of appeals criticized DOE for providing no "actual evidence that [certain] market failures affect the market" "under the heightened standard requiring clear and convincing evidence." Here, no heightened standard applies. Regardless of the applicable standard, however, EPA has provided significant evidence of the existence of an energy efficiency gap. See RIA 6.2. The agency and many stakeholders, moreover, have recognized the existence of such a gap since the HD Phase 1 rule. See 81 FR at 73859-62 (HD Phase 2 rule discussing the gap and also discussing related findings in the Phase 1 rule). Moreover, such a gap and agency regulation make intuitive sense. Market actors often lack perfect information and have uncertainties regarding emerging technological developments, whether they are ZEVs or the ICE engine and vehicle efficiency improvements identified in the Phase 1 and Phase 2 rules. The administrative agency conducts extensive fact-finding to obtain the necessary information, identifies available technologies, and then promulgates standards that create regulatory certainty supporting the application of technologies.

By contrast, it is AmFree's position that is unsubstantiated. AmFree appears to assume, without any supporting data or analysis, that the HDV market is perfectly competitive, and that HD vehicle purchasers are perfectly rational agents in command of perfect information, even with respect to emerging technologies. Nowhere does AmFree address the agency's prior findings or the broader literature regarding the energy efficiency gap.

Separately, we note that AmFree appears to erroneously conflate the current adoption rate of ZEVs with the adoption rates during the timeframe of the rulemaking (MY 2027-32). As described in Chapter 6.2 of the RIA, the current low adoption rates of HD ZEVs are likely due to many factors, including uncertainty related to the technology, fuel prices or infrastructure, or information asymmetry. EPA anticipates large increases in HD ZEV adoption by MY 2027-32, as reflected in our analysis of the no-action baseline.

For more information on EPA estimates of operational savings of HD ZEVs compared to HD ICE vehicles, refer to RIA Section 3.6.

19.2 Rebound

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

D. EPA's Cost-Benefit Analysis Is Seriously Flawed In Several Respects

First, EPA has unreasonably obscured many of the costs associated with the proposed rule by labeling them "qualitative[]." 88 Fed. Reg. at 26,068. Calling these costs qualitative enabled EPA to avoid assigning them any dollar value— and thereby omit them from the overall cost-benefit calculation. This tactic violated a clear mandate from the Office of Management and Budget that agencies must use quantitative estimates whenever possible.9 See OMB, Circular A-4 at 10, 26–27 (Sept. 17, 2003); see also Mozilla Corp. v. FCC, 940 F.3d 1, 70 (D.C. Cir. 2019) (per curiam). That is because it was eminently possible for the agency to quantify most of these purportedly "qualitative" costs, as evidenced by EPA itself previously doing so in related contexts and other actors doing so in studies of similar issues. [EPA-HQ-OAR-2022-0985-1660-A1, p. 62]

9 In April 2023, OMB published a set of "proposed revisions" to its guidance on this issue. Request for Comments on Proposed OMB Circular No. A-4, "Regulatory Analysis," 88 Fed. Reg. 20,915 (Apr. 7, 2023) (public comment period ending on June 6, 2023). Until those proposed revisions are "finalized," however, OMB's existing guidance "remains in effect." OMB, Draft Circular A-4, at 1 (Apr. 6, 2023), https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf. Moreover, the revised guidance that OMB has proposed continues to call for "[s]ound quantitative estimates of benefits, costs, and transfers, where feasible," id. at 43, and sets forth criteria for determining whether such estimates are feasible and guideposts for conducting appropriate non-quantitative analyses, id. at 43–47.

For example, EPA declined to quantify any costs associated with "rebound [driving]"—the tendency of drivers to drive more miles in response to enhanced fuel efficiency. 88 Fed. Reg. at 26,072. EPA suggests that this decision was the result of a lack of data on whether the "operational cost savings of switching from a[] [combustion-engine vehicle] to a [zero emissions vehicle]" will result in increased vehicle use in the same way that greater fuel efficiency does. Yet EPA cited numerous studies estimating a rebound effect for heavy-duty vehicles of between 7 and 30 percent. Id. And for this very same effect in the Light and Medium-Duty rule, EPA did produce a concrete estimate, predicting that costs associated with rebound driving, including increased road congestion and noise, would total more than $2.3 billion. 88 Fed. Reg. at 29,383–84. EPA does not explain the discrepancy. Given its experience in calculating costs from the rebound effect and the availability of academic research on the issue, it was unreasonable for EPA to make no effort to calculate rebound costs here. [EPA-HQ-OAR-2022-0985-1660-A1, pp. 62 - 63]

EPA Summary and Response:

Summary:

AmFree comments that many of the costs of the rule are labeled by EPA as qualitative and are therefore unreasonably obscured. They state EPA can quantify most of these costs, citing quantification previously in related contexts and others doing so in similar studies, and therefore EPA is in violation of OMB Circular A-4. AmFree specifically mentions that EPA does not quantify costs associated with rebound driving even though multiple studies that estimate rebound in the HD context are cited, and EPA estimates rebound in the Light- and Medium-duty rule. AmFree comments that it is unreasonable for EPA not to estimate rebound costs in this rule.

Response:

AmFree's comment is significantly misplaced. In the first place, the commenter mischaracterizes what EPA stated. Am Free says "First, EPA has unreasonably obscured many of the costs associated with the proposed rule by labeling them "qualitative." 88 Fed. Reg. at 26,068**.** In fact, what EPA stated at the cited page is that the agency is evaluating certain "impacts" – not costs, as AmFree would have it – qualitatively, namely the possibility of pre-buys, low-buys, or mode shifting due to the proposed rule. In light of the record before the agency, these types of predictive evaluations do not readily admit to quantitative determinations. EPA has evaluated these possibilities carefully, looking to market behavior in anticipation of, and following, EPA's promulgation of other CAA mobile source emission standard regulations. RIA Chapter 6.1. This is not 'obscuring' quantitative information, as the commenter would have it, but a rational means of evaluating and making these types of predictive judgments.

Second, in any case, agencies have discretion whether to evaluate issues qualitatively or quantitatively. See, e.g., *Am. Fuel & Petrochemical Manufacturers v. EPA*, 937 F.3d 559, 584 (D.C. Cir. 2019) ("Certainly [the] EPA must provide a reasoned explanation for its actions, but rationality does not always imply a high degree of quantitative specificity.") (in context of determinations under the Renewable Fuels program); *Nasdaq Stock Mkt. LLC v. Sec. & Exch. Comm'n*, 34 F.4th 1105, 1111 (D.C. Cir. 2022) ("An agency's duty to consider economic impacts does not necessarily require a precise cost-benefit analysis, *see Nat'l Ass'n of Home Builders v. EPA*, 682 F.3d 1032, 1039 (D.C. Cir. 2012); this court has recognized that the Commission 'need not ... base its every action upon empirical data,' *Chamber of Commerce v. SEC*, 412 F.3d 133, 142 (D.C. Cir. 2005), and may reasonably conduct 'a general analysis based on informed conjecture,' *id.* (quoting *Melcher v. FCC*, 134 F.3d 1143, 1158 (D.C. Cir. 1998))".

The commenter's citation to Mozilla v. FCC is likewise misplaced. In that case, the court in fact noted that the agency was not obligated to conform to Circular A-4, and in any case, that the agency had acted consistently with Circular A-4 in making qualitative determinations. Here is the court's entire discussion, which the commenter elided:

> "The notice argument rests on a claim that the NPRM's discussion committed the Commission to a quantitative analysis under OMB Circular A-4. It fails on two grounds: the NPRM made clear that the Commission was not wedded to the idea of following the Circular, and the Circular itself calls for a qualitative analysis under circumstances that the Commission reasonably invoked.
>
> The Commission said in the NPRM that it "*propose*[*s*] to follow the guidelines in Section E * * * of * * * Circular A-4." *NPRM* ¶ 107 (emphasis added). It then added that it was "seek[ing] comment on following Circular A-4 generally" and "on any specific portions of Circular A-4 where the Commission should *diverge* from the guidance provided." *Id.* (emphasis added). "Commenters should explain why particular guidance in Circular A-4 *should not be followed* in this circumstance and should propose alternatives." *Id.* (emphasis added). The passage leaves little doubt that the Commission envisioned possibly deviating from Circular A-4 in

> ways large and small, necessarily including a possibility of electing qualitative analysis even where the Circular contemplates quantitative. Even assuming that the Commission applied a laxer standard than prescribed by the Circular for choosing qualitative over quantitative (see below), notice of such a possible detour was adequate and the Commission's way of proceeding was a "logical outgrowth" of the notice, as suffices under our cases. *See Covad Commc'ns Co. v. FCC*, 450 F.3d 528, 548 (D.C. Cir. 2006); *see also USTA*, 825 F.3d at 700.
>
> Further, although not essential to rejection of this claim, the Commission's ultimate decision to conduct a qualitative analysis appears consistent with the Circular. The latter provides that 'where no quantified information on benefits, costs, and effectiveness can be produced, the regulatory analysis should present a qualitative discussion of the issues and evidence.' OMB Circular A-4 at 10 (2003). The Commission, after finding that "the record provides little data that would allow [the agency] to quantify the magnitudes of many of" the costs and benefits, adopted the qualitative approach, seeking to assess "the direction of the effect on economic efficiency." *2018 Order* ¶ 304; *cf. National Ass'n of Regulatory Util. Comm'rs v. FCC*, 737 F.2d 1095, 1140–1141 (D.C. Cir. 1984) (holding that the Commission had acted within the scope of its "broad discretion" in a context where "no reliable data was available").
>
> Mozilla makes no effort to undermine the Commission's finding that a quantitative analysis was infeasible. In fact, as we will see shortly, its fault-finding (apart from matters addressed elsewhere in this opinion) focuses on exactly the sort of issues on which hard and convincing quantitative data would be difficult to find—the sort of issues that are the basis of the Circular's warning that "[w]hen important benefits and costs cannot be expressed in monetary units," attempting a quantitative cost-benefit analysis 'can even be misleading, because the calculation of new benefits in such cases does not provide a full evaluation of all relevant benefits and costs.' OMB Circular A-4 at 10."

Mozilla Corp. v. Fed. Commc'ns Comm'n, 940 F.3d 1, 70–71 (D.C. Cir. 2019). As in *Mozilla*, and as provided in Circular A-4, issues relating to certain predictive judgments regarding market response to the Phase 3 standards is a situation "where no quantitative information on benefits, costs, and effectiveness" can be adduced. EPA is consequently proceeding in accord with Circular A-4 in evaluating these issues qualitatively.

In response to the commenter stating that we do not estimate rebound costs in the rule, we point out that this is discussed in RIA Chapter 6.3. Specifically, we estimate a rebound effect of zero in this rule; therefore there are no rebound costs. This is a quantitative determination, which the commenter mistakenly asserts EPA did not provide. See 88 FR at 26072 (likewise estimating the effect at zero). We note that no other commenter questioned this determination. That a rebound effect greater than zero exists in the light-duty market does not mean that a comparable effect exists in the heavy-duty market, where VMT is determined by commercial exigencies. In addition, the commenter noted that EPA mentioned that there are a few studies providing quantitative estimates (one of which estimated zero effect), but fails to note our reasonable explanation for not basing a determination on these studies: none examined the effects on VMT of replacing ICE vehicles with ZEVs. See RIA 6.3.

19.3 Uncertainty, including regulatory and technological uncertainty

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

Political uncertainty

Suppliers cannot simply assume that manufacturing and supply costs will reduce to a level that will entice fleet owners to make significant investments in new ZEV trucks. Furthermore, suppliers do not need to look too far back to recall that federal support for a stringent standard may not always continue as planned. EPA assumes that the subsidies now being promised under the IRA will continue under a future Administration or Congress. [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

As recent events have shown, the threat of regulatory ping-pong changing GHG regulations is real and costly. In under four years, the automotive industry was required to respond to the EPA and NHTSA's midterm evaluation, the freezing of those standards in early 2017, the re-issuing of new standards under the Safer Affordable Fuel-Efficient Vehicles Rule (SAFE), the repeal of SAFE a mere 12-months later, and new standards issued at the end of 2021. With sizable opposition to EPA's recent rulemakings in Congress,7 suppliers cannot have reasonable assurance of the future standards that will be applicable, and this can impact investment in new advanced technologies. [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

7 See H.R.2811 - Limit, Save, Grow Act of 2023 and S.J.Res.11 - A joint resolution providing for congressional disapproval of EPAs "Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards".

This very real "political" uncertainty will bring significant risk to the investments made by manufacturers and suppliers. We realize that EPA cannot, and should not, account for political reasoning when planning future standards. EPA can, however, aim to repeat the success of previous rulemakings that brought together numerous industry and regulatory stakeholders. Doing so will produce standards that are supported by those that need to make the investments for future standards to be successful. Without broad support from manufacturers and fleet owners, technology providers will likely face stranded investments. [EPA-HQ-OAR-2022-0985-1571-A1, p. 3]

Technology integration across the U.S. fleet does not happen quickly.

Based on the public statements by manufacturers, EPA is predicting a significant number of BEVs to be available to fleet owners.8 Advanced vehicle technology integrations, however, are historically slow to take effect and fleet owners are reluctant to invest in new vehicles. As EPA is aware, despite emission control technology mandates being set over 20 years ago, almost 50% of the trucks on American roads still operate without emission reduction technology. This is not unique. As indicated in EPA's 2020 Trends Report, "…it has taken, on average, approximately 15-20 years for new technologies to reach maximum penetration across the industry." 9 [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

8 Federal Register / Vol. 88, No. 81 / April 27, 2023 / at 25933

9 EPA 2020 Trends Report at p.63

Eleven years ago, EPA made similar predictions about the increased use of then-available technologies to meet future standards, many of which never came close to EPA's predictions. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

"The agencies believe that advances in gasoline engines and transmissions will continue for the foreseeable future, and that there will be continual improvement in other technologies, including vehicle weight reduction, lower tire rolling resistance, improvements in vehicle aerodynamics, diesel engines, and more efficient vehicle accessories." 10 [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

10 Federal Register / Vol. 77, No. 199 / October 15, 2012 / at 62631

Indeed, fleet owners' acceptance of BEVs is still a question mark for large portions of the country and the Proposal does not fully address this issue. [EPA-HQ-OAR-2022-0985-1571-A1, p. 4]

Organization: American Trucking Associations (ATA)

Stranded assets The fear of making mistakes or committing too early is a common concern when fleets evaluate ZEVs. To many, uncertainty makes fleet electrification seem like a roll of the dice. Of the fleet owners that have been early adopters, they are still determining whether the investment will yield successful results within a payback period that aligns with their expected ROI. In ATA's fleet survey, respondents were asked what the expected payback period is for their current conventionally powered fleet and any electric or hydrogen fuel cell vehicles. Most respondents (73 percent) indicated an expected payback period of 1 to 5 years for conventionally powered vehicles, and 58 percent indicated an expected payback period of more than seven years for electric or hydrogen fuel cell vehicles. Caution about the technology stems from a handful of concerns, including the limited availability of certain technologies at scale, the affordability and accessibility of power to sustain the required duty cycle, and the inadequate investments in capacity by electric utilities. In effect, these factors make it challenging to accurately calculate near- and medium-term returns and present a risk of stranded assets if fleets invest in one brand, configuration, or technology only to discover later another is more suitable for their operation. [EPA-HQ-OAR-2022-0985-1535-A1, p. 13-14] [See Docket Number EPA-HQ-OAR-2022-0985-1535-A1, page 14 for Figure 2].

EPA Summary and Response:

Summary:

The Alliance for Vehicle Efficiency (AVE) comments that the analysis for this rule assumes the subsidies being promised under the IRA will continue under a future Administration or Congress. AVE comments on the regulatory uncertainty that exists with respect to GHG regulations, citing the recent history of the mid-term evaluation, the SAFE rule, and the new Light-Duty vehicle rule all being finalized in under 4 years. AVE comments that, unless the regulation is supported by manufacturers and fleet owners, technology providers will face stranded investments. ATA also comments that there is a risk of stranded assets if companies invest in one specific technology, brand or configuration, only to discover that there is a different one that is more suitable to their needs.

AVE comments that fleet owners are reluctant to invest in new vehicles, stating that almost 50% of trucks on the road are still operating without emission reduction technology, and that EPA's previous projections about increasing penetration of then-available technologies in previous published heavy-duty rules were not met, and that the proposal does not fully address the uncertainty of fleet owners' acceptance of BEVs. ATA also comments that ZEVs have uncertain payback, with results from a fleet survey indicating that more than half of their respondents expect a payback of more than seven years for EVs and FCEVs, compared to 1-5 years for conventional trucks. They state that uncertainty stems from limited availability, affordability and accessibility of power to sustain required duty cycles, and inadequate investment in capacity by electric utilities.

Response:

In response to AVE's comment regarding future uncertainty of GHG regulations and the IRA, we understand that there is uncertainty about what could happen in the future. In general, EPA conducts regulatory analysis based on the assumption that existing laws remain in place and without unduly speculating on future legal changes. With respect to the IRA specifically, the agency's analysis accounts for certain IRA tax credits, including their current sunset dates; that is, EPA's analysis does not assume that a future Congress will renew any IRA tax credits.

Regarding AVE's comments that the proposed regulation will results in stranded assets, and that there is uncertainty in ZEV acceptance, we point to Section C of the Executive Summary to the preamble, where we describe the phase-in of the final standards. As also described in this response and elsewhere in this document, EPA does not mandate how affected entities must meet our standards. In Section II.F. of the preamble and RIA Chapter 2 we illustrate a sample of example potential compliance pathways, all of which include a range of HD vehicles available in the market. Allowing manufacturers to choose technology applications to meet the final rule that best suit their customers' needs allows for a range of pathways that incorporate possible level of uncertainty or HD ZEV acceptance over time. Moreover, even in the agency's modeled potential compliance pathway, a majority of vehicles are ICE for all subcategories.

In response to AVE's comments that EPA's previous projections for adoption of available technologies were not met, we do not mandate how affected entities must meet our standards. Our estimates for each rule are one path that might be used to achieve compliance with our regulations, illustrating the feasibility, costs and benefits of that pathway. They support our assertion that the standards are appropriate. The usual reason that technology may not have been adopted at the rates estimated in our rules is that the affected entities found more optimal ways to comply. This is not a defect of the standards, but an illustration that standards are not constraining private ingenuity while still obtaining needed emission reductions and environmental benefits. See also Section I.C of the preamble and RTC section 2.1 where we discuss the Major Questions Doctrine.

In response to comments on payback uncertainty and sustaining required duty cycles, we refer to Sections 2 and 3 of the RTC.

In response to comments on electric utility investments, we refer to RTC Section 7.

19.4 Vehicle Sales, including pre- and low-buy, fleet turnover and class shift

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Similarly, EPA did not conduct any quantitative assessment of how it expects vehicle sales to change as a result of the heavy-duty rule. See 88 Fed. Reg. at 26,068. This approach, too, is inconsistent with the approach taken in the light- and medium-duty rule, where EPA identified the percentage by which it expected vehicle sales to change as a result of the rule. 88 Fed. Reg. at 29,371. The approach is also unreasonable in light of EPA's other recent proposed heavy-duty vehicle rule, which set criteria-pollutant standards. There, EPA explicitly "outlined a method to quantify sales impact" for heavy-duty vehicles. 88 Fed. Reg. at 4431. EPA offers no explanation for why it did not use some combination of its own tools and the research methods of other actors to evaluate the costs (or benefits) associated with a change in vehicle sales resulting from the rule. [EPA-HQ-OAR-2022-0985-1660-A1, p. 63]

Organization: American Highway Users Alliance

We note that in the NPRM EPA estimates operating cost savings from EVs, and also makes a favorable reference to tax incentives to help meet acquisition costs. ADT's statement, however, presents a different perspective on those issues [EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

The thrust of the statement was that with high initial costs and after purchase concerns, truck purchasers would not support the new EVs but, instead, invest in maintenance and keeping the current fleet going, or invest in somewhat newer but nonetheless used trucks not utilizing EV or other alternate fueled technology. [EPA-HQ-OAR-2022-0985-1550-A1, p. 7]

Based on such statements the benefits of the proposed rule as estimated by EPA appear to be overstated because the fleet will not turn over to EVs as quickly as EPA estimated. [EPA-HQ-OAR-2022-0985-1550-A1, p. 8]

Organization: American Trucking Associations (ATA)

Payback periods concerns

EPA discusses the potential for pre-buys or low buys, which may occur in response to buyers' concerns about higher upfront costs, a higher operational cost, or reduced reliability.16 EPA concludes, "We expect pre-buy and low buy to be very small if they occur at all."17 EPA does not evaluate the potential for an "alternative buy" strategy, however. The prospect of fleets purchasing lower cost conventional vehicles and utilizing lower carbon fueling options, such as renewable diesel or renewable natural gas, is not addressed in the proposed regulation. [EPA-HQ-OAR-2022-0985-1535-A1, p. 12]

16 U.S. Environmental Protection Agency, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3: Draft Regulatory Impact Analysis, EPA-420-D-23-001, pg. 449, April 2023.

17 Ibid, pg. 456

Organization: Bradbury, Steven G.

(Text giving the following bullet points context: Some of the most consequential burdens and negative ramifications of the proposed rules that EPA hides, disregards, or minimizes include the following:)

- Worsening air quality and increasing global carbon emissions. As the EPA touts the environmental benefits it hopes to achieve from the production of more EVs, it ignores the fact that as consumers turn away from new models and the overall U.S. fleet ages, the older cars left on America's highways will produce more smog and other traditional air pollutants that degrade local air quality. And if there truly were an explosion in the sale of EVs, those EVs would need to be charged using electricity produced mostly from fossil-fuel-fired power plants, increasing the national emissions of carbon dioxide.47 EPA largely dismisses this reality based on the wishful claim that America's future power generation will soon shift en masse to wind and solar.48 [EPA-HQ-OAR-2022-0985-2427-A2, p. 17]

47 See Roger Pielke Jr., "The Energy Transition Has Not Yet Started: Global fossil fuel consumption is still increasing," The Honest Broker, June 29, 2023, https://rogerpielkejr.substack.com/p/the-energytransition-has-not-yet; Robert Bryce, "The Energy Transition Isn't: Despite $4.1 trillion spent on wind and solar, they aren't even keeping pace with the growth in hydrocarbons," July 1, 2023, https://robertbryce.substack.com/p/the-energy-transition-isnt.

48 See 88 FR at 29303-04.

Organization: Dana Incorporated

Industry Costs due to the Pre-buy

Past EPA rulemakings have driven significant pre-buys of trucks followed by subsequent drops in orders once a rule takes effect. ACT Research has also projected a significant pre-buy ahead of new heavy-duty vehicle and engine NOx emissions standards taking effect in MY 2027. EPA indicates in the Draft Regulatory Impact Analysis (DRIA) that Inflation Reduction Act (IRA) tax credits should reduce the potential for a pre-buy based on the proposed GHG emissions standards, but Dana and other companies in the industry harbor concerns about a pre-buy driven by the costs of complying with the proposed rules. This pre-buy effect imposes on the industry's ability to adequately supply the higher volume in the previous year to an incremental improvement in emission standards. The increased demand also creates a cost increase for the previous model year. [EPA-HQ-OAR-2022-0985-1610-A1, p. 3]

Organization: Moving Forward Network (MFN) et al.

10. EPA Should Reject Feasibility Challenges Based on the Pre-Buy/Low-Buy Myth

As EPA evaluates the possible effects of this regulation on the sale of heavy-duty ICE and ZEV vehicles, including potential impacts associated with a "pre-buy and low-buy" scenario, it is important that the Agency refer to reputable analyses and literature reviews that have been conducted on this topic, including an analysis conducted by ERM in 2022 to evaluate the connection between the implementation of heavy-duty engine emission regulations and changes in the heavy-duty vehicle (HDV) manufacturing employment, production, and sales. The review found that there was no firm basis for concluding that there is a material pre-buy/low-buy impact on sales, production, or employment as a result of the EPA HDV engine regulations for 2004, 2007, 2010, and 2014. 170 [EPA-HQ-OAR-2022-0985-1608-A1, pp. 81 - 82]

170 ERM. ERM Report: Impact of Engine Regulations on Heavy-Duty Vehicle Manufacturing Employment, Production, and Sales. (2022). https://www.erm.com/hdv-prebuy-report-oct2022/

In particular, this study scrutinized the "pre-buy/low-buy" claim by analyzing prior federal truck regulations to see whether they impacted employment, production, and sales. To test the thesis, ERM compared sales of heavy-duty trucks subject to new regulations to sales of cars and light-duty trucks (LDVs) not subject to new regulations during the same time period. After analyzing four HDV regulations (2004, 2007, 2010, and 2014), the report found no significant impact on employment, production, or sales in any instance and concludes there is no firm basis to claim that truck emissions standards impact sales or employment. [EPA-HQ-OAR-2022-0985-1608-A1, p. 82]

The 2007 HDV standards, which required large technology changes, are often cited by truck manufacturers as displaying pre-buy/low-buy patterns. But the ERM analysis refutes this claim using a difference-in-difference (DiD) econometric model informed with federal, monthly datasets for sales, production, and manufacturing employment of heavy-duty vehicles, automobiles, and light trucks to assess whether past engine regulations impacted the heavy-duty vehicle manufacturing industry. The analysis results found no significant pre-buy/low-buy pattern occurred and determined that demand fluctuations were likely due to factors other than the regulation. As the figure below shows, if a pre-buy/low-buy phenomenon occurred, there would be a significant increase in employment, production, and sales before the regulation came into effect ("Pre"), followed by a commensurate significant decrease in employment, production, and sales once the regulation was implemented ("Post"). That did not occur. [EPA-HQ-OAR-2022-0985-1608-A1, p. 82.] [See Figure 19, DiD Model Coefficients for 2007 Regulation located on p. 82 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

Additionally, a key finding from the report is that a decline in HDV sales appears to be a leading indicator of recessions. This is particularly salient to the 2007 HDV standard. In 2006, economic growth had slowed, and the federal reserve raised interest rates four times in an effort to control inflation. The rate hikes increased financing costs for companies, including truck purchasers. By the start of 2007, the economy was limping along at 1.3 percent growth. Then, in April of 2007, subprime mortgage lender leader New Century Financial Group filed for bankruptcy, precipitating an economic downturn that likely had a much more significant impact on HDV sales than did the 2007 HDV standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 83]

10.1. Macroeconomics Drives the Pace of Truck Sales

As Figure 20 illustrates, during years of a bad economic outlook, companies reduce their spending and investments, including in capital expenditures such as trucks, well before an official recession period begins. In other words, macroeconomics drives the pace of truck sales, not regulations. But regulations are essential to ensure trucks sold to meet exogenous demand pollute less. That being said, if we want to ensure that there is a zero-emission shift in sales and manufacturing, then we need regulations to ensure compliance, accountability, and, most importantly, justice. [EPA-HQ-OAR-2022-0985-1608-A1, p. 83.] [See Figure 20, History of

Class 3 to 8 Truck Sales located on p. 83 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

And as Figure 21 illustrates, We also see that bad economic conditions impacted car sales similarly. The chart below highlights how the LDV sector experienced declining sales starting in 2006 and significantly dropped as economic conditions worsened. So, while trucks had new tailpipe emissions standards at this time, cars did not, but they both saw a similar slump in sales. [EPA-HQ-OAR-2022-0985-1608-A1, p. 84.] [See Figure 21, Historical LDV Sales (1976-2020)located on p. 84 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

10.2. Pre-Buy/Low-Buy is a False Narrative Used to Mislead Policymakers

Using the pre-buy/low-buy myth as a tool to persuade policymakers is part of an ongoing trend by truck manufacturers, especially since the critics pushing this argument suggest that truck regulations impact demand and therefore lead to manufacturing layoffs. Lawsuits filed and then withdrawn against zero-emission truck regulations, aggressive lobbying efforts by the Truck and Engine Manufacturers Association across the country to delay regulations, and misleading information on the state and cost of zero-emission truck technology have become part of an arsenal of tools critics are using to prioritize status quo over public health and the environment. [EPA-HQ-OAR-2022-0985-1608-A1, p. 84]

10.3. Pre-Buy/Low-Buy is Inapplicable to the Agency's Proposal

Even setting aside the above evidence against the existence of a pre-buy around previous tailpipe emissions standards, there is absolutely no reason to suggest that the agency's Phase 3 rulemaking could lead to a pre-buy because of the TCO benefits to fleet operators. As noted in this analysis and in the agency's own analysis, the trucks being put on the road as the result of the NPRM result in direct net benefits to the operator. Even the industry experts proclaiming the existence of pre-buy/low-buy scenarios, touted by manufacturers as part of their disinformation campaign against stronger, more protective emissions standards, acknowledge that greenhouse gas rules like the Phase 3 NPRM would not lead to any such effect. 171 [EPA-HQ-OAR-2022-0985-1608-A1, p. 85]

171 "The way to avoid pre-buys ahead of regulations is to offer cost savings to the operators that would provide a net payback, as is the case with the step-up in fuel economy coming in 2027 under EPA's Phase 2 regulations. … The model did not detect any pre-buying ahead of the Phase 1 GHG regulations beginning in 2014, because improved fuel efficiency more than neutralized the higher upfront vehicle purchase price, ta, finance and insurance costs." in ACT Research. 2022. Pre-buy/Low-buy: Analysis of heavy-duty sector impacts from emissions regulations, prepared for Truck and Engine Manufacturers Association, April 29. EPA-HQ-OAR-2019-0055-1203, Exhibit D.

EPA should reject the pre-buy/low-buy myth and adopt the strongest possible Phase 3 standards to protect public health and curb greenhouse gas emissions. [EPA-HQ-OAR-2022-0985-1608-A1, p. 85]

Organization: National Association of Chemical Distributors (NACD)

While NACD supports reducing greenhouse gas emissions from heavy-duty trucks, we believe that it must be done in a way that is economically realistic. Adopting standards that make trucks excessively expensive will be counterproductive as it will lead to pre-buys of trucks with higher emissions, as seen in previous EPA heavy-duty truck emission rulemakings,2 and wreak havoc on the American economy. NACD urges the EPA to adopt more incremental measures to avoid creating scenarios where upfront costs for heavy-duty trucks rise dramatically. [EPA-HQ-OAR-2022-0985-1564-A1, pp. 2 - 3]

2 Environmental Protection Agency, “Analysis of Heavy-Duty Vehicle Sales Impacts Due to New Regulation,” cfpub.epa.gov, EPA, https://cfpub.epa.gov/si/si_public_pra_view.cfm?dirEntryID=349838&Lab=OTAQ

Organization: NTEA - The Association for the Work Truck Industry

Federal Excise Tax

The federal government levies a 12% excise tax (FET) on the retail sale of new heavy-duty trucks. This tax would apply to any additional costs associated with compliance to the proposed EPA rules. Placing an additional tax burden on what are primarily domestically manufactured trucks will only serve to disincentivize their sale. The best way to reduce emissions is to incentivize the replacement of the oldest trucks on the road. Making new trucks more expensive, via both the actual cost of the new technology and the excise tax on that additional cost, will ensure that older trucks stay on the road longer than is healthy for both the environment and the economy. [EPA-HQ-OAR-2022-0985-1510-A1, p. 3]

Conclusion

EPA has the opportunity to issue a single, nationwide rule that is both reasonable and reduces emissions while allowing manufacturers to continue developing the future of ZEV’s. Issuing a rule in a time-compressed manner that is technologically questionable and increases acquisition costs will simply force fleets to delay the turnover of their oldest trucks and will not efficiently help the environment. [EPA-HQ-OAR-2022-0985-1510-A1, p. 5]

Organization: Truck and Engine Manufacturers Association (EMA)

Class Shifting – EPA has inquired in the preamble about the possibility of class-shifting occurring as a result of the Phase 3 regulation. EPA states that “Class shift occurs when a vehicle purchaser decides to purchase a different class of vehicle than originally intended due to the new regulation. For example, a purchaser may buy a Class 8 vehicle instead of the Class 7 vehicle they may have purchased in the absence of a regulation.” See, 88 Fed. Reg. 26068. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

In this rulemaking, the more likely class shift will come as a result of the higher-capacity axle specs that an OEM must use on a ZEV to accommodate either the shift of more weight onto the front axle in the design of a ZEV, especially with the batteries of a BEV, or the desire to maintain the payload capacity of a vehicle type/application to perform its intended functions. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

The class of a vehicle is defined by its Gross Vehicle Weight Rating (GVWR). That is a summation of the Gross Axle Weight Ratings (GAWRs) for the front and rear axles, and any auxiliary fixed axles (pushers or tags) that may be installed. The weight ratings are defined by the component manufacturer’s rated capacity of the axle, wheels, tires, suspension, and steering gear, for the front axle. For example, a Class 6 vehicle is defined by the range of 19,501 to

26,000 pounds, Class 7 from 26,001 to 33,000 pounds, and Class 8 is greater than 33,000 pounds. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

The specifications for a Class 6 vehicle typically use a 8,000 to 12,000 pound rated front axle and a 10,000 to 14,000 pound rated rear axle. Class 7 vehicles are built with 10,000 to 12,000 pound front axles and 16,000 to 21,000 pound rear axles. Class 8 vehicles' front and rear axles can vary greatly depending on the job that they are intended for. [EPA-HQ-OAR-2022-0985-2668-A1, p. 50]

Class 6 and 7 BEVs can add from less than 500 pounds to more than 8,000 pounds of additional weight as calculated through HD TRUCS. That additional weight on the chassis must be positioned to avoid interference with the vehicle bodies that are installed on trucks. For Class 7 tractors, there is limited chassis space behind the cab, so a substantial portion of the weight must be carried by the front axle. As a result, the OEM may be required to increase the size of the front axle to accommodate the additional weight on the front axle. The resultant increased rating of the front axle components will also cause an upward shift in the class of the vehicle. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 50 - 51]

An upward shift to Class 7 from Class 6 requires the driver to have a commercial drivers license, which decreases the pool of available drivers and increases the wage of the driver. A shift to Class 8 from Class 7 mandates the payment of the 12% FET on the purchase price of the vehicle and associated body and mounted equipment. A class shift is thus a negative for vehicle buyers and can be a deterrent for the purchase of a ZEV. [EPA-HQ-OAR-2022-0985-2668-A1, p. 51]

Organization: U.S. Chamber of Commerce

Potential Unintended Consequences of Slower Fleet Turnover

As indicated above, steady fleet turnover is arguably the most important factor to achieving substantial emissions reductions from the trucking sector. A regulation that adds significant cost or uncertainties could delay this progress. [EPA-HQ-OAR-2022-0985-1583-A1, p. 3]

In particular, we are concerned that EPA's proposal underestimates the lack of infrastructure needed to support the transition to zero-emission heavy-duty vehicles and the associated negative consequences with large scale 'pre-buys' prior to compliance deadlines. While EPA's proposal dedicates attention to this issue, stating that '[p]re-buy and low-buy impact fleet turnover, which can result in a level of emission reduction attributable to the new emission standards that is different from the level of emission reduction EPA estimated would be achieved by the new regulation.' [EPA-HQ-OAR-2022-0985-1583-A1, p. 3]

Slower Fleet Turnover will Reduce Emissions Reductions In Communities that Need it Most [EPA-HQ-OAR-2022-0985-1583-A1, p. 3]

EPA has often used various program elements to incentivize early emissions reductions due to their ability to drive more estimated health benefits. Much like early investments help drive more retirement savings down the road, achieving emissions reductions earlier allows the time value of those health benefits to accrue over a longer period of time, thus providing more cumulative benefits. EPA has applied various incentives through its averaging, banking, and trading programs. Early reduction credits, emissions reduction multipliers, and other incentives help businesses to take steps to reduce their emissions earlier and in the most cost-effective manner. EPA does this recognizing that the benefits of earlier reductions, even if the standards are less stringent, will often outweigh potentially larger benefits achieved at a later date. [EPA-HQ-OAR-2022-0985-1583-A1, p. 3]

EPA Summary and Response:

Summary:

Many commenters, including AmFree, ATA, Dana Incorporated, NACD, and others discussed pre- and low-buy or fleet turnover, including the potential for this rule to spur pre- or low-buy in response to the costs of the rule, and the potential of the rule to slow down fleet turnover. Dana Incorporated commented that increased demand for previous model year vehicles due to pre-buy will lead to an increase in cost of those previous model years vehicles. NACD urges EPA to adopt more incremental measures than those proposed in order to avoid dramatic increases in up-front costs of HD trucks. The U.S. Chamber of Commerce stated that there will be large scale pre-buys with associated negative consequences, and that EPA underestimates those possible effects. However, MFN commented that pre-buy or low-buy are unlikely, citing work done by EPA, as well as comments from industry experts on how to avoid pre-buy ahead of regulations. MFN also pointed out that to support a shift in sales and manufacturing toward zero-emission vehicles, regulations are needed to support compliance, accountability and justice.

Commenters state that EPA should estimate sales effects similar to what was done in the Light- and Medium-Duty Vehicle proposed rule as well as in the previously published HD NOx rule, and the reason for not doing so was not clear in the proposal. Dana Incorporated commented that previous rulemakings have led to significant pre-buy, and that ACT research projected that a significant pre-buy will occur ahead of the HD NOx rule coming into effect in MY 2027.

ATA stated that there is a potential for an “alternative buy” situation, where fleets might purchase lower cost conventional vehicles and use lower carbon fueling options, such as renewable diesel or natural gas instead of the vehicle they would have bought absent the standards. Steven Bradbury states that even under an increasing share of EVs, those EVs would use mostly fossil-fuel based electricity, increasing CO2 emissions nationally, and that EPA dismisses this possibility using “wishful thinking” of increasing wind and solar power generation.

Commenters stated that there will be decreased fleet turnover, leading to an older fleet on average, and higher emissions than EPA estimates. The American Highway Users Alliance states that the estimated benefits in the proposed rule appear to be overstated because adoption of ZEVs will be slower than EPA estimates. They state that instead of adopting EVs, purchasers will invest in maintenance of their current fleet, or in purchasing somewhat newer, yet still used, ICE trucks. Some commenters state that pre-buy will lead to higher emissions than EPA estimates because there will be more higher emission trucks on the road than projected. The U.S. Chamber of Commerce states that benefits of early reductions in emissions often outweigh potentially larger benefits later due to accumulated reductions, and that EPA has applied various incentives to achieve earlier emissions reductions (including averaging, banking and trading). Commenters state that this will impact the communities most in need of emission reductions. NTEA states that the increased up-front costs due to the rule will be higher than EPA estimated in the NPRM due to the excise tax on the retail sales of new, higher cost, HD trucks. The commenter states that the best way to reduce emissions is to incentivize the replacement of the oldest trucks on the road, but the higher cost of the new trucks due to this rule will ensure that older trucks stay on the road longer. NTEA states that the time-compressed manner of issuance of this rule will lead to delayed fleet turnover.

The U.S. Chamber of Commerce states that EPA underestimates the lack of infrastructure needed to support the transition to zero-emission HD vehicles.

EMA commented that the proposed rule would result in class shift, where OEMs will use higher-capacity axles to accommodate either more weight being shifted onto the front axle due to the design of a ZEV, or because they wish to maintain payload capacity with the additional weight due to a battery. The commenter states that class shift is a negative for vehicle buyers and can be a deterrent to purchasing a ZEV. Reasons stated include that shifting a vehicle from Class 6 to Class 7 will reduce the pool of available drivers because Class 7 drivers need a commercial driver's license, as well as increase costs for owners because drivers' wages will increase. The commenter also states that shifting from Class 7 to Class 8 will result in increased costs due to excise taxes on Class 8 vehicles.

Response:

Regarding comments that compare the sales effects estimates in this rule to those used in the previous HD rules, as well as in the LD rules, we do not agree that these comparisons are appropriate. We note that the previously finalized HD2027 rule where we illustrated a pre- and low-buy analysis was not a GHG rule. The cost of GHG-reducing technologies are offset through operating savings, unlike the technologies associated with the HD2027 rule. Thus, we would expect sales effects of this rule to be significantly different from those associated with the HD2027 rule. In that rule, we also did not estimate ZEV penetration at a rate close to those estimated in the modeled potential compliance pathway for this rule. In addition, the methods and research used to support LD sales impacts are not applicable to the HD market. In response to the report cited by Dana Incorporated on possible pre-buy effects, we note that this report was submitted in response to the HD2027 rule, and as stated above, that was not a GHG rule and assumptions and analyses completed for that rule do not necessarily transfer cleanly to this rule. See Section VI.E.1 of the preamble and Chapter 6.1 of the RIA for more information. Chapter 6.1 of the RIA also describes possible impacts on fleet turnover, pre-buy, and low-buy, and the possibility of actual emission effects being different than those estimated as well. See Chapter 4 of the RIA for more information on estimated emission impacts of this rule.

In response to comments that increasing shares of EVs will lead to increased CO_2 emissions, we point the reader to Sections 4.6 and 4.7 of the RIA, where we discuss our analysis of emissions impacts of this final rule and RIA Chapter 6.5 where we discuss electricity consumption impacts. This analysis includes an assessment of possible impacts due to increased electricity demand and refutes the commenter's undocumented assertion to the contrary. In response to comments that the impacts of this rule will impact communities most in need of emissions reductions, we refer to RTC Section 18 and RIA Chapter 5.4 where we discuss the environmental justice impacts of this rule, as well as RTC Section 13 and RIA Chapter 4 where we discuss the emissions impacts of the rule.

Regarding ATA's comments on the possibility of "alternative buy," fleets will purchase vehicles that best suit their needs, given their individual constraints. As we show in preamble Section II.F.3, the performance-based GHG standards can be met with other technologies besides ZEVs. We also expect large numbers of ICE vehicles to remain within the onroad HD fleet during the timeframe of this rulemaking, ensuring that purchasers have access to a large and diverse array of vehicle choices.

In response to commenters, including NACD, who urged EPA to adopt more incremental measures than those proposed, or expressed concerns that this rule is time-compressed and will lead to delayed fleet turnover, we refer to Section II.B.2 of the preamble, where we discuss the final rule and updates made from the proposed rule, including to the phase-in of the final standards. The phase-in of this rule will also support the build-out of infrastructure that will be needed to support an increase in ZEV share of the HD fleet under the modeled potential compliance pathway. Our analysis of infrastructure availability over the time frame of this rule is discussed in RIA Chapter 2.6 and RTC sections 6 and 7.1.

Regarding comments from NTEA and EMA that up-front costs of this rule will be higher than EPA estimated due to excise taxes, we refer to reader to RIA Chapter 3.4 where we describe how we estimate costs for this final rule, including the addition of excise taxes for specific vehicles.

In response to comments from EMA that the rule will lead to class shifting, we refer to our discussion of class shifting in RIA Chapter 6.1, where we discuss that the likelihood of this is low, and that payload capacity is accounted for in our modeling. In general, we expect that our component sizing methodology (see RTC Section 3.3.1) describes ZEVs that can perform as a full replacement for a comparable ICE vehicle as described in RTC Section 3.10, thereby staying within the same class. Discussion of ability to maintain payload capacity as a ZEV can be found in RTC Section 4.6 and RIA Chapter 2.9.1. We disagree that more weight will be shifted onto the front axle, as discussed in RTC Section 4.6. In response to the possibility of reduced driver availability due to this type of class shifting, our modeling does not reflect class shifting that would result in a reduced pool of drivers. In addition, we note that electrification may lead to improved driver retention, as discussed in RIA Chapter 6.4. Similarly, as we disagree that there will be a shift from Class 7 to Class 8, we disagree that there will be increased costs due to excise taxes on Class 8 vehicles. Finally, we note that some class shift could result due to purchaser preference alone, which would not be a change attributable to the Phase 3 rule.

19.5 Purchaser Acceptance

Comments by Organizations

Organization: American Trucking Associations (ATA)

ATA's TMC Fleet Survey respondents see promise in ZEV technology but most rate serious dissatisfaction as it exists today. Eighty-three percent are dissatisfied with cost, 65 percent with range, and 58 percent with charge times. Seven to ten percent of respondents were satisfied or greatly satisfied in five of the six categories presented (range, serviceability, charging times, maintainability, and durability)8. No respondents were satisfied or greatly satisfied with the cost. In qualitative feedback provided to ATA through the survey and interviews, fleets said they need validation to ensure that ZEVs will deliver the cost and operational efficiencies they see with current ICEVs. The negative experiences of product delays, challenges related to local electric utility under-capacity and distribution, and the under-specification of BEV products to meet current operational capacity and payload requirements strongly deter potential early adopters from placing ZEV purchase orders. [EPA-HQ-OAR-2022-0985-1535-A1, p. 7] [See Docket Number EPA-HQ-OAR-2022-0985-1535-A1, page 7 for Figure 1].

7 U.S. Environmental and Protection Agency, Greenhouse Gas Emissions Standards for Medium-Heavy Duty Vehicles-Phase 3, Draft Impact Regulatory Analysis, pg. 242, April 27, 2023.

8 Refer to appendix 1 Technology and Maintenance Council Greenhouse Gas Phase 3 Member Survey (2023), June 16, 2023.

During our conversations with fleets, a few brought up their strategy not to be early ZEV adopters due to past experiences with early-stage selective catalytic reduction (SCR) and exhaust gas recirculation (EGR) technologies. Early adoption of generations one and two of SCR and EGR technology left lasting financial scars and impressions carried forward today as fleets evaluate the reliability of any new technologies and the difficulty of maintaining uptime. Their experiences of unvalidated technologies being rushed to the market to meet regulatory requirements left lasting impressions that real-world mileage is more valuable than in-lab testing. [EPA-HQ-OAR-2022-0985-1535-A1, p. 8]

Organization: Bradbury, Steven G.

Some of the most consequential burdens and negative ramifications of the proposed rules that EPA hides, disregards, or minimizes include the following:

- Stifling consumer choice at the dealership. Many of the vehicle models most popular with American families will no longer be sustainable under the EPA's proposed rules. Automobiles have long been America's favorite freedom machines. When the models of ICE vehicles Americans love the most disappear from dealerships, that will represent an enormous drop in consumer welfare (in basic happiness and wellbeing) for the average American family and for the U.S. economy as a whole. For many of these ICE vehicle models, there is no EV option likely to be available that could provide the same performance, utility, or recreational value at a comparable price (or at all). EPA makes no real effort to quantify this generational loss of consumer welfare. [EPA-HQ-OAR-2022-0985-2427-A2, p. 15]

Organization: Clean Air Task Force et al.

2. Purchaser acceptance of HD ZEVs is not a barrier to feasibility because interest in purchasing HD ZEVs is widespread and growing.

Purchaser preferences here generally align with the most economically advantageous compliance pathway (increasing the deployment of zero-emission technologies within the heavy-duty fleet) toward meeting strong emission standards that fulfill EPA's statutory mandate. HDV purchasers have shifted and are continuing to shift toward acceptance of—and, increasingly, preference for—ZEVs. As several OEMs have themselves explained, "[r]educed interest in legacy products due to technology advancements and consumer preference shifts are an inevitable reality of the market and occur in all sectors of the economy." See Initial Brief for Industry Respondent-Intervenors at 13-14, State of Ohio et al. v. EPA, No. 22-1081 (D.C. Cir.

Feb. 13, 2023). Here, as ZEV technology advances and the public health, fleet operator, and driver-experienced benefits become apparent, preferences are naturally shifting away from diesel trucks and toward ZEVs, for both purchasers and operators. EPA correctly explains that "[w]hen it comes to HD ZEVs, we are seeing increasing demand for, and increasing investment in, ZEV technology in the absence of the proposed standards," DRIA at 417, and more stringent standards that encourage manufacturers to provide more HD ZEV options will further drive purchaser acceptance and "lead to an increase in the adoption of HD BEVs and FCEVs." Id. [EPA-HQ-OAR-2022-0985-1640-A1, p. 69]

Most HDVs are purchased by principals or fleet managers who are not the ultimate operators of the vehicles. See 88 Fed. Reg. at 26071. Thus, when considering demand and acceptance in the context of HDVs, both fleets and drivers are relevant parties. Recent actions by and statements from fleet managers, corporate fleet operators, and drivers indicate strong and growing acceptance of and demand for HD ZEVs from both groups. A 2018 survey of fleet managers listed "sustainability and environmental goals" as the primary motivator for transitioning to ZEVs, with "lower cost of ownership" as the second most important factor.300 In fact, "[l]arge corporate fleets are responsible for much of the early momentum in commercial [medium- and heavy duty vehicle] fleet electrification…driven by corporate sustainability commitments and a desire to achieve operational savings."301 These cost and sustainability motivations exist independent of regulatory requirements and support the expectation that HD ZEV uptake will continue to grow in all states—including those that have not yet adopted more stringent regulations—in a business-as-usual scenario. Support for HD ZEVs will grow further in response to standards that encourage greater availability of various ZEV options. [EPA-HQ-OAR-2022-0985-1640-A1, p. 69]

300 Nadel & Huether, at 10–11. See also 87 Fed. Reg. at 17596.

301 NESCAUM, Action Plan, at 17.

The HDV industry is also developing models and strategies to support fleets in deploying HD ZEVs. For example, the industry has begun to develop a Trucks-as-a-Service (TaaS) model that "aims to make it easier and faster for fleets to tap into electric trucks and all it takes to acquire, charge, and run them (including maintenance in some cases) via a single provider on a monthly 'subscription' fee basis."302 This framework is based on the existing Software-as-a-Service model developed for the software industry, and services are already in place providing access to trucks along with the costs of charging infrastructure, installation, and maintenance.303 [EPA-HQ-OAR-2022-0985-1640-A1, p. 70]

302 David Cullen, Trucks-as-a-Service Model to Help Drive EV Adoption by Fleets, HD Truckinginfo (June 2, 2023), https://www.truckinginfo.com/10200014/trucks-as-a-service-model-to-help-drive-ev-adoption-by-fleets.

303 Id.

Recent significant commitments by corporations operating heavy-duty fleets underscore the growing acceptance of and demand for ZEVs. Several corporate commitments include aims to reduce carbon emissions by one-third to one-half by 2030.304 Amazon, PepsiCo, and Walmart all plan to reach net zero carbon emissions across their businesses by 2040, including in their long-haul tractor operations.305AT&T plans to be carbon neutral even earlier, by 2035.306 Anheuser-Busch plans to reduce carbon emissions by 25 percent by 2025, and FedEx is committed to 50 percent of its pickup and delivery fleet purchases being electric by 2025 and 100 percent by 2030.307 Interest in developing HD ZEV fleets is far-ranging, evidenced by the fact that over 230 different commercial fleets have either ordered or deployed HD ZEVs.308 Additionally, at least 77 commercial fleets, both large and small, have announced fleet-level commitments to increased ZEV penetration and/or reduced carbon emissions.309 In a recent survey of nearly 250 U.S.-based fleets that have used clean fuels and vehicles, nearly 85 percent said that their use of clean vehicle technologies would grow over the next five years.310 [EPA-HQ-OAR-2022-0985-1640-A1, p. 70]

304 EDF, Electric Fleet Deployment & Commitment List.

305 Id.

306 Id.

307 Id.

308 Id.

309 Id.

310 Jack Roberts, On the Glide Path to Net Zero, HDT Truckinginfo (May 10, 2022), https://www.truckinginfo.com/10170224/on-the-glide-path-to-net-zero.

A recent report described as a "technology-neutral analysis," based on a survey of 225 fleet operators and decision makers, found that "BEV interest by fleets has grown to become the highest among clean drivetrains in the State of Sustainable Fleets survey, and it is spreading across a broad range of fleet types."311 This report, sponsored by the HD trucking industry itself (including Penske, Daimler Truck North America, and Dana), found very strong interest in ZEVs. According to survey respondents, 65 percent of surveyed fleets have used a BEV in the past two years and 92 percent of fleets with BEVs intend to grow their use in the next five years.312 The report also noted that "[f]or the first time among the technologies studied in this report, [BEV] use reached at least 50% of respondents in all 11 of the applications—called 'fleet types'—tracked in the annual survey."313 The report called interest in BEVs "high and broad."314 [EPA-HQ-OAR-2022-0985-1640-A1, p. 70]

311 Gladstein, Neandross & Associates, State of Sustainable Fleets, at 1, 10.

312 Id. at 10.

313 Id.

314 Id.

Another 2023 survey of 110 U.S. fleet professionals found that 54 percent of fleets surveyed have ZEVs already in their fleet or on order.315 More than half of those surveyed expect customers to demand increased fleet sustainability initiatives over the next 1-3 years in order to continue business, and 66 percent of fleet managers reported that they plan to invest more in sustainability initiatives over the next three years, with only 3 percent planning to invest less.316 And a 2021 survey by Ceres Alliance—whose members include "industry giants like Amazon, Best Buy, DHL, Hertz, Schindler Elevator, T-Mobile, and UNFI (United Natural Foods Inc.), and who collectively represent more than $1 trillion in annual revenue and own, lease, or operate over 1.3 million on-road fleet vehicles in the U.S. alone"—found that, in the next five years, its companies plan to purchase at least 42,000 ZEV cargo vans, 5,000 step vans, 5,000 box trucks, 2,000 utility trucks, and 6,000 Class 8 tractors.317 Ceres Alliance called the demand for commercial BEVs “significant” and “substantial.”318 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 71]

315 Geotab, Geotab “Greening the Fleet” Survey Reveals the Key Benefits of Investing in Sustainability (Apr. 27, 2023), https://www.geotab.com/press-release/fleet-sustainability-survey/.

316 Id.

317 Ceres, New Corporate Electric Vehicle Alliance Survey on Commercial EVs Establishes a Clear Demand Signal and Roadmap for Manufacturers Looking to Compete in Global Vehicle Market 1, 6-7 (2022), www.ceres.org/sites/default/files/reports/2022-01/Ceres%20Analysis%20New%20Corporate%20Electric%20Vehicle%20Alliance%20survey.pdf.

318 Id. at 1.

Interest in HD ZEVs is so high at least in part because many ZEV attributes make them more appealing than their conventional counterparts. First and foremost is cost, and EPA explains that pressure and strong incentives to reduce operating costs will encourage purchasers to identify and rapidly adopt new vehicle technologies that do so. DRIA at 421. As EPA notes, and section III.B.4 of these comments explains, virtually all categories of HD ZEVs are expected to have a lower TCO when compared to combustion vehicles in the very near future, if not already. 88 Fed. Reg. at 26071. EPA explains that “[p]otential savings in operating costs appear to offer HD vehicle buyers strong incentives to pay higher upfront prices for vehicles, such as ZEVs, that feature technology or equipment that reduces operating costs.” DRIA at 417. The IRA and BIL incentives explained in section III.B.5 of these comments are also accelerating the cost favorability of HD ZEVs. Because HDVs are generally operated in the business context, there are likely fewer considerations beyond the bottom line that factor into purchaser acceptance and demand. As RMI explains, “for most fleets, cost is the driving concern; once electric trucks make the most economic sense for fleets, they increasingly adopt them.”319 [EPA-HQ-OAR-2022-0985-1640-A1, p. 71]

319 Kahn et al., The Inflation Reduction Act

Second, ZEVs have many additional attributes that appeal to drivers and operators. RMI has recognized that “[a] truck is also an office,” explaining that “[t]he operator has to be happy being in the cab, or else they just quit. Driver retention is a huge problem in trucking.”320 But research by RMI and NACFE has made clear that “drivers love electric trucks.”321 NACFE research sponsored by PepsiCo, Cummins, and Shell found that electric trucks are quieter (“no need to crank up the radio and drivers can hear what’s going on around them”); offer better visibility and cleaner, simpler operation; have smoother torque; have superior air conditioning; and “d]riving in traffic seems easier and safer” 322 Members of the trucking industry have made the following positive comments about HD ZEV operation:

- “They don’t vibrate, they don’t smell, they accelerate properly, so you’re not constantly the slow one in traffic off a red light. Drivers don’t come home at the end of the day and feel exhausted or feel like they’ve been operating a jackhammer for the past eight hours.”323
- “The truck is so quiet, everything is smooth. It gives you time to focus on what’s going on around you. With the diesel trucks there’s rattling, there’s driver fatigue, things you

don't even know are going on. But as soon as I got in the electric truck, I realized this is the way of the future."324

- "EVs won't tow your boat? This beast will actually tow a bloody big boat, and a gross load of up 44 tonnes. And it will do so with ease. It will also do it in relative silence, with no crunching of gears, no loud braking, and no emissions . . . . These huge machines are remarkably simple to drive. First of all, they are quiet. If you are outside, the noise reduction is 50 per cent [sic]. If you are inside, the noise reduction is nearly one-third. That means a lot for the community, and for the well-being and working conditions of the driver."325
- "I've had a positive experience and enjoyed driving the truck. It's a whole different experience and it's a step up . . . . Driving the electric truck is smooth, quiet and it doesn't shift, so it's smooth from the take off . . . . The only noise you hear is the little whine from the motors, the tires rolling down the road and your radio. You kind of get used to it after a while and have to get back in the diesel to really notice the difference again . . . . You're helping the environment and the electric is definitely smoother and quicker."326
- "The guys love it, because it's like a Tesla. The truck is quiet."327
- "I can't help but think that EVs may be a great way to attract the next generation of both drivers and technicians. The fact that EVs are 'clean' is a big plus; the fact that they are 'cool' might just be the boost we need to put the driver and technician shortages to bed."328 [EPA-HQ-OAR-2022-0985-1640-A1, pp. 71 - 72]

320 Laurie Stone, Reality Check: Electric Trucks Are Viable Today, RMI (May 25, 2022), https://rmi.org/reality-check-electric-trucks-are-viable-today/.

312 Id.

322 NACFE, Run on Less – Electric: Drivers Love Electric, Run on Less, https://runonless.com/videos/drives-love-electric/ (last visited June 15, 2023).

323 Comment by RMI Principal Dave Mullaney. Laurie Stone, Reality Check: Electric Trucks are Viable Today, RMI (May 25, 2022), https://rmi.org/reality-check-electric-trucks-are-viable-today/.

324 Comment by Donald Disesa, driver for Penske. id.

325 Giles Parkinson, "Not Like Anything I've Tried Before:" First Drive of Volvo's Heavy Duty Electric Truck, The Driven (Sept. 19, 2022), https://thedriven.io/2022/09/19/like-nothing-ive-tried-before-first-drive-of-volvos-heavy-duty-electric-truck/ (comments regarding Volvo's FH long-haul HD truck).

326 The Schneider Guy, Schneider Driver Tests New eCascadia Electric Semi-Truck, Schneider, https://schneiderjobs.com/blog/driver-tests-ecascadia-electric-semi-truck (last visited June 15, 2023) (comments by Marty Boots, Schneider truck driver since 2017 and diesel technician for 30 years, who drove the Freightliner eCascadia for three months).

327 Rob Verger, Electric Garbage Trucks Are the Quiet, Clean Titans of Waste Collection, Popular Science (Aug. 18, 2021), https://www.popsci.com/technology/nyc-sanitation-acquires-mack-electric-garbage-trucks/ (comments of Rocky DiRico, deputy commissioner with New York City's Department of Sanitation, on Mack's electric garbage truck).

328 Comment by Gino Fontana, COO and EVP at Transervice Logistics Inc., and prior VP of operations at Berkeley Division and Puerto Rico. He has "more than 35 years of experience in the transportation and logistics industry with both operational and sales experience." See Gino Fontana, Preparing Trucking to Safely Service Electric Vehicles, Fleet Maintenance (May 26, 2023), https://www.fleetmaintenance.com/shop-operations/employees-and-training/article/53061731/preparing-trucking-tosafely-service-electric-vehicles.

Moreover, as the number of HD ZEVs on the road continues to grow, and more drivers and fleet managers are exposed to their benefits, interest in and demand for these vehicles will inevitably increase. Analysis from the light-duty sector suggests that once 5 percent of a country's new car sales are electric, the country has reached an "electric-car tipping point" which "signals the start of mass EV adoption, the period when technological preferences rapidly flip."329 The reason for this "tipping point" is that technologies generally follow an S-shaped adoption curve.330 "Sales move at a crawl in the early-adopter phase, then surprisingly quickly once things go mainstream . . . . In the case of electric vehicles, 5% seems to be the point when early adopters are overtaken by mainstream demand. Before then, sales tend to be slow and unpredictable. Afterward, rapidly accelerating demand ensues."331 Along the same lines, "studies show that increasing knowledge and exposure to these [ZEV technology] vehicles results in lasting, positive impressions."332 [EPA-HQ-OAR-2022-0985-1640-A1, p. 73]

329 Tom Randall, U.S. Crosses the Electric-Car Tipping Point for Mass Adoption, Bloomberg, at 1 (July 9, 2022).

330 Id. at 2.

331 Id at 3.

332 CARB, California's Advanced Clean Cars Midterm Review, Appendix B: Consumer Acceptance of Zero Emission Vehicles and Plug-In Hybrid Electric Vehicles B-2 (2017), https://ww2.arb.ca.gov/sites/default/files/2020-01/appendix_b_consumer_acceptance_ac.pdf.

While essentially all of the research in this area has been in the light-duty sector, as that sector is further along the ZEV adoption S-curve, it still holds lessons for HD ZEV adoption. This light-duty data shows that some consumers have no interest in purchasing a ZEV simply because they lack information about the characteristics of ZEVs. Consumer preference for ZEVs increases as exposure to ZEVs increases. And there is considerable research—including in peer-reviewed academic journals—showing that when consumers learn about ZEVs, they are more likely to indicate interest in purchasing one. A study considering hybrid electric vehicle adoption—which "can be used as a proxy for future PEV [plug-in electric vehicle] adoption"—found that there is a strong "direct neighbor effect" by which each consumer's hybrid electric vehicle-adoption decision can be influenced by the hybrid electric vehicle-adoption decisions of geographic neighbors.333 Another study, using a survey of vehicle customers in California and a spatial and statistical analysis, found that having more neighbors and work colleagues who have BEVs increases ZEV adoption.334 Yet another study using very rich data from Sweden found the same result: having more neighbors and work colleagues who drive BEVs increases BEV adoption. This study also explored reasons for the effect, finding that information transmission is likely very important.335 Another literature review regarding consumer adoption of BEVs found that social interactions can influence BEV adoption.336 While these studies all looked at ZEV adoption in the LDV context, the general principles likely can be extrapolated to the HD sector. As drivers of HDVs meet and converse with their colleagues throughout the nation, they will continue to learn about the benefits and advantages of HD ZEVs. This "neighbor effect" should be expected in the HD sector as well. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 73 - 74]

333 Xiaoli Liu et al., Spatial Effects on Hybrid Electric Vehicle Adoption, 52 Transp. Rsch. Pt D: Transport & Env't 85, 95 (2016), https://www.osti.gov/pages/biblio/1346139.

334 Debapriya Chakraborty et al., Plug-In Electric Vehicle Diffusion in California: Role of Exposure to New Technology at Home and Work, 156 Transp. Rsch. Pt. A: Pol'y & Practice 133, 148 (2022).

335 Sebastian Tebbe, Peer Effects in (Hybrid) Electric Vehicle Adoption (working paper), at 37 (2023), https://sebastiantebbe.github.io/files/YST_Paper.pdf

336 Makena Coffman et al., Electric Vehicles Revisited: A Review of Factors that Affect Adoption, 37 Transp. Revs., 79, 86, 88 (2017).

Survey data from the light-duty sector also supports this point. A Consumer Reports survey found that for all groups of consumers, "experience with EVs strongly correlated to interest in purchasing or leasing an EV."337 The survey found, for example, that "Americans who are more likely to say that they will buy/lease an electric-only vehicle if they were to get a vehicle today have had more exposure to them. They see them where they live and have friends, relatives, or co-workers who own one."338 In fact, 71 percent of those who said they would definitely buy or lease a ZEV if they were getting a vehicle today had seen ZEVs in their neighborhood, compared to 44 percent of all Americans.339 "There is also a strong relationship between having some personal experience with an electric-only vehicle and the likelihood of buying or leasing one. Just seventeen percent of all Americans have been a passenger in an electric-only vehicle in the past 12 months; this is compared to 39% of people who say they would definitely buy or lease an electric-only vehicle if they were to buy/lease a vehicle today. Similarly, only seven percent of Americans have driven one in the past 12 months, whereas 20% of those who would definitely buy/lease one have driven one."340 Additionally, two surveys commissioned by the Consumer Federation of America to study consumer attitudes toward ZEVs, administered in Aug. 2015 and 2016, found that the more consumers know about electric vehicles, the more positive their attitudes towards them and the more likely they are to consider purchasing one.341 [EPA-HQ-OAR-2022-0985-1640-A1, p. 74]

337 Consumer Reps., et al., Survey Says: Considerable Interest in Electric Vehicles Across Racial, Ethnic Demographics: Smarter Policies Can Help Overcome Barriers 2 (2022), https://www.ucsusa.org/sites/default/files/2022-09/ev-demographic-survey_0.pdf.

338 Consumer Reps., Battery Electric Vehicles & Low Carbon Fuel Survey: A Nationally Representative Multi-Mode Survey 7 (2022), https://article.images.consumerreports.org/image/upload/v1657127210/prod/content/dam/CRO-Images-2022/Cars/07July/2022_Consumer_Reports_BEV_and_LCF_Survey_Report.pdf.

339 Id.

340 Id. at 8.

341 Consumer Fed'n Am., Knowledge Affects Consumer Interest in EVs, New EVs Guide to Address Info Gap (Oct. 29, 2015), https://consumerfed.org/press_release/knowledge-affects-consumer-interest-in-evs-new-evs-guide-to-address-info-gap/; Consumer Fed'n of Am., New Data Shows Consumer Interest in Electric Vehicles Is Growing (Sept. 19, 2016), https://consumerfed.org/press_release/new-data-shows-consumer-interest-electric-vehicles-growing/.

Finally, where there are concerns or hesitancies expressed by HD purchasers, it is clear that these are not insurmountable barriers to significant levels of HD ZEV adoption at least as protective of public health and welfare as the ACT Rule, implemented nationwide. Some reports and surveys have noted that purchasers may hesitate to invest in HD ZEVs due to concerns related to supply chain disruptions, costs, infrastructure ability, or range.342 But as section III of these comments makes clear,343 none of these potential concerns present a barrier to greater HD ZEV deployment, particularly at the volumes expected in connection with the Phase 3 standards. Even with standards at least as protective as to the ACT Rule implemented nationwide, conventional HDVs will remain available for purchase, and therefore purchaser acceptance should not be a constraining factor for that level of stringency. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 74 - 75]

342 See Gladstein, Neandross & Associates, State of Sustainable Fleets, at 10; Geotab, Greening the Fleet: A Sustainability Survey of U.S. Fleet Managers 10 (2023), https://www.geotab.com/CMS-GeneralFiles-production/NA/ebooks/Geotab_Greening-the-Fleet-Survey_EN_AODA.pdf%20%5BPUBLIC%5D.pdf.

343 Specifically, see section III.B.4 (regarding ZEV costs) and sections III.C.1.a–c (regarding battery prices, charging and grid infrastructure, and critical minerals supply).

Organization: Moving Forward Network (MFN) et al.

9.4. Stronger Zero-emission Truck Standards are Reasonable Because Purchasers and Fleets Will Be Attracted to the Fuel Cost Savings and Relief from the Volatility of the World Oil Market

EPA requests comment on data related to consumer acceptance of HD ZEVs. 166 A survey of nearly 20,000 EV drivers reveals "Saving Money on Fuel Costs" is the single biggest motivator of EV purchase decisions as shown in Figure 16. [EPA-HQ-OAR-2022-0985-1608-A1, p. 79.] [See Figure 16, Most Important Reason to Acquire an EV located on p. 79 of docket number EPA-HQ-OAR-2022-0985-1608-A1.]

166 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. (2023). p. 462 https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

167 California Clean Vehicle Rebate Project. EV Consumer Survey Dashboard, Q15. https://cleanvehiclerebate.org/sites/default/files/attachments/CVRPConsumerSurvey2013-15Reference.pdf. (last accessed: September 14, 2022)

And if that motivation holds for individual consumers, it would likely ring even more true for fleet managers who track operating costs more diligently than most households. [EPA-HQ-OAR-2022-0985-1608-A1, p. 79]

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

Additional Impediments to Electrifying Trucks

There is little indication that HD electric trucks will make economic sense for commercial trucking companies in ten years' time, even if refueling concerns are mitigated. Nearly 80% of long-haul truck drivers say they would 'never add an electric vehicle to their fleet.'12 If electric trucks do not provide a return on investment to the vehicle owner, it will result in the transfer of costs to the consumers and communities these vehicles service. Further, if new vehicle costs result in a reduction in the rate of vehicle replacement, legacy vehicles will remain in operation for a prolonged period of time, slowing progress on reducing emissions with newer vehicles. [EPA-HQ-OAR-2022-0985-1603-A1, p. 6]

12 Tyson Fisher, LAND LINE, 'Most truckers have no interest in electric trucks, survey reveals' (Apr. 11, 2023), available at https://landline.media/most-truckers-have-no-interest-in-electric-trucks-survey-reveals/#:~:text=Truckers%20do%20not%20appear%20to,they%20will%20within%20five%20years.

HD trucks currently are responsible for moving 72% of the U.S. economy's freight.14 The implications for the cost and efficiency of moving goods by electric truck will create large cost increases for virtually all goods sold in the United States and challenge the supply chains needed to get those goods to market. EPA must account for these consequences in the Proposed Rule. [EPA-HQ-OAR-2022-0985-1603-A1, p. 6]

14 Bob Costello, American Trucking Associations, 'Economics and Industry Data' available at https://www.trucking.org/economics-and-industry-data.

Organization: National Automobile Dealers Association (NADA)

III. The Phase 3 GHG standards must be affordable and must not compromise performance.

A. Background on HDV sales and marketplace.

HDV customers are vastly different than light-duty customers in that new HDVs are primarily sold to businesses and to government fleets. Those customers range widely from large and sophisticated fleets running many vehicles and vehicle classes to a single owner/operator running one truck. And, unlike for light-duty vehicles, HDVs are highly customizable to meet the needs of customers who often spec engines and other major components from a variety of manufacturers with no single one having complete dominion over the finished product. For prospective HDV buyers, choosing the right HDV is crucial to maximizing operational efficiency and to ensuring business profitability. Thus, all new HDVs potentially covered by the Phase 3 GHG proposal have a work purpose that must be met through unique design, specification, ordering, and manufacture processes. Every customer's needs are different. [EPA-HQ-OAR-2022-0985-1592-A1, p. 4]

In years of high HDV sales, only a few hundred thousand new units are built for sale nationwide. This number pales in comparison to the 10-17 million new light-duty vehicles sold nationwide each year. Moreover, unlike for most new light-duty purchases, prospective new HDV buyers are businesspersons who carefully consider both the upfront cost of vehicle features, the costs of operation (e.g., fuel efficiency, range, payload), and vehicle resale values, especially when credit is tight and/or freight rates and profit margins are low. Fuel is the number one variable cost for the trucking industry. In fact, most new HDV customers focus on fuel efficiency once they have determined which vehicle and drivetrain features are essential to meet their specific business needs. Consequently, the final rule must leverage, not resist, the fact that acceptable total cost analysis (TOC) and return on investment (ROI) is critical to new HDV purchasers. [EPA-HQ-OAR-2022-0985-1592-A1, p. 5]

Organization: U.S. Chamber of Commerce

Ensuring Sufficient Implementation Time will Increase Market Adoption of Cleaner Technologies

Technological feasibility and compliance costs go hand-in-hand. Establishing standards that are technologically feasible will help ensure that standards are achievable and cost-effective. Although the agency views these standards to be technology forcing, the adoption of those technologies in the marketplace will in significant part depend upon the increased cost to consumers for the new vehicles. Other aspects of the design and successful deployment of new technologies needed to meet more stringent environmental standards can sometimes be difficult for companies and the agency to anticipate. [EPA-HQ-OAR-2022-0985-1583-A1, p. 3]

Many companies are investing significantly in zero emitting medium- and heavyduty vehicles across various vehicle classes; however, overcoming consumer acceptance is one challenge that is difficult to anticipate and to model. This is a particularly important issue when considering major shifts in technology or compliance costs as mentioned above. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

Consumers and fleet owners that choose to adopt electric vehicles will need to consider the cost and time needed to install recharging infrastructure at appropriate distances across their distribution supply chains to avoid disruptions. A cost that also should be considered is the optimization of these distribution routes as companies spend significant resources on optimizing their supply chains to reduce operating costs. [EPA-HQ-OAR-2022-0985-1583-A1, p. 4]

EPA Summary and Response:

Summary:

Steven Bradbury provided comments pertaining to GHG standards on light- and medium-duty vehicles which are out of scope for the HD Phase 3 rule. Within the scope of the HD Phase 3 rule, Mr. Bradbury commented that EPA is ignoring/downplaying reduced choice at the dealership due to fewer ICE vehicles models and makes no real effort to quantify consumer welfare loss due to reduced vehicle choice.

ATA commented that, based on a survey, fleet owners are dissatisfied with ZEV technology as it exists today. However, ATA also noted that many respondents were satisfied with many qualities of ZEV technology, though none were satisfied with cost of the technology. ATA also commented that product delays, electric utility distribution issues and BEV products unable to meet current needs deter potential purchases. ATA commented that negative experiences for some fleets with early adoption of previous technologies to meet regulatory requirements, including SCR and EGR, are leading some fleets to plan on delaying adoption of ZEV technologies until they are more proven in the market.

Clean Air Task Force, et al. says that HDV purchasers are increasingly showing acceptance for ZEVs in part due to technology advancements. They cite a survey of fleet manufacturers from 2018 that says sustainability and environmental goals is the primary motivator for purchasing a ZEV, with the second most important factor being the lower cost of ownership. These factors exist outside of the regulations being introduced and CATF expects support for HD ZEVs to continue to grow, regardless of the outcome of the regulation. CATF discusses the development of a "Trucks-as-a-Service" model, with a goal of increasing the ability of fleets to use electric trucks, including getting the trucks and charging them, through the use of a subscription service. CATF also points to recent commitments by large corporations, including Amazon, PepsiCo and Walmart, to reduce carbon emissions, including in long-haul tractor operations and delivery trucks. The HD trucking industry sponsored a report that found strong interest in ZEVs within the industry. Two additional, separate, surveys found that many fleets have a ZEV either in their fleet, or on order, with the majority of respondent indicating they plan to invest more in sustainability over the next three to five years.

CATF states that interest in ZEVs is, in part, due to the reduced operating costs of ZEVs compared to ICE trucks, and, as CATF states, that costs are a prime consideration for fleets. ZEVs are also appealing to drivers due to quieter operations, better visibility, smoother ride, and faster accelerations, with research also indicating that driving in traffic is easier and safer. CATF comments that information from the LD sector can inform understanding of ZEV adoption in the HD market, including that experience with, and exposure to, HD ZEVs will lead to increased demand for ZEVs. CATF comments that, concerns HD purchases have expressed are not insurmountable barriers to ZEV adoption, stating that ICE HD vehicles will remain available for purchase.

The Moving Forward Network (MFN) comments that the results of a survey of EV drivers revealing that fuel cost savings was the biggest motivator in purchasing an EV should be even more true for fleet managers, who are more concerned with operating costs than most households.

NADA commented that HD and LD customers are different – HD vehicles are primarily sold to businesses and range from single truck with a single owner/operator to large and sophisticated fleets. They also make the point the HD vehicles are customized to the needs of the purchaser, and HD buyers will choose the vehicles that maximizes operational efficiency and business profitability, considering upfront costs, operational costs and resale values. NADA states that most new HD vehicle customers focus on fuel efficiency once the determination of vehicle and drivetrain features has been made. NADA comments that understanding the total cost analysis and return on investment analyses and leveraging them is critical to the final rule.

The National Association of Convenience Stores, et al. (NACS), state that commercial trucking companies will not choose HD electric trucks even ten years in the future. They also state that electric HD vehicles will lead to large cost increases leading to challenges in the supply chain for goods being moved, and if there are no returns on investment, the costs incurred will be transferred to consumers. NACS comments that if there is an increase in cost, it could lead to lower fleet turnover and reduced emissions reductions.

The U.S. Chamber of Commerce states that EPA views the proposed standards as technology forcing, though adoption of the new ZEV technologies depends on increased costs of new vehicles to consumers as well as cost and time needed to install infrastructure. The Chamber also comments that EPA should consider the costs of optimizing distribution routes, and that other aspects of new technologies can be difficult for companies and the agency to anticipate, which makes consumer acceptance hard to estimate.

Response:

Regarding Steven Bradbury's comment that this rule will lead to fewer ICE vehicle models available at the dealership, we disagree. As discussed in RIA Chapter 2.10, our modeled potential compliance pathway includes continued availability of a wide variety of HD vehicle types in each subcategory. In addition, there are multiple possible pathways to compliance with this rule, and we discuss additional potential examples in Section II.F.4 of the preamble, including potential compliance pathways without producing additional ZEVs to comply with the final rule. Based on our analysis, we anticipate continued availability of HD vehicles that meet customer needs and results in compliance with this final rule.

Regarding ATA's comments that fleet owners are dissatisfied with ZEVs today, ATA mentioned that respondents were dissatisfied with the technology as it exists today. We note that, first, this rule is not effective until MY 2027. Reactions to a limited number of early niche applications is not a necessary predictor of reactions to later models reflecting further research and larger scale production. Second, as described in Section II.B of the preamble, this final rule allows for lead time and ramps up in stringency over time, allowing for additional research and refinement and improvement to the technology, including range and charging times. Third, this rule sets performance-based emissions standards and does not mandate how manufacturers comply with the rule so long as they meet the standards. This allows manufacturers to determine the best path of compliance for them. We also assessed additional example potential pathways to compliance, and note that these pathways also include the continued production and sale of ICE vehicles. Based on our analyses, we project that fleets will be able to purchase and use vehicles that meet their current and future needs. Lastly, as noted in RIA Chapter 6.2, uncertainty with the technology will decrease as familiarity with it grows.

Regarding CATF's comments that support for ZEVs continues to grow regardless of the finalization of this rule, we agree. The financial expenditures and commitments by large corporations, discussed in RIA Chapter 1.5, supports growth in the ZEV industry. This is also supported in the discussion of our baseline throughout RIA Chapter 2.

We agree with MFN that operating cost is a strong motivator in the purchase decisions of fleet managers, and that compared to most consumer households, HD vehicle purchasers are more concerned with operating cost of the vehicle they are purchasing. This purchase decision factor is reflected in the analytical method used for this final rule, discussed in RIA Chapter 2.

Regarding NADA's comment that HD and LD customers are different, we agree. As we stated in our response to MFN, above, the analytical methods used for this rule reflect how HD purchase decisions are made, including reflecting the reliance on operational costs and payback as a metric in our analysis (RIA Chapter 2). HD TRUCS also accounts for powertrain and payload consistency between the no action baseline and the modeled potential compliance pathway we analyzed for this rule. For more information on responses to comments about the payback method we use in our analysis for this rule, see RTC Section 3.

Regarding the NACS comment that many long-haul truck drivers state they would not purchase an electric vehicle, regardless of if recharging concerns are mitigated, we first point out that we do not have any data on the methodology of the survey, including how it was conducted or over what time frame, the framing of the questions, or number or representation of respondents, other than the survey was focused on long-haul truck drivers. The survey also fails to explain why drivers would not want to buy an HD ZEV. In addition, drivers may not be the only party participating in the purchase decision, as many HD vehicles are often purchased and owned by fleets, as opposed to the drivers themselves. As discussed in RIA Chapter 6.2, many companies with large distribution needs have expressed interest in fleet electrification. Also, the world may look very different in the future and, as also discussed in RIA Chapter 6.2, as ZEVs enter the market, familiarity with them will increase and uncertainty related to the vehicle technology and charging infrastructure will decrease. As noted above, other sources indicate significant reasons for drivers to prefer HD ZEVs, including for example, lower operating costs, quieter operations, better visibility, smoother ride, faster accelerations, and improved safety.

In addition, as stated elsewhere in this RTC, the preamble for this rule, and the RIA, this rule does not mandate the use of a specific technology, and we assessed additional example potential pathways to compliance with the rule, which may result in ZEV penetrations that are different from those we estimate for the modeled potential compliance pathway if manufacturers use a method of compliance similar to those examples. We also note that payback is said to be the most influential part of a HD vehicle buyers' purchase decision, and the analysis for this rule relies on estimations of payback of technology applied to HD vehicles in response to this final rule, as described in RIA Chapter 2. Regarding the NACS comment that HD EVs will lead to cost increases and issues in the supply chains that these vehicles serve, as well as that costs will be transferred to consumers if there is no return on investment, we refer to RIA Chapter 2, where we discuss operational cost estimates in this rule, as well as the payback analysis. Regarding the U.S. Chamber of Commerce's comment that this rule is technology forcing, this rule requires the addition of control technologies beyond that required by Phase 2 through a balanced and measured approach, as explained in preamble Section II. This rule does not mandate any particular technology be used to meet the standards, such as ZEV technology. See, e.g. Preamble section II.F.4. We agree that willingness to purchase any new technology is an important aspect of technology adoption and depends on a wide variety of inputs, including risk aversion, available information on the technology and on supporting infrastructure, up-front costs, operational costs and more. Some of these are discussed in RIA Chapter 6.2. With respect to the Chamber's comments on infrastructure, we point to Section II.B of the preamble, where we discuss phase-in of this final rule, and RIA Chapter 2.6 and RTC 7 (Distribution), where we extensively discuss current and future ZEV infrastructure needs and why we project these needs can be satisfied within the lead time afforded by the final standards. With respect to the Chamber's comments on considering the cost of optimizing distribution routes, EPA acknowledges that there are a number of factors fleet owners may consider as part of their infrastructure planning process, including how to best site stations to meet operational needs. See RIA Chapter 2.6 where we discuss EVSE and infrastructure cost elements related to this regulation. See RIA Chapters 1.6.3.2 and 1.6.5 for a discussion of some siting considerations, including innovative or alternative charging options that may reduce costs or deployment time in certain cases.

19.6 Employment

Comments by Organizations

Organization: Alliance for Vehicle Efficiency (AVE)

ZEV Workforce: A growing concern for suppliers is the lack of technicians qualified to manufacture electrical components for BEVs. Despite funding for training and certification programs, the lack of qualified technicians has led to increased costs. Fleet owners are also expressing concerns that the lack of qualified repair technicians is leading to higher repair costs and longer delays in getting trucks back onto the roads.13 [EPA-HQ-OAR-2022-0985-1571-A1, p. 5]

13 https://www.forbes.com/sites/jimhenry/2022/07/25/repairing-an-electric-vehicle-could-cost-more-than-gasoline-cars-a-new-kind-of-sticker-shock/?sh=54488abf5eee

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

EPA further asserts that "a lack of data" left the agency unable "to estimate employment effects" of the stricter heavy-duty vehicle standards. 88 Fed. Reg. at 26,072. But a wealth of research in recent years shows the effect of a shift to electric vehicles on employment in key sectors. For instance, the Economic Policy Institute estimates that "a rise in BEVs to 50% of domestic auto sales by 2030 could see losses of roughly 75,000 jobs by 2030." Jim Barrett & Josh Bivens, The Stakes for Workers in How Policymakers Manage the Coming Shift to All-Electric Vehicles, Econ. Pol'y Inst. (Sept. 22, 2021). Likewise, a Princeton analysis estimates that jobs in the fossil-fuel industry may decline by 131,000 to 210,000 jobs by 2030 as a result of the move to electric vehicles. See Net-Zero America: State-Level Health, Employment, and Land Use Impacts (Oct. 2021). And the California Air Resources Board projects that by 2040, nearly 32,000 (13.8 percent of baseline employment) auto-mechanic jobs will be lost in that State alone. See Advanced Clean Cars II Proposed Amendments to the Low Emission, Zero Emission, and Associated Vehicle Regulations: Standardized Regulatory Impact Assessment (Mar. 29, 2022). The White House has published research breaking out employment in the electric-vehicle sector as distinct from the rest of the automotive industry. See White House Report at 89. Given this ample research on the questions at issue, it was unreasonable for EPA to decline to even attempt to quantify the employment effect of the rule. [EPA-HQ-OAR-2022-0985-1660-A1, p. 63]

Organization: American Trucking Associations (ATA)

6. Workforce and Maintenance Training Needs to be Established

The deployment of ZEVs must support the trucking industry's workforce initiatives. The safety of drivers and maintenance technicians is the primary focus of these efforts. Ensuring adequate compensation to attract and maintain this workforce is a critical component. In 2022, the truck driver shortage remained near its historical high at nearly 78,000 drivers.27 Qualified technicians, especially ones with advanced electrical training, are in short supply.28 To achieve the proposed emission standards, training, education, and facility upgrades will be needed to ensure each driver and technician can safely and efficiently perform their job duties while operating or maintaining zero-emission trucks. [EPA-HQ-OAR-2022-0985-1535-A1, p. 19]

27 American Trucking Associations, Inc., Driver Shortage Update 2022 (October 25, 2022).

28 Techforce, 2022 Transportation Technician Supply & Demand Report (November 1, 2022).

Driver experience and learnings

Education and training are needed to efficiently operate ZEVs. Training drivers on efficiently using regenerative braking or operating tractors safely are clear examples. Like EPA's discussion of first responders, drivers need to know how to locate and apply high voltage disconnects. Drivers must also know industry best practices and the policies and procedures to follow should crashes occur, such as avoiding high-voltage power sources and responding to runaway thermal events. Fleets will need time to develop and incorporate those practices into their safety handbooks. At a higher level, standards-setting bodies will need time to develop and standardize processes on the safe operation of ZEVs across a wide range of safety issues. [EPA-HQ-OAR-2022-0985-1535-A1, p. 20]

Organization: BlueGreen Alliance (BGA)

BGA urges the U.S. Environmental Protection Agency (EPA) to finalize its Phase 3 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles while keeping the following principles in mind:

1) Climate policy must not fail the auto manufacturing workers and communities who are going to make ambitious emissions reduction targets possible.

2) Industry stakeholders must be honest brokers in both the stakeholder process, and in their efforts to comply with the standards.

3) EPA's heavy-duty vehicle standards have significant impacts on the U.S. auto manufacturing sector, with major stakes for workers. EPA should leverage its analytical and research capacities to fully understand these impacts and conduct this rulemaking process accordingly. [EPA-HQ-OAR-2022-0985-1605-A1, p. 1]Strong, technology-forcing vehicle standards are essential to meeting climate goals, advancing environmental justice, and creating good jobs in the clean economy. Heavy-duty vehicles make outsized contributions to climate-warming greenhouse gas emissions, and to local air pollution—with the burden largely falling on low-income and non-white communities located near high-traffic areas and industrial zones.2 Their supply chains, and the manufacturing jobs within them, however, are critical to the economic health and stability of auto manufacturing communities across the country (see Figure 1). [EPA-HQ-OAR-2022-0985-1605-A1, p. 2. See Figure 1 on page 2 of docket number EPA-HQ-OAR-2022-0985-1605-A1.]

2 ibid.

Contrary to the repeated threats of industry stakeholders opposing regulation, strong vehicle emissions standards do not have to come at the cost of good auto manufacturing jobs. In fact, they can support U.S. competitiveness in the global auto market, which protects and creates jobs. BGA analysis on the impact of former rounds of light-duty vehicle standards has found that when they are well-designed and supported by worker protections and investments, standards can generate high-quality jobs, and position the domestic auto industry as a leader in a competitive global market.34 The same is true of heavy-duty vehicle standards. [EPA-HQ-OAR-2022-0985-1605-A1, pp. 2 - 3]

3 BlueGreen Alliance, Supplying Ingenuity II, May 2017: Available Online: https://www.bluegreenalliance.org/resources/supplying-ingenuity-ii-u-s-suppliers-of-key-clean-fuel-efficient-vehicle-technologies/.

4 BlueGreen Alliance, Tech@Risk, August 2019. Available Online: https://www.bluegreenalliance.org/resources/techrisk-the-domestic-innovation-technology-deployment-manufacturing-and-jobs-at-risk-in-stepping-away-from-global-leadership-on-clean-cars/.

And while regulatory progression and certainty are an important part of creating and protecting the domestic auto manufacturing jobs of the future, standards must be designed with workers in mind in order to maximize employment benefits. [EPA-HQ-OAR-2022-0985-1605-A1, p. 4]

EPA must consider how the transition to clean vehicles—including heavy-duty vehicles—will impact manufacturing workers and the communities they live in. This should be an essential part of the comprehensive analysis that EPA conducts to project its proposals' economic impacts. The map in Figure 1 plots more than 1200 facilities manufacturing heavy-duty vehicles and their components. Of these facilities, approximately 190 manufacture internal combustion engine (ICE) heavy-duty vehicles and their components, like engines and transmissions, and fuel saving technologies. These facilities in the ICE supply chain, the nearly 1000 facilities making "fuel agnostic" components for heavy-duty vehicles, and other as yet unbuilt zero emissions vehicle

(ZEV) manufacturing facilities may experience impacts as zero emission vehicles become increasingly cost competitive compared to ICE vehicles. [EPA-HQ-OAR-2022-0985-1605-A1, p. 4]

EPA already develops its proposed standards based on sophisticated economic analyses that model the impact of the proposal on total fuel cost savings, vehicle maintenance savings, and health cost savings from improved health outcomes. EPA's economic analysis should also seek to project the economic and employment impacts of the shift to clean vehicles on auto manufacturing communities. For each of EPA's proposals and alternatives, this analysis should, at minimum, identify heavy-duty vehicle manufacturing communities (as in Figure 1), quantify the share of each community's economy that is supported by jobs associated with heavy-duty vehicle manufacturing, and quantify the number of jobs associated with that sector. EPA should collaborate with the U.S. Department of Labor (DOL) and the U.S. Department of Energy (DOE) to conduct this analysis. EPA may consider structuring its analysis to identify communities that are particularly reliant on a domestic heavy-duty vehicle manufacturing supply chain, potentially identified as those with heavy-duty vehicle manufacturing "clusters"—or geographic areas where there are at least two manufacturing facilities within a 50-mile radius that are producing heavy-duty vehicles, or components for them. BGA collects detailed supply chain data that can support this analysis. [EPA-HQ-OAR-2022-0985-1605-A1, pp. 4 - 5]

Considering and quantifying the employment opportunities and risks associated with each of EPA's proposals is essential to ensuring that the regulations advance equity along economic axes, as well as climate and public health ones. The domestic auto manufacturing sector has historically been characterized by a higher unionization rate, community-supporting wages and benefits, the provision of pathways to the middle class (particularly for people without a four-year college education), and strong representation of Black workers and workers without a four-year college education. Research from the Economic Policy Institute finds that "Black workers account for 12.5% of workers economy wide, but 16.6% of workers in the auto sector, while workers without a four-year degree account for 62.2% of workers economy wide, but 74.6% in the auto sector."5 The auto manufacturing sector represents a critical path to the middle class for the very workers and communities that have disproportionately borne the brunt of neoliberal economic and trade policies. It is therefore essential that EPA leverage available data to project how its proposals will shape the domestic auto manufacturing sector, and the workers and communities that comprise it. Such analysis would also help inform stakeholders weighing in on the proposals by projecting tangible, on-the-ground, economic impacts of the transition to cleaner heavy duty vehicles, rather than limiting the scope of the economic analysis to fleet owners and automakers. [EPA-HQ-OAR-2022-0985-1605-A1, p. 5]

5 Economic Policy Institute, The stakes for workers in how policymakers manage the coming shift to all-electric vehicles, September 2021. Available Online: https://www.epi.org/publication/ev-policy-workers/.

EPA must hold automakers and industry stakeholders accountable to workers and communities in their pursuit of regulatory compliance. In particular, this means collecting data to ensure that standards do not exacerbate the offshoring of the automotive supply chain, or facilitate rent-seeking behavior from automakers seeking to reduce their regulatory burdens and labor costs. BGA research demonstrates the significant economic footprint that the heavy-duty auto manufacturing sector has in the United States. This footprint represents both an opportunity and a risk, depending on whether or not the United States emerges as a global leader in the manufacturing of clean vehicles during this critical transitional period. The past two decades have seen significant offshoring of the automotive supply chain to other countries in Asia, Europe, and North America, where automakers have benefitted from lower labor costs, looser environmental regulations, and favorable tax regimes. Between 1998 and 2019, employment in the manufacturing of motor vehicles and motor vehicle components fell by more than 20%.6 A part of a larger globalization trend, this shift not only gutted auto manufacturing communities in the United States, but it also allowed auto suppliers to establish supply chains in other countries, often with minimal labor protections and loose environmental standards.7 [EPA-HQ-OAR-2022-0985-1605-A1, p. 5]

6 Economic Policy Institute, Botched policy responses to globalization have decimated manufacturing employment with often overlooked costs for Black, Brown, and other workers of color, January 2022. Available Online: https://www.epi.org/publication/botched-policy-responses-to-globalization/.

7 Strategic Management Journal, Offshoring pollution while offshoring production, March 2017. Available Online: https://onlinelibrary.wiley.com/doi/10.1002/smj.2656.

Many industry stakeholders opposing heavy-duty vehicle regulations threaten that advancing vehicle emissions forces them to cut their costs elsewhere—like in their domestic production capacities, and in the wages and benefits they provide to their employees. They suggest that compliance with the regulation will be so costly as to force them to reduce the number and quality of auto manufacturing jobs here. These claims must be thoroughly interrogated. Automakers have announced $120 billion in new investments in clean vehicle manufacturing in the last eight years, with over 40% of those investments occurring in the six months following the passage of the Inflation Reduction Act in August 2022.8 Domestic automakers' 2023 Q3 profits were the highest they have been since 2016.9 Moreover, due to the passage of transformative programs in the Inflation Reduction Act and the Bipartisan Infrastructure Law, automakers and their suppliers have more federal resources than ever before to support the transition to cleaner vehicles in ways that do not shortchange their workers, their communities, or the environment. [EPA-HQ-OAR-2022-0985-1605-A1, p. 6]

8 Environmental Defense Fund, "Report finds U.S. investments in electric vehicle manufacturing reach $120 billion, create 143,000 new jobs," March 2023. Available Online: https://www.edf.org/media/report-finds-investments-us-electric-vehicle-manufacturing-reach-120-billioncreate-143000.

9 U.S. Bureau of Economic Analysis, Corporate profits with inventory valuation adjustments: Domestic industries: Nonfinancial: Manufacturing: Durable goods: Motor vehicles, bodies and trailers, and parts, March 2023. Available Online: https://fred.stlouisfed.org/series/N411RC1Q027SBEA.

EPA recently published a Request for Information (RFI) targeting automakers manufacturing clean school buses receiving funding through the Clean School Bus Program.10 This optional RFI asks bus manufacturers to provide information about worker voice (whether employees are covered by a collective bargaining agreement, whether the company is committed to maintaining union neutrality, etc.), employee benefits, inclusive hiring practices, training and advancement programs, and community partnerships. Such an RFI can be a powerful tool through which EPA can solicit information about how manufacturers interact with their employees and their communities, and facilitate a "race-to-the-top" for the quality of auto manufacturing jobs in the United States. EPA should create a new RFI for automakers regulated by the Phase 3 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles that, at minimum, seeks detailed information about worker voice, employee wages and benefits, inclusive hiring practices, training and advancement programs, and community partnerships. This RFI could also apply to vehicle battery manufacturers, fuel efficiency technology manufacturers, and other advanced materials and components manufacturers in the automotive supply chain, which will play a significant role in automakers' ability to meet increasingly stringent emissions standards. [EPA-HQ-OAR-2022-0985-1605-A1, p. 6]

10 EPA, Request for information about OEM job quality and workforce development practices, April 2023. Available Online: https://www.epa.gov/system/files/documents/2023-04/fy23-csb-oem-workforce-req-info-2024-04.pdf.

Ultimately, the transition to cleaner vehicles must function to raise the job quality and safety standards associated with all impacted workforces, including manufacturing workers, drivers, and warehouse workers. It is essential, but not enough, to create and protect auto manufacturing jobs in the United States. as increasingly stringent standards drive the transition to cleaner vehicles. We must also work to ensure that all jobs that will facilitate the transition are good, community-supporting jobs in safe and democratic work environments, where workers have the free and fair choice to join a union. The current landscape—wherein some new manufacturing jobs (especially in the battery sector) are low-paid contract roles in states where employers can evade union organizing, wherein truck drivers are being misclassified as contractors by their employers, and wherein port and warehouse workers endure extremely hazardous conditions must be corrected.12,13,14 [EPA-HQ-OAR-2022-0985-1605-A1, p. 7]

12 The Washington Post. "The unlikely center of America's EV battery revolution," April 2023. Available Online: https://www.washingtonpost.com/climate-environment/2023/04/17/georgia-evs-battery-belt/.

13 University of California Berkeley Labor Center, Truck driver misclassification: Climate, labor, and environmental justice impacts, August 2019. Available Online: https://laborcenter.berkeley.Aedu/truck-driver-misclassification/.

14 Warehouse Workers for Justice, For good jobs and clean air: How a just transition to zero emission vehicles can transform warehousing, 2022. Available Online: https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

Deregulation, unfavorable trade policy, and the systematic undermining of labor laws in this country have been chipping away at worker power in this country for decades. But as clean vehicle technologies continue to transform the auto industry—regulators, policymakers, advocates, and organizers have an important opportunity to determine what the jobs of tomorrow's auto industry will look like. EPA must leverage its regulatory power to set the industry on the right course, for the climate, for public health, and for workers. [EPA-HQ-OAR-2022-0985-1605-A1, p. 8]

Organization: BorgWarner Inc.

BorgWarner is investing in our workforce and recommends increased public investment programs to upskill the U.S. talent pool to assist the industry's ZEV transition.

BorgWarner is committed to developing the workforce necessary to support our charging product development and maintenance. Our Power to Evolve training program transforms our industry-leading automotive engineers into a cutting-edge team, developing our EV products. A key facet of that strategy is also evolving the skills of our existing talent, so our workforce is sustainable. Power to Evolve is a training program created in partnership with leading universities in the U.S. and Europe to increase our talent's knowledge of, and skills for, electrical engineering. Employees learn hands-on skills required for productive work and complete modules for inverters, batteries, and motors. [EPA-HQ-OAR-2022-0985-1578-A1, p. 6]

For manufacturers, the need to train and certify workers is paramount. Similarly, for consumers, the lack of qualified BEV technicians is leading to increased costs for repairs, lengthy delays, and higher insurance premiums. These delays could have an impact on the decision-making process of future new vehicle purchasers by fleet owners that cannot afford to be without a vehicle for an extended period of time.3 [EPA-HQ-OAR-2022-0985-1578-A1, p. 6]

3 Tesla, insurers take different paths to deal with expensive repairs | Reuters

BorgWarner is concerned about the shortage of certified automotive technicians trained to analyze and repair EVs and EV charging stations. The National Institute for Automotive Service Excellence estimates that the U.S. currently has approximately 229,000 certified car technicians. Only about 3,100 (less than 1.4%) of these technicians, however, are certified to work on electric vehicles.4 [EPA-HQ-OAR-2022-0985-1578-A1, pp. 6 - 7]

4 https://www.bostonglobe.com/2022/08/16/business/ev-sales-soar-its-back-school-car-techs/

We propose that EPA revisit how the lack of qualified technicians could impact the total cost of ownership for BEVs, and the maintenance and service needed to ensure reliable, consistent charging station operability as this could significantly impact HD fleet owners purchasing decisions. [EPA-HQ-OAR-2022-0985-1578-A1, p. 7]

Organization: Bradbury, Steven G.

(Text giving the following bullet points context: Some of the most consequential burdens and negative ramifications of the proposed rules that EPA hides, disregards, or minimizes include the following:)

- Destroying jobs in the U.S. auto industry. The loss of popular new vehicle options and the significant price increases at the dealership will mean that fewer new vehicles will be purchased—almost certainly far fewer than EPA is predicting. This drop-off in demand will challenge the profitability of the auto industry and lead to a loss of jobs for tens of thousands of America's autoworkers, as well as a loss of jobs in the many U.S. companies that supply inputs for the production of automobiles and heavy trucks.40 The United Auto Workers union has warned of the potential for job losses from the transition to EVs,41 as automakers announce more plant closures and layoffs due to the costs of electrification.42 [EPA-HQ-OAR-2022-0985-2427-A2, p. 16]

40 See Technality, "Ford Just Proved How Far Ahead Tesla Really Is: Profitability May Continue to Be a Struggle for All Legacy Automakers," May 10, 2023, https://medium.com/tech-topics/ford-just-provedhow-far-ahead-tesla-really-is-6a4d95cff519 ("Despite wanting to be a fully-electric brand by 2035, as of Q4 2022, Ford's average net margin on the Mustang Mach-E was -40.4%. Unfortunately, that's a figure that's only gotten worse since, to the point where Ford is now losing an average of $58,000 for every EV sold."). [EPA-HQ-OAR-2022-0985-2427-A2, p. 17]

41 See Press statement, United Auto Workers, "UAW Statement on Job Cuts at Stellantis," April 26, 2023, https://uaw.org/uaw-statement-job-cuts-stellantis.

42 See Michael Wayland, "Stellantis to indefinitely idle Jeep plant, lay off workers to cut costs for EVs," CNBC.com, December 9, 2022, https://www.cnbc.com/2022/12/09/stellantis-to-idle-jeep-plant-lay-offworkers-to-cut-costs-for-evs.html.

Organization: CALSTART

Last year saw $4.8 billion in roll-out announcements, investment, debt financing, and acquisitions in the electric vehicle infrastructure industry; electric vehicle infrastructure constitutes a market estimated to yield $300 billion in cumulative investment by 2030 and $1 trillion by 2040, though already these estimates may be surpassed by events.58 As of April, 13 manufacturers have announced plans to spend over $75 billion to open new or renovated plants in the United States to build electric vehicles in six different states. These plants will directly employ between 24,000 and 30,000 workers. Since April 2022, there has been $111 billion invested in U.S.-based electric vehicle manufacturing, assembly, and battery production.59 [EPA-HQ-OAR-2022-0985-1656-A1, p. 26]

58 https://www.bloomberg.com/news/articles/2022-08-16/car-charging-investment-soars-driven-by-ev-growth-and-government-funds#xj4y7vzkg

59 https://blogs.edf.org/climate411/files/2022/04/electric_vehicle_market_report_v6_april2022.pdf

A 2021 Environmental Defense Fund study found that at least 330,000 employees are currently working within 44 states in companies involved in the commercial ZEV market, including manufacturing, infrastructure, and midlife operating at over 996 locations.60 CALSTART has shown in a Green Vehicle Technology Manufacturing Study, and in an update to that study, that almost no state lacks green vehicle manufacturing.61 The potential growth of jobs can also be considered in terms of the sheer number of product offerings across the commercial vehicle emissions-reduction technology supply chain, which CALSTART has internally tracked since 2016. Since that time, electrification products have grown from 121 to 307; energy storage companies now offer a total of 164 products, and connected systems manufacturing now involves 125 products. [EPA-HQ-OAR-2022-0985-1656-A1, p. 26]

60 https://calstart.org/wp-content/uploads/2021/02/CA-ZEV-Jobs-Study-Final-0203.pdf

61 https://calstart.org/wp-content/uploads/2021/02/CA-ZEV-Jobs-Study-Final-0203.pdf

Organization: Clean Fuels Development Coalition et al.

And, as will be discussed later in this comment, the proposal's listed costs grossly underestimate the rule's true costs. The proper metric is aggregate cost because the major-questions doctrine asks about the rule's significance to the "national economy." West Virginia v. EPA, 142 S. Ct. at 2609 (2022). These aggregate costs include: [EPA-HQ-OAR-2022-0985-1585-A1, p. 4]

Elimination of American Jobs: EPA's electrification goal would overhaul the American fuels industry—causing harm to both the petroleum industry and to those who, like commentors, help to supply clean and renewable fuels—as well as the American automobile industry, which "supports 10 million direct and indirect jobs" and "accounts for more than three percent of GDP." See Comments of Securing America's Future Energy (SAFE) on EPA's Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards (Sept. 27, 2021), EPA-HQ-OAR-2021-0208-0527. [EPA-HQ-OAR-2022-0985-1585-A1, p. 6]

Organization: ClearFlame Engine Technologies

ClearFlame strongly believes that implementing our recommendations will yield a stronger Final Rule. Such a Final Rule will:

- Preserve jobs in the diesel engine manufacturing and maintenance sectors. [EPA-HQ-OAR-2022-0985-1654-A2, p. 2]

Organization: Delek US Holdings, Inc.

VI. The Proposed Rule Fails To Holistically Consider Impacts Beyond the Automotive Industry

a. ZEV mandates will negatively affect domestic employment rates.

If EPA's Proposed Rule goes into effect, tens of thousands of high-paying, family-supporting jobs will be lost as refining capacity continues to decline. Indeed, EPA admits that its proposal may affect employment for firms providing fuels: "[w]hile reduced fuel consumption represents cost savings for purchasers of fuel, it could also represent a loss in value of output for the petroleum refining industry, which could result in reduced employment in that sector."33 But EPA also presumes that the Proposed Rule will not have a noticeable impact on aggregate net employment as labor will be reallocated from one product use to another34 and that the reduction in fuel consumption will be met through reduced petroleum imports rather than reductions in domestic production, shielding American jobs in the petroleum refining industry.35 Further, EPA's conjectural conclusions are made weaker by the Agency's failure to consider employment impacts in related sectors, including downstream businesses such as automotive dealerships and other small businesses like parts suppliers and auto mechanics.36 [EPA-HQ-OAR-2022-0985-1561-A1, pp. 7 - 8]

33 Id. at 26,074.

34 DRIA at 422, 426 (citing external sources indicating that "although battery electric vehicles have fewer parts than their ICE counterparts, there is potential for job growth in electric vehicle component manufacturing, including batteries, electric motors, regenerative braking systems and semiconductors, and manufacturing those components in the US can lead to an increase in jobs… [but] if the US does not become a major producer for these components, there is risk of job loss.").

35 Id. at 429.

36 See, e.g., EDMUNDS, "Where Does the Car Dealer Make Money?" (June 13, 2019) available at https://www.edmunds.com/car-buying/where-does-the-car-dealer-make-money.html (automobile dealerships, for example, cannot recoup revenue or maintain employees by merely switching the types of vehicles it sells because parts and service accounts for 44% of revenue).

Organization: Electrification Coalition (EC)

The battery is the most valuable component of an EV and battery manufacturing is the most labor-intensive step along the EV supply chain. Onshoring battery cell, module, and pack jobs, therefore, is key to minimizing job reductions with ZEV adoption. Under a 33 percent penetration rate, for example, battery manufacturing alone can replace about 80 percent of the jobs at risk. There is already a strong business case for domestic battery manufacturing, and both the manufacturing industry and the U.S. government have been taking steps to promote domestic battery manufacturing. Continued efforts in this space will be critical to replace jobs lost as transportation electrification accelerates. [EPA-HQ-OAR-2022-0985-1558-A1, p. 8]

Organization: Environmental Defense Fund (EDF)

Domestic production of batteries and battery components is growing rapidly. Analysis by EDF and WSP found that there has been over $79.7 billion in investment in U.S. battery and battery component production announced within the past 8 years, resulting in almost 70,000 new jobs.197 In 2026, these already announced investments will be capable of producing batteries sufficient to supply the equivalent of 11.2 million new passenger vehicles per year.198 [EPA-HQ-OAR-2022-0985-1644-A1, p. 76]

197 U.S. Electric Vehicle Manufacturing Investments and Jobs, Characterizing the Impacts of the Inflation Reduction Act after 6 Months, WSP for EDF, (March 2023). https://blogs.edf.org/climate411/files/2023/03/State-Electric-Vehicle-Policy-Landscape.pdf. (Attachment AA).

198 Ibid.

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

I. Direct Impact on UAW Members

UAW members are acutely affected by the impacts of greenhouse gas (GHG) emissions. We live near transportation corridors, truck freight routes, and we suffer from the risks generated by manufacturing vehicles themselves. The EPA's proposed GHG emissions standards ("proposed standards") will impact the over 40,000 UAW members working in heavy truck, vocational, van, and heavy-duty pickup vehicle and parts manufacturing. These members work in communities throughout the country for major truck manufacturers at assembly, engine, and component manufacturing facilities. UAW members are proud to meet our economy's diverse trucking needs. We will continue to advocate for advanced technology investments in UAW-represented plants where our members are prepared to build the vehicles of the future. The heavy-duty vehicles built by UAW members include:

Zero-Emission Vehicles (ZEV):

- Thomas Built Bus Saf-T-Liner C2 Jouley – BEV School Bus (High Point, NC)
- IC Bus Electric CE – BEV School Bus (Tulsa, OK)
- Mack LR – BEV Refuse Truck (Macungie, PA)
- Volvo Truck VNR – BEV Class 8 Truck (Dublin, VA)
- Components for these vehicles at supplier plants located throughout our country. [EPA-HQ-OAR-2022-0985-1596-A1, p. 1-2]

Absent sufficient safeguards incorporated into the rule or revisions to the proposed standards, the burden of compliance is poised to fall heaviest on the workers who currently build heavy-duty ICE vehicles and those who will build heavy-duty ZEVs in the future. The proposed standards' uncertain disruption to ICE jobs and the uncertain quality of new EV jobs must be addressed as the EPA works to finalize the rule. Without this, we fear the proposed standards threaten to facilitate a race to the bottom, allowing manufacturers to pit EV jobs against ICE jobs, and ensuring the standards we fought for are absent for the next generation of vehicles and those who build them. [EPA-HQ-OAR-2022-0985-1596-A1, p. 2]

A. Uncertain Disruption to ICE Jobs

The EPA's proposed standards anticipate a dramatic change in the types of vehicles that will be driven on our roads. But, the expedited transition to ZEVs that is required by the standards will not impact vehicles and drivetrains alone. The robust supply chain and domestic manufacturing base that has long supported the production of ICE vehicles will be placed in jeopardy. We are concerned that an impracticable regulatory environment will only encourage original equipment manufacturers (OEMs) to seek cost savings by placing the risk of the electric vehicle (EV) transition solely on autoworkers. The EV transition will not succeed if the workers building ICE vehicles are left behind. Rest assured, it is never a more efficient process, innovative technology, or greater market share that saves the industry. Autoworkers are always expected to sacrifice: [EPA-HQ-OAR-2022-0985-1596-A1, p. 2]

"We absolutely have too many people in certain places, no doubt about it... And we have skills that don't work anymore. We have jobs that need to change." (Ford CEO Jim Farley)2 [EPA-HQ-OAR-2022-0985-1596-A1, p. 2]

2 Neal Boudette, "Ford to Cut 3,000 Jobs to Reduce Costs in Transition to Electric Vehicles", (New York Times, Aug. 22, 2022), https://www.nytimes.com/2022/08/22/business/ford-motor-job-cuts.html

The scores of workers who power the industry and rely on stable employment to provide for their families deserve a better path forward. Unfortunately, the EPA's projections of the proposed standards' impact on employment will fail to ease concerns about a major disruption to the workforce. The EPA believes both that the proposed standards will have "little cost effect on employment"3 and that "[d]ue to a lack of data, we are not able to estimate employment effects from this proposed rule."4 We are highly skeptical that the proposed standards will have minimal effect on employment. In the light-duty sector, automakers have used the cost of EVs as an excuse to cut jobs and we are concerned we will see similar claims in the medium-duty and heavy-duty sector.5 Whether these claims by manufacturers are valid or a pretext to reduce costs should be interrogated, but in either case, it is the workers building the vehicles that bear the brunt of these threats. And where EV battery jobs have been established domestically, job quality at these plants threatens to undermine standards in the entire sector. As the White House has found, "the automotive battery plants that are in existence or are advertising for production workers pay much less than existing powertrain plants".6 The only way to mitigate these concerns is to build out a completely unionized domestic supply chain for vehicles and batteries. The EPA has reached extensive conclusions about the proposed standards' impact on the climate, health, and even oil imports.7 The workers who build heavy-duty ICE vehicles deserve a comprehensive assessment of the proposed standards' impact on their livelihoods. [EPA-HQ-OAR-2022-0985-1596-A1, p. 2-3]

3 Supra note 1 at 26074.

4 Id. at 26072.

5 The Washington Post. April 26, 2023. "Auto giant Stellantis offers buyouts to 33,500 workers": https://www.washingtonpost.com/business/2023/04/26/auto-giant-stellantis-offers-buyouts-33500-workers/; Reuters. May 21, 2021. "Daimler Truck predicts engine job losses in transition to 'green' trucks":

https://www.reuters.com/business/autos-transportation/daimler-truck-predicts-engine-job-losses-transition-green-trucks-2021-05-21/

6 The White House. June 2021. "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth": https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf, p. 120.

7 See EPA, Factsheet, "Proposed Standards to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles for Model Year 2027 and Beyond" at 3 (April 2023), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P101762L.pdf ("EPA estimates that the total benefits of this proposal far exceed the total costs, by as much as $320 billion. Society would realize approximately $87 billion in climate benefits and up to $29 billion in benefits from fewer premature death and serious health effects such as hospital admissions due to respiratory and cardiovascular illnesses, and approximately $12 billion in reduced reliance on oil imports").

We urge the EPA to craft a final rule that avoids creating economic insecurity for workers in the industry. Heavy-duty truck manufacturing is already a highly cyclical industry. Many of the industry's customers are sophisticated commercial actors that can anticipate increased costs from environmental regulations and pull purchases forward to avoid those costs.8 The EPA's new GHG regulations should be crafted to avoid disrupting the market or creating a "pre-buy/no-buy" cycle that results in layoffs or job losses. A significant market disruption is not only bad for workers, it is bad for their families, communities, and the overall economy. [EPA-HQ-OAR-2022-0985-1596-A1, p. 3]

8 See ACT Research, April 29, 2022. "Pre-Buy/Low-Buy Analysis of Heady-Duty Sector Impacts from Emissions Regulations", p.37 for case study on 2007 Class 8 HHD Tractor pre-Buy.

The EPA should recognize that the domestic heavy-duty vehicle manufacturing footprint relies substantially on the production of profitable ICE vehicles and that those profits will be necessary to fund the transition to cleaner technologies. By requiring increased ZEV adoption, and therefore less ICE vehicles, the proposed standards should be expected to disrupt ICE jobs. We urge the EPA to conduct additional analysis of the proposed standards' projected impact on employment, with particular focus on the union workforce that produces heavy-duty ICE vehicles. EPA's analysis should also consider the location, job quality, and unionization rates of workers manufacturing the batteries, fuel cells, and advanced ICE powertrain components that will be necessary to meet the regulations. Viewing employment in the aggregate is not sufficient. Not all jobs should be treated as equal. Heavy-duty vehicle manufacturing relies on a union workforce. Therefore, the preservation of standards, fought for and won by UAW members, in new EV jobs should receive significant attention in the EPA's economic impact analysis. [EPA-HQ-OAR-2022-0985-1596-A1, p. 3-4]

B. Uncertain EV Job Quality

Federal policy must ensure EV jobs are as good as or better than ICE jobs. Compliance with GHG emissions standards can never justify the offshoring of jobs, the slashing of wages, or the busting of unions. [EPA-HQ-OAR-2022-0985-1596-A1, p. 4]

Unless and until we build a comprehensive domestic EV supply chain, the transition to EVs will risk trading dependency on fossil fuels for dependency on imported EVs, batteries, fuel cells, and materials, all while hollowing out quality union jobs in the process. While there have been positive trends in domestic battery investment to supply light-duty vehicles, the sourcing patterns for medium-duty and heavy-duty batteries and fuel cell remains unknown. Uncertainty around the build-out of the domestic EV supply chain is recognized by the EPA, but does not seem to play a significant role in altering the proposed standards' increased adoption of ZEVs.9 The EPA must craft its standards to hold manufacturers accountable to both environmental and labor concerns. [EPA-HQ-OAR-2022-0985-1596-A1, p. 4]

9 Supra note 1 at 25985 ("we recognize that there are currently few manufacturing plants for HD vehicle batteries in the United States").

Organization: Moving Forward Network (MFN) et al.

6.3. Labor and Workplace Impacts Must be Integrated into EPA's Analysis

There has been a dearth of federal labor policies and standards ensuring that there are protective workplace environments, that wages reflect the cost of living, and that workers have the right to organize. In fact, over the last few decades, industries have increased their reliance on temporary or third-party worker hiring practices, thus further distancing the employers from their responsibility to prioritize workers' rights, health, and safety. [EPA-HQ-OAR-2022-0985-1608-A1, p. 33]

While improving the standards across the freight sector is critical, enforcement expansion must also be intentional and prioritized. Labor and those working in and adjacent to the freight sector (including truck drivers, equipment operators, warehouse and logistics workers, manufacturers, small business repair shops, and others) are essential constituents in the quest for a just transition to a cleaner energy economy, air quality improvements, zero emissions, and climate mitigations. 75 [EPA-HQ-OAR-2022-0985-1608-A1, p. 33]

75 The Just Transition Alliance defines this concept as "a principle, a process and a practice. The principle of just transition is that a healthy economy and a clean environment can and should co-exist. The process for achieving this vision should be a fair one that should not cost workers or community residents their health, environment, jobs, or economic assets. "What Is Just Transition?" Just Transition Alliance, http://jtalliance.org/what-is-just transition/.

The exploitative practice of a freight transportation system that relies on misclassified workers ultimately undermines any regulatory policy that aims to "clean up" the trucking industry by shifting costs of emissions reductions to the most economically vulnerable within the industry. The NESCAUM Action Plan noted that "small trucking companies operating with six or fewer trucks make up 90 percent of carriers in the United States." 76 [EPA-HQ-OAR-2022-0985-1608-A1, p. 33]

76 ZEV Taskforce. Multi-State Medium-And Heavy-Duty Zero-Emission Vehicle Action Plan A Policy Framework to Eliminate Harmful Truck and Bus Emissions. (July 2022). p. 21. https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf

However, with the correct policy levers in place, working with the whole-of-government approach while centering frontline and fenceline experience and knowledge, EPA could propose the necessary successful rule that would move ZEVs with the goal of just transition and promoting environmental justice. In the workplace, the just transition framework centers the voices of workers whose jobs will radically transform with the promise of clean energy industries. Workers' voices are critical to the success of policies and programs that will ultimately move towards zero-emission solutions across the freight transportation system. [EPA-HQ-OAR-2022-0985-1608-A1, p. 33]

6.3.1. Misclassification

Bearing in mind that the jobs of truckers and some warehouse workers might look quite different in an electrified world, looking to workers to provide leadership on what their needs will look like around training, affordability, and working conditions is a way to ensure a fair progression to ZEVs. 78 Since deregulation in the ‘80s, port drivers have become indentured servants to their trucks. “Drivers are on the job five days a week, from ten to twelve hours a day, earning an average income of $28,000 per year.” 79 Because they are not considered employees, they have no benefits -- no health care, pension, paid vacation, etc. Drivers must pay the total cost of their rigs and be on the road. In 2014, the National Employment Law Project report, “Big Rig: Poverty, Pollution, and the Misclassification of Truck Drivers at America’s Ports,” found that over 60% of port truck drivers are misclassified as independent contractors. 80 The low road labor practice of misclassifying workers in the trucking industry undermines climate action by shifting the costs of emission reductions from companies onto the most economically vulnerable in the industry: contract truck drivers. Contract truck drivers often earn a low income and face high capital costs. 81 [EPA-HQ-OAR-2022-0985-1608-A1, p. 34]

78 Id.

79 David Bensman. Port trucking down the low road: a sad story of deregulation. Rutgers University. (2009). p.5

80 Rebecca Smith, Paul Alexander, Marvy Jon Zerolnick. The Big Rig Overhaul Restoring Middle-Class Jobs at America’s Ports Through Labor Law Enforcement. (February 2014). https://www.nelp.org/wp-content/uploads/2015/03/Big-Rig-Overhaul-Misclassification-Port-Truck-Drivers-Labor-Law-Enforcement.pdf

81 Appel, Sam, and Carol Zabin. Truck Driver Misclassification: Climate, Labor, and Environmental Justice Impacts. UC Berkeley Labor Center. (August 2019). https://laborcenter.berkeley.edu/pdf/2019/Truck-Driver-Misclassification.pdf.

Drivers are often in the position of absorbing the costs of upgrading to new technologies, while trucking companies externalize their costs. Instead of purchasing new trucks to replace older trucks that have reached the end of their useful lives, many smaller fleets, independent owner/operators, and contract drivers buy used trucks on the secondary market. Because these smaller fleets and contract drivers often have slimmer profit margins, fewer capital resources, and less certain access to credit, there is less capacity to assume the inherent risks and uncertainties associated with adoption of new technology. 82 [EPA-HQ-OAR-2022-0985-1608-A1, p. 34]

82 ZEV Taskforce. Multi-State Medium-And Heavy-Duty Zero-Emission Vehicle Action Plan A Policy Framework to Eliminate Harmful Truck and Bus Emissions. (July 2022). p. 21. https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf

To address the issues of workforce exploitation, especially for port truck drivers, EPA needs to propose a just transition towards zero-emission vehicles. Just transition to ZEVs ensures that workers within the port transportation sector are not further burdened but benefit from increased job growth. Several policy measures would support this; first and foremost, state and federal standards are in place to protect drivers from misclassification, which is, in effect, a form of indentured servitude. Worker rights groups want to see support for the passage of the Protecting the Right to Organize (PRO) Act of 2021, 83 which would address the issue of worker misclassification and protect the right of workers to organize. They would also like the restrengthening of the Obama-era Fair Labor Standard Act 84 concerning employee and contractor classifications, which the Trump administration weakened. [EPA-HQ-OAR-2022-0985-1608-A1, p. 35]

83 Education & Labor Committee. Protecting the Right to Organize Act Section by Section. Education & Labor Committee. (2021). https://edlabor.house.gov/imo/media/doc/Section%20by%20Section%20-%20PRO%20Act.pdf.

84 Office of Financial Management. Fair Labor Standards Act (FLSA). Office of Financial Management.(2019). https://ofm.wa.gov/state-human-resources/compensation-job-classes/compensation-administration/fair-labor-standardsact-flsa-washington-minimum-wage-act-wmwa/fair-labor-standards-act-flsa.

The labor practice of misclassifying workers in the trucking industry undermines climate action by shifting the costs of emission reductions from companies onto the most economically vulnerable in the industry: contract truck drivers. Currently, supporting these misclassified workers is possible and feasible with the billions the government has been putting into zero emissions and freight. EPA should apply the whole-of-government approach and leverage these new resources from the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL), coupled with the Administration's priority to implement Justice 40. These combined efforts could create a ZEV implementation program that prioritizes just transition. [EPA-HQ-OAR-2022-0985-1608-A1, p. 35]

The Biden Administration's recent EO Revitalizing Our Nation's Commitment to Environmental Justice for All provides clear directives that EPA should apply the administration's whole-of-government commitment to this rule. This means accounting for labor, impacts, and solutions as well as coordination with at least the Department of Labor, Department of Energy, Office of Environmental Justice, and Department of Transportation. 85 [EPA-HQ-OAR-2022-0985-1608-A1, p. 35]

85 Deepen the Biden-Harris Administration's whole-of-government commitment to environmental justice. Better protect overburdened communities from pollution and environmental harms. The Executive Order directs agencies to consider measures to address and prevent disproportionate and adverse environmental and health impacts on communities, including the cumulative impacts of pollution and other burdens like climate change. Promote the latest science, data, and research, including on cumulative impacts. https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/21/fact-sheet-president-biden-signs-executive-order-to-revitalize-our-nations-commitment-to-environmental-justice-for-all/

MFN provided a detailed analysis in our Making the Case for Zero-Emission Solutions in Freight 86 report on the economic benefits of zero emissions for different labor sectors through the freight transportation system, including manufacturing, maintenance, etc. MFN found that if the Administration prioritized money and resources in the transition to zero-emissions for the commercial fleet infrastructure, the job creation alone from direct and indirect work would be at around 30,000 additional jobs by 2037 (Figure 1). [EPA-HQ-OAR-2022-0985-1608-A1, p. 36] [Refer to Figure 1. Job Creation per $1 million invested in MHD Commercial Fleet EV Infrastructure on p. 36 of docket number EPA-HQ-OAR-2022-1608-A1.].

86 Moving Forward Network. Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice. (2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-theCase_Report_May2021.pdf.

A strong ZEV requirement has the potential to achieve one of the goals of the Biden administration to develop domestic manufacturing jobs. A new report from SAFE highlights the potential for more than 270,000 jobs "through investment in transportation manufacturing grants and tax incentives" and nearly 154,000 jobs through "incentives that make it cheaper to buy medium and heavy-duty electric vehicles, like trucks and buses." And research conducted on behalf of EV Infrastructure Strike Force suggests that, if the Biden Administration's goal of deploying 500,000 EV charging stations is met with public fast charging stations, it will support about 30,000 job-years. 87 [EPA-HQ-OAR-2022-0985-1608-A1, p. 36] [Refer to Figure 2. Manufacturing overview of heavy-duty electric trucks on p. 37 of docket number EPA-HQ-OAR-2022-1608-A1.]

87 Edward W. Carr. James J. Winebrake. Samuel G. Winebrake. Workforce Projections to Support Battery Electric Vehicle Charging Infrastructure Installation, Energy and Environmental Research Associates, LLC. Available at: https://etcommunity.org/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf

Many of the components that make up an MHD internal combustion engine (ICE) vehicles are the same as a ZEV. However, key electric drive components differentiate a ZEV, such as battery packs, electric motors, inverters and converters, and other electrical parts. These various components, from materials sourcing to design to assembly, all make up the long list of sub-segments within the ZEV manufacturing segment of the supply chain. [EPA-HQ-OAR-2022-0985-1608-A1, p. 37]

88 Environmental Defense Fund. Zero-emission trucks generating jobs across the U.S. https://www.edf.org/zero-emission-trucks-generating-jobs-across-us (last accessed: June 2023)

In the case of the previous NOx regulation, ERM's analysis found that a strong ZEV Rule would generate a 63,000 net increase in jobs and net GDP growth of over $10 billion by 2035. 89 Importantly, the average wages for the new jobs created are roughly double the average wages of those replaced. [EPA-HQ-OAR-2022-0985-1608-A1, p. 37]

89 Robo et al. (2022). p. 4.

12.9. EPA Should Expect Significant Employment Opportunities Associated with the Installation and Maintenance of Charging Infrastructure and Associated Grid Infrastructure

EPA correctly observes:

As the share of ZEVs in the HD market increases, there may also be effects on employment in the associated BEV charging and hydrogen refueling infrastructure industries. These impacts may occur in several ways, including through greater demand for charging and fueling infrastructure to support more ZEVs, leading to more private and public charging and fueling facilities being constructed, or through greater use of existing facilities, which can lead to increased maintenance needs for those facilities. We request comment on data and methods that could be used to estimate the effect of this action on the HD BEV vehicle charging infrastructure industry. 271 [EPA-HQ-OAR-2022-0985-1608-A1, p. 120]

271 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 469. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

Research conducted on behalf of EV Infrastructure Strike Force suggests that, if the Biden Administration's goal of deploying 500,000 EV charging stations is met with public fast charging stations, it will support about 30,000 job-years. 272 The work supported by HDV charging, which is generally higher-powered than LDV charging, could be even more extensive. [EPA-HQ-OAR-2022-0985-1608-A1, p. 120]

Organization: National Association of Chemical Distributors (NACD)

These concerns are supported by an analysis conducted by NACD economist John Dunham & Associates (JDA), which used the EPA's regulatory impact analysis to estimate the rule's impact on chemical distributors. JDA's economic analysis found that chemical distributors would bear a cost of $1.2 billion with a loss of 5,890 full time equivalent (FTE) jobs in the chemical distribution industry and a loss of over $1.7 billion of economic output if this rule is implemented. When applied to the total economy, this would force a loss of over 27,000 FTE jobs and over $5.6 billion of economic output. This analysis determined these costs while also accounting for benefits calculated by the EPA related to savings on diesel exhaust fluid and maintenance costs. It is also important to note that these negative economic and employment impacts only account for costs associated with chemical distributors, meaning the entire costs when applied to every economic sector are significantly higher. [EPA-HQ-OAR-2022-0985-1564-A1, p. 2.] [See Docket Number EPA-HQ-OAR-2022-0985-1564-A2 for the JDA report.]Based on the model developed for NACD by JDA, this additional fee will result in 7,005,341 tons of reduced chemical sales.9 This is a decrease of about 11.4 percent of current volume.10 Lower sales volumes will result in reduced jobs as distributors need fewer truck drivers, clerks, and warehouse staff. [EPA-HQ-OAR-2022-0985-1564-A2, p. 3]

9 Prepared for the National Association of Chemical Distributors by John Dunham & Associates, 2023. See methodology section,

10 This is true even though chemical sales are not extremely price sensitive. In other words, they have an elasticity of less than -1.0. In this model, at this price level, the average elasticity is calculated to be-0.416.

As Table 3 shows, the fees would impact both the chemical distribution industry and its customers. Around 5,890 FTE chemical distributor jobs could be lost due to the higher prices under the proposed rule. Including businesses that supply chemical distributors, and those that depend on re-spending by direct and supplier firm employees, the rule would lead to a total of over 27,140 fewer FTE jobs and almost $1.74 billion in lost wages and benefits. On top of this, the American economy would be $5.63 billion smaller. These figures are over the entire 30-year study period. [EPA-HQ-OAR-2022-0985-1564-A2, p. 3.] [See Docket Number EPA-HQ-OAR-2022-0985-1564-A2, page 3, for Table 3.]

It must be remembered that this is just the impact on the chemical distribution industry. Higher prices for chemicals will flow through nearly every other sector of the economy, leading to more job losses. [EPA-HQ-OAR-2022-0985-1564-A2, p. 3]

Organization: National Automobile Dealers Association (NADA)

E. Significant technician training investments are necessary to support the ZEV HDVs.

As the number of ZEVs on the road increases, there will be increased demands on the technician workforce required to maintain the vehicles. This demand in ZEV training of technicians is also occurring during a nationwide technician shortage.27 When an ZEV needs service or repair, not every technician can perform the work. Once dealerships begin making the investment in their facility to support the sale and service of ZEVs, their next investment is in technician ZEV training. [EPA-HQ-OAR-2022-0985-1592-A1, p. 13]

27 See e.g., Ed. Garsten, Repair Tech Shortage Costing Motorists Time And Money, CCC Study Shows, FORBES (March 15, 2022). Trey Howard, New technology contributing to nationwide auto technician shortage, WDAM (Feb. 24, 2023).

Technicians require training to work on ZEVs safely and properly. The hydrogen cell and battery-electric vehicles operate with very high voltage. Therefore, technicians need to know how to safely shut down and disconnect these systems prior to working on the vehicle. Not all technicians need to be trained on high voltage usage, but all technicians must have at least a basic understanding of EV safety, precautions, and emergency response procedures. For technicians that will be working on the mechanical and low-voltage systems of the vehicle, a short electrical safety familiarization course is all that is necessary. For technicians that intend to specialize in high voltage vehicles, while the training requirements vary by manufacturer, certification ranges from 2-4 weeks and requires courses in high voltage electrical and battery safety, along with technical service and maintenance courses for high voltage vehicles. [EPA-HQ-OAR-2022-0985-1592-A1, p. 13]

With battery electric vehicles having large amounts of electrical energy stored onboard, there are several precautions that need to be taken to prevent exposing service technicians to severe electrical shock. Motors, inverters, HVAC systems and the air compressor all are driven by high voltage AC current and require specific training to safely service. Training on the use of proper personal protective equipment and the inspection for reuse is critical. It is also recommended that there be a trained observer outside of the electric vehicle work area to assist in the case of an emergency. [EPA-HQ-OAR-2022-0985-1592-A1, p. 13]

The U.S. is projected to see a shortage of 642,000 technicians by 2024.28 ATD is concerned this industry shortage will be exasperated when combined with the increased education requirements needed to service ZEVs. This expertise shortage could undermine projections that ZEVs will save owners money on maintenance, at least until enough the skills gap is addressed. [EPA-HQ-OAR-2022-0985-1592-A1, p. 14]

28 TechForce Releases 2020 Technician Supply & Demand Report, TECHFORCE (Aug. 31, 2020).

Organization: RMI

In addition to the economic and environmental benefits, electric trucks are considered to be desirable from a workplace comfort perspective. Trucks are also an office, and operators must be comfortable in the cabs or they will switch jobs. Driver retention is a huge problem in trucking industry. The mechanics of an electric truck make them more comfortable to drive because they don't vibrate, they don't smell, they are quiet, and they accelerate more smoothly to make driving in high traffic and urban conditions easier. 26 [EPA-HQ-OAR-2022-0985-1529-A1, p. 9]

26 Laurie Stone, Reality Check: Electric Trucks Are Viable Today, RMI, May 25, 2022 https://rmi.org/reality-check-electric-trucks-are-viable-today/

Organization: United Steelworkers Union (USW)

Job Impacts

As mentioned prior, USW represents the majority of workers in the auto supply chain and oil refinery workers. The auto supply chain has historically been characterized by high union density, family-supporting wages and benefits, and pathways to the middle class. However, the shift to low-emission vehicle deployment cannot leave these workers behind. Unfortunately, the EPA's proposal of Phase 3 for GHG Emissions Standards for HDVs does not address the impact on jobs. EPA must consider how the rapid transition to low-emission vehicles – including HDVs – will impact manufacturing workers and the communities they live in. This should be an essential part of the comprehensive analysis that EPA conducts to project its proposals' economic impacts. [EPA-HQ-OAR-2022-0985-1514-A1, p. 2]

"Due to the speed of the transition to electric vehicles in EPA's proposal, tens of thousands of America's best manufacturing jobs are at risk, devastating not only oil workers, but those who make catalytic converters, pistons, fuel lines and numerous other materials, parts, and components for gasoline-powered vehicles. Research finds that there are 1200 facilities manufacturing HDVs and their components in the United States. Of these facilities, approximately 190 manufacture ICE HDVs and their components. The facilities producing these components and fuel are the most likely to see near-term job loss from the increased deployment of low-emission and ZEVs. Additionally, there are nearly 1000 facilities making "fuel agnostic" components for heavy-duty vehicles, such as glass and seat belts, and these components are a large part of the auto supply chain that will be disrupted with the proposed rapid transition to ZEVs.1" [EPA-HQ-OAR-2022-0985-1619-A1, p. 1]

1 BlueGreen Alliance Foundation, "U.S. Automotive Manufacturing: Motor Vehicles, Parts, and Materials", Accessed June 14, 2023.

Additionally, the transition to low-emission vehicles must function to raise the job quality and safety standards associated with all impacted workforces, including manufacturing workers, drivers, and mechanics. We remain deeply concerned that workers manufacturing components for and assembling ZEVs earn lower wages and receive less benefits when compared with workers manufacturing components for ICE vehicles.2 The high quality of these jobs is attributable to the ICE vehicle manufacturing sector's dense unionization. Union membership helps ensure that workers share in the benefits of the economic growth they help generate through collective bargaining, higher wages, increased access to healthcare, and improved retirement security. As a whole, union members earn approximately 20 percent more than their nonunion counterparts, helping to increase social mobility and improving workers' economic outcomes.3 [EPA-HQ-OAR-2022-0985-1514-A1, p. 3]

2 Economic Policy Institute, "The stakes for workers in how policymakers manage the coming shift to all-electric vehicles", September 22, 2021.

3 Department of Labor, "The Union Advantage", Accessed June 14, 2023.

However, there is a way to ensure that a transition to low-emission vehicles is equitable for the workers significantly impacted – a gradual transition. An Economic Policy Institute (EPI) report found that a gradual transition to battery powered electric vehicles significantly reduced the amount of jobs lost in the auto sector. While this report focused on light- and medium-duty vehicles, the message is relevant to HDVs. For example, one of the best scenarios configured in the report accounted for combustion vehicles taking up 50 percent, hybrid vehicles at 25 percent, and battery electric vehicles at 25 percent of the market share by 2030. Again, this scenario is based on light- and medium-duty vehicles, so the transition to low-emissions for HDVs would be much slower and below the proposed rule's projections. This report concludes that a more gradual and focused approach in transitioning to ZEVs is key.4 [EPA-HQ-OAR-2022-0985-1514-A1, p. 3]

4 Economic Policy Institute, "The stakes for workers in how policymakers manage the coming shift to all-electric vehicles", September 22, 2021.

In order to protect good-paying, union jobs and promote a safer environment, EPA should address the negative impacts on jobs and job quality that the proposed rule creates. Without well-rounded policy, good paying jobs are lost and communities are destroyed. [EPA-HQ-OAR-2022-0985-1514-A1, p. 3]

Infrastructure Rollout & Domestic Supply Chain Revitalization

The proposed rule identifies that the manufacturing investments from the Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA) play a critical role in setting emission standards. Programs related to the auto manufacturing sector include the Battery Manufacturing and Recycling Grants, the Battery Material Processing Grants, the Domestic Manufacturing Conversion Grants, the 48C Advanced Manufacturing Tax Credit, the Advanced Technology Vehicle Manufacturing Loan Program, the National Electric Vehicle Infrastructure Program, and the Charging and Fueling Infrastructure Grant Program. [EPA-HQ-OAR-2022-0985-1514-A1, pp. 3 - 4]

Organization: Zero Emission Transportation Association (ZETA)

The transition to EVs is already leading to new domestic manufacturing jobs, improved property values, and investment in communities.25 This trend should not only be expected to continue, but indeed accelerate in the coming years. The burgeoning HDEV industry will create new jobs for the manufacturing of components such as batteries, electric motors, and power electronics, as well as charging infrastructure. In addition, the manufacture of conventional vehicle component parts like brakes and windshields will continue to be a source of employment in the automotive industry. [EPA-HQ-OAR-2022-0985-2429-A1, p. 8]

25 Sklarz and Miller, "The Impact of Noise on Residential Property Value," (September 20, 2018) https://www.collateralanalytics.com/wp-content/uploads/2018/10/CA-RESEARCH-The-Impact-of-Noise-on-Residential-Property-Values.pdf

a. HDV Electrification Will Create Good-Paying American Jobs

HDV electrification will require building out a domestic EV supply chain and charging capacity, both of which hold considerable economic potential. A study by ICF Climate Center found that, as a whole, truck electrification provides greater benefits to the economy than other fleet composition.28 The study found that investment in HDEVs and charging infrastructure results in greater net employment, gross regional product, and industrial activity per dollar spent compared to natural gas vehicles and infrastructure. [EPA-HQ-OAR-2022-0985-2429-A1, p. 8]

28 "Comparison of Medium- and Heavy-Duty Technologies in California," ICF, (December 2019) https://caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf

Researchers at the Goldman School of Public Policy found that a scenario with 100% electric LDV sales by 2030 and 100% MHDV by 2035 would result in 2 million more jobs than the current trajectory.29 This is a result of the new jobs in charging infrastructure, the electricity sector, and maintenance. Additional estimates find that the 45W commercial clean vehicle tax credit could create more than 154,000 jobs in the U.S.30 The manufacturing and installation of charging infrastructure alone is projected to create more than 29,000 jobs.31 Heavy-duty charging infrastructure will demand even more jobs than the light-duty sector due to the large scale of these projects.32 In general, jobs in the EV industry are high-quality, high-paying, and tech focused. As a result, the industry is attracting a new generation of workers, including individuals transitioning from other industries, who are eager to work in sustainable transportation. [EPA-HQ-OAR-2022-0985-2429-A1, pp. 8 - 9]

29 "Switching to Electric Cars and Trucks Would Support 2 Million Green Jobs in 2035," UC Berkeley School of Public Policy, accessed May 15, 2023, https://www.2035report.com/transportation/green-jobs

30 "Decarbonization Pathways: Full Study Results," Eurelectric, (May 2018) https://cdn.eurelectric.org/media/3558/decarbonisation-pathways-all-slideslinks-29112018-h4484BB0C.pdf

31 "The Commanding Heights of Global Transportation: Quantifying the Employment Effects," SAFE, (March 9, 2021) https://secureenergy.org/the-commanding-heights-ofglobal-transportation-quantifying-the-employment-effects/

32 "Electrification of mobility will create new and support existing well-paying jobs in Canada," ChargePoint, (February 16, 2023) https://www.chargepoint.com/blog/electrification-mobility-will-create-new-and-support-existing-well-paying-jobs-canada

Relatedly, the transportation industry is also experiencing considerable shortages of available truck drivers, and HDV electrification could alleviate this crisis. The trucking industry is an estimated 80,000 drivers short, with many long-term employees citing stress as a reason for quitting.35 The American Trucking Association estimates the shortage could grow to 160,000 drivers by 2030.36 Consumer reports consistently demonstrate higher satisfaction with the EV driving experience compared to fossil fuel-powered vehicles. EVs provide a smoother ride with minimal vibrations, less noise pollution, and a high-tech driving experience free from diesel exhaust fumes.37 As a result, the health benefits associated with eliminating diesel fume inhalation and improved experience from a quieter drivetrain may reduce healthcare costs and increase driver retention.38 [EPA-HQ-OAR-2022-0985-2429-A1, pp. 9 - 10]

35 "The Biggest Kink in America's Supply Chain: Not Enough Truckers," New York Times, (November 9, 2021) https://www.nytimes.com/2021/11/09/us/politics/trucker-shortage-supply-chain.html

36 "ATA Chief Economist Pegs Driver Shortage at Historic High," American Trucking Associations, (October 25, 2021) https://trucking.org/news-insights/ata-chief-economist-pegs-driver-shortage-historic-high

37 "FAQ about electric trucks," Volvo Trucks, accessed May 15, 2023 https://www.volvotrucks.com/en-en/trucks/renewable-fuels/electric-trucks/faq.html

38 J. Leung and J. Peace. "Insights on Electric Trucks for Retailers and Trucking Companies," C2ES, accessed May 15, 2023 https://www.c2es.org/wp-content/uploads/2020/02/Insights-On-Electric-Trucks-For-Retailers-And-Trucking-Companies.pdf

With applications well beyond just EVs, ensuring a domestically-sourced supply of copper will be critical to ensuring a rapid transition to electrified transportation. In May 2023, the Department of Energy proposed to characterize copper as critical through its inclusion on the official DOE Critical Materials List.86 In particular, DOE is recommending a designation for copper of "near-critical" in the medium term (2025-2035). To meet the forthcoming increases in demand for copper, a pair of domestic projects are currently in various stages of development: [EPA-HQ-OAR-2022-0985-2429-A1, pp. 21 - 22]

86 "Critical Materials Assessment," U.S. Department of Energy, (May 2023) https://www.energy.gov/sites/default/files/2023-05/2023-critical-materials-assessment.pdf

Resolution Copper, Arizona: This project has the potential to supply up to 25% of the nation's copper demand to power America's clean energy transition with $1B annually into Arizona's economy. The project currently employs 300 people, 80% who live locally in rural communities within 40 miles of the project. When the mine is fully operational, Resolution Copper expects to directly employ about 1,500 workers, paying around $134 million per year in total compensation. In total, the project is expected to support 3,700 direct and indirect jobs, many of them local building trades and U.S. Steel Workers union jobs.87 [EPA-HQ-OAR-2022-0985-2429-A1, p. 22]

87 See: https://resolutioncopper.com/

NewRange Copper Nickel: This project is a 50:50 joint venture of Teck Resources Limited and PolyMet Mining Corp., holding the NorthMet and Mesaba deposits—two large, well defined resources in the established Iron Range mining region of Minnesota. The stand-alone company is creating a path to develop one of the world's largest and lowest cost copper-nickel-PGM producing districts, unlocking a new domestic supply of critical minerals for the low-carbon transition through responsible mining, and delivering significant, multi-generational economic and other benefits to the region and beyond.88 [EPA-HQ-OAR-2022-0985-2429-A1, p. 22]

88 See: https://newrangecoppernickel.com/

EPA Summary and Response:

Summary:

Some commenters, including Alliance for Vehicle Efficiency (AVE), BorgWarner, and NADA, stated that there is a lack of qualified technicians to manufacture, repair or maintain electric vehicle components and electric vehicle charging stations, and that there is a lack of drivers. Commenters state that this will lead to higher repair costs and longer delays in fixing issues that arise. NADA commented that ZEV technicians require specialized training with the depth of training depending on specific specializations, and the American Trucking Association (ATA) states that training, education and facility upgrades are needed to attract and maintain drivers and maintenance technicians in order to achieve the proposed standards and ensure employees can remain safe and perform efficiently. Commenters state that fleets will need time to implement training, education and facility upgrades for drivers and technicians, as well as to incorporate safety and best practices into handbooks and training materials and that these should be developed and standardized by standards-setting bodies, which takes time. NADA stated that safety is an issue in servicing EVs, and training is critical. They also commented that the increased training needs will exacerbate technician shortages. Commenters stated that EPA needs to revisit how a lack of qualified technicians can impact total cost of ownership as well as maintenance and repair, and that this may lead to companies shutting down.

AmFree commented that is it unreasonable that EPA doesn't even attempt to quantify the effect of the rule on employment especially given that the Economic Policy Institute estimates increasing electrification could lead to job losses, an analysis out of Princeton estimates EVs could lead to reduced jobs in the fossil fuel industry, CARB projects job losses for auto mechanics, and the White House breaks out EV employment from rest of auto industry in published research. BlueGreen Alliance (BGA) similarly commented that EPA must consider how the transition to EVs will impact workers and the communities they live in in the analysis of economic impacts. They state that EPA should identify communities associated with HD manufacturing, and quantify the share of the economy supported by HD manufacturing, as well as the number of jobs in the sector. BGA suggests that EPA collaborate with the Departments of Labor and Energy. BGA also states that EPA should consider risks and opportunities associated with the proposal, and project how the proposal will shape the domestic auto manufacturing sector, and the workers and communities within it. BGA also commented that EPA must look into claims from industry stakeholders that the proposed regulations will force reductions in job quality and quantity. UAW and USW commented that EPA's employment analysis does not reflect what the organizations expect would happen under a transition to a greater share of ZEVs in the market, stating that they are skeptical that the proposed standards will have minimal effect on the market and that the EPA must consider how a rapid transition to low-emission vehicles will impact manufacturing workers and their communities. UAW commented that EPA's proposed standard should be expected to disrupt ICE jobs, and the analysis for the rule should consider location, job quality and unionization rates of workers manufacturing batteries, fuel cells and advanced powertrain components that will be needed to meet the regulations. Both the UAW and USW commented that the rule will negatively impact job quality and safety, as well as that there will be localized effects, where some communities may see a decrease in number or quality of jobs even if some communities gain jobs. UAW and USW commented that ZEV workers earn lower wages and get less benefits from ICE worker counterparts due to unionization in ICE manufacturing.

UAW also commented that not all jobs should be treated as equal, and EPA should pay attention to preserving workforce standards for UAW members in new EV jobs in the analysis for the rule. They commented that setting emissions standards should not justify offshoring, wage cuts or union busting, and that the government should ensure that EV jobs are as good as or better than ICE jobs. BGA and UAW commented that EPA needs to consider how the transition to EVs will affect workers and their communities, that there will be distributional/geographic differences in the effects of the rule on employment where some places will see reduced employment, and others may see increased employment, though the quality or quantity of those jobs may not be equal. Both the UAW and USW state that a more graduation transition to ZEVs than proposed would be more equitable to workers, and that the transition for HD vehicles should be slower than that for the LD market.

BGA also commented that climate policy can't negatively affect workers and communities, and that EPA must track and hold industry accountable for any efforts that reduce their regulatory burdens and labor costs by doing so. They state that it is essential that jobs that facilitate the transition to cleaner vehicles are good, community supporting jobs in safe and democratic work environments. The UAW commented that EPA must craft standards that hold manufacturers accountable to environmental and labor concerns, and that the burden of compliance will fall on auto workers unless there are safeguards built into the rule. They commented that the uncertain disruption to ICE jobs, and uncertain quality of new EV jobs must be addressed, otherwise manufacturers could put EV jobs again ICE jobs. BGA state the EPA should leverage its analytical and research capacities to fully understand the significant impacts of this rule on auto manufacturing workers. BGA commented that supply chains and manufacturing jobs within them are critical to economic health and stability, and strong, technology-forcing vehicle emissions standards are essential to meeting climate goals. They also stated that when standards are well designed with workers in mind and supported by worker protections and investment, have the potential to create good jobs and support global competitiveness.

UAW and others also commented that domestic manufacturing and the supply chain supporting auto manufacturing will be impacted. USW commented that the speed of the transition due to the proposed rule will devastate oil workers as well as those along the ICE vehicle manufacturing supply chain. MFN commented that truckers and warehouse worker jobs might look different in a market where vehicles are electrified. They also commented that those working in, and adjacent to, the freight sector are essential constituents in the transition to a cleaner energy economy. BGA commented that EPA must ensure the standards don't exacerbate the historical offshoring of the automotive supply chain, or facilitate rent seeking behavior from automakers. BGA also commented that EPA should create a request for information similar to that of the Clean School Bus Program to solicit info from auto manufacturers, battery manufacturers, fuel saving technology manufacturers, and other suppliers seeking information on topics such as worker voice, wages, benefits, hiring practices, training, advancement programs, and community partnerships.

Steven Bradbury commented that the rule will destroy jobs in the U.S. auto industry through reduced demand leading to job loss for American's autoworkers. The UAW states that the rule should be crafted to avoid market disruptions that crease economic uncertainty, or pre-buy/no-buy that results in job losses.

The Clean Fuels Development Coalition commented that the analysis underestimates the rule's costs because the rule does not estimate aggregate costs, which includes the elimination of American jobs. ClearFlame Engine technologies comments that the final rule should preserve jobs in the diesel engine manufacturing and maintenance sectors. Dalek US Holdings commented that the rule will lead to jobs lost in the refining industry, and EPA needs to include the cost of lost jobs in petroleum and other fuels industries, as well as in the auto industry, and in downstream sectors.

Some commenters discussed battery manufacturing impacts. Electrification Coalition commented that onshoring battery cell, module and pack manufacturing is the key to minimizing job reductions, and replacing jobs lost as electrification in the transportation sector increases. They state that continued industry and government efforts needed to promote domestic battery manufacturing. EDF also noted that production of batteries and battery components is rapidly growing, pointing out that almost 70,000 jobs were added in this sector over last 8 years in response to demand for battery production.

CALSTART commented that there is potential growth of jobs, citing that green vehicle manufacturing exists in almost every U.S. state.

MFN mentioned that a whole-of government approach accounting for labor impacts and solutions, as well as coordination with Departments of Labor, Energy and Transportation, as well as the Office of Environmental Justice could lead to a just transition, and promote environmental justice, which focuses on workers' voices. They recommend putting state and federal standards in place to protect drivers from misclassification, including passing the Protecting the Right to Organize Act and restrengthening the Fair Labor and Standard Act. They also recommend EPA leverage resources from the IRA and BIL.

MFN also commented that workers should be included in determining what a fair progression toward ZEVs looks like. They state that smaller fleets and contract drivers have less capacity to assume inherent risks and uncertainty associated with adoption of new technology. In their comments, MFN noted that electrification of the HD fleet has the potential to create new, domestic, employment opportunities, especially when infrastructure build out, like public fast charging stations and other aspects of BEV charging and hydrogen refueling, are accounted for, and that those jobs have the potential for increased wages compared to the wages of the jobs they are replacing.

NACD commented that, based on a report by John Dunham & Associates, the chemical distributor industry will see economic and job losses due to the costs of the proposed rule, and those losses will be compounded when expanded to include total economic effects.

Some commenters, including RMI and ZETA stated that HD ZEVs are appealing to drivers, and will increase driver retention because drivers are more satisfied with HD ZEVs compared to HD ICE vehicles due to a more comfortable, smoother and quieter ride, a high-tech driving experience, less diesel odor, and that the ZEVs accelerate more smoothly making driving in high traffic and urban conditions safer and easier. ZETA also states that HD ZEVs are associated with health benefits for drivers due to reduced exhaust inhalation and may reduce healthcare costs.

ZETA comments that electrification is already producing new jobs in sectors supporting the manufacturing of batteries, electric motors and charging infrastructure, and investment in those areas is expected to accelerate. They also point out that fuel-agnostic parts will continue to be a source of employment. ZETA commented at increasing electrification needs increasing EV supply chain and charging capacity and cite a report by ICF Climate Center that finds that electrification, including infrastructure build-out, provides benefits to the economy over other fleet compositions. ZETA also cites research from Goldman Sachs that finds that EVs will lead to increased job availability due to associated infrastructure, electricity sector and maintenance needs, and that this could be increased even more due to Federal tax credits. They also note that the HD sector will require more infrastructure than the LD sector, so the effect is expected to be larger for HD than LD. ZETA also comments that jobs in the EV industry are expected to attract workers because they are generally high-paying, high-quality, tech focused jobs.

Response:

We acknowledge that the increasing penetration of zero-emission vehicles in the automotive industry will have an effect on employment, including ICE and ZEV manufacturing sectors, infrastructure-related employment sectors, and upstream and downstream sectors. While EPA does not mandate a specific compliance pathway for this rule, we recognize that adoption of additional pollution control technologies in response to the rule can also affect employment. This rule provides regulatory certainty to support increased employment in many economic sectors, though we acknowledge that OEM compliance decisions in response to the rule may reduce employment in other sectors. Opposing impacts across many sectors (e.g., increasing employment in ZEV and battery manufacturing, decreasing employment in ICE and ICE vehicle manufacturing) are normal, expected changes during periods of technological transition and are not specific to this rule. While it is currently difficult to estimate net employment impacts of this rule at this time, as discussed in Chapter 6.4 of the RIA and throughout this section of the RTC, we note that there is the potential for net positive employment. As noted in Section VI.E.4 of the preamble, support from a peer-reviewed tear-down study of a battery electric car and a comparable internal combustion engine vehicle indicates that if production of plug-in vehicles and their power supplies are done in the U.S. at the same rates as ICE vehicles, employment may increase. In addition, as noted by commenters on this rule, reports from ICF and Goldman Sachs indicate that electrification leads to increased job availability and provides benefits to the economy over other fleet compositions.

According to the U.S. Energy and Employment Report (USEER), jobs related to the energy sector increased from 2020 to 2021, and at a faster rate than the workforce overall.[977] These energy-sector-related jobs include electric power generation; transmission, distribution and storage; fuels; energy efficiency; and motor vehicles and component parts. The report states that employment in motor vehicles and component parts increased about 2.5 percent from 2020 to 2021, and jobs in clean energy vehicles increased by almost 21 percent, with jobs in EVs increasing by 27 percent. Employment in producing, building and maintaining charging infrastructure needed to support the ever-increasing number of plug-in vehicles on the road is also expected to significantly increase with the increasing buildout of charging infrastructure and thereby affect the nature of employment in automotive and related sectors. A recent report from the World Resources Institute indicates that if the right investments are made in manufacturing and infrastructure, autoworkers and communities will benefit from job growth, lower auto related costs, and reduced air pollution.[978] The report focused on effects that would be felt in Michigan, which, as of 2023 has the most clean energy jobs in the Midwest, and the ranks 5th nationally.[979] Michigan also ranks second, behind California, for the most hybrid and electric vehicle employment. Taking Michigan as an example, clean energy jobs grew by almost 4.6 percent in 2022, which was twice as fast as the overall economy. Electric vehicle-related jobs, specifically, grew by about 14 percent in the state in 2022. In addition to the 21 percent increase in employment in 2021 that USEER reported in clean energy vehicles, EDF also reports that the job growth and investment in the EV sector that has been seen nationally over the last eight years is expected to continue, with new factories or production lines for EVs, batteries, components and chargers supporting more than 125,000 jobs being announced across 26 states.[980] EDF reports that more than 140,000 new jobs have been announced in the U.S. since 2015, with 60,000 jobs being created in U.S. battery manufacturing.[981] They also point out that 66 percent of those job announcements were made in the time after BIL was passed, and 32 percent of those jobs were announced after the IRA was passed, and 86 percent of those jobs announcements were concentrated in ten states: Michigan, Tennessee, Georgia, Nevada, Kentucky, South Carolina, Ohio, North Carolina, Indiana and Kansas. DOE reports that more than 80,000 potential jobs in

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977 https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20Fact%20Sheet_0.pdf

978 https://www.wri.org/insights/michigan-electric-vehicle-job-creation, https://www.wri.org/research/michigan-ev-future-assessment-employment-just-transition

979 https://www.governing.com/work/michigan-leads-electric-vehicle-jobs-but-lags-in-sales#:~:text=More%20than%2032%2C000%20Michigan%20workers,involved%20%E2%80%9Cin%20this%20ecosystem.%E2%80%9D

980 EDF. (2023). New climate laws drive boom in electric vehicle jobs. Retrieved November 1, 2023 from https://vitalsigns.edf.org/story/new-climate-laws-drive-boom-electric-vehicle-jobs

981 EDF. (2023). U.S. Electric Vehicle Manufacturing Investments and Jobs. https://www.edf.org/sites/default/files/2023-03/State-Electric-Vehicle-Policy-Landscape.pdf

U.S. battery manufacturing and supply chain, and more than 50,000 potential jobs in U.S. EV component and assembly have been announced since 2020.[982]

EPA has considered input from labor groups in carefully designing the final rule, which includes a slower phase-in of the final standards compared to the proposed standards (as described in Section II.B of the preamble). In addition, EPA has consulted other federal partners, including the Department of Energy (DOE) and the Department of Labor (DOL), and engaged in significant dialogue with EJ and labor groups. Here in this RTC section, as well in the RIA and preamble, we note many of the ongoing efforts that labor-oriented groups, federal agencies. and others are engaging in to support workers and their communities in providing opportunities for a just economic transition. The list of programs and other efforts discussed throughout this rulemaking not exhaustive, and there may be more programs available that are not included here. While EPA does not set standards for labor, the agency fully supports a just economic transition for workers in association with the transition to clean vehicle technologies, and we believe that the numerous Federal, State, and private efforts we have identified, as well as other efforts not included here, significantly support quality jobs for workers across the nation.

There is a DOE funding package which makes $2 billion in grants and up to $10 billion in loans available to support projects converting existing automotive manufacturing facilities to support electric vehicle production.[983] This package is focused on the retention of high-quality, high-paying jobs in communities that currently host manufacturing facilities, and along the full supply chain for the automotive sector from components to assembly, and it gives priority to refurbishing and retooling manufacturing facilities, especially for those likely to retain collective bargaining agreements and/or an existing higher-quality, high-wage hourly production workforce.[984] DOE has also announced funding to support clean energy supply chains, with the funding going toward projects to support domestic clean energy manufacturing (including projects supporting battery production) in, or near, nine communities that were formerly tied to coal mining, and are expected to create almost 1,500 jobs.[985] The Joint Office of Energy and Transportation (JOET), created by the BIL, supports efforts related to deploying infrastructure, chargers and zero emission vehicles and school buses.[986] One example of a project from the JOET is the Ride and Drive grant program, which targets investments in EV charging resiliency, community-driven workforce development and EV charging performance and reliability. The ongoing actions discussed throughout this section supporting green jobs, including those by DOE, the Department of Labor (DOL), the Office of Energy Jobs, and others, are particularly focused on jobs with high standards and the right to collective bargaining.

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[982] https://www.energy.gov/invest

[983] https://www.energy.gov/articles/biden-harris-administration-announces-155-billion-support-strong-and-just-transition

[984] U.S. Department of Energy Office of Manufacturing and Energy. 2024. "Supply Chains Inflation Reduction Act Domestic Manufacturing Conversion Grants Funding Opportunity Announcement DE-FOA-0003106_FOA_Doc_Amendment_000006_IRA 50143." https://infrastructure-exchange.energy.gov/Default.aspx#FoaIdf9eb1c8a-9922-46b6-993e-78972d823cb2

[985] EnergyTech. 2023. *DOE Announces $275M for 7 Projects to Strengthen Clean Energy Supply Chains adn Manufacturing in Former Coal Communities.* EnergyTech. https://www.energytech.com/energy-efficiency/article/21278185/doe-announces-275m-for-7-projects-to-strengthen-clean-energy-supply-chains-and-manufacturing-in-former-coal-communities

[986] More information on these programs, and other programs, can be found in the memo Labor/Employment Initiatives in the Battery/Vehicle Electrification Space located in the docket for this rule.

In addition to the many programs at the federal level, states are making efforts to support increasing domestic production of electric vehicles and batteries, including support for the workforce. An Executive Order issued in South Carolina prioritized implementing a strategic initiative to explore opportunities related to ongoing economic development, business support and recruitment efforts with electric vehicle and automotive manufacturers.[987] A study from Ohio estimates that there will be more than 25,000 new jobs in EV manufacturing and maintenance, battery development and charging station installation and operations in the state by 2030.[988] California has a Workforce Development Board that has been focused on furthering the development of an equitable ZEV industry, including high quality jobs and access to them, since at least 2021.[989] Illinois has invested in EV training programs, research and development in the EV industry, and in workforce development and community support in the clean energy sector.[990] The Nevada Battery Coalition is tasked with identifying gaps in, and developing solutions for, workforce and economic development supporting the lithium industry in Nevada.[991] Kentucky has been the location for at least two recent automotive sector development projects, and it is providing resources toward upgrading industrial sites throughout the state, with funding evaluated based on factors including workforce availability.[992] Tennessee is co-locating a new Tennessee College of Applied Technology with a new EV manufacturing facility Ford is building in the state to provide specialized technical training.[993] In Michigan, the Department of Labor and Economic Opportunity created the Electric Vehicle Jobs Academy to assist with tuition and other supportive services for those training to be in the advanced automotive mobility and electrification industry, and the University of Michigan contracted with the state to open the University of Michigan Electric Vehicle Center focusing on research and development and developing a highly skilled workforce.[994,995]

Regarding comments that there is a lack of qualified technicians for electric vehicle repair and maintenance, we disagree. As described throughout this section, there are many programs available to support training of electric vehicle repair and maintenance technicians, as well as technicians supporting ZEV infrastructure. We do not agree that there will be a significant lack of technicians in the timeframe of this rule given investments and programs focused on training for EV sector positions, including those discussed throughout this RTC section, as well as other programs, including those at many community colleges, supporting jobs related to EV

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987 SCpowersEV: State support - Driving the Future, https://scpowersev.com/state-support.

988 Accelerating Ohio's Auto & Advanced Mobility Workforce, Auto and Advanced Mobility Workforce Strategy, 2023. https://workforce.ohio.gov/wps/wcm/connect/gov/2e9f6e52-a4bc-4ef6-9080-e6b06f067a1a/Ohio%27s+Electric+Vehicle+Workforce+Strategy.pdf?MOD=AJPERES.

989 California Workforce Development Board, 2021. https://business.ca.gov/wp-content/uploads/2021/03/CWDB_ZEV-Plan.pdf

990 Illinois Drive Electric: Abundant Workforce, https://ev.illinois.gov/grow-your-business/abundant-workforce.html.

991 Nevada Battery Coalition: https://nevadabatterycoalition.com/about/

992 Kentucky: Leading the Charge, https://ced.ky.gov/Newsroom/Article/20230816_Leading_th.

993 Area Development: Tennessee: A growing Capital of Electric Vehicle Production, https://www.areadevelopment.com/ContributedContent/Q4-2021/tennessee-growing-capital-of-electric-vehicle-production.shtml

994 MI Labor and Economic Opportunity: Electric Vehicle Jobs Academy, https://www.michigan.gov/leo/bureaus-agencies/wd/industry-business/mobility/electric-vehicle-jobs-academy.

995 Michigan Engineering News, $130M Electric Vehicle Center launches at U-Michigan, https://news.engin.umich.edu/2023/04/130m-electric-vehicle-center-launches-at-u-michigan/.

technology, including technicians.[996] However, as described in RTC Section 3.7, we do account for a transition period during which extra training needs for ZEV maintenance and repair may be required. To account for this, we use a decreasing scaling factor over 5 years, starting in MY 2027 for BEVs and MY 2030 for FCEVs, which, in effect, reduces the projected cost savings of maintenance and repair in the early years compared to those in the later years. Additionally, the phase-in of this final rule, described in Section II.B of this preamble, will allow time for technicians to be trained. We do find that this rule provides regulatory certainty that supports significant job growth for qualified technicians that service electric vehicles.

As described in Section 6.1 of the RTC and Chapter 2 of the RIA, we assessed availability of the charging infrastructure for the final rule, as well as describe our assumptions and resulting analysis of that availability with respect to our estimates of charging needs. We note that there will likely be a significant increase in demand for labor in sectors that manufacture, build and maintain charging stations, associated with the increasing penetration of electric vehicles. To that end, the BIL is investing in the build out of EV chargers along America's major roads, freeways and interstates, focusing on domestically produced iron and steel, and domestically manufactured chargers.[997] The magnitude of all of these impacts depends on a variety of factors including the labor intensities of the related sectors, as well as the nature of the linkages (which can be reflected in measures of elasticity) between them and the regulated firms.

In response to comments on the speed of the transition to electrification, and that a slower phase in will support workers during the transition, as described in Section II.B of the preamble, the stringency levels for this rule are phased in, which will allow for increased opportunities for training, education and facility upgrades over time. To that effect, we also point out that there are existing projects focused on training new and existing employees. For example, the Transit Workforce Center provides a Battery Electric Bus Familiarization Course intended to educate and familiarize employees of public transportation systems on the safe use of battery electric buses[998] and the American Public Transportation Association provides recommended practices and guidance for developing zero emission bus maintenance training curricula and materials.[999]

Regarding claims this rule will affect, and we should account for, job quality, as well as quantity, that there may be geographically localized effects even if there are not national net effects, and that jobs may look different in a market where vehicles are electrified, we acknowledge that different markets and different workers may be affected differently by a transition to clean vehicle technologies. We find that there are significant Federal, State, and private efforts to support quality jobs for workers across the nation, including those we summarized earlier in this section and more below. We point to work by the Departments of Energy (DOE) and Labor (DOL), as well as others, who are funding grants and initiating programs to support green jobs, including those related to electric vehicle battery production, training and apprenticeship programs, and more. JOET is responsible for executing funding from

[996] For a list of some of the community college and other programs that support the electric vehicle industry, see the Community College and Other EV Training Programs memo to the docket.
[997] The White house: Full Charge: The Economics of Building a National EV Charging Network, https://www.whitehouse.gov/briefing-room/blog/2023/12/11/full-charge-the-economics-of-building-a-national-ev-charging-network/.
[998] https://www.transitworkforce.org/battery-electric-bus-familiarization-course/
[999] https://www.apta.com/research-technical-resources/standards/bus-transit-systems-standards-program/apta-bts-zbt-rp-001-23/

the Investing in America Agenda granted to 30 projects across 16 states and Washington D.C. to support EV charging performance, resiliency and reliability, and, relevant here, supports projects for equitable access to clean transportation solutions, and to help grow the clean energy workforce.[1000] DOE has an Office of Energy Jobs, focused on supporting the creation of jobs in the energy sector, with particular focus on jobs with high standards and the right to collective bargaining.[1001] The office works with other federal agencies to support meaningful jobs in the transition to a zero-emission economy, including through:

- The 21st Century Energy Workforce Advisory Board to support current and future energy-sector labor needs, and to expand energy jobs and training opportunities
- A DOE Labor Working Group, a forum with labor unions and others to engage on key energy topics
- A Community Benefits Plan to account for labor and community engagement, quality jobs, worker investment and more
- The Battery Workforce Initiative established by the Department of Energy (DOE) in coordination with the Department of Labor (DOL), AFL-CIO and other organizations to bring together industry stakeholders, including employers and unions, to develop consensus on skills and training needed to support a growing domestic battery supply chain with the goal of accelerating the development of high-quality training

DOL's Employment and Training Administration oversees the DOL Building Pathways to Infrastructure Jobs Grant Program aimed at investing in the development and implementation of worker-centered strategies and training programs needed to support the transition to a zero-emissions economy.[1002] These programs include support aimed at jobs in renewable energy, energy efficiency, broadband expansion, smart city grids, and jobs facilitating the design, construction, modernization and maintenance of infrastructure. DOL also provides grants to help community colleges provide skilled pathways to good jobs in the transportation and clean energy sectors. DOL is providing technical assistance to the Southeast EV Collaborative, which is made up of collection of state workforce agencies in the southeast region of the U.S. focused on identifying opportunities to work together to provide equitable access to good jobs across the region.

Research on domestic employment in the EV transition funded by the Department of Energy (DOE) indicates that a wide range of jobs in the ICE vehicle sector have a relatively high similarity in needed skill sets to jobs in the EV sector, as well as in other sectors, including the heat pump, solar panel manufacturing and transformer industry.[1003] The research also indicates that higher-wage jobs with more specialized skills may be better positioned to transition their skill sets from ICE sectors to EV sectors, although they are more geographically concentrated

[1000] https://www.energy.gov/articles/biden-harris-administration-announces-over-46-million-enhance-ev-charging-reliability-and
[1001] https://www.energy.gov/policy/energy-jobs
[1002] https://www.dol.gov/sites/dolgov/files/ETA/skillstraining/Building%20Pathways%20to%20Infrastructure%20Grantee%20Abstracts_12-4-2023.pdf
[1003] Workforce Analytic Approaches to Find Degrees of Freedom in the EV Transition; https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4699308

and hence dependent on co-location of EV production capacity with automotive production for transition opportunities. This research is supported by comments provided by ZETA, indicating that the EV industry is attracting workers transitioning from other industries. At the same time, we note the considerable efforts to support workers with lower wages and lower skills levels, including, for instance, the targeting of IRA funds to economically disadvantaged counties discussed below. Also, we point out that even though vehicle manufacturing and battery manufacturing may create more localized employment effects, infrastructure work is, and will continue to be, a nation-wide effort. We note that ICCT estimated that charging infrastructure growth in the U.S. could create about 160,000 jobs by 2032, in sectors ranging from electrical installation, maintenance and repair, charger assembly, general construction, software maintenance and repair, planning and design, and administration and legal.[1004] We also note that JOET has funded initiatives related to job training for many sectors related to charging resiliency and performance, including those in the electrical industry.[1005]

Regarding community level effects, we note data at sub-national level is not consistent, nor consistently available, and subnational estimations are too precise compared to the uncertainty in estimating possible future effects for the nation as a whole. Regarding comments that we should quantify effects on job quality at existing ICE plants versus those at new or to-be-built electric vehicle or battery manufacturing plants, we point out that data related to job quality is not wide-spread or consistent enough, and is too uncertain to rely on, in addition to the fact that we do not know where these plants may be in 2030, nor their size or employment capacity. We may be able to obtain data from a select few manufacturers, but this would ignore the possible effects at all vehicle and battery plants, leading to a high level of uncertainty. Also, we would need to determine a consistent measure of job "quality." Commenters who advocated for this kind of quantitative job quality analysis did not provide any such analysis themselves. Notwithstanding the technical difficulties with performing such an analysis, we find there is considerable support for quality jobs in association with the ongoing transition to clean vehicle technologies, as discussed throughout this section.

As described in comments by CALSTART, EDF and ZETA, investments in both money and jobs in vehicle and battery manufacturing plants and infrastructure to support electric vehicle production is already happening, and as noted throughout this section, this investment is supported by Federal actions, including the IRA, BIL, CHIPS Act, the Battery Workforce Initiative and other programs out of the DOE, DOL and others. And though crafting standards about labor concerns are not in the purview of EPA, we point out that these efforts, among others, support the workforce in the transition to cleaner vehicles. It is also important to note that investments from the IRA have, so far, been focused in more economically disadvantaged counties. The U.S. Department of Treasury states that as of November 2023, 70 percent of post-IRA investments in clean energy have happened in counties with a smaller share of the population employed than the U.S. average; almost 80 percent have happened in counties with below-average median household incomes; more than 80 percent of have happened in counties with below-average wages; and more than 85 percent have gone to counties with below-average

[1004] ICCT: Charging Up America, https://theicct.org/wp-content/uploads/2024/01/ID-28-%E2%80%93-U.S.-infra-jobs-report-letter-70112-ALT-v6.pdf.
[1005] JOET: New Funding Enhances EV Charging Resiliency, Reliability, Equity and Workforce Development, https://driveelectric.gov/news/workforce-development-ev-projects.

college graduation rates.[1006] We also note that during and after the comment period, several major U.S. automakers were negotiating new labor contracts, with an emphasis on workers in facilities that support the production of electrified vehicles.[1007] The negotiations resulted in many workers in EV production, including EV battery workers, becoming newly eligible to join the union, as well as in raising wages for those employed by unionized automakers, and those employed by non-unionized automakers.[1008]

Regarding comments on a gradual phase in of the standards, we refer to Section II.B of the preamble, where we describe how this final rule phases in over time, which will allow for training, education, and planning for workforces as the market transitions to greater use of ZEVs. We also point out that there are many potential pathways to compliance for this rule, and they also include continued production of ICE vehicles.

In addition, as commented on by RMI and ZETA, HD vehicle drivers find HD ZEVs appealing for many reasons including comfort, safety and health, which could lead to increased willingness to become and stay a HD driver. ZETA also commented that employment opportunities have the potential to improve with the increased demand for critical minerals, specifically pointing out two domestic projects aimed at increasing the supply of copper and nickel in the U.S. The same commenter notes the added employment opportunities associated with expanded distributed grid buildout, citing a study by ICF Climate Center. The study focuses on effects of increasing electrification in California, finding that electrification of the medium- and heavy-duty sectors, including building out the supporting infrastructure, increases net employment in the state.[1009] In addition, as noted by ZETA, even under increasing ZEV production, sectors associated with fuel-agnostic vehicle components (for example, windshield wipers, windscreens, seat, etc.) will continue to be a source of employment.

Regarding AmFree's comment that we do not attempt to quantify employment impacts, and other comments that the supply chain supporting auto manufacturing will be affected in addition to domestic auto manufacturing, we refer to our discussion on employment in RIA Chapter 6.4 where we discuss potential employment effects in auto manufacturing as well as in sectors upstream and downstream. As we noted in the Phase 2 final rule, "[t]he overall effect of the final rules on motor vehicle sector employment depends on the relative magnitude of output and substitution effects…Because we do not have quantitative estimates of the output effect, and only a partial estimate of the substitution effect, we cannot reach a quantitative estimate of the total employment effects… on the motor vehicle sector employment…". 81 FR at 73897. This

[1006] The Inflation Reduction Act: A Place-Based Analysis: https://home.treasury.gov/news/featured-stories/the-inflation-reduction-act-a-place-based-analysis

[1007] UAW: Bargaining 2023 UAW-GM, https://uaw.org/gm2023/; UAW: UAW National Negotiators Reach Tentative Agreement with Ford on Record Contract, https://uaw.org/uaw-national-negotiators-reach-tentative-agreement-with-ford-on-record-contract/#:~:text=Some%20of%20our%20lower-tier%20members%20at%20Sterling%20Axle,workers%20will%20receive%20an%20immediate%2011%25%20wage%20increase.; UAW: UAW reaches a Tentative Agreement with Stellantis, https://uaw-newsroom.prgloo.com/press-release/uaw-reaches-a-tentative-agreement-with-stellantis.

[1008] Bloomberg: UAW Scores Victory in EV Worker Battle Even with Wage Compromise, https://news.bloomberglaw.com/daily-labor-report/uaw-scores-victory-in-ev-worker-battle-even-with-wage-compromise; The Washington Post: UAW members ratify record contracts with Big 3 automakers, https://www.washingtonpost.com/business/2023/11/20/uaw-contract-ford-general-motors-stellantis/.

[1009] ICF: "Comparison of Medium- and Heavy-Duty Technologies in California," (December 2019) https://caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf remains the case. To quantify the estimated effects of this final rule on employment would necessitate data which is not available to EPA. Commenters also did not provide such data or analysis specific to the impacts of this rule. In addition, quantifying employment effects in sectors upstream or downstream from the directly affected sector is dependent on more than just the effect of this final regulation, for example macroeconomic conditions in each state, as well for the country as whole. We also note that, in cooperation with DOE and DOL, we did qualitatively assess a number of employment initiatives currently underway pertaining to ZEVs and related industries. Information on many of these initiatives are discussed throughout this RTC section, as well as in the RIA (Chapter 6.4) and the preamble (Section VI.E.4). These initiatives support continued growth, training, and investment in workers and their communities throughout automotive manufacturing and supply chain industries, as well as throughout industries related to charging infrastructure.

In addition, AmFree cites a few studies that seem to indicate that job losses are going to result from increasing electrification, and it states that given these reports, it is unreasonable for EPA not to attempt to quantify employment on this rule. They quote a portion of a result from EPI that states, “a rise in BEVs to 50% of domestic auto sales by 2030 could see losses of roughly 75,000 jobs by 2030”; however, they did not include the entire statement from EPI, which is as follows: “due to manufacturing policy inaction, a rise in BEVs to 50% of domestic auto sales by 2030 could see losses of roughly 75,000 jobs by 2030. These losses would stem from policy failures that stunted investment in domestic capacity of U.S. producers to build the batteries and drivetrains of BEVs, and from a failure to regain market share in overall vehicle sales.”[1010] Another finding in the study is that if the U.S. supports domestic production of electric vehicle powertrain components through common-sense measures to boost investment in domestic auto capacity for producers and suppliers, and to support employment and job quality, employment could increase by over 150,000 jobs. As noted throughout this RTC section, there are already many actions being taken to support domestic autoworkers and those in related sectors. In addition, the authors note that the analysis is very narrowly focused on the impacts of increased EV technology deployment on employment in car and light-duty truck/SUV auto and parts manufacturing. It does not include impacts in, for example, HD vehicle manufacturing, auto maintenance and repair, battery manufacturing, or charging infrastructure. AmFree also cites a Net-Zero America (NZA) study, saying that the fossil-fuel industry will lose jobs due to the move to electric vehicles. However, in that study, even in the most aggressive modeling assumption, EVs only account for 17% of all light-duty vehicles by 2030. In addition, NZA notes that “net job losses in fossil fuel sectors in near- and long-term are more than offset by increases in low carbon sectors.”[1011] And though the ACC II SRIA does predict a reduction in auto-mechanic jobs in California alone, it should be noted that ACC II is a regulation of light-duty vehicles, and its results cannot readily extrapolated to the heavy-duty sector. Moreover, there are key sectors not represented by the analysis in the SRIA.[1012] For example, there is no estimated

[1010] Jim Barrett & Josh Bivens, The Stakes for Workers in How Policymakers Manage the Coming Shift to All-Electric Vehicles, Econ. Pol’y Inst. (Sept. 22, 2021), https://www.epi.org/publication/ev-policy-workers/

[1011] Net-Zero America: State-Level Health, Employment, and Land Use Impacts (Oct. 2021) https://netzeroamerica.princeton.edu/img/Princeton%20NZA%20FINAL%20REPORT%20SUMMARY%20(29Oct2021).pdf

[1012] Advanced Clean Cars II Proposed Amendments to the Low Emission, Zero Emission, and Associated Vehicle Regulations: Standardized Regulatory Impact Assessment (Mar. 29, 2022) https://dof.ca.gov/wp-content/uploads/sites/352/Forecasting/Economics/Documents/ACCII-SRIA.pdf impact on auto manufacturing, although they note that increasing electrification would likely lead to increases in jobs with manufacturers producing ZEVs. The results presented in the SRIA are also unclear about the inclusion of infrastructure-related jobs, or jobs related to battery production, though results do show an increase in electric power generation, transmission and distribution, and an increase in basic chemical manufacturing starting around 2034. AmFree also points out that the White House breaks out EV sector employment levels from the rest of the automotive sector in a June 2021 report reviewing E.O. 14017.[1013] However, the employment numbers referred to in that White House report are from the USEER from 2017, and are a snapshot of employment estimates at a point in time, based on comprehensive survey results, and are not a result of a study of the impact a single regulation might have on employment.

As stated earlier in this section, according to the U.S. Energy and Employment Report, jobs related to the energy sector (including electric power generation; transmission, distribution and storage; fuels; energy efficiency; and motor vehicles and component parts) have increased at a faster rate than the workforce overall, from 2020 to 2021.[1014] The report states that employment in motor vehicles and component parts increased almost 2.7% from 2020 to 2021, and that employers across all motor vehicles and component parts industries anticipate growth through 2023.[1015] The results described in this report support comments from EDF, the Electrification Coalition, CALSTART and ZETA that the transition to zero emission vehicles has the potential to result in an increase in jobs. ZETA cites a study by the Goldman School of Public Policy indicating that as EV sales increase, reductions in auto repair and maintenance jobs are more than offset by increases in jobs in construction and maintenance in green job sectors like wind, solar, and battery storage, and in electric grid infrastructure jobs.[1016] EDF noted that almost 70,000 jobs were added in the battery production and components sector over the last 8 years. The projects, agencies and efforts mentioned above will support the continued investment in domestic, quality jobs in a transition to a zero emission transportation future, which will happen slowly over time.

Regarding comments that EPA should create a request for information (RFI) like the voluntary one EPA published targeting manufactures receiving funding in the Clean School Bus (CSB) Program to solicit information from affected parties, we disagree, noting that the CSB Program was not a regulation that limits pollution emissions from school buses, but instead is a program meant to help schools replace existing buses with zero- or low-emission models through grants and rebate funding opportunities. The RFI in the CSB was created to support the overall success of the CSB Program, and to help EPA, partners, and stakeholders understand how the CSB Program, with funds provided by the BIL, is contributing to the creation of high-quality

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[1013] White House, Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth, 100-day Reviews under Executive Order 14017, June 2021. https://www.epi.org/publication/ev-policy-workers

[1014] https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20Fact%20Sheet_0.pdf.

[1015] The data in the USEER relies on a comprehensive survey of about 34,000 respondents across the U.S. and because it is a snapshot in time, current events may impact these results. For example, the report notes that COVID-19 and associated effects deeply impacted energy employment, leading the sector to lose jobs at a higher rate in 2020 than the economy as a whole, though the report indicates that the energy sector has recovered about 71% of the jobs lost during 2020. In addition, USEER notes that the conflict in Ukraine has impacted fuels industries leading to increased petroleum and wet gas exports from the U.S.

[1016] "Switching to Electric Cars and Trucks Would Support 2 Million Green Jobs in 2035," UC Berkeley School of Public Policy, accessed May 15, 2023, https://www.2035report.com/transportation/green-jobs

jobs across the country. We appreciate the information provided by those OEMs who have already volunteered to participate, and those who might in the future.[1017]

Regarding the comments that market disruptions that create economic uncertainty or pre-buy/no-buy could result in job-losses, pre-buy or low-buy is unlikely to occur in a significant manner, which points to very little sales related changes in employment. See RIA Chapter 6.1 and RTC Section 19.4 for more information on sales effects.

Regarding comments from MFN that workers should be included in determining what a fair progression toward ZEVs looks like, we note that we participated in an extensive public engagement process, receiving input from many vehicle-related industries, environmental groups, labor unions, EJ groups, and others in response to the proposed rule. In addition, the public engagement process gave an opportunity to workers and drivers to comment on the rule. We also note that there are many support programs available, some of which are discussed throughout this section. Regarding the comments from MFN that workers are misclassified, and that small trucking companies will bear the brunt of the costs with less capacity to assume inherent risks and uncertainties associated with the adoption of new technology, we refer to RTC Section 26 and RIA Chapter 9 where we discuss how we account for small businesses in our analysis. We recognize concerns from small businesses about the rapid rate of transition, noting that the final rule has a slower phase in of the standards compared to the proposal. By 2032, EPA's modeling for the central case projects 80% onroad fleet is still ICE, which continues to provide markets and demand for gas stations, mechanics, aftermarket servicers, etc. At the same time, we see many opportunities for small businesses to incorporate EV related jobs. For example, many retail gas stations are being outfitted with EVSE right now.[1018,1019,1020] Though these efforts are currently focused on light-duty EVSE, it indicates a strong opportunity for EVSE supporting HD to follow this path. In addition, this rule provides regulatory certainty for these small businesses, as well as to support the creation of new jobs. Regarding the comment about passing the Protecting the Right to Organize Act and restrengthening the Fair Labor and Standard Act, this is outside the scope of this rule.

Regarding the Clean Fuels Development Coalition comments concerning the Major Questions Doctrine, see RTC Section 2.1. In addition, we describe possible effects on employment in the vehicle manufacturing sectors, and upstream and downstream sectors, including those in the petroleum sector, in RIA Chapter 6.4

[1017] For responses provided to the Clean School Bus RFI, see https://www.epa.gov/cleanschoolbus/bus-manufacturer-job-quality-and-workforce-development-practices. A copy of this webpage as of March 5, 2024 is provided in the docket for this rule.

[1018] Businesswire: Electric Era Announces Investment from Chevron Technology Ventures to Scale Adoption of it PowerNode Electric Vehicle Charging Stations.
https://www.businesswire.com/news/home/20231003932625/en/Electric-Era-Announces-Investment-from-Chevron-Technology-Ventures-to-Scale-Adoption-of-its-PowerNode%E2%84%A2-Electric-Vehicle-Charging-Stations

[1019] Shell Recharge: https://www.shell.us/business-customers/shell-fleet-solutions/shell-recharge?msclkid=b112711a7f16131508b614da1ed439cf&utm_source=bing&utm_medium=cpc&utm_campaign=US_RCG_EN_NB_PM_BNG_Fleet_Recharge_Product&utm_term=ev%20charging&utm_content=Recharge%20Solution#iframe=L0xlYWRfR2VuX0Zvcm0_SUQ9VUhKdlpIVmpkRDFUWld4bUlITmxiR1ZqZEdWa0preGxZV1JUYjNWeVkyVTlUM0puWVc1cFl3PT0

[1020] Love's: Electrify America Announces Collaboration with Love's Travel Stops:
https://www.loves.com/en/news/2020/august/electrify-america-announces-collaboration-with-loves-travel-stops

We note that comments suggesting EPA track and hold industry accountable for specific business practices such as offshoring are out of scope for this rulemaking. While we set standards and prescribe test procedures to demonstrate compliance, and consider costs, employment impacts, and potential supply chain concerns in setting the standards, EPA's engine and vehicle regulations do not dictate how manufacturers source their materials or staff their production to meet the standards. This approach allows each manufacturer to identify the business approach most appropriate for their company, yet still achieve the environmental and health benefits associated with the reduced level of tailpipe emissions allowed by the rule.

Regarding comments from NACD that the chemical distributor industry will see losses due to the costs of the proposed rule, we point out that this rule projects that there will be operational cost savings, which may reduce the economic costs of freight distribution. Also, as discussed elsewhere in this section, there are many potential pathways to compliance for this rule that also include continued production of ICE vehicles.

20 Social Cost of GHGs

20.1 Discount Rate

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Third, when calculating the climate benefits that the proposed rule would generate, EPA relied on estimates from the Interagency Working Group on the Social Cost of Greenhouse Gases. See 88 Fed. Reg. at 26,075–80. This introduced two additional flaws into EPA's cost-benefit analysis. To start, it rendered the analysis internally inconsistent as to the discount rates used. For every other cost and benefit in the proposed rule, EPA followed OMB's guidance and used discount rates of 3 and 7 percent to calculate present values. See id. at 26,082. But the Interagency Working Group discounted its estimates at 2.5, 3, and 5 percent discount rates. Id. at 26,081. As a result, aside from its 3- percent scenarios, EPA was irrationally comparing costs and benefits valued using distinct discount rates. [EPA-HQ-OAR-2022-0985-1660-A1, p. 65]

Organization: Arizona State Legislature

Selection of the discount rate. First, the selection of the discount rate plays an outsized role in the IAMs' damage calculations. The Interagency Working Group describes the 'discount rate' as follows: '[I]n calculating the SC-GHG, the stream of future damages to agriculture, human health, and other market and non-market sectors from an additional unit of emissions are estimated in terms of reduced consumption (or consumption equivalents). Then that stream of future damages is discounted to its present value in the year when the additional unit of emissions was released.' 2021 TSD, at 17. Dr. Dayaratna describes this process as follows: 'Discounting future benefits of averting climate damage compares the rate of return from CO2 reduction to the rate of return that could be expected from other investments. In principle, discounting runs the compound rate of return exercise backwards, calculating how much would need to be invested at a reasonably expected interest rate today to result in the value of the averted future climate damage.' Ex. A, ¶ 18. A lower discount rate entails a higher calculation of anticipated damages from climate change, and thus a higher 'social cost' for each greenhouse gas. 'The present value of a future benefit or cost is the amount you would have to invest today that would grow in value to match that benefit or cost at the specified time in the future. The discount rate represents the rate of return of this investment and should reflect the real rates of return to capital.' Id. ¶ 19.[EPA-HQ-OAR-2022-0985-1621-A1, pp. 16-17]

As the Working Group admits, the selection of a discount rate 'has a large influence on the present value of future damages.' 2021 TSD, at 17. As the analysis of Dr. Dayaratna demonstrates, this is an understatement—the selection of discount rate has an enormous influence on outcomes. But, as the Working Group also admits, the selection of the discount rate is an exercise in value judgment, not scientific calculation: 'the choice of a discount rate … raises highly contested and exceedingly difficult questions of science, economics, ethics, and law.' 2021 TSD, at 17. As the Working Group admits, the selection of a discount rate ultimately rests on 'different policy or value judgments.' Id. at 27 [EPA-HQ-OAR-2022-0985-1621-A1, p. 17]

Before the 2021 TSD, the discount rate was calculated using OMB's peer-reviewed Circular A-4, which provided for a 7 percent discount rate based on the long-term return on investment capital to be used in cost-benefit analyses. Dayaratna Statement ¶ 20. The 2021 TSD abandons the longstanding, peer-reviewed approach to the discount rate in favor of a range of much lower discount rates, which yield much higher 'social cost' calculations: 2.5 percent, 3 percent, 5 percent, and the 95th percentile probability distribution at the 3 percent discount rate. 2021 TSD, at 5-8. [EPA-HQ-OAR-2022-0985-1621-A1, p. 17]

The Working Group admits that there are 'disagreements in the literature on the appropriate discount rate to use in this context, and uncertainty about how rates may change over time.' Id. at 17. Rather than grappling with this uncertainty and disagreement, the Working Group simply selects a range of low values that (it states) 'span a plausible range of certainty-equivalent constant consumption discount rates.' Id. The Working Group rejects OMB Circular A-4's peer-reviewed approach, concluding that 'the social rate of return to capital, estimated to be 7 percent in OMB's Circular A-4, is not appropriate for use in calculating the SC-GHG,' and opts for a range of much lower discount rates based on consumption equivalents instead of investment equivalents instead—yielding much higher 'social costs' for each gas. Id. Thus, 'the IWG is returning to the approach of calculating the SC-GHG based on the consumption rate of interest,' which is much lower than the expected rate of return on investment. Id. at 18. [EPA-HQ-OAR-2022-0985-1621-A1, p. 17]

As Dr. Dayaratna discussed, this decision—which purports to resolve 'exceedingly difficult questions of science, economics, ethics, and law,' id. at 17—results in a dramatic inflation of the 'social cost' values on all three of the IAMs—DICE, FUND, and PAGE. Ex. A, ¶¶ 21-27. For example, using the FUND model, 'the choice in the discount rate can cause the social cost of carbon to drop by as much as 80 percent or more.' Id. ¶ 24. The other models yield similar results. 'These figures show that the discount rate an agency picks have a drastic effect on the cost estimates, and the lower the discount rate, the greater the damages.' Id. ¶ 27. [EPA-HQ-OAR-2022-0985-1621-A1, p. 17]

Organization: Bradbury, Steven G.

Regrettably, the EPA is not likely to adjust its "social cost of carbon" benefits estimates downward at all. In fact, the Agency may be planning to dial them way up—perhaps to as high as $3 trillion to $5 trillion—when it finalizes these rules. The proposals rely on the usual discount rates of 3 and 7 percent traditionally used by the Office of Management and Budget (OMB) when estimating the present value of benefits expected to accrue in the distant future. But the Biden OMB has recently proposed to amend its Circular A-4 (governing such calculations) to encourage agencies to use lower discount rates (such as the 1.7 percent rate generally applicable to interest on long-term Treasury bonds) in assessing the value of long-term or so-called "intergenerational" benefits.66 The use of the lower rate will increase the monetized present value of claimed benefits considerably. In these proposed rules, EPA has labeled its benefits calculations "interim," signaling that it may choose to recalculate the benefits using a lower discount rate, should OMB finalize the proposed amendments to A-4. Doing so would only exacerbate the arbitrary nature of the Agency's inflated benefit estimates for the proposed rules. [EPA-HQ-OAR-2022-0985-2427-A2, p. 23]

66 See https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf.

Organization: Institute for Policy Integrity at NYU School of Law et al.

II. Extensive Justification Supports EPA's Decisions to Omit a 7% Discount Rate and To Discount Long-Term Climate Impacts at a Lower Range of Discount Rates than the Proposed Rule's Shorter-Term Impacts

EPA applies the social cost of greenhouse gases estimates calculated at discount rates of 2.5%, 3%, and 5%,108 consistent with the Working Group's current recommendations, and justifies its decision to return to its prior conclusion that a 7% capital-based discount rate is inappropriate for climate effects. EPA's return to a reasonable range of discount rates to assess climate impacts is well supported—in fact, as recognized by both the Working Group in its 2021 update109 and EPA in the Draft SC-GHG Update,110 discount rates of 2% or lower are appropriate for valuing climate damages. Nonetheless, in anticipation of specious legal challenges, EPA should consider providing additional justifications for its discounting choices.111 [EPA-HQ-OAR-2022-0985-1643-A1, p. 17]

108 Note that just as there is growing evidence that the discount rate should be below 2%, there is growing evidence that 5% is much too high a discount rate. The values at 5% should be considered a very conservative lower bound.

109 2021 TSD, supra note 4, at 16–22 (offering extensive evidence for the use of lower discount rates and recommending that agencies "consider discount rates below 2.5 percent" for valuing the social cost of greenhouse gases). See also id. at 4 ("Consistent with the guidance in E.O. 13990 for the IWG to ensure that the SC-GHG reflect the interests of future generations, the latest scientific and economic understanding of discount rates discussed in this TSD, and the recommendation from OMB's Circular A-4 to include sensitivity analysis with lower discount rates when a rule has important intergenerational benefits or costs, agencies may consider conducting additional sensitivity analysis using discount rates below 2.5 percent.").

110 In the Draft SC-GHG Update, EPA applies a central near-term discount rate of 2%, with additional valuations using near-term discount rates of 1.5% and 2.5%. The discount rates in the Draft SC-GHG Update also decline over time. See Draft SC-GHG Update, supra note 9, at 3 tbl.ES-1; id. at 52–61 (explaining discounting module).

111 See generally Peter Howard & Jason A. Schwartz, About Time: Recalibrating the Discount Rate for the Social Cost of Greenhouse Gases (Policy Integrity Report 2021), https://policyintegrity.org/files/publications/About_Time.pdf.

The RIA cites the Working Group's arguments that, for long-term policies with intergenerational effects, uncertainty and ethical considerations make a 7% capital-based discount rate inappropriate.112 These arguments provide sufficient reason for EPA's approach to discount rates. Nonetheless, additional justifications support EPA's discounting choices. [EPA-HQ-OAR-2022-0985-1643-A1, p. 17]

112 RIA at 437–38.

A. For Numerous Reasons, the 7% Discount Rate Is Inappropriate for Climate Effects

There is no support in the economics literature for applying a 7% discount rate to longterm impacts such as climate damage. The suggestion that EPA must apply a 7% discount rate to climate impacts—which is based exclusively on a narrow reading of two pages of the current Circular A-4 that OMB has proposed to substantially revise—is utterly inconsistent with economic practice and theory.113 There are in fact numerous reasons why applying a 7% discount rate to climate effects that occur over a 300-year time horizon would be unjustifiable—

and that discount rates of 2% or lower are appropriate. [EPA-HQ-OAR-2022-0985-1643-A1, p. 17]

113 Although the current Circular A-4 provides discount rates of 3% and 7% as a default assumption, it also requires agency analysts to do more than rigidly apply default assumptions. Circular A-4, supra note 74, at 3 ("You cannot conduct a good regulatory analysis according to a formula. Conducting high-quality analysis requires competent professional judgment."). As such, analysis must be "based on the best reasonably obtainable scientific, technical, and economic information available," id. at 17, and agencies must "[u]se sound and defensible values or procedures to monetize benefits and costs, and ensure that key analytical assumptions are defensible," id. at 27.

First, there is widespread consensus that the consumption rate of interest (which the 3% rate in the current Circular A-4 represents, and the Draft Circular A-4 Update pegs at 1.7%) supplies the correct framework for the analysis of climate effects—not the opportunity cost of capital. While the current Circular A-4 suggests that 7% should be a "default position" that reflects regulations that primarily displace capital investments, it also explains that "[w]hen regulation primarily and directly affects private consumption . . . a lower discount rate is appropriate."114 The 7% discount rate is based on a private sector rate of return on capital, as private market participants typically have short time horizons. By contrast, climate change concerns the public well-being broadly rather than market participants narrowly. Indeed, the Draft Circular A-4 Update acknowledges this consensus, providing an updated consumption rate of interest as the default risk-free discount rate and eliminating the use of the opportunity cost of capital approach in regulatory impact analysis.115 [EPA-HQ-OAR-2022-0985-1643-A1, p. 18]

114 Id. at 33.

115 Draft Circular A-4 Update, supra note 10, at 75–76, 78–80.

Second, uncertainty over the long time horizon of climate effects should drive analysts to select a lower discount rate. As an example of when a 7% discount rate is appropriate, the current Circular A-4 identifies an EPA rule with a 30-year timeframe of costs and benefits.116 By contrast, greenhouse gas emissions generate effects stretching out across approximately 300 years. As Circular A-4 notes, "[p]rivate market rates provide a reliable reference for determining how society values time within a generation, but for extremely long time periods no comparable private rates exist."117 Circular A-4 discusses how uncertainty over long time horizons drives the discount rate lower.118 It cites the work of renowned economist Martin Weitzman and concludes that the "certainty-equivalent discount factor . . . corresponds to the minimum discount rate having any substantial positive probability."119 The National Academies of Sciences makes the same point about discount rates and uncertainty.120 And indeed, the Draft Circular A-4 Update provides that discount rates below 1.7% (and, therefore, well below 7%) should be used for impacts beyond 30 years.121 [EPA-HQ-OAR-2022-0985-1643-A1, p. 18]

116 Circular A-4, note 74, at 34; see also Interagency Working Group on the Social Cost of Carbon, Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 at 21 (2015), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc-response-to-comments-final-july-2015.pdf [hereinafter "Response to Comments"] (noting that "most regulatory impact analysis is conducted over a time frame in the range of 20 to 50 years," and thus do not fully implicate "special ethical considerations [that] arise when comparing benefits and costs across generations").

117 Circular A-4, note 74, at 36.

118 Id. (explaining that "the longer the horizon for the analysis," the greater the "uncertainty about the appropriate value of the discount rate," which supports a lower rate).

119 Id.; see also Council of Econ. Advisers, Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate at 9 [hereinafter "CEA Issue Brief"], available at https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf.

120 Nat'l Acad. Sci., Engineering & Med., Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide 28 (2017) [hereinafter "NAS 2017 Report"].

121 Draft Circular A-4 Update, supra note 10, at 76 ("setting one default rate for social rate of time preference for all effects from the present through 30 years into the future," at 1.7%); id. at 80–82 (supporting "discounting the benefits and costs accruing to future generations at a lower rate" than 1.7%).

Third, a 7% discount rate also ignores catastrophic risks and the welfare of future generations. As EPA showed in a recent cost-benefit analysis, the 7% rate truncates the long right-hand tail of social costs relative to the 3% rate's distribution.122 The long right-hand tail represents the possibility of catastrophic damages. Thus, the 7% discount rate effectively assumes that present-day Americans are barely willing to pay anything at all to prevent mediumto long-term catastrophes. Given that Congress expressed its goal for the Clean Air Act Amendments of 1977 to "[e]nsure the protection of the public health and the environment, both of this and future generations," it would not be reasonable for EPA to discount climate impacts at such a high rate as to effectively ignore the welfare of future generations.123 Moreover, as noted above, NEPA requires agencies to consider the "long-range character of environmental problems,"124 and citing this statutory requirement, the Council on Environmental Quality has advised agencies to apply climate-damage valuations that "discount future effects at rates that consider future generations."125 The 7% discount rate simply not meet that standard. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 18 - 19]

122 EPA, Benefit and Cost Analysis for Revisions to Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, at I-4 fig. I-1 (showing the 7% discount rate distribution).

123 H.R. Rep. No. 95-294, 34, 1977 U.S.C.C.A.N. 1077, 1112.

124 42 U.S.C. 4332(2)(F).

125 Council on Env't Quality, National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, 88 Fed. Reg. 1196, 1203 (Jan. 9, 2023).

Fourth, long-term time horizons counsel particularly strongly against applying a capital-based rate. For instance, recent scholarship from Dr. Qingran Li and Dr. William Pizer finds that, given their best estimate of the shadow price of capital, the appropriate social discount rate collapses to the consumption-based rate within just several decades. Consequently, the longer the time horizon of analysis, the less the capital-based rate is applicable— making the opportunity cost of capital approach entirely inappropriate for long-term effects like climate change.126 Citing this scholarship, OMB's Draft Circular A-4 Update centralizes the consumption-based discount rate, which it estimates at 1.7%, as the appropriate risk-free social discount rate for regulatory analysis.127 Particularly given the long time horizon that analysis of climate policies demands, therefore, the capital-based rate is inapplicable. [EPA-HQ-OAR-2022-0985-1643-A1, p. 19]

126 Qingran Li & William A. Pizer, Use of the Consumption Discount Rate for Public Policy Over the Distant Future, 107 J. ENV'T ECON. & MGMT. 1 (2021); Qingran Li & William A. Pizer, Discounting for Public Benefit- Cost Analysis, RES. FOR THE FUTURE 3 (2021).

127 Draft Circular A-4 Update, supra note 10, at 76.

Fifth, several standard justifications for capital-based discount rates break down given the particular threats of climate change. For example, one argument for capital-based discount rates is that spending capital on climate-abatement policies has opportunity costs and so, in policy analysis, future costs and benefits should be discounted at the rate of return to capital. However, the irreversible, uncertain, and catastrophic risks of climate change may disrupt this “opportunity cost” rationale: while it may seem, for instance, that future, wealthier generations might have better opportunities to address climate change for themselves, irreversible or catastrophic damages could arise that make future mitigation efforts more expensive or impossible.128 Similarly, if climate damages are “non-marginal,” such that climate change significantly affects the very natural resources needed to drive economic growth, then growth could plummet or even turn negative.129 [EPA-HQ-OAR-2022-0985-1643-A1, p. 19]

128 Richard L. Revesz & Matthew R. Shahabian, Climate Change and Future Generations, 84 S. CAL. L. REV. 1097, 1149-52 (2011).

129 Id. at 1153 & n.246 (citing Heal’s observation that estimates of productivity growth based on historical records omit depletion of natural resources, and thus bias discount rates upwards).

Sixth, a 7% discount rate is inappropriate because it is based on outdated data and diverges from the current economic consensus. Circular A-4’s default assumption of a 7% discount rate was published twenty years ago and was based on data from even earlier.130 As OMB’s Draft Circular A-4 Update reflects, the economic consensus now supports the use of much lower discount rates. In fact, that update drops the opportunity cost of capital approach altogether and endorses a default, risk-free discount rate of 1.7% for all regulatory impact analyses.131 In a recent article in Science, nearly 20 experts expressed strong support for OMB’s proposed discounting update, explaining that the proposal is consistent with the leading scholarship in the field.132 Likewise, the Council of Economic Advisers has called for the use of lower discount rates in regulatory analysis dating back to 2017.133 [EPA-HQ-OAR-2022-0985-1643-A1, p. 20]

130 The 7% rate was based on a 1992 report; the 3% rate was based on data from the 30 years preceding the publication of Circular A-4 in 2003. Id. at 33–34.

131 Draft Circular A-4 Update, supra note 10, at 76.

132 Peter H. Howard et al., U.S. Benefit-Cost Analysis Requires Revision, 380 SCIENCE 803 (2023). Dr. Howard and Max Sarinsky, the other corresponding author of the Science letter, are signatories on this comment.

133 CEA Issue Brief, supra note 119, at 1; see also id. at 3 (“In general the evidence supports lowering these discount rates, with a plausible best guess based on the available information being that the lower discount rate should be at most 2 percent while the upper discount rate should also likely be reduced.”).

Seventh and finally, a 7% rate is inappropriate because it is now widely recognized that social discount rates reflecting the opportunity cost of capital, even when appropriate, are far below 7%. The 7% opportunity cost of capital rate reflects numerous factors that do not reflect social returns including a private risk premium, land and resource rents, private returns to social externalities, and market power.134 Recent scholarship from Newell et al. adjusts for these factors and finds an opportunity cost of capital discount rate below 3%.135 [EPA-HQ-OAR-2022-0985-1643-A1, p. 20]

134 Peter Howard & Jason Schwartz, Valuing the Future: Legal and Economic Considerations for Updating Discount Rates, 39 YALE. J. ON REG. 595, 619–20.

135 Richard G. Newell, Brian C. Prest & William Pizer, The Shadow Price of Capital: Accounting for Capital Displacement in Benefit-Cost Analysis, RES. FOR THE FUTURE (2023).

Executive Order 13,990 instructs agencies to ensure that the social cost of greenhouse gas values adequately account for "intergenerational equity."136 A 7% rate ignores much of future generations' welfare and so would be inconsistent with that mandate. Notably, even when using high discount rates for climate damages in 2020, EPA explained that the 7% capital rate did not adequately account for "tradeoffs between improving the welfare of current and future generations."137 Accordingly, EPA's decision not to apply that discount rate for assessing climate damages is entirely justified. [EPA-HQ-OAR-2022-0985-1643-A1, p. 20]

136 Exec. Order § 13,990 5(b)(ii)(E).

137 85 Fed. Reg. at 24,735 (explaining that the central analysis focused on a 3% rate, and the 7% rate was used only for sensitivity analysis).

B. Extensive Justification Supports EPA's Distinct Approach to Discounting Climate Effects Relative to Other Costs and Benefits

As explained above, EPA's choice to use the social cost of greenhouse gases values calculated with consumption-based discount rates is fully justified. But this choice also means EPA is calculating the present value of reduced greenhouse gas emissions differently than the present value of other costs and benefits (which, per Circular A-4's default recommendations, it calculates using 3% and 7% discount rates). Extensive justification supports this distinct treatment of climate impacts relative to other costs and benefits. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 20 - 21]

For one, given the nature of the Proposed Rule's costs and benefits and in light of the Draft Circular A-4 Update, it is more appropriate to discount all effects using consumption-based rates, and so the present value calculations that include some costs and benefits discounted at a 7% rate can be viewed as lower-bound sensitivity analyses. The capital-based discount rate theoretically assesses whether the net benefits from government action will exceed the returns that society could earn by instead investing the same resources in the private sector. But this framework for discounting and comparing benefits and costs makes sense only under the "extreme" assumption that all the costs of government action would "fully displace" (i.e., crowd out) private investment.138 In this way, the capital-based rate "at best creat[es] a lower bound on the estimate of net benefits," by applying a maximum discount rate that reflects an extreme case not likely to apply to many government actions.139 As Li and Pizer explain, a capital-based approach does not provide "a suitable discount rate" for regulatory cost-benefit analysis, in large part because the benefits of regulation—and not just the costs—may fall on capital as well.140 [EPA-HQ-OAR-2022-0985-1643-A1, p. 21]

138 2021 TSD, supra note 4, at 18-19.

139 Id.

140 Qingran Li & William A. Pizer, Discounting for Public Benefit-Cost Analysis, RES. FOR THE FUTURE 3 (July 2021), https://www.rff.org/publications/issue-briefs/discounting-for-public-benefit-cost-analysis/.

Moreover, apart from the widespread support for consumption- over capital-based rates,141 special legal, economic, and policy considerations justify a distinct approach to discounting climate effects. While effects like compliance costs will play out over the next several decades, the climate effects of this rule are much longer term, affecting the welfare of future generations over centuries. Therefore, the arguments in favor of lower consumption-based discount rates—based on long-term uncertainty, ethics, declining economic growth, inapplicable market data, and other considerations—apply much more strongly to climate effects than to other costs and benefits. And because a high capital-based rate, like 7%, will effectively ignore the welfare of future generations (e.g., over the course of just 80 years, a 7% rate discounts away 99.5% of a future effect's value142) legal requirements to consider the welfare of future generations caution much more strongly against the application of a 7% rate to long-term climate effects than to other costs and benefits. [EPA-HQ-OAR-2022-0985-1643-A1, p. 21]

141 See Howard et al., supra note 132 ("Recent economic literature strongly supports the use of a consumption discount rate over a capital rate of return over longer time horizons").

142 The discount factor is 1/(1+r)^t' x 1/(1+0.07)^80 = 0.0045 = 0.45%.

Consequently, as the National Academies of Sciences has recognized, differences in the application of discount rates may be warranted "when only some categories [of costs and benefits] have an intergenerational component."143 The National Academies has offered recommendations for how agencies can best apply different annualized discount rates to climate impacts versus other costs and benefits,144 and EPA can rely on the National Academies' guidance to support its approach to discounting here. Likewise, as noted above, both the current Circular A-4145 and Draft Circular A-4 Update also recognize that intergenerational effects merit lower discount rates than intragenerational costs and benefits.146 [EPA-HQ-OAR-2022-0985-1643-A1, p. 22]

143 NAS 2017 Report, supra note 120, at 182.

144 Id.

145 Circular A-4, supra note 74, at 35–36.

146 Draft Circular A-4 Update, supra note 10, at 80–82.

Case law on the social cost of greenhouse gases also offers support for EPA's discounting approach. Specifically, in Zero Zone v. Department of Energy, the plaintiffs argued that the Department of Energy had arbitrarily considered hundreds of years of climate benefits while limiting its assessment of employment impacts and other effects to just a thirty-year time horizon. The court upheld the regulatory analysis, concluding that the difference in time horizons was justified because the rule "would have long-term effects on the environment but . . . would not have long-term effects on employment."147 The choice of time horizons is related to the choice of discount rate: any cost or benefit occurring beyond the end of the analytical time horizon is effectively discounted at an infinitely high (or 100 percent) rate.148 Analogizing from this precedent, a court may similarly defer to an agency's finding that the long time horizon of climate change justifies a lower discount rate than the rate applied to shorter-term costs and benefits. [EPA-HQ-OAR-2022-0985-1643-A1, p. 22]

147 Zero Zone, 832 F.3d at 679.

148 See Arden Rowell, Time in Cost-Benefit Analysis, 4 U.C. IRVINE L. REV. 1215, 1237-38 (2014) (noting time inconsistencies in different regulatory analyses and advising agencies to identify a temporal break-even point by which a proposed policy will pay for itself).

Organization: Moving Forward Network (MFN) et al.

6. EPA's Weak Proposal is Based on Faulty Analyses of Impacts and Benefits

6.1. Flaws in EPA's Assessment of Impacts

It is clear that drastic emission reductions from the heavy-duty truck sector are needed to advance public health and address climate change. EPA's analysis of the climate and health impacts of the rule vastly underestimates its potential benefits. EPA should update the analyses by (1) using a 1.7% discount rate rather than 3%; (2) updating the social cost of carbon calculations by utilizing the most recent science; and (3) developing additional analyses on health benefits in alignment with the December 2022 Science Advisory Board (SAB) report assessing the EPA's proposed regulation for NOx emissions from heavy-duty trucks.[EPA-HQ-OAR-2022-0985-1608-A1, p. 26]

First, EPA's calculation of $87 billion in climate benefits and $15-$29 billion in non-GHG benefits are significant underestimates because they are based on an outdated 3% discount rate. The White House Office of Management and Budget Office of Information and Regulatory Affairs recently proposed Circular A-4 to guide federal agencies' regulatory analyses, finding that a 1.7% discount rate is accurate and supported by the most recent evidence. 48 EPA's use of a 3% discount rate inaccurately undervalues future benefits to the public, and EPA should utilize the more accurate 1.7% discount rate. In addition, EPA should remove the alternative analysis looking at a 7% discount rate, as this undervalues benefits to future generations. [EPA-HQ-OAR-2022-0985-1608-A1, p. 26]

48 Office of Information and Regulatory Affairs. Circular A-4, Draft for Public Review. (April 6, 2023). p. 76. https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf.

EPA Summary and Response:

Summary:

A few commenters expressed concern with how discount rates are applied within the proposed regulation's analyses. For example, the *American Free Enterprise Chamber of Commerce* expressed concern with using a 3% discount rate for climate benefits while all other costs and benefits within the proposed regulation use 3% and 7% discount rates. The *Arizona State Legislature* expressed concern that the 2021 TSD used lower discount rates than the 7% discount rate that the commenter claims is supported by longstanding peer-reviewed approaches. *Steven Bradbury* expressed concern that the proposed rule's interim values may be recalculated using even lower discount rates in the final rule. the *Moving Forward Network* expressed concern in the opposite direction that the discount rates used for climate benefits are too high and suggests that EPA update their analyses by using a 1.7% discount rate. However, the *Institute for Policy Integrity* wrote at length supporting EPA's choice of discount rate, including support for omitting the 7% discount rate and EPA's choice to use the SC-GHG values calculated with consumption-based discount rates.

Response:

Regarding the discount rate used within the SC-GHG, consistent with the recent scientific literature, the recommendations of the National Academies, and the recent update of OMB Circular A-4, the SC-GHG now relies on the use of a dynamic discount rate. This discount rate is calibrated to observed market interest rate in the near term and uses a Ramsey approach to dynamically update the discount rate over the long-term. See the preamble of this rule and the 2023 Final Oil and Gas NSPS RIA for more details. Within the RIA for this final rule, EPA uses updated SC-GHG estimates that EPA believes represents the latest available science and follows the recommendations of the National Academies of Science, Engineering, and Medicine. Please refer to the appendix to the rule, “Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances,” for detailed responses pertaining to the rigor of the updated methodology, including the discounting approach.

Note that the EPA presented these updated discount rate estimates in a sensitivity analysis in the December 2022 Supplemental RIA that address recommendations of the National Academies of Sciences, Engineering, and Medicine (2017), and invited public comment on the sensitivity analysis and on the technical report, titled External Review Draft: Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances, explaining the methodological updates that was included as Supplementary Material to the Oil and Gas Supplemental Proposal RIA. The EPA published and used these estimates in the main analysis of the RIA for the December 2023 Final Oil and Gas NSPS/EG Rulemaking, “Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review” and responded to public comments received on the new estimates in the Response to Comments document for the Final Oil and Gas Rulemaking.

20.2 Domestic versus Global

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

In addition, the Interagency Working Group’s estimates include global benefits from reducing GHG pollution. See 88 Fed. Reg. at 26,075.10 This led EPA to rely on factors not authorized by Congress, because the purpose of the Clean Air Act is to “enhance the quality of the Nation’s air resources,” not the world’s air resources. 42 U.S.C. § 7401(b)(1) (emphasis added); see Motor Vehicle Mfrs. Ass’n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (holding that agency action is arbitrary and capricious if “the agency has relied on factors which Congress has not intended it to consider”). At minimum, if EPA intends to consider global benefits, then it must also consider global costs to the rule—including its potential effects on global supply chains, upstream emissions in foreign countries, and the environmental effects on local communities of extracting critical minerals. The lithium-extraction process, for instance, has reportedly led to environmental harms in South American countries like Chile, Argentina, and Bolivia, none of which are accounted for in EPA’s analysis.11 [EPA-HQ-OAR-2022-0985-1660-A1, pp. 65 - 66]

10 See also Interagency Working Grp. on Soc. Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide, at 3 (Feb. 2021).

11 See James Blair et al., Exhausted: How We Can Stop Lithium Mining from Depleting Water Resources, Draining Wetlands, and Harming Communities in South America, at 4, Nat’l Res. Def. Council (Apr. 2022), https://tinyurl.com/524rsm86; Victoria Flexer et al., Lithium Recovery from Brines: A Vital Raw

Material for Green Energies with a Potential Environmental Impact in Its Mining and Processing, 639 Sci. of Total Env't 1188 (2018), https://tinyurl.com/9fz6jwah.

Organization: Arizona State Legislature

Global damages. The 2021 Working Group departed from recent practice by considering not just domestic harms, but global anticipated climate damages in its analysis. 2021 TSD, at 3. The decision to consider not just damages to the United States of America, but all other countries potentially impacted by climate change, is not a scientific decision—it is a political decision. In fact, the Working Group did not make this decision—in E.O. 13990, the President commanded it to consider global damages. See E.O. 13990, 86 Fed. Reg. 7040; 2021 TSD, at 3 (acknowledging that '[t]he IWG was tasked with' publishing estimates that 'tak[e] global damages into account'). The Working Group concedes that this is a policy decision, involving considerations of 'climate risk, environmental justice, and intergenerational equity.' 2021 TSD, at 3. [EPA-HQ-OAR-2022-0985-1621-A1, p. 20]

In doing so, the Working Group departed from black-letter Supreme Court law, without lawful justification. Unlike the Working Group—which claims to be constrained by no statute—the federal agencies that must rely on the Working Group's calculations in 'regulations and other relevant agency actions,' E.O. 13990, 5(b)(ii)(A), 86 Fed. Reg. 7040, are exercising delegated authority from Congress, pursuant to statutory delegations of authority. There is a black-letter presumption applicable to each of those statutes, that they do not authorize the federal agency to consider global effects when calculating 'social costs.' When interpreting federal statutes, the Supreme Court has long recognized 'the presumption against extraterritorial application,' which provides that 'when a statute gives no clear indication of an extraterritorial application, it has none.' Kiobel v. Royal Dutch Petroleum Co., 569 U.S. 108, 115 (2013) (quoting Morrison v. National Australia Bank Ltd., 130 S.Ct. 2869, 2878 (2010)). This presumption reflects the 'presumption that United States law governs domestically but does not rule the world.' Id. (quoting Microsoft Corp. v. AT & T Corp., 550 U.S. 437, 454 (2007)). [EPA-HQ-OAR-2022-0985-1621-A1, p. 20]

The Working Group justified its decision to consider global damages, instead of domestic impacts, by arguing that 'climate impacts occurring outside U.S. borders can directly and indirectly affect the welfare of U.S. citizens' through 'spillover pathways.' 2021 TSD, at 3. But that argument, if true, merely calls for the calculation of additional harms to domestic citizens and the domestic economy—it does not argue that 'social costs' include harms to foreign citizens and nations. Arguing that domestic actors are harmed through foreign pathways is not the same as arguing that domestic cost-benefit analysis should consider harms to foreign actors. Absent a 'clear indication' from Congress in the statute—and none is identified here—there is no statutory authorization to consider such effects. Kiobel, 569 U.S. at 115. [EPA-HQ-OAR-2022-0985-1621-A1,pp. 20-21]

Organization: Bradbury, Steven G.

Furthermore, EPA's proposal to count the purported benefits of carbon dioxide reductions on a global basis, as opposed to confining its estimates to domestic U.S. effects, is flawed and inappropriate. Even if they were accurately estimated, which they are not, these global benefit forecasts could not properly and reasonably justify the regulatory costs that the proposed rules would impose on businesses and individuals in the U.S. It is more appropriate and consistent with the purposes of regulatory cost-benefit analyses for federal agencies to consider only the estimated benefits that a proposed rule is expected to have domestically on the U.S. economy and on persons in the United States.67 [EPA-HQ-OAR-2022-0985-2427-A2, pp. 23-24]

67 Generally, federal agencies are authorized only to promulgate rules that apply domestically, unless the federal statute under which the agency is acting clearly and expressly authorizes the agency to issue rules to achieve benefits outside the territorial reach of the United States. Correspondingly, absent such a clear statutory mandate, the requirement of a regulatory cost-benefit analysis imposed under Executive Order 12,866 and administered by OMB's Office of Information and Regulatory Affairs (OIRA) is properly limited to considering only the benefits the rule is expected to produce for the American people in the U.S.

Organization: Institute for Policy Integrity at NYU School of Law et al.

I. Extensive Justification Supports EPA's Reliance on Global Climate Damage Valuations

In the Proposed Rule, EPA appropriately focuses on a global estimate of climate benefits, continuing its historical approach and once again rejecting its temporary and arbitrary practice during the Trump administration of disregarding all climate effects that occur outside the physical borders of the United States. While EPA offers persuasive justifications for this decision, many additional justifications—some of which EPA itself provides in the Draft SCGHG Update12—further support this approach.13 In particular, EPA could emphasize the concern for the impacts of U.S. pollution on foreign welfare in the Clean Air Act and other sources of law, further highlight the significance of U.S. strategic interests and reciprocity, further emphasize the importance of extraterritorial impacts and spillovers, and highlight the inconsistency that would occur if the agency considered only domestic benefits while focusing on global costs. [EPA-HQ-OAR-2022-0985-1643-A1, p. 3]

12 Draft SC-GHG Update, supra note 9, at 10–15.

13 See generally Jason A. Schwartz, Inst. for Pol'y Integrity, Strategically Estimating Climate Pollution Costs in a Global Environment (2021), https://policyintegrity.org/files/publications/Strategically_Estimating_Climate_Pollution_Costs_in_a_Global_Environment.pdf.

A. Relevant Statutes and Executive Orders Compel, And Certainly Permit, a Global Perspective on Climate Damages

The Clean Air Act, National Environmental Policy Act, Administrative Procedure Act, and other key sources of law not only permit, but in fact require, EPA to consider international effects. EPA should highlight these legal requirements as justification for its focus on global climate impacts. [EPA-HQ-OAR-2022-0985-1643-A1, p. 3]

Section 202 of the Clean Air Act, under which EPA issues the Proposed Rule, charges EPA with regulating "air pollutant[s] which may be reasonably anticipated to endanger public health or welfare,"14 where "welfare" is defined to include "effects on . . . weather . . . and climate."15 When interpreting Section 202, the Supreme Court found "there is nothing counterintuitive to the notion that EPA can curtail the emission of substances that are putting the global climate out of kilter."16 And when industry challenged another EPA climate program under Title I of the Clean Air Act by arguing that the statute "was concerned about local, not global effects," the U.S. Court of Appeals for the D.C. Circuit had "little trouble disposing of Industry Petitioners' argument that the [Clean Air Act's prevention of significant deterioration] program is specifically focused solely on localized air pollution," finding instead that the statute was "meant to address a much broader range of harms," including "precisely the types of harms caused by greenhouse gases."17 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 3 - 4]

14 42 U.S.C. § 7521(a)(1).

15 42 U.S.C. § 7602(h); Massachusetts v. EPA, 127 S. Ct. 1438, 1447 (2007).

16 Massachusetts, 127 S. Ct. at 1461 (emphasis added). This case concerned Section 202 of the Clean Air Act, which similarly permits EPA to regulate "any air pollutant . . . which may reasonably be anticipated to endanger public health or welfare." Id. at 1454 (quoting 42 U.S.C. § 7521(a)(1)).

17 Coalition for Responsible Regulation v. EPA, 684 F.3d 102, 137-38 (D.C. Cir. 2012), aff'd in part, rev'd in part sub nom. Util. Air Regulatory Grp. v. EPA, 134 S. Ct. 2427 (2014).

A recent law-review article exhaustively reviewed the legislative history of the Clean Air Act's definition of "welfare" and concluded that "when Congress included the 'effects on . . . climate' language in the statute, it understood that adverse climate effects could occur on a global scale."18 For instance, Senator Caleb Boggs, a Republican from Delaware and ranking minority member of the Public Works Subcommittee on Air and Water Pollution, which was considering the Clean Air Act in 1970, entered a report into the record stating that air pollution "alters climate and may produce global changes in temperature."19 Senator Jennings Randolph of West Virginia likewise submitted a statement into the record explaining that U.S. air pollution could "produce unacceptable worldwide climate changes."20 Congress's clear concern for the effects of domestic pollution on the global climate—many more examples of which are discussed in this law-review article—demonstrates that a global perspective is appropriate, if not required, when EPA regulates under the Clean Air Act. [EPA-HQ-OAR-2022-0985-1643-A1, p. 4]

18 Richard L. Revesz, Bostock and the End of the Climate Change Double Standard, 46 COLUM. J. ENV'T L. 1, 9 (2020).

19 Id. at 32–33.

20 Id. at 33.

This interpretation is further compelled by the National Environmental Policy Act ("NEPA"). Though best known for requiring agencies to prepare environmental impact statements before taking certain actions (a requirement that does not apply to Clean Air Act actions),21 NEPA also much more broadly declares a national environmental policy and requires of all agencies that "to the fullest extent possible[,] the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter,"22 including the need to "recognize the worldwide and long-range character of environmental problems" and to "lend appropriate support" to help "maximize international cooperation."23 In other words, especially because adopting a global perspective on climate damages will advance U.S. foreign policy goals (see the next subsection), NEPA requires EPA to interpret all of its laws, including the Clean Air Act, in ways that recognize the worldwide character of environmental problems. As EPA recognizes in the Draft SC-GHG Update,24 using global social cost of greenhouse gas estimates helps fulfill that requirement. Likewise, in a recent guidance document, the Council on Environmental Quality highlighted this very statutory language to conclude that "it is most appropriate for agencies to focus on [social cost of greenhouse gases] estimates that capture global climate damages."25 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 4 - 5]

21 While actions taken under the Clean Air Act "shall [not] be deemed a major Federal action significantly affecting the quality of the human environment within the meaning of [42 U.S.C. § 4332(2)(C)]," 15 U.S.C. § 793(c)(1), the other provisions of NEPA—including those quoted and cited in this paragraph—continue to apply.

22 42 U.S.C. § 4332(1) (emphasis added).

23 Id. § 4332(2)(I); see also EDF v. Massey, 986 F.2d 528, 536 (D.C. Cir. 1993) ("Section 102(2)(F) further supports the conclusion that Congress, when enacting NEPA, was concerned with worldwide as well as domestic problems facing the environment. . . . Compliance with one of the subsections can hardly be construed to relieve the agency from its duty to fulfill the obligations articulated in other subsections."); NRDC v. NRC, 647 F.2d 1345, 1387 (D.C. Cir. 1981) (J. Robinson, concurring; J. Wilkey wrote for the Court, but there was no majority opinion) (concluding that even if a conflict with another statute prevents the agency from conducting an environmental impact statement, that "does not imply that NRC may ignore its other NEPA obligations," including the "provision for multinational cooperation" and the "policy of the United States with respect to the ecological well-being of this planet"; rather, the agency "should remain cognizant of this responsibility"); Greene County Planning Bd. v. Federal Power Comm'n, 455 F.2d 412, 424 (2d Cir. 1972) ("The Commission's 'hands-off' attitude is even more startling in view of the explicit requirement in NEPA that the Commission 'recognize the worldwide and long-range character of environmental problems' and interpret its mandate under the Federal Power Act in accordance with the policies set forth in NEPA.").

24 Draft SC-GHG Update, supra note 9, at 15 n.37.

25 Council on Env't Quality, National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, 88 Fed. Reg. 1196, 1203 (Jan. 9, 2023).

Other key legal commitments compel this same conclusion. For instance, the United Nations Framework Convention on Climate Change—to which the United States is a party26— declares that national "policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost."27 The Convention further commits parties to evaluate global climate effects in their policy decisions, by "employ[ing] appropriate methods, for example impact assessments . . . with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change."28 The unmistakable implication of the Convention is that parties—including the United States—must account for global economic, public health, and environmental effects in their impact assessments. In 2008, a group of U.S. senators— including then-Senator John Kerry, who helped ratify the framework convention on climate change—agreed with this interpretation of the treaty language, saying that "[u]pon signing this treaty, the United States committed itself to considering the global impacts of its greenhouse gas emissions."29 [EPA-HQ-OAR-2022-0985-1643-A1, p. 5]

26 S. Treaty Doc. No. 102-38; S. Exec. Rept. No. 102-55.

27 U.N. Framework Convention on Climate Change art. 3(3), May 9, 1992, 1771 U.N.T.S. 107 (emphasis added); see also id. art. 3(1) ("The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities.") (emphasis added); id. art. 4(2)(a) (committing developed countries to adopt policies that account for "the need for equitable and appropriate contributions by each of these Parties to the global effort").

28 Id. art. 4(1)(f) (emphasis added); see also id. art. 3(2) (requiring parties to give "full consideration" to those developing countries "particularly vulnerable to the adverse effects of climate change"); see also North American Agreement on Environmental Cooperation art. 10(7), Jan. 1, 1994, 32 I.L.M. 1480 (committing the United States to the development of principles for transboundary environmental impact assessments).

29 Comment Letter from U.S. Sens. Feinstein, Snowe, Nelson, Cantwell, Sanders, Kerry, Durbin, Reed, Boxer, & Cardin to Mary Peters, Sec'y, U.S. Dep't of Transp. on Proposed Rule for Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011–2015 (July 1, 2008).

And under the Administrative Procedure Act, it is arbitrary and capricious for agencies to "entirely fail[] to consider an important aspect of the problem"30—an obligation that a federal court held requires federal agencies to consider transboundary climate impacts. Specifically, a recent ruling from the U.S. Court for the Northern District of California struck down as arbitrary the Bureau of Land Management's ("BLM") rescission of the Waste Prevention Rule in part because the agency had abandoned the Working Group's peer-reviewed, global estimates of the social cost of greenhouse gases in favor of flawed estimates (the same estimates that EPA applied under the Trump administration) that looked narrowly at effects within the U.S. borders.31 The court found that the global values developed by the Working Group reflected "the best available science about monetizing the impacts of greenhouse gas emissions,"32 whereas "focusing solely on domestic effects has been soundly rejected by economists as improper and unsupported by science."33 The court reminded BLM that relevant executive orders, including Executive Order 12,866, require consideration of "all" costs and benefits, based on the "best reasonably obtainable scientific, technical, economic, and other information," and concluded that "no[] . . . regulatory rules or orders require exclusion of global impacts."34 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 5 - 6]

30 Motor Vehicle Manufacturers Ass'n v. State Farm Mutual Auto. Ins. Co., 463 U.S. 29, 41–43 (1983).

31 Bernhardt, 472 F. Supp. 3d at 613.

32 Id. at 611.

33 Id. at 613.

34 Id. at 611–12 (internal quotation marks omitted).

More recently, Executive Order 13,990 instructed agencies to "tak[e] global damages into account," because "[d]oing so facilitates sound decision-making, recognizes the breadth of climate impacts, and support the international leadership of the United States on climate issues."35 This language again reinforces the instructions from NEPA that, whenever not precluded by statute from doing so, agencies should account for the environmental impacts of their actions on foreign nations and global commons. [EPA-HQ-OAR-2022-0985-1643-A1, p. 6]

35 Exec. Order No. 13,990 § 5(a), 86 Fed. Reg. 7037, 7040 (Jan. 20, 2021).

EPA should draw upon these legal authorities in justifying its reliance on global climate-damage valuations. [EPA-HQ-OAR-2022-0985-1643-A1, p. 6]

B. Focusing on Global Climate Damages Furthers U.S. Strategic Interests by Facilitating Reciprocity, Mitigating International Spillover Effects, and Protecting U.S. Extraterritorial Interests

EPA explains in both the regulatory impact analysis36 and the Draft SC-GHG Update37 that it is appropriate to value climate damages on a global scale because climate impacts occurring outside U.S. borders can directly and indirectly affect U.S. welfare through spillovers and foreign reciprocity. Indeed, the theory and evidence for reciprocity by itself justify a focus on the full global values, and additional strategic and practical justifications provide further support for EPA's approach. [EPA-HQ-OAR-2022-0985-1643-A1, p. 6]

36 RIA at 437.

37 Draft SC-GHG Update, supra note 9, at 10–15.

1. Use of the Global Values Facilitates International Reciprocity

Because the world's climate is a single interconnected system, the United States benefits greatly when foreign countries consider the global externalities of their greenhouse gas pollution and cut emissions accordingly. It therefore promotes the strategic interests of the United States to encourage all other countries to think globally in setting their climate policies. The United States can advance this objective by itself adopting the full global social cost of greenhouse gases—as numerous leading climate economists and experts have explained.38 Indeed, basic economic principles demonstrate that the United States stands to benefit greatly if all countries apply global social cost of greenhouse gas values in their regulatory decisions and project reviews39—likely trillions of dollars in direct benefits from foreign action to combat climate change.40 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 6 - 7]

38 Most generally, it is individually rational for a country to fully internalize the global social cost of greenhouse gases "if a country expects a decrease in its own emissions to decrease that of all others in proportion to the ratio of its external cost of emissions to its internal costs." Matthew J. Kotchen, Which Social Cost of Carbon? A Theoretical Perspective, 5 J. ASSOC. ENV'T & RES. ECON. 673, 683 (2017). Other economists have justified use of the global social cost estimates on more intuitive grounds. See, e.g., Tamma Carleton & Michael Greenstone, Updating the United States Government's Social Cost of Carbon at 26-27 (Becker Friedman Institute Working Paper 2021-04, Jan. 2021), https://perma.cc/H9EU-XWBX ("The global SCC . . . is an ingredient in efforts to procure the necessary international action. . . . Even if policymakers decide that the effects of regulations on U.S. citizens are what matter (in terms of both law and policy), it would make sense to use the global measure, as it would protect U.S. citizens against a range of adverse effects from unmitigated climate change."); William Pizer et al., Using and Improving the Social Cost of Carbon, 346 SCIENCE 1189, 1190 (2014) (explaining that the "potential to leverage foreign mitigation," combined with moral, ethical, and security issues, provide "compelling reasons to focus on a global SCC but, more important, to make a strategic choice."); Robert S. Pindyck, Comments on Proposed Rule and Regulatory Impact Analysis on the Delay and Suspension of Certain Requirements for Waste Prevention and Resource Conservation, Nov. 6, 2017, available at https://perma.cc/HG8Q-MT6H ("[W]hat treatment of international damages is in the United States' self-interest? . . . The simplest answer is to find the value of the [social cost of carbon] that maximizes global welfare. . . . continue to think that the global value is the appropriate provisional value for use as research on this topic continues.").

39 See Kotchen, supra note 38, at 678 (providing formulas for the "efficiency argument in support of all countries internalizing the GSCC [global social cost of carbon] for domestic policy").

40 Inst. for Pol'y Integrity, Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action (2015), https://perma.cc/T3WN-H42U.

The Biden Administration has made such a strategic choice, to adopt a global valuation of climate damages as part of its diplomatic strategy. Executive Order 13,990 unequivocally states that "[i]t is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account . . . [to] support the international leadership of the United States on climate issues."41 The Order later elaborates: "Our domestic efforts must go hand in hand with U.S. diplomatic engagement. Because most greenhouse gas emissions originate beyond our borders, such engagement is more necessary and urgent than ever. The United States must be in a position to exercise vigorous climate leadership to achieve a significant increase in global climate action and put the world on a sustainable climate pathway."42 [EPA-HQ-OAR-2022-0985-1643-A1, p. 7]

41 Exec. Order No 13,990 § 5(a).

42 Id. § 6(d). Though this subsection takes action on the Keystone XL Pipeline permit, its statement of diplomatic goals has much broader relevance.

There is already evidence that the U.S. strategy of combining its domestic efforts— including the global valuation of climate damages—with its diplomatic engagement is spurring foreign reciprocity. As EPA explained in the Draft SC-GHG Update, "[m]any countries and international institutions have either already explicitly adapted the IWG's estimates of global damages in their domestic analyses . . . [or] developed their own estimates of global damages" following the U.S. approach.43 Earlier this year, in fact, Canada adopted the climate-damage valuations from EPA's Draft SC-GHG Update as its official estimates.44 [EPA-HQ-OAR-2022-0985-1643-A1, p. 7]

43 Draft SC-GHG Update, supra note 9, at 14.

44 Social Cost of Greenhouse Gas Emissions, Government of Canada (last modified Apr. 20, 2023), https://www.canada.ca/en/environment-climate-change/services/climate-change/science-research-data/social-costghg.html.

Moreover, during the April 2021 "Leaders' Summit on Climate" hosted by the United States, following the announcement of a new U.S. commitment to reduce emissions to 50–52% below 2005 levels by 2030, multiple other countries reciprocally increased the ambition of their own climate targets. Notably, Japan accelerated its reduction goal from 26% to 46–50%; Canada strengthened its target from 30% to 40–45%; South Korea strengthened its target to achieve net zero emissions by 2050; China promised to peak coal use by 2025 and phase down coal consumption after that, and to join the Kigali Amendment to reduce hydrofluorocarbon emissions; Argentina pledged to strengthen its goal by 2.7% and make previously "conditional" targets "unconditional" instead; Brazil committed to a net zero target by 2050 (ten years earlier than its previous 2060 goal) and pledged to end illegal deforestation by 2030; South Africa shifted its emission peak ten years earlier, to 2025; and New Zealand, Bhutan, and Bangladesh all committed to submit more ambitious plans in the near future.45 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 7 - 8]

45 U.S. Dept. of State, Leaders' Summit on Climate: Day 1, Apr. 22, 2021, https://perma.cc/3X8A-KF4G; Climate Action Tracker, Warming Projections Global Update: May 2021 at 3 (2021), https://perma.cc/7JYN-N2DU.

This flurry of activity is just the latest evidence of reciprocity in international climate actions. Some past reciprocity has been explicit. The Kigali Amendment, for example, is the latest internationally negotiated climate treaty, with more than 120 parties so far committing to common but differentiated responsibilities to phase down hydrofluorocarbons.46 Previously, under the Copenhagen Accord and the Paris Agreement, some parties, including the European Union and Mexico, have at times explicitly made conditional pledges, promising to ratchet up their efforts if other countries make comparable reductions.47 By contrast, when the United States "failed to take action to reduce greenhouse gas emissions during the George W. Bush Administration and during . . . the Trump Administration," as economist Michael Greenstone has testified before the U.S. House of Representatives, "both periods were characterized by little [international] progress, and indeed many instances of backsliding, in reducing emissions globally."48 By failing to take international climate damages into account, in other words, EPA and other U.S. agencies would incentivize other countries to do the same, which in turn would cause greater greenhouse gas pollution originating in other countries that causes climate damage within the United States. [EPA-HQ-OAR-2022-0985-1643-A1, p. 8]

46 See U.N., Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (2016), https://perma.cc/SEX3-HAQA (last visited June 8, 2021).

47 See Eur. Comm'n, Expression of Willingness to Be Associated with the Copenhagen Accord and Submission of the Quantified Economy-Wide Emissions Reduction Targets for 2020 at 2, Jan. 28, 2010, https://perma.cc/77DDM4LS (committing to a 20% reduction but "reiterat[ing] its conditional offer to move to a 30% reduction by 2020 compared to 1990 levels, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities"); Gov't of Mex. Ministry of Env't & Nat. Res., Nationally Determined Contributions: 2020 Update at 22, https://perma.cc/VF4A-K5HK (making an unconditional pledge of 22% reduction of GHGs and 51% of black carbon by 2030; and making a conditional pledge of up to 36% reduction GHGs and 70% black carbon, conditioned on "an international price for carbon trading, adjustment of tariffs for carbon content" as well as technology transfers and financial resources).

48 Economics of Climate Change: Hearing before the U.S. H. Comm. on Oversight & Reform's Subcomm. on Env't at 6 (Dec. 19, 2019) (testimony of Michael Greenstone), available at https://perma.cc/H5JS-V4H6.

In January 2021, Trevor Houser and Kate Larsen published a conservative estimate of the number of tons of greenhouse gases that the rest of the world had committed to reduce for each ton that the United States has pledged to reduce: a figure they call the "Climate Reciprocity Ratio."49 Using only the quantifiable, unconditional pledges that 51 countries had made since 2014 to cut emissions through 2030, Houser and Larsen conservatively estimate that for every ton the United States pledged to reduce, these other countries had collectively pledged to reduce 6.1–6.8 tons in return.50 While implementation of all these foreign policies is not guaranteed, and while these estimates reflect pledges that may now be outdated, Houser and Larsen cite evidence that several large emitters are on track to meet their goals, and that the ratio should grow over time as the U.S. share of global emissions falls.51 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 8 - 9]

49 Trevor Houser & Kate Larsen, Rhodium Grp., Calculating the Climate Reciprocity Ratio for the U.S. (2021), https://perma.cc/7MJ8-DN23 (calling their estimate "deliberately conservative").

50 The estimate is conservative because it omits any conditional pledges, any pledges that are not readily quantified into specific reductions, any actions from countries that have not formally submitted Nationally Determined Contributions to the United Nations, any reductions occurring after 2030, and any foreign actions already achieved before 2014 that may have motivated U.S. pledges in the first place. Id.

51 Id.

In short, both empirical evidence and economic theory strongly support a strategic choice for U.S. agencies to adopt the full global estimates of the social cost of greenhouse gases, as this facilitates international reductions in greenhouse gas pollution that directly benefits the United

States. Notably, OMB's Draft Circular A-4 Update specifically recognizes that "the potential for inducing strategic reciprocity or other policy changes from actors abroad" offers a basis for considering regulatory impacts on a global basis.52 Accordingly, EPA should provide current evidence of foreign reciprocity to further support its focus on the full global valuations of the social cost of greenhouse gases. [EPA-HQ-OAR-2022-0985-1643-A1, p. 9]

52 Draft Circular A-4 Update, supra note 10, at 9.

2. Use of the Global Values Recognizes Spillover Impacts from Climate Change

As EPA further recognizes, spillover impacts into the United States also support the use of global damage valuations.53 Significant costs to trade, human health, and security will inevitably "spill over" to the United States as other regions of the planet experience climate change damages.54 Due to its unique place among countries—both as the largest economy with trade- and investment-dependent links throughout the world, and as a military superpower—the United States is particularly vulnerable to effects that will spill over from other regions of the world. The use of global damage values recognizes these spillover effects, which were ignored under the Trump administration's domestic-only valuation. [EPA-HQ-OAR-2022-0985-1643-A1, p. 9]

53 RIA at 437; see also Draft SC-GHG Update, supra note 9, at 11–13.

54 Though some positive spillover effects are also possible, such as technology spillovers that reduce the cost of mitigation or adaptation, see S. Rao et al., Importance of Technological Change and Spillovers in Long-Term Climate Policy, 27 ENERGY J. 123–39 (2006), overall climate spillovers are likely strongly negative, see Jody Freeman & Andrew Guzman, Climate Change and U.S. Interests, 109 COLUM. L. REV. 1531 (2009).

These spillover effects take many forms. In terms of trade-related impacts, for one, as climate change disrupts the economies of other countries, decreased availability of imported inputs, intermediary goods, and consumer goods will cause supply shocks to the U.S. economy, causing particularly damaging disruptions in sectors such as agriculture and technology. Similarly, the U.S. economy will experience demand shocks as climate-affected countries decrease their demand for U.S. goods. U.S. trade and businesses that rely on foreign-owned infrastructure, services, and resources will suffer.55 Financial markets will also suffer as foreign countries become less able to loan money to the United States and as the value of U.S. firms declines with shrinking foreign profits. As seen historically, economic disruptions in one country can cause financial crises that reverberate globally at a breakneck pace.56 [EPA-HQ-OAR-2022-0985-1643-A1, p. 9]

55 U.S. Global Change Res. Prog., Fourth National Climate Assessment, Volume II: Impacts, Risks, and Adaptation in the United States, Chapter 16: Climate Effects on U.S. International Interests 608 (2018) [hereinafter "NCA4"].

56 See Steven L. Schwarcz, Systemic Risk, 97 GEO. L.J. 193, 249 (2008) (observing that financial collapse in one country is inevitably felt beyond that country's borders).

Climate change is also predicted to exacerbate existing security threats—and possibly catalyze new security threats—to the United States.57 Besides threats to U.S. military installations and operations at home and abroad from flooding, storms, extreme heat, and wildfires,58 climate change is also a "source[] of conflict around the world"59 and a "threat multiplier" that, as recognized by the Department of Defense, will "aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions—conditions that can enable terrorist activity and other forms of violence."60 Climate change will create and exacerbate new conflicts and humanitarian crises that will require a U.S. response, even as climate change also complicates the logistics of deploying forces and achieving missions. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 9 - 10

57 See CNA Military Advisory Board, National Security and the Accelerating Risks of Climate Change (2014).

58 U.S. Gov't Accountability Off., GAO-14-446, Climate Change Adaptation: DOD Can Improve Infrastructure Planning and Processes to Better Account for Potential Impacts (2014); Union of Concerned Scientists, The U.S. Military on the Front Lines of Rising Seas (2016).

59 U.S. Dep't of Def., Report on Effects of a Changing Climate to the Department of Defense 8 (2019), available at https://perma.cc/4WPP-86EN.

60 U.S. Dep't of Def., Quadrennial Defense Review 2014 at vi, 8 (2014).

Climate change will also very directly cause spillover damages across transboundary resources. The United States has already begun to experience increased smoke from Canadian wildfires and drought conditions that spread along the U.S.-Mexico border.61 The United States shares a maritime border with 21 other countries, shares water resources like the Columbia River with our neighbors, and shares ecosystems—including the oceans through which migratory species with high economic and ecosystem-service values, like the Pacific hake, travel and live.62 [EPA-HQ-OAR-2022-0985-1643-A1, p. 10]

61 NCA4, supra note 55, at 607.

62 Id. at 615.

All of these individual spillover effects can also interact and trigger feedback loops that will propagate additional spillover damages.63 Economic shocks around the world can make it more difficult for other countries to continue investing in mitigation and abatement, thus hastening the pace of climate change.64 Conflict and political instability caused by climate change can further reduce the willingness or ability of countries to engage in domestic climate policy or international cooperation.65 Spillover effects can chain together: if climate change accelerates migration, the attendant economic ripple effects and spread of health risks may cause political instability, which in turn can cause more migration and further economic ripple effects, thus starting the feedback loop again.66 [EPA-HQ-OAR-2022-0985-1643-A1, p. 10]

63 Peter Howard & Michael Livermore, Climate-Society Feedback Effects: Be Wary of Unidentified Connections, 15 INTL. REV. ENV'T & RES. ECON. 33 (forthcoming 2021).

64 Peter Howard & Michael A. Livermore, Sociopolitical Feedbacks and Climate Change, 43 HARV. ENV'T L. REV. 119, 122-23 (2019).

65 Id.

66 NCA4, supra note 55, at 621 (explaining that instability has economic effects, and economic risks create risk of conflict); Freeman & Guzman, supra note 54, at 1581–89; id. at 1581 (noting that climate-induced pandemics may cause political instability); id. at 1564 n.157 (noting that cross-sectoral interactions will "reinforce" international spillovers and create "a costly multiplier effect"). Howard & Livermore, supra note 63.

Experts on the social cost of greenhouse gases have therefore concluded that, because the integrated assessment models that underlie the Working Group's social cost valuations currently do not capture many of these key inter-regional costs, the use of the global values can be further justified as a proxy for capturing all spillover effects.67 Though not all climate damages will spill back to affect the United States, many will, and together with other justifications, the likelihood of significant spillovers makes a global valuation the better, more transparent accounting of the full range of costs and benefits that matter to U.S. policymakers and the public. EPA can therefore highlight spillover impacts as further justification for relying on global social cost valuations. In addition to the spillover effects that EPA already mentions,68 EPA should further argue that transboundary spillovers, feedback loops, information spillovers, and other effects justify a focus on the full global values, either independently or in combination with other strategic and ethical considerations.69 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 10 - 11]

67 Robert E. Kopp & Bryan K. Mignone, Circumspection, Reciprocity, and Optimal Carbon Prices, 120 CLIMATE CHANGE 831, 833 (2013) (2013) (explaining that the principle of "circumspection" can account for spillover effects and can then be used to justify a global SC-GHG value). Notably, in Katharine Ricke et al., Country-Level Social Cost of Carbon, 8 NATURE CLIMATE CHANGE 895 (2018), the authors concede that after factoring in spillovers and other considerations, an individual country's interests may be better reflected in a global valuation than a country-specific valuation, and it may not be appropriate to use a country-specific valuation in setting climate policies: Globalization and the many avenues by which the fortunes of countries are linked mean that a high CSCC in one place may result in costs as the global climate changes even in places where the CSCC is nominally negative. For many countries, the effects of climate change may be felt more greatly through transboundary effects, such as trade disruptions, large-scale migration, or liability exposure than through local climate damage. . . . These considerations suggest that country-level interests may be more closely aligned to global interests than indicated by contemporary country-level contributions to the SCC. . . . [A] host of other strategic and ethical considerations factor into the international relations of climate change mitigation. . . . We make no claim here regarding the utility of the CSCC in setting climate policies. CO2 emissions are a global externality. Id. at 899 (emphases added).

68 RIA at 437 (citing trade, tourism, economic spillovers, political destabilization, and global migration).

69 See Schwartz, supra note 13, at 26; id. at 12 (on information spillovers).

3. Use of the Global Values Preserves Extraterritorial Interests

The RIA highlights direct and indirect impacts on U.S. citizens and assets located abroad as a justification for a global valuation,70 but U.S. extraterritorial interests are even more extensive and significant. A domestic-only estimate of the social cost of greenhouse gases based on some rigid conception of geographic borders or U.S. share of world GDP will fail to capture all the climate-related costs and benefits that matter to U.S. citizens, including impacts to significant U.S. ownership interests in foreign businesses, properties, and other assets, as well as U.S. consumption abroad including tourism,71 and even effects to the millions of Americans living abroad.72 The United States also has military personnel and assets located in almost every nation across the globe, and many if not all installations abroad—including those with high replacement costs or irreplaceable strategic value—face imminent climate risks.73 Because no methodology for estimating a "domestic-only" value would capture these impacts to extraterritorial interests, focusing on the global values can be further justified in part as a proxy for these important considerations. [EPA-HQ-OAR-2022-0985-1643-A1, p. 11]

70 RIA at 437.

71 "U.S. residents spend millions each year on foreign travel, including travel to places that are at substantial risk from climate change, such as European cities like Venice and tropical destinations like the Caribbean islands." David A. Dana, Valuing Foreign Lives and Civilizations in Cost-Benefit Analysis: The

Case of the United States and Climate Change Policy 10 (Northwestern Faculty Working Paper 196, 2009), https://perma.cc/EW3B-NKYC. 72 2021 TSD, supra note 4, at 15 (citing a 2016 figure from Bureau of Consular Affairs, Dept. of State); see also Dept. of State, Consular Affairs by the Numbers (2020), https://perma.cc/F3M8-EFSJ.

73 Ctr. for Climate & Sec., Military Expert Panel Report: Sea Level Rise and the U.S. Military's Mission 7 (2d ed. 2018), https://perma.cc/ZM4R-ED89.

The Office of Management and Budget's current Circular A-4 guidance on conducting regulatory impact analysis requires agencies to count all significant costs and benefits, including "use" values as well as "non-use" values like bequest and existence values.74 Circular A-4 cautions that "ignoring these values" may cause analyses to "significantly understate the benefits and/or costs" involved.75 Similarly, Circular A-4 recognizes that U.S. citizens may have "altruism for the health and welfare of others," and instructs agencies that when "there is evidence of selective altruism, it needs to be considered specifically in both benefits and costs."76 U.S. citizens will experience costs because of their use values, non-use values, and altruistic values attached to climate effects occurring outside the U.S. borders. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 11 - 12]

74 A bequest value captures willingness to pay to preserve a resource for a future generation. Existence value captures willingness to pay to preserve a resource even with no intention to ever use or bequeath the resource. Off. of Mgmt. & Budget, Circular A-4: Regulatory Analysis 22 (2003).

75 Id.

76 Id.

Such non-use and altruistic values take many forms. For one, the United States and its citizens have a willingness to pay—as well as a legal obligation—to protect the global commons of the oceans and Antarctica from climate damage. Furthermore, a quarter of the U.S. population consists of either foreign-born immigrants or second-generation residents,77 and subsequent generations of Americans retain significant familial, cultural, economic, and religious ties to their ancestors' home nations across the world.78 U.S. citizens and residents have a significant willingness to pay to protect their relatives, ancestral homes, and cultural and religious sites located abroad.79 Similarly, U.S. citizens value natural resources and plant and animal lives abroad—even if they never see or use those resources—and care about the health and welfare of unrelated foreign citizens80 and cultural and world heritage sites threatened by climate change.81 This altruism is "selective altruism," consistent with Circular A-4, because the United States is directly responsible for a huge amount of the historic emissions contributing to climate change.82 [EPA-HQ-OAR-2022-0985-1643-A1, p. 12]

77 U.S. Census Bureau, Characteristics of the U.S. Population by Generational Status: 2013 at 3 (2016), https://perma.cc/AS3H-BCWK; see also Pew Res. Ctr., First- and second-generation share of the population, 1900- 2017, June 3, 2019, https://perma.cc/Y9WT-75R4 (showing a growing percentage in recent years); see also Pew Res. Ctr., Key Findings About U.S. Immigration, Aug. 20, 2020, https://perma.cc/8JEK-Y88S (showing that 77% of the U.S. foreign-born population are naturalized U.S. citizens or permanent/temporary U.S. residents).

78 Over $100 billion is sent from the United States to other countries in remittances every year. See Pew Res. Ctr., Remittance Flows Worldwide in 2017, Apr. 3, 2019, https://perma.cc/D684-7ZA8.

79 Many cultural sites are located near water because of how civilization developed, Yu Fang & James W. Jawitz, The evolution of human population distance to water in the USA from 1790 to 2010, 10 NATURE COMMUNICATIONS 1 (2019), and so such sites may be especially vulnerable to climate change, see Lee

Bosher et al., Dealing with multiple hazards and threats on cultural heritage sites: an assessment of 80 case studies, 29 DISASTER PREVENTION AND MANAGEMENT: AN INTERNATIONAL JOURNAL 109 (2019). More broadly, there are clear cultural costs of climate change, W. Neil Adger et al., Cultural dimensions of climate change impacts and adaptation, 3 NATURE CLIMATE CHANGE 112 (2013), and a willingness to pay to protect culture, Ali Ardeshiri et al., Conservation or Deterioration in Heritage Sites? Estimating Willingness To Pay for Preservation (Working Paper, 2019).

80 See Arden Rowell, Foreign Impacts and Climate Change, 39 HARV. ENV'T L. REV. 371 (2015); Dana, supra note 71 (discussing U.S. charitable giving abroad and foreign aid, and how those metrics likely severely underestimate true U.S. willingness to pay to protect foreign welfare).

81 See UNESCO, Climate Change Now Top Threat to Natural World Heritage, Dec. 2, 2020, https://perma.cc/K9SW-XQDM.

82 Datablog, A History of CO2 Emissions, THE GUARDIAN (Sept. 2, 2009) (from 1900-2004, the United States emitted 314,772.1 million metric tons of carbon dioxide; Russia and China follow, with only around 89,000 million metric tons each).

Both strategic considerations and the need to account for spillovers already provide independent justifications for focusing on the full global social cost of greenhouse gas estimates. But the global values can also be at least partly justified as a proxy for these extra-territorial interests that otherwise would be overlooked using a domestic-only damage estimate. EPA can therefore further highlight U.S. extraterritorial interests as additional justification for relying on global social cost valuations, and can specifically call attention to climate-vulnerable U.S. military installations abroad with high replacement costs or irreplaceable strategic value, U.S. willingness to pay to protect relatives, ancestral homes, cultural and religious sites, and natural resources located abroad, and U.S. altruism toward the people, animals, and natural habitats across the globe. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 12 - 13]

Indeed, OMB's Draft Circular A-4 Update is even more explicit than the current guidance on the need to consider direct and indirect transboundary impacts on U.S. citizens. As the Draft Circular A-4 Update explains, effects that occur entirely outside the United States are relevant effects to consider in a regulatory impact analysis "when they affect U.S. citizens and residents, such as effects experienced by citizens residing abroad"; when "assessing effects on noncitizens residing abroad provides a useful proxy for effects on U.S. citizens and residents that are difficult to otherwise estimate"; and when "assessing effects on noncitizens residing abroad provides a useful proxy for effects on U.S. national interests that are not otherwise fully captured by effects experienced by particular U.S. citizens and residents."83 [EPA-HQ-OAR-2022-0985-1643-A1, p. 13]

83 Draft Circular A-4 Update, supra note 10, at 9–10.

C. Focusing on Global Climate Damages Is Consistent With EPA's Consideration of Global Costs

EPA can further justify its focus on global climate benefits as necessary for consistency with the rest of its analysis. In particular, EPA's analysis implicitly takes a global perspective on compliance costs, and so—as OMB's Draft Circular A-4 Update emphasizes84—it would be arbitrary not to similarly take a global perspective on climate effects. [EPA-HQ-OAR-2022-0985-1643-A1, p. 13]

84 Id. at 10 ("You should be consistent in your treatment of noncitizens residing abroad in your benefit and cost estimates. If you include some effects experienced by such noncitizens in your primary analysis,

consistency generally requires also including countervailing effects on similar noncitizens in your primary analysis. For example, if benefits that are experienced by noncitizens residing abroad are included in your analysis, compliance costs borne by noncitizens residing abroad should generally be included in your analysis as well, and vice versa.”).

All industry compliance costs ultimately fall on the owners, employees, or customers of regulated and affected firms. Whether the Proposed Rule’s compliance costs are passed to consumers or investors, or some combination thereof, a significant portion of the Proposed Rule’s alleged compliance costs will ultimately accrue to foreign customers or foreign investors. Regulated manufacturers include major corporations that are headquartered abroad or that are publicly traded with investors across the globe. In general, about 29% of U.S. corporate debt and 14% of equities are foreign-owned,85 and adding foreign direct investment to portfolio stock ownership suggests that foreigners own about 40% of U.S. corporate equity.86 These patterns largely hold true for the vehicle and trucking industry. Thus, a significant share of the Proposed Rule’s compliance costs are likely to fall on foreign entities, but EPA never distinguishes between those costs that would accrue to foreign entities as opposed to U.S. citizens or U.S. entities. Thus, the agency’s calculations of cost implicitly include all global effects. Considering global climate benefits is consistent with that approach. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 13 - 14]

85 Dept. of Treasury et al., Foreign Portfolio Holdings of U.S. Securities at B-3 (2020), https://perma.cc/6VP6- PPG6.

86 Steve Rosenthal & Theo Burke, Who’s Left to Tax? U.S. Taxation of Corporations and Their Shareholders at 2 (Urban-Brookings Tax Policy Center Working Paper, 2020), https://perma.cc/YMR2-XREM.

In a few recent analyses, agencies including EPA have admitted that some portion of the costs or cost savings calculated for publicly-traded corporations will “accru[e] to entities outside U.S. borders” through foreign ownership, employment, or consumption.87 Yet much like in the Proposed Rule, these analyses do not attempt to separate such effects to foreign interests, nor attempt to exclude such effects from consideration altogether. Indeed, splitting corporate effects into subparts based on ultimate ownership—much like separating climate benefits geographically—could be extremely complicated.88 Thus, as a practical matter, agencies typically count all costs or benefits to corporations, no matter how those effects may be passed through to foreign owners, foreign employees, or foreign customers. As the Draft Circular A-4 Update explains, this practice requires consistent treatment for benefits.89 [EPA-HQ-OAR-2022-0985-1643-A1, p. 14]

87 See, e.g., EPA, Regulatory Impact Analysis for the Proposed Reconsideration of the Oil and Natural Gas Sector Emission Standards for New, Reconstructed, and Modified Sources at 3-13 (2018); EPA, Regulatory Impact Analysis for the Proposed Revised Cross-State Air Pollution Rule (CSAPR) Update for the 2008 Ozone NAAQS at 5-5 (2020).

88 See, e.g., EPA, Draft Guidelines for Preparing Economic Analyses: Review Copy prepare for EPA’s Science Advisory Board at 5-2 (2020), available at https://perma.cc/3K86-M7AH (“Limiting standing to citizens and residents of the United States can be complicated to operationalize in practical terms (e.g., how should multinational firms with plants in the United States but shareholders elsewhere be treated?).”).

89 Draft Circular A-4 Update, supra note 10, at 10.

Since EPA analyzes the Proposed Rule’s costs globally—without distinguishing between U.S. and foreign effects—it would be inconsistent and arbitrary for the agency to attempt to separate and disregard climate benefits that occur abroad, as doing so would "put a thumb on the scale" by treating costs globally but benefits domestically.90 EPA can therefore highlight its consistent treatment of costs and benefits as further justification for assessing climate damages from a global perspective. [EPA-HQ-OAR-2022-0985-1643-A1, p. 14]

90 Ctr. for Biological Diversity, 538 F.3d at 1198.

D. Considering Extraterritorial Climate Effects Is Consistent With Administrative Precedent Outside the Climate Context

While EPA offers extensive justification for its focus on global damage estimates, it can provide additional regulatory precedent supporting that approach. Agencies often consider the extraterritorial effects of their actions—including effects on international reciprocity, international cooperation, and transboundary spillovers—when administering their statutory authority. And on numerous occasions, courts have endorsed this practice. To bolster its justification for its global perspective, EPA could highlight these regulatory precedents. [EPA-HQ-OAR-2022-0985-1643-A1, p. 14]

For one, as noted above, the National Environmental Policy Act (NEPA) requires agencies to administer and interpret the nation's law to "recognize the worldwide and long-range character of environmental problems" and to "lend appropriate support" to help "maximize international cooperation."91 Numerous court decisions—including one from the U.S. Court of Appeals for the D.C. Circuit—have held that reasonably foreseeable transboundary effects must appear in NEPA analyses.92 And consistent with those decisions, agencies have assessed transboundary impacts under NEPA for over forty years under Executive Order 12,114, which instructs agencies to "take into consideration in making decisions" effects of their actions on the "environment of a foreign nation" and "the global commons."93 In other words, EPA's consideration of extraterritorial environmental impacts is consistent with decades of agency practice. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 14 - 15]

91 42 U.S.C. § 4332(2)(F) (cited at Draft SC-GHG Update, supra note 9, at 15 n.37).

92 E.g. Env't Def. Fund, Inc. v. Massey, 986 F.2d 528 (D.C. Cir. 1993); Gov't of Man. v. Salazar, 691 F. Supp. 2d 37, 51 (D.D.C. 2010).

93 See Exec. Order No. 12,114 § 2–3, 44 Fed. Reg. 1957 (Jan. 4, 1979).

Beyond NEPA, and outside the climate context, agencies have considered key effects on international reciprocity in their regulatory cost-benefit analyses and decisionmaking. Perhaps the best antecedent on this front is EPA's 1988 regulations to protect stratospheric ozone—another global pollutant that, like greenhouse gases, requires international cooperation to effectively mitigate. In issuing those regulations, EPA recognized that it could "consider other countries' willingness to take regulatory action" in "deciding whether and how to regulate."94 EPA also took "[c]onsideration of the international ramifications of United States action" into account when "analyzing the cost and feasibility of controls."95 And in its regulatory impact analysis, EPA modeled alternative regulatory stringency levels based on potential international participation rates and the influence that EPA regulation would have on reciprocal international actions.96 By adopting a global approach to the social cost of greenhouse gases, EPA therefore draws upon the approach that it took for stratospheric ozone under the Reagan administration. [EPA-HQ-OAR-2022-0985-1643-A1, p. 15]

94 Protection of Stratospheric Ozone, 53 Fed. Reg. 30,566, 30,569 (Aug. 12, 1988).

95 Id. ("Certainly other nations' ozone-depleting emissions or control of emissions affect the cost of United States' controls, and the need for other nations to limit their emissions may make appropriate United States action that encourages, or does not discourage, other nations to agree to such limits.").

96 Env't Prot. Agency, Regulatory Impact Analysis for the Protection of Stratospheric Ozone (1988).

On several prior occasions—again outside the context of climate change—courts have upheld EPA's authority to consider effects on international reciprocity and cooperation due to domestic pollution standards. In one case, for instance, the D.C. Circuit upheld EPA's decision to set an interim tolerance of 30 ppb for the chemical ethylene dibromide under the Food, Drug, and Cosmetic Act (FDCA)—rather than ban the chemical altogether—after EPA concluded that a ban "could damage cooperative [food-safety] efforts," reasoning that "[s]ince effective enforcement of food safety laws depends upon such cooperation, a ban might increase the risk that fruit and vegetables would enter the U.S. treated with unsafe levels of pesticides or infested with pests or diseases."97 The D.C. Circuit similarly upheld EPA's consideration of international harmonization in setting NOx emissions standards for commercial aircraft gas turbine engines, after EPA issued a standard under the Clean Air Act to align U.S. standards with international standards.98 [EPA-HQ-OAR-2022-0985-1643-A1, p. 15]

97 National Coalition Against the Misuse of Pesticides v. Thomas, 815 F.2d 1579, 1582 (D.C. Cir. 1987).

98 National Ass'n of Clean Air Agencies v. EPA, 489 F.3d 1221 (D.C. Cir. 2007).

In addition to EPA's consideration of international reciprocity and cooperation in prior rulemakings, agencies have also considered transboundary spillover effects in making key decisions. As one example, when considering the "public interest" in the certification of natural gas exports under the Natural Gas Act,99 the Department of Energy routinely "consider[s] international trade policy, foreign policy, and national security interests."100 As another example, the Food and Drug Administration also frequently considers international effects as part of its regulatory decisionmaking, and has recognized that such costs are particularly relevant because "a portion of foreign costs could be passed on to domestic consumers."101 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 15 - 16]

99 15 U.S.C. § 717b(a).

100 New Policy Guidelines and Delegation Orders from Secretary of Energy to Economic Regulatory Administration and Federal Energy Regulatory Commission Relating to the Regulation of Imported Natural Gas, 49 Fed. Reg. 6,684 6,688 (Feb. 22, 1984).

101 Requirements for Additional Traceability Records for Certain Foods, 87 Fed. Reg. 70,910, 71,071 tbl.2 (Nov. 21, 2022).

Courts have confirmed that agencies may—and, in some cases, must—take into account international spillover effects. In 2020, the U.S. Court of Appeals for the Ninth Circuit rejected a Bureau of Ocean Energy Management approval of an offshore oil drilling and production facility after the agency concluded that domestic extraction would not affect international fossil-fuel supply and consumption.102 As the court explained, because domestic production causes "foreign consumers [to] buy and consume more oil"—and because that consumption "can be translated into estimates of greenhouse gas emissions" that harms the United States—the agency had an obligation to consider those increased foreign emissions resulting from domestic action.103 Two subsequent district court opinions similarly faulted Department of Interior analyses for omitting the effects of domestic production on foreign demand and consumption.104 The fact that courts have required agencies to consider the spillover impacts from foreign greenhouse gas emissions provides strong support for EPA's consideration of spillovers from domestic emissions. [EPA-HQ-OAR-2022-0985-1643-A1, p. 16]

102 Ctr. for Biological Diversity v. Bernhardt, 982 F.3d 723, 738 (9th Cir. 2020).

103 Id.

104 Sovereign Iñupiat for a Living Arctic v. Bureau of Land Mgmt., 555 F. Supp. 3d 739, 764–67 (D. Alaska 2021); citing Friends of the Earth v. Haaland, No. CV 21-2317 (RC), 2022 WL 254526, at *14–15 (D.D.C. Jan. 27, 2022).

Consistent with these examples, the Draft Circular A-4 Update recognizes that relevant benefits and costs to consider in regulatory impact analysis include both effects that "result directly from a regulation's domestic applicability" and those that result "indirectly from a regulation's impact on foreign entities."105 With regard to the latter category, the Draft Circular A-4 Update explains that relevant impacts "include the effects of a regulation on U.S. strategic interests, including the potential for inducing strategic reciprocity or other policy changes from actors abroad or effects on U.S. government assets located abroad," which "are particularly likely to occur when [a] regulation bears on a global commons or a public good."106 Additionally, the Draft Circular A-4 Update states that relevant impacts include "those that occur entirely outside the United States when they affect U.S. citizens and residents."107 [EPA-HQ-OAR-2022-0985-1643-A1, p. 16]

105 Draft Circular A-4 Update, supra note 10, at 9.

106 Id.

107 Id.

As all of these examples illustrate, EPA's consideration of climate damages on a global scale is consistent with how EPA and other agencies have exercised regulatory authority in numerous contexts. [EPA-HQ-OAR-2022-0985-1643-A1, p. 16]

Organization: State of California et al. (2)

B. EPA's Cost-Benefit Analysis Appropriately Relies on a Social Cost of GHGs that Takes Into Account a Global Perspective on Climate Change Impacts

Our States and Cities agree with EPA's recognition that the SC-GHG must take into account global, not just domestic impacts.267 The consideration of global impacts is also fully within the authority of federal agencies. In Zero Zone, the Seventh Circuit specifically upheld DOE's consideration of global benefits, accepting DOE's explanation that "climate change involves a global externality, meaning that carbon released in the United States affects the climate of the entire world."268 [EPA-HQ-OAR-2022-0985-1588-A1, p.40]

267 U.S. Environmental Protection Agency, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3, Draft Regulatory Impact Analysis ("RIA") at 437.

268 Zero Zone, 832 F.3d at 679.

In fact, ignoring global climate change impacts would be arbitrary and capricious. In California v. Bernhardt, the Northern District of California held that the Bureau of Land

Management (“BLM”) erred in evaluating only the domestic costs of increases in greenhouse gas emissions from BLM’s repeal of regulations to reduce waste at natural gas wells.269 The Court noted that “focusing solely on domestic effects has been soundly rejected by economists as improper and unsupported by science.”270 The Court concluded that BLM could not “construct a model that confirms a preordained outcome while ignoring a model that reflects the best science available.”271 [EPA-HQ-OAR-2022-0985-1588-A1, pp.40-41]

269 472 F.Supp.3d 574, 608–14 (N.D. Cal. 2020), appeal pending Docket Nos. 20-16794, 20-16801 (9th Cir.).

270 Id. at 613.

271 Id. at 614.

EPA Summary and Response:

Summary:

American Free Enterprise, *Arizona State Legislature and Steven Bradbury* all express concerns with the use of global SC-GHG values and consider it a political decision, rather than a scientific decision. *Arizona State Legislature and Steven Bradbury* asserted that EPA departed from Supreme Court precedent without lawful justification, stating that the statute EPA is acting under does not authorize EPA to consider global effects when calculating social costs, and that E.O. 12866 analysis should thus be limited to domestic benefit. *American Free Enterprise* asserted that EPA inappropriately relied on factors in the proposed rule not authorized by Congress by including such global benefit estimates. *American Free Enterprise* also asserted that if climate benefits are calculated at the global scale then the costs of the rule should be at the global scale as well, specifically stating that those should include its potential effects on global supply chains, upstream emissions in foreign countries, and the environmental effects on local communities of extracting critical minerals. However, the *Institute for Policy Integrity and the State of California* supports EPA’s use of global values within the proposed rule, arguing that this global approach is justified because the impacts of GHGs are global, because there are spillover effects from global impacts to the U.S., because of extraterritorial interests of the U.S., because of administrative precedent, because relevant statutes and Executive Orders compel or at least permit it, and in order to facilitate international reciprocity, among other arguments.

Response:

EPA disagrees with commenter’s assertions regarding what factors EPA consider in setting the HD GHG Phase 3 final standards and consistency with CAA section 202(a)(1)-(2). As discussed in preamble Section II.G.2, EPA notes that the key factors that were dispositive to the Administrator’s decision in selecting the final standards included feasibility, compliance costs, lead time, GHG emissions reductions, and cost to purchasers, and that other factors, such as non-GHG emissions, energy, and safety, were not used to select the standards but nonetheless provide further support for the Administrator’s decision. Section 202(a)(1)-(2) directs the Administrator to promulgate “standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare,” taking into consideration the cost of compliance and lead time. EPA is not required to conduct formal cost-benefit analysis to determine the appropriate standard under Section 202(a)(1)-(2). As also discussed in preamble Section II.G and Section VII, we monetize benefits of the final CO_2 standards and evaluate other costs in part to better enable a comparison of costs and benefits pursuant to E.O. 12866, but we recognize that there are benefits we are unable to fully quantify. EPA's consistent practice has been to set standards to achieve improved air quality consistent with CAA section 202 and not to rely on cost-benefit calculations, with their uncertainties and limitations, in identifying the appropriate standards. Regarding commenters' assertions that EPA has improperly inflated the climate benefits of the rule, and one commenter's (Steven Bradbury) assertion that the SC-GHG "effectively approaches zero," EPA disagrees with these commenters' contentions. As we explain in preamble Section VII.A and RIA Chapter 5.2, the SC-GHG is based on a voluminous record, significant public process, and an external expert peer review. EPA's use of SC-GHG for purposes of assessing the monetized climate benefits of this rulemaking is clearly reasonable. While we strongly disagree with commenter Steven Bradbury about monetized climate benefits, solely for purposes of this argument we note that even without the monetized benefits from the SC-GHG the rule would be net beneficial. As further explained in Section II.G of the preamble, even to the extent that EPA considers the positive monetized net benefits as supportive of the final standards (regardless of magnitude of the net benefits), this illustrative hypothetical shows that the positive monetized net benefits do not depend on either the final rule's SC-GHG estimates or the IWG SC-GHG estimates (see RIA Appendix to Chapter 8 for the latter in the final rule); EPA would still find the emissions reductions, in light of the cost of compliance, available lead time and other factors, justify adoption of these standards.

EPA follows applicable guidance and best practices when conducting its benefit-cost analyses, including OMB Circular A-4 and EPA's Guidelines for Preparing Economic Analyses. We therefore consider our analysis methodologically rigorous and a best estimate of the projected benefits and costs associated with the final rule.

With respect to the social cost of greenhouse gases (SC-GHG), as more fully discussed in preamble Section VII.A and RIA Chapter 5.2, EPA has updated its approach in the final rule and the final approach uses updated estimates of the SC-GHG that reflect recent advances in the scientific literature on climate change and its economic impacts and incorporate recommendations made by the National Academies of Science, Engineering, and Medicine[1021]. The EPA published and used these estimates in the RIA for the December 2023 Final Oil and Gas NSPS/EG Rulemaking, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review." As we explain in preamble Section VII.A and RIA Chapter 5.2, the SC-GHG is based on a voluminous record, significant public process, and the well-considered judgment of experts. EPA's use of SC-GHG for purposes of assessing the climate benefits of this rulemaking is clearly reasonable.

An updated discussion of the reasons for focusing on the global impacts of GHGs when calculating the SC-GHG can be found in the preamble for this final rule, as well as the RIA for the December 2023 Final Oil and Gas NSPS/EG Rulemaking, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review." Within the RIA for this final rule, EPA used updated SC-GHG estimates that EPA believes represents the latest available science and follows the

[1021] National Academies of Sciences, Engineering, and Medicine (National Academies). 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. National Academies Press.

recommendations of the National Academies of Science, Engineering, and Medicine. Please refer to the appendix to the RIA, "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances" for detailed responses pertaining to the rigor of the updated methodology and responses pertaining to the global focus of the SC-GHG estimates.

Note that the EPA presented these updated estimates in a sensitivity analysis in the December 2022 Supplemental RIA that address recommendations of the National Academies of Sciences, Engineering, and Medicine (2017), and invited public comment on the sensitivity analysis and on the technical report, titled External Review Draft: Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances, explaining the methodological updates that was included as Supplementary Material to the Oil and Gas Supplemental Proposal RIA. The EPA published and used these estimates in the main analysis of the RIA for the December 2023 Final Oil and Gas NSPS/EG Rulemaking, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review" and responded to public comments received on the new estimates in the Response to Comments document for the Final Oil and Gas Rulemaking.

EPA notes that when the Agency is directed to consider costs under the CAA, it does not consider costs on a nationality basis but rather, typically, cost is considered at the facility or firm level without respect to which entity owns or operates the facility(s) or firm(s). Further, EPA's cost estimates in RIAs, including the cost estimates contained in the Final RIA for this rule, regularly do not differentiate between compliance costs expected to accrue to U.S. firms versus foreign interests.[1022][

20.3 Modeling of SC-GHG and benefits

Comments by Organizations

Organization: Arizona State Legislature

The Interagency Working Group's Interim Estimates in the 2021 TSD are also substantively arbitrary and capricious because they ignore important aspects of the problem, they decline to consider relevant data, they violate longstanding principles of statutory interpretation, they suffer from glaring methodological flaws, they lack scientific rigor, and they are irredeemably speculative. See State Farm, 463 U.S. at 43. Moreover, all these errors work in the same direction—to inflate estimated future climate damages. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 15-16]

As an initial matter, the Integrated Assessment Models ('IAMs') employed by the Working Group claim a predictive power that is staggering in scope. They purport to predict the global

[1022] For example, in the RIA for the 2018 Proposed Reconsideration of the Oil and Natural Gas Sector Emission Standards for New, Reconstructed, and Modified Sources, the EPA acknowledged that some portion of regulatory costs will likely "accru[e] to entities outside U.S. borders" through foreign ownership, employment, or consumption (https://www.epa.gov/sites/default/files/2018-09/documents/oil_and_natural_gas_nsps_reconsideration_proposal_ria.pdf, p. 3-13, accessed 03/05/2024). Similarly, some portion of the regulatory costs of this rule will fall on foreign vehicle manufacturers and on companies who import components or entire vehicles made in other countries for sale in the U.S.. In general, a significant share of U.S. corporate debt and equities are foreign-owned.

impact of human migrations, wars, natural disasters, agricultural capacities, technological developments, worldwide mitigation efforts, and other unknowable future developments for the next 300 years—i.e., 'the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services,' until the year 2300. 2021 TSD, at 2. According to the 2021 TSD, '[e]xamples of affected interests include: direct effects on U.S. citizens and assets located abroad, international trade, tourism, and spillover pathways such as economic and political destabilization and global migration.' Id. at 3. The Working Group admits that proper calculations would require predicting 'mitigation activities by other countries,' and 'international mitigation actions.' Id. In short, the Working Group's calculations purport to predict the arc of human and ecological history for the next three centuries. [EPA-HQ-OAR-2022-0985-1621-A1, p. 16]

The Interagency Working Group convened by E.O. 13990 lacks adequate tools to make such impossible predictions with anything like scientific rigor. On the contrary, its attempts are hampered by hopelessly outdated assumptions and glaring methodological flaws, as discussed further below. EPA candidly acknowledges that the IAMs suffer from such methodological shortcomings and outdated assumptions. As noted above, EPA admits that the three 'Integrated Assessment Models' ('IAMs') on which the 2021 values are based suffer from grievous methodological flaws, including 'outdated' assumptions and what EPA euphemistically calls 'limitations.' 88 Fed. Reg. 26,075. EPA does not bother to elucidate these flaws and limitations, but an analysis of the IAMs and their application reveals that they are inherently speculative, fundamentally non-scientific, lacking in methodological rigor, based on false assumptions, and subject to virtually limitless user manipulation. Five examples illustrate these shortcomings: (1) the selection of the discount rate, (2) the selection of the time horizon over which damages are calculated, (3) the estimate of the Equilibrium Climate Sensitivity factor, (4) the treatment of anticipated benefits of moderate warming, and (5) the geographic scope of anticipated damages. [EPA-HQ-OAR-2022-0985-1621-A1, p. 16]

Dr. Kevin Dayaratna aptly summarizes these shortcomings: '[L]ike its predecessors, the 2021 TSD is predicated on faulty models that are prone to user-selected manipulation. Each model is highly sensitive, or produces a vastly disparate range of results, based on the user assumptions. Essentially the assumptions, and not quantifiable data, drive the results—garbage in, garbage out.' Statement of Kevin D. Dayartna ¶ 15 ('Ex. A') (attached as Exhibit A). [EPA-HQ-OAR-2022-0985-1621-A1, p. 16]

Time horizon selected. The time horizon selected for expected damages is another arbitrary choice that has a strong influence on the IAMs' results. 'Closely related to the choice of discount rate, the time horizon that the agencies choose to use to calculate damages has an outsized impact on the social cost of greenhouse gases.' Ex. A, ¶ 28. [EPA-HQ-OAR-2022-0985-1621-A1, p. 18]

Quite obviously, purporting to predict climate damages centuries into the future is an irreducibly speculative task. 'It is essentially impossible to forecast technological changes decades, let alone centuries, into the future. In particular, many commonplace technological innovations such as internet, smartphones and GPS technology were mere science fiction 300 years ago.' Id. ¶ 29. 'Yet, in every TSD to date, including the 2021 TSD, the IAMs have calculated damages based on projections ending in 2300—nearly 300 years into the future.' Id. Asking the models to predict technological changes and other developments for 300 years is speculative to the point of absurdity. [EPA-HQ-OAR-2022-0985-1621-A1, p. 18]

Suggesting that the IAMs can make reliable predictions across a 300-year time frame for all of global economic and technological history is pure speculation. It is akin to asking the soldiers of the First Crusade to predict Columbus's discovery of America, Queen Anne of England to predict the election of Donald Trump, the signers of the Peace of Westphalia to predict the invention of nuclear weapons, and the court of King Louis XIV to predict the invention of smartphones and the internet—all rolled into one, and compounded thousands of times over. This is not science. It is naked speculation. [EPA-HQ-OAR-2022-0985-1621-A1, p. 18]

Yet this naked speculation is an important driver of the Working Group's calculations— and it drives uniformly them in one direction: upward. 'Extending the time horizon in such a manner increases the SCC estimates, thus enabling the IWG to claim larger economic damages associated with CO2 emissions.' Ex. A, ¶ 29. As Dr. Dayaratna recounts, the IAMs leverage the wild uncertainty inherent in 300-year projections of global history by concealing key assumptions. '[T]he IWG's estimates of the SCC are based on climate scenarios 'that are not just badly out of date, but reflecting a set of fictional worlds.'' Ex. A, ¶ 31 (quoting Roger Pielke Jr., The Biden Administration Just Failed its First Science Integrity Test (Feb. 28, 2021), at https://rogerpielkejr.substack.com/p/the-biden-administration-just-failed). 'The IWG originally estimated the SCC in 2010 based on eight different scenarios of the future of the climate, developed over a decade ago. Four of these scenarios were to represent different trajectories of the future, sans climate policies and thus referred to as 'business as usual'….' Id. (emphasis added). 'Four others were combined into a single scenario to reflect a future with climate policy. These five scenarios initially projected out to 2100, and the IWG extended the scenarios to 2300 using a range of assumptions.' Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 18]

'[T]hese BAU scenarios are over a decade old and thus badly outdated and unrealistic.' Id. ¶ 33. 'In fact, they fail to take into account recent transitions toward less CO2 intensive forms of energy such as natural gas—assuming instead [that] … the 'world would have to make it a policy goal to burn as much coal as possible over the coming centuries.'' Id. (quoting Pielke, supra). 'If fossil fuels are not burned at the levels described in the scenarios above, then the IWG's estimates of the SCC that they constitute the basis for are therefore wrong, unfounded, and nonsensical.' Id. Thus, the IAMs take an implausible worst-case scenario—in fact, one that is not just implausible, but has already been falsified by recent events—and project that worst-case scenario 300 years into the future. Needless to say, this approach 'continues to unrealistically increase damages' calculated using the 'social cost' rubric. Id. ¶ 37. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 18-19]

Equilibrium Climate Sensitivity assumptions. Each IAM includes assumptions about 'Equilibrium Climate Sensitivity' ('ECS') in its calculation of future climate damages. See 2021 TSD, at 2 ('The three IAMs were run suing a common set of input assumptions in each model for … equilibrium climate sensitivity (ECS) – a measure of globally averaged temperature response to increased atmospheric CO2 concentrations.'). 'The ECS is a distribution that probabilistically quantifies the earth's temperature response to a doubling of carbon dioxide concentrations. Simply put, it is one of the most fundamental measures within an IAM of CO2 impacts on climate. Other effects, such as sea-level rise, all depend on a reliable ECS.' Ex. A, ¶ 39. [EPA-HQ-OAR-2022-0985-1621-A1, p. 19]

The IAMs used by the Working Group employ outdated ECS assumptions that date to 2007 and have been rendered obsolete by subsequent research. 'All the TSDs … since … 2013,' including the 2021 TSD, 'have relied on the Roe & Baker article 'Why is Climate Sensitivity So Unpredictable' published in Science in October 2007.' Id. ¶ 40. '[T]his [2007] distribution vastly overstates the probability of high-end global warming compared to more recent distributions.' Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 19]

The Working Group, like EPA itself, admits that its assumptions are outdated on this point. It admits that 'the versions of the three models used in the 2013 and 2016 TSDs,' which the 2021 TSD nevertheless adopts, 'do not reflect the tremendous increase in the scientific and economic understanding of climate-related damages that has occurred in the past decade.' 2021 TSD, at 22. In fact, '[t]here are several newer and more up-to-date distributions suggested in the peer-reviewed literature, and many of those suggest lower probabilities of extreme global warming in response to CO2 concentrations.' Ex. A, ¶ 41. In fact, using ECS assumptions current based on peerreviewed research in 2015—which is 'preferable to Roe Baker (2007) because its estimation controlled for observed ocean heat uptake efficiency, thus yielding an empirically constrained sensitivity distribution, id. ¶ 42—yields 'a reduction of over 45% with respect to the IWG's estimates' for the DICE model, id. ¶ 44. Updating the ECS factor likewise yields 'a reduction of over 80% with respect to the IWG's estimates' for the FUND model. Id. ¶ 45. [EPA-HQ-OAR-2022-0985-1621-A1, p. 19]

Agricultural benefits of warming. 'Another policy assumption that is made by the IWG in its modeling choices is that it does not fairly account for agricultural benefits by increased CO2 concentration.' Id. ¶ 47. 'For example, it is a well-established fact that increases in CO2 concentration enhance plant growth by increasing their internal water use efficiency as well as raising the rate of net photosynthesis.' Id. Thus, increasing temperature results in an increase in net agricultural productivity—a benefit of warming. Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 19]

Some models used by the Working Group, such as the DICE model, simply ignore the potential benefits of warming and do not include them in their calculations. '[T]he DICE model as utilized by the IWG explicitly presumes that only damages will result from more CO2 in the atmosphere.' Id. ¶ 52. By contrast, '[t]he FUND model attempts to quantify these benefits, and when the benefits of CO2 emissions outweigh costs, the SCC is negative.' Id. ¶ 48. For example, if one corrects the admittedly 'outdated' ECS assumption with more current 2015 figures under the FUND model, accounting for the benefits of warming results in negative mean estimates for social costs in 2020, 2030, 2040, and 2050: 'Using the empirically estimated Lewis and Curry distribution (2015), the mean estimate of the SCC is negative $1.10 in 2020, negative $1.01 in 2030, negative $0.82 in 2040, and negative $0.53 in 2050 in 2007 dollars.' Id. So also, under the other models, 'under reasonable updates to the agricultural productivity component, the mean SCC estimate may be zero or negative and that there are substantial probabilities of negative SCC under very reasonable assumptions.' Id. ¶ 53. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 19-20]

A negative 'social cost' means that emitting a metric ton of carbon dioxide is beneficial to society, and thus should be encouraged. See id. ¶ 54 ('One policy implication of a negative SCC is that the emission of an additional ton of a greenhouse gas should be encouraged, rather than avoided.'). This result effectively discredits the IAMs as tools of rational policymaking: 'The fact that, under very reasonable assumptions, the model can elicit SCC estimates of either sign [positive or negative] suggests that it is highly prone to user manipulation, and thus … the model is unreliable and should not be used by lawmakers and regulators.' Id. ¶ 55. [EPA-HQ-OAR-2022-0985-1621-A1, p. 20]

The 2021 TSD does not 'likely underestimate' climate damages. Parroting the Interagency Working Group, see 2021 TSD, at 4, 31, 35, EPA suggests with scant analysis that the 2021 TSD's 'limitations suggest that these SCGHG estimates likely underestimate the damages from GHG emissions.' 88 Fed. Reg. 26,075. This ipse dixit is unsupportable. As discussed above, virtually every error in the Working Group's analysis points in the same direction—toward overstating likely damages, not 'underestimating' them. The selection of discount rates well below 7 percent massively inflates damage calculations. The adoption of a 300-year time horizon massively inflates damage calculations. The continued use of the obsolete 2007 ECS values massively inflates damage calculations. The complete disregard of countervailing benefits massively inflates damage calculations. The unlawful expansion of damages to include foreign as well as domestic anticipated harms massively inflates damage calculations. These errors are not randomly distributed. They all point in the same direction: jacking the calculation of costs upward. [EPA-HQ-OAR-2022-0985-1621-A1, p. 21]

For all these reasons, the IAMs and their 'social cost' calculations are inherently arbitrary, capricious, and unreliable. For very similar reasons, a federal agency has previously declined 'to use 'social cost of carbon' analysis or a similar analytical tool to analyze the environmental impacts of greenhouse gas emissions from the construction and operation of the converted [natural gas] facilities.' EarthReports, Inc. v. Fed. Energy Regul. Comm'n, 828 F.3d 949, 956 (D.C. Cir. 2016). In that instance, the Federal Energy Regulatory Commission (FERC) rejected 'social cost' calculations because of three factors: (1) 'the lack of consensus on the appropriate discount rate leads to significant variation in output,' (2) the SCC 'tool does not measure the actual incremental impacts of a project on the environment,' and (3) 'there are no established criteria identifying the monetized values that are to be considered significant for NEPA purposes.' Id. (internal quotation marks omitted). FERC noted that 'there is no standard methodology to determine how a project's incremental contribution to [greenhouse gas emissions] would result in physical effects on the environment, either locally or globally.' Id. All these concerns remain true today. [EPA-HQ-OAR-2022-0985-1621-A1, p. 21]

Robert Pindyck, the MIT economist, writes that 'an IAM-based analysis suggests a level of knowledge and precision that is nonexistent, and allows the modeler to obtain almost any desired result because key inputs can be chosen arbitrarily.' Robert S. Pindyck, Climate Change Policy: What do the Models Tell Us?, National Bureau of Economic Research Working Paper 19244, at 16 (2013), at https://www.nber.org/system/files/working_papers/w19244/w19244.pdf (emphasis added). The IAMs 'have crucial flaws that make them close to useless as tools for policy analysis: certain inputs (e.g. the discount rate) are arbitrary, but have huge effects on the SCC estimates the models produce; the models' descriptions of the impact of climate change are completely ad hoc, with no theoretical or empirical foundation; and the models can tell us nothing about the most important driver of the SCC, the possibility of a catastrophic climate outcome.' Id. at ii. 'IAMbased analyses of climate policy create a perception of knowledge and precision, but that perception is illusory and misleading.’ Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 21]

The EPA should jettison its serial reliance on the so-called ‘interim estimates’ for the ‘Social Cost of Greenhouse Gases’ adopted by the unconstitutional Interagency Working Group in the 2021 TSD, as unlawful, unconstitutional, arbitrary, and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 22]

Organization: Bradbury, Steven G.

EPA’s projections of benefits from carbon dioxide reductions are primarily based on the so-called “social cost of carbon” models. However, as summarized in analyses published by my colleague from The Heritage Foundation, Kevin Dayaratna, these models are deeply flawed and unreliable. Among other things, they depend on outdated assumptions and fail to account for the positive agricultural effects of higher carbon dioxide levels. Using more appropriate assumptions, these models would show a social cost of carbon dioxide emissions that effectively approaches zero.65 [EPA-HQ-OAR-2022-0985-2427-A2, p. 23]

65 See Kevin D. Dayaratna, “Climate Change, Part IV: Moving Toward a Sustainable Future,” Testimony before Subcommittee on Environment Committee on Oversight and Reform, U.S. House of Representatives, September 24, 2020; Kevin Dayaratna and David Kreutzer, Loaded DICE: An EPA Model Not Ready for the Big Game, Backgrounder No. 2860, The Heritage Foundation, November 21, 2013, https://www.heritage.org/environment/report/loaded-dice-epa-model-not-ready-the-big-game; Kevin Dayaratna and David Kreutzer, “Unfounded FUND: Yet Another EPA Model Not Ready for the Big Game,” Backgrounder No. 2897, April 29, 2014, http://thf_media.s3.amazonaws.com/2014/pdf/BG2897.pdf; Kevin Dayaratna, Ross McKitrick, and David Kreutzer, “Empirically Constrained Climate Sensitivity and the Social Cost of Carbon,” Climate Change Economics, Vol. 8, No. 2 (2017), pp. 1750006-1-1750006-12, https://www.worldscientific.com/doi/abs/10.1142/S2010007817500063; and Kevin Dayaratna, Ross McKitrick, and Patrick Michaels, “Climate sensitivity, agricultural productivity and the social cost of carbon in FUND,” Environmental Economics and Policy Studies, 22: 433-448 (2020), https://link.springer.com/article/10.1007/s10018-020-00263-w.

These estimated values are the EPA’s main focus in evaluating the claimed benefits of carbon dioxide reduction. EPA pointedly avoids claiming that its proposed rules will achieve any specific reduction in global temperatures. That is not surprising. Apparently, EPA wishes to save itself the embarrassment of predicting a vanishingly small effect. Using the UN Climate Panel’s model for global average temperature effects, Bjorn Lomborg has shown that if every country in the world achieved its stated EV targets by 2030, the total savings in carbon dioxide emissions would be expected to reduce global temperature by only 0.0002 degree Fahrenheit by the year 2100.68 [EPA-HQ-OAR-2022-0985-2427-A2, p. 24]

68 See Bjorn Lomborg, “If Electric Vehicles Are So Great, Why Mandate Them?,” Wall Street Journal , September 10, 2022, https://www.wsj.com/articles/policies-pushing-electric-vehicles-show-why-fewpeople-want-one-cars-clean-energy-gasoline-emissions-co2-carbon-electricity-11662746452.

Organization: Clean Fuels Development Coalition et al.

G. The calculations of the social cost of carbon are incorrect.

The rule estimates $87 billion in Social Cost of GHG (“SC-GHG”) benefits. 88 Fed. Reg. 25,937, Table ES-8. Social cost of carbon estimates are nothing new, but those used here are illegal. Relying on such estimates in the proposal exceeds EPA's statutory authority. [EPA-HQ-OAR-2022-0985-1585-A1, p. 37]

Organization: Institute for Policy Integrity at NYU School of Law et al.

III. Common Criticisms of the Working Group's Methodology from Opponents of Climate Regulation Lack Merit

While the Working Group developed its social cost valuations through a rigorous process that incorporated the best scientific and economic modeling available at the time, its assumptions have sometimes been criticized by opponents of climate regulation. Such objections lack merit and do not supply bases for EPA to reject the Working Group's expert valuations. This section offers responses to criticisms from opponents of sensible climate policy. [EPA-HQ-OAR-2022-0985-1643-A1, p. 22]

A. EPA Is Required to Value Climate Damages, and Doing So Provides Balance to EPA's Cost-Benefit Analysis

One objection to agency usage of the Working Group's estimates is that Congress, not the executive branch, should set policy with respect to climate change. But EPA has broad authority to assess climate impacts, and judicial precedent suggests that it must value climate-change impacts as part of its regulatory impact analysis. In fact, assessing climate damages as part of its regulatory impact analysis provides rationality and balance to EPA's approach—and does not, as critics have suggested, inappropriately skew the analysis. [EPA-HQ-OAR-2022-0985-1643-A1, p. 22]

1. EPA Must Monetize Climate Impacts as Part of Its Analysis

It is widely established that federal agencies may—and often must—consider effects on climate change when those effects flow from the agency's actions. With EPA, this is especially well-established. In Massachusetts v. EPA, the Supreme Court held that greenhouse gas emissions qualify as an "air pollutant" for regulation under the Clean Air Act.149 Because the purpose of the Proposed Rule is to regulate greenhouse gas pollution as an "air pollutant" under Section 202 of the Clean Air Act—following the Massachusetts precedent—EPA should naturally and obviously consider impacts on climate when deciding upon the stringency of its regulation. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 22 - 23]

149 Massachusetts v. EPA, 127 S. Ct. 1438 (2007).

Monetizing climate impacts is a natural and rational option to account for those impacts. Indeed, it is well accepted in regulatory practice and precedent that agencies should monetize regulatory impacts to the extent feasible, to compare costs and benefits along a common metric.150 EPA has long monetized climate damages in vehicles regulations promulgated under the Obama, Trump, and Biden administrations. [EPA-HQ-OAR-2022-0985-1643-A1, p. 23]

150 Circular A-4, supra note 74, at 2 ("Benefit-cost analysis is a primary tool used for regulatory analysis.2 Where all benefits and costs can be quantified and expressed in monetary units, benefit-cost analysis provides decision makers with a clear indication of the most efficient alternative, that is, the alternative that generates the largest net benefits to society (ignoring distributional effects).").

Monetizing climate impacts may also be legally required. In 2007, the U.S. Court of Appeals for the Ninth Circuit held that the federal government must monetize climate impacts when it conducts a cost-benefit analysis. In Center for Biological Diversity v. National Highway Traffic Safety Administration, the Ninth Circuit remanded a fuel economy rule to the Department of Transportation ("DOT") for failing to monetize the benefits of carbon dioxide reductions in its regulatory analysis.151 The Court recognized the presence of uncertainty in the valuation of climate damages, but explained that "the value of carbon emissions reduction is certainly not zero."152 By failing to value the benefit of greenhouse gas emission reductions in its analysis, the Court continued, DOT effectively ignored the adverse impacts of greenhouse gas emissions and thus "put a thumb on the scale by undervaluing the benefits . . . of more stringent standards."153 [EPA-HQ-OAR-2022-0985-1643-A1, p. 23]

151 Ctr. for Biological Diversity, 538 F.3d at 1198–1203 (9th Cir. 2008).

152 Id. at 1200.

153 Id. at 1198.

2. Monetizing Climate Benefits Does Not Skew the Analysis, but Rather Provides Balance Since EPA Also Monetizes Costs

Another objection to the use of the social cost of greenhouse gases from critics of climate action is that these valuations account only for the damages from climate change, but do not take account of the alleged economic benefits from fossil-fuel production and usage. But this argument is unpersuasive for two key reasons. [EPA-HQ-OAR-2022-0985-1643-A1, p. 23]

First, the economic benefits of fossil-fuel extraction are far more limited than its proponents suggest, since the broader benefits that society derives from power and electricity are attributable to energy production in general and are not unique to fossil fuels.154 Accordingly, controls on fossil fuels will have limited net economic impacts.155 Second, while there are of course some economic impacts from reductions in fossil-fuel production and usage, including effects on revenues and jobs, those impacts should not be included in any calculation of climate damages, but rather considered separately by regulators on the costs side of the ledger in individual determinations. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 23 - 24]

154 Renewable energy, like fossil fuels, generates revenue, supports jobs, and vitalizes local economies. See, e.g., Katie Siegner et al., Rocky Mtn. Inst., Seeds of Opportunity: How Rural America Is Reaping Economic Development Benefits from the Growth of Renewables 6–16 (2021), available at https://perma.cc/DWH9-D4L7.

155 Environmental regulation typically has limited impacts on total employment or other macroeconomic indicators, but rather shifts production from one sector to another. See Inst. for Pol'y Integrity, Does Environmental Regulation Kill or Create Jobs (2017), available at https://policyintegrity.org/files/media/Jobs_and_Regulation_Factsheet.pdf. Meanwhile, the sharp decline in the cost renewable energy is already expected to crowd out the demand for gas-fuel electricity in the coming years and decades. See, e.g. Energy Info. Admin., Annual Energy Outlook 2021 Narrative 18 tbl. 11 (projecting doubling of renewables as a share of domestic energy consumption—from 21% to 42%—by 2050 under reference case, while share of coal and natural gas declines); Charles Teplin et al., ROCKY MTN. INST., The Growing Market for Clean Energy Portfolios 8 fig. ES-2 (2019), available at https://perma.cc/P5YJ-WARJ (showing precipitous decline in cost of clean energy to being cheaper than fossil fuels).

In the Proposed Rule, EPA monetizes not only the expected benefits of the proposal but also the expected compliance costs from industry. EPA then compares quantified cost and benefit estimates in determining whether and how to regulate, as instructed by federal guidance and executive order.156 Capturing climate benefits is thus essential to ensuring a balanced analysis. As the Ninth Circuit has recognized, "failure to monetize the most significant benefit of more stringent standards: reduction in carbon emissions"—while continuing to value estimated compliance costs—would "put a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent standards."157 [EPA-HQ-OAR-2022-0985-1643-A1, p. 24]

156 Exec. Order No. 12,866 § 1(a), 58 Fed. Reg. 51,735 (Oct. 4, 1993) (directing that "in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits").

157 Ctr. for Biological Diversity, 538 F.3d at 1198–99.

B. Other Common Criticisms of the Working Group's Methodology from Opponents of Climate Policy Lack Merit

EPA should also provide responses to any objections lobbed against the Working Group's methodology and valuations during this comment period. The Working Group, of course, has already responded to criticisms of its methodology that were offered during the public comment period that it held in 2013,158 and EPA should draw from that document where relevant in responding to objections offered through this notice-and-comment process. But some objections are now being raised that were not offered during the 2013 comment period, while some of the responses that the Working Group provided can be supplemented with more recent information. Below, we provide brief responses to common objections that are now being presented by opponents of climate reforms. [EPA-HQ-OAR-2022-0985-1643-A1, p. 24]

158 Response to Comments, supra note 116.

1. The Social Cost Valuations Are Not Too Uncertain to Apply

While critics sometimes argue that there is too much uncertainty to rely on the Working Group's social cost valuations, this argument is incorrect on multiple levels. As a legal matter, the presence of some uncertainty in the social cost valuations should not preclude agencies from using available valuations. And as a factual matter, the Working Group rigorously considered uncertainty and accounted for it in numerous ways. Moreover, the presence of continued uncertainty suggests that the social cost valuations should be higher than presently valued—not that climate damages should be ignored. This is confirmed by EPA's Draft SC-GHG Update, which incorporates the latest available research and produces substantially higher climate damage valuations than those the Working Group previously developed. [EPA-HQ-OAR-2022-0985-1643-A1, p. 24]

Federal courts have repeatedly recognized that agency analysis necessitates making predictive judgments under uncertain conditions, explaining that "[r]egulators by nature work under conditions of serious uncertainty" 159 and "are often called upon to confront difficult administrative problems armed with imperfect data."160 As the Ninth Circuit has explained, "the proper response" to the problem of uncertain information is not for the agency to ignore the issue but rather "for the [agency] to do the best it can with the data it has."161 Courts generally grant broad deference to agencies' analytical methodologies and predictive judgments so long as they are reasonable, and do not require agencies to act with complete certainty.162 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 24 - 25]

159 Pub. Citizen v. Fed. Motor Carrier Safety Admin., 374 F.3d 1209, 1221 (D.C. Cir. 2004).

160 Mont. Wilderness Ass'n v. McAllister, 666 F.3d 549, 559 (9th Cir. 2011).

161 Id.

162 See Wis. Pub. Power, Inc. v. FERC, 493 F.3d 239, 260 (D.C.Cir.2007) ("It is well established that an agency's predictive judgments about areas that are within the agency's field of discretion and expertise are entitled to particularly deferential review, so long as they are reasonable.").

The Working Group rigorously considered various sources of long-term uncertainty "through a combination of a multi-model ensemble, probabilistic analysis, and scenario analysis."163 As the Working Group explained, the three reduced-form integrated assessment models (IAMs) account for uncertainty themselves by spanning a range of economic and ecological outcomes.164 Additionally, the use of three separate models—all developed by different experts spanning a range of views—accounts for uncertainty by integrating a diversity of viewpoints and structural and analytical considerations.165 [EPA-HQ-OAR-2022-0985-1643-A1, p. 25]

163 2021 TSD, supra note 4, at 26.

164 See id.

165 See id.

In addition to the use of three distinct damage models with different inputs and assumptions, the Working Group integrated various sources of uncertainty into its damage valuations. For instance, the Working Group applied an equilibrium climate sensitivity—that is, an estimate of how much an increase in atmospheric greenhouse gas concentrations affects global temperatures—that reflects a broad distribution of possible outcomes.166 The Working Group also applied five different socioeconomic and emissions trajectories from the published literature reflecting a range of possible outcomes for future population growth, global gross domestic product, and greenhouse gas emission baselines—all important inputs that affect long-term climate damage estimates.167 The Working Group ran each integrated assessment model 10,000 times per scenario (and per greenhouse gas) for a total of 150,000 draws per greenhouse gas, and then averaged across those results to develop its recommended estimates.168 In addition to reporting the average valuations, the Working Group published the results of each model run under each scenario.169 [EPA-HQ-OAR-2022-0985-1643-A1, p. 25]

166 Id. at 13 tbl.1 (showing 5th-95th probability range of distributions in the chosen Roe & Baker model from 1.72°C from a doubling of atmospheric greenhouse gas concentrations to 7.14°C(.

167 Id. at 15–17 & tbl.2.

168 Id. at 28; see also 2021 TSD, supra note 4, at 26–27 (providing additional detail).

169 Interagency Working Group, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis 26 tbl.3 (2010) ["2010 TSD"].

Moreover, experts broadly agree—and EPA's Draft SC-GHG Update confirms—that the presence of uncertainty in the social cost valuations counsels for more stringent climate regulation, not less.170 This is due to various factors including risk aversion, the informational value of delaying climate change impacts, and the possibility of irreversible climate tipping points that cause catastrophic damage.171 In fact, as discussed above and emphasized in EPA's Draft SC-GHG Update, uncertainty is a factor justifying lowering the discount rate, particularly in intergenerational settings.172 Furthermore, the current omission of key effects of climate change—such as catastrophic damages, wildfires and certain cross-regional spillover effects—also suggests that the true social cost values are likely higher than the Working Group's current estimates.173 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 25 - 26]

170 See, e.g., Alexander Golub et al., Uncertainty in Integrated Assessment Models of Climate Change: Alternative Analytical Approaches, 19 ENV'T MODELING & ASSESSMENT 99 (2014) ("The most important general policy implication from the literature is that despite a wide variety of analytical approaches addressing different types of climate change uncertainty, none of those studies supports the argument that no action against climate change should be taken until uncertainty is resolved. On the contrary, uncertainty despite its resolution in the future is often found to favor a stricter policy.").

171 The undersigned organizations have filed comments in numerous regulatory proceedings highlighting the various forms of uncertainty that increase the social cost of greenhouse gases, and providing numerous references. See, e.g., Environmental Defense Fund et al., Improper Valuation of Climate Effects in the Proposed Revised Cross- State Air Pollution Rule Update for the 2008 Ozone NAAQS, Technical App'x: Uncertainty (Dec. 14, 2020), https://policyintegrity.org/documents/Joint_SCC_comments_EPA_revised_CSAPR_Ozone_NAAQS_2020.12.14.pdf.

172 See Howard & Schwartz, supra note 111, at 13–25.

173 Interagency Working Group, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis 21 (2016) ["2016 TSD"] (recognizing that "these limitations suggest that the [social cost of greenhouse gases] estimates are likely conservative").

2. The Working Group Did Not Bias Its Estimates by Ignoring Positive Impacts of Climate Change

Critics sometimes claim that the Working Group's social cost values ignore important positive impacts of a warming climate. Examples that have been offered to support this argument include alleged agricultural benefits from higher temperatures and decreased wintertime mortality. But these arguments are legally and factually dubious, and miss the forest for the trees. [EPA-HQ-OAR-2022-0985-1643-A1, p. 26]

Mere omission of some impacts does not counsel for abandoning the social cost estimates, particularly since independent experts—and EPA's Draft SC-GHG Update—widely agree that those estimates likely undervalue true climate damages because they omit far more negative effects than positive ones. For instance, the Working Group has explained that several of the underlying economic models omit certain major damage categories such as catastrophic damages and certain cross-regional spillover effects.174 These effects can be massive: One paper, for instance, finds that the inclusion of tipping points doubles the social cost estimates, 175 with another paper concluding that the effect is even greater and thus the Working Group's existing values "may be significantly underestimating the needs for controlling climate change."176 The current consensus of experts puts damages for a 3°C increase at roughly 5% to 10% of gross domestic product,177 which is substantially higher than the damages estimated by the IAMs.178 And as the Ninth Circuit has explained, the presence of some omitted damages does not provide a legal basis to ignore established methodologies to monetize climate damages, since while "there is a range of [plausible] values, the value of carbon emissions reduction is certainly not zero."179 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 26 - 27]

174 2010 TSD, supra note 169, at 26, 32.

175 Derek Lemoine & Christian P. Traeger, Economics of Tipping the Climate Dominoes. 6 NATURE CLIMATE CHANGE 514 (2016).

176 Yongyang Cai et al., Environmental Tipping Points Significantly Affect the Cost-Benefit Assessment of Climate Policies, 112 PROCS. NAT'L ACADS. SCIS. 4606 (2015).

177 See, e.g., Peter Howard & Derek Sylvan, Inst. for Pol'y Integrity, Gauging Economic Consensus on Climate Change 25 (2021) (reporting mean estimate of 8.5% GPD loss and median estimate of 5% loss, based on elicitation of over 700 climate-policy experts).

178 2010 TSD, supra note 169, at 9 fig.1A (showing range of GDP loss below 5% for 3°C temperature increase).

179 Ctr. for Biological Diversity, 38 F.3d at 1200.

In addition to its legal shortcomings, arguments about the impact of positive externalities are also factually suspect. For instance, while agricultural benefits have become a flashpoint in this debate, the IAMs in fact do account for the potential agricultural benefits of carbon dioxide fertilization from a warming planet.180 And evidence suggests that, if anything, these models likely overvalue agricultural benefits from a warming planet—and thus undervalue the social cost of greenhouse gases.181 One paper, for instance, concludes that estimates of net agricultural impacts produced an undervaluation of the social cost values by more than 50%, explaining that "new damage functions reveal far more adverse agricultural impacts than currently represented" in the IAMs used by the Working Group.182 And a comprehensive investigation of the impacts of climate change on agriculture has rejected the hypothesis "that agricultural damages over the next century will be minimal and indeed that a few degrees Celsius of global warming would be beneficial for world agriculture," concluding that climate change "will have at least a modest negative impact on global agriculture in the aggregate."183 This conclusion is confirmed by the Draft SC-GHG Update, which finds that climate change on net will harm, not benefit, the agricultural sector.184 [EPA-HQ-OAR-2022-0985-1643-A1, p. 27]

180 See Peter Howard, Omitted Damages: What's Missing from the Social Cost of Carbon 6 (2014), available at https://policyintegrity.org/files/publications/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. See also Inst. for Pol'y Integrity, A Lower Bound: Why the Social Cost of Carbon Does Not Capture Critical Climate Damages and What That Means for Policymakers 5 (2019), available at https://policyintegrity.org/files/publications/Lower_Bound_Issue_Brief.pdf; Climate Impacts Reflected in the SCC Estimates, Cost of Carbon Project, https://costofcarbon.org/scc-climate-impacts.

181 See, e.g., Frances C. Moore et al., Economic Impacts of Climate Change on Agriculture: A Comparison of Process-Based and Statistical Yield Models, 12 ENV'T RES. LTRS., 65008 ("[W]e find little evidence for differences in the yield response to warming. The magnitude of CO2 fertilization is instead a much larger source of uncertainty. Based on this set of impact results, we find a very limited potential for on-farm adaptation to reduce yield impacts.").

182 Frances C. Moore et al., New Science of Climate Change Impacts on Agriculture Implies Higher Social Cost of Carbon, 8 NATURE COMMUNS. 1607 (2017).

183 WILLIAM R. CLINE, GLOBAL WARMING AND AGRICULTURE: IMPACT ESTIMATES BY COUNTRY 1–2 (2007).

184 Draft SC-GHG Update, supra note 9, at 70 tbl.3.1.4 (breaking down damage estimates by sector/category).

Other arguments focusing on omitted positive impacts are equally misguided. For example, while some critics of the Working Group's methodology misleadingly point out that one of the models, DICE, focuses on increased heat-related mortality and does not account for reductions in wintertime mortality, consideration of the many damages omitted from the IAMs (such as particulate matter from wildfires, deaths from flooding, Lyme and other tick-based diseases), including certain mortality effects, consistently point toward a higher social cost value.185 One recent study concludes that the IAMs, on net, undervalue mortality from climate change.186 Focusing on the omission of reductions in wintertime mortality thus misses the forest for the trees, and does not supply a basis to disregard the Working Group's valuations. [EPA-HQ-OAR-2022-0985-1643-A1, p. 27]

185 See, e.g., Howard, supra note 180. See also 2016 TSD, supra note 173, at 21.

186 See Tamma A. Carleton et al., Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits (U. Chicago, Becker Friedman Inst. for Econ. Working Paper No. 2018-51) (Jul. 31, 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3224365 (finding that new empirical estimates suggest that the increase in morality risk from climate change is valued at approximately 3.2% of global GDP in 2100).

3. The Working Group Did Not Overstate the Pace of Climate Change

Critics sometimes allege that the chosen Equilibrium Climate Sensitivity ("ECS") distribution—that is, the amount of warming that is expected to result from a doubling of the atmospheric carbon dioxide concentration—is outdated and fails to account for recent evidence showing that sensitivity to be lower than previously believed. But these arguments rely on cherry-picked data and ignore the scientific consensus. [EPA-HQ-OAR-2022-0985-1643-A1, p. 28]

In 2016, the National Academies of Sciences dedicated an entire report to whether the Working Group should update the social cost metrics to reflect more recent science on the ECS. The National Academies decided that such an update was unnecessary, "recommend[ing] against a near-term change in the distributional form of the ECS" and explaining that any reasonable revisions on this front would "have a minimal impact on estimates of the [social cost of greenhouse gases]."187 [EPA-HQ-OAR-2022-0985-1643-A1, p. 28]

187 Nat'l Acad. Scis., Eng'g & Med., Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update 34, 46 (2016), available at https://perma.cc/TJM6-XE65 [hereinafter "NAS 2016 Report"].

On top of the National Academies' rejection of this argument, there is little support for the claim that the Working Group overstated the pace of climate change. The most recent estimate from the Intergovernmental Panel on Climate Change ("IPCC")—which reflects consensus estimates from the worldwide scientific community—projects an ECS range from 2.5°C to 4°C, with 3°C as a "best estimate."188 This is consistent with the range applied by the Working Group—based off of Roe & Baker—which uses 3°C as its median and 3.5 °C as its mean ECS value.189 In evaluating the ECS, the Working Group assessed estimates from a wide range of experts and selected consensus values. In fact, as the Working Group acknowledged, some ECS estimate ranges go as high as 10º C, making its selected ECS distribution substantially lower than these high-end estimates and a reasonable middle range.190 The Draft SC-GHG Update confirms this approach by applying a similar ECS value using the FaIR model.191 [EPA-HQ-OAR-2022-0985-1643-A1, p. 28]

188 IPCC, AR6 Synthesis Report SPM-14 (2021).

189 2010 TSD, supra note 169, at 13 tbl.1.

190 Id. at 14 fig.2.

191 Draft SC-GHG Update, supra note 9, at 28–29 & 29 tbl.2.2.1.

In previous dockets, opponents of the Working Group's estimates have cited Lewis & Curry (2015)—which estimates a median ECS of 1.64 ºC with an uncertainty range (5–95%) of 1.05–4.05 ºC—to suggest that the Working Group applied an inappropriately high ECS range.192 But in light of the consensus estimates discussed above, that paper is a severe outlier. Since its publication, Lewis & Curry (2015) has been criticized by other climate scientists for methodological deficiencies that may cause it to underestimate the ECS.193 And as noted above, the National Academies did not think that Lewis & Curry (2015) merited an update to the Working Group's valuations to revise the ECS estimates.194 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 28 - 29]

192 Nicholas Lewis & Judith A. Curry, The Implications for Climate Sensitivity of AR5 Forcing and Heat Uptake Estimates, 45 Climate Dynamics 1009 (2015).

193 See, e.g., Kate Marvel et al., Internal Variability and Disequilibrium Confound Estimates of Climate Sensitivity from Observations, 45 GEOPHYS. RES. LTRS. 1595 (2018) ("[A] range of recent work … suggests that [Lewis & Curry (2015)] may underestimate equilibrium warming."); Timothy Andrews et al., Accounting for Temperature Patterns Increases Historical Estimates of Climate Sensitivity, 45 GEOPHYS. RES. LTRS. 8490 (2018) (explaining that Lewis and Curry disregard "the impact from non-CO2 forcings and unforced climate variability that could have had a significant impact on the pattern of historical temperature change").

194 NAS 2016 Report, supra note 187.

Critics further argue that the ECS distribution applied by the Working Group inappropriately skews rightward, meaning that its mean ECS value exceeds the median value of 3º C that the IPCC has indicated. But that decision is a feature, not a bug. As the National Academies explained, the IPCC has found that there is a "positively skewed distributional form for [the ECS] parameter" similar to the ECS distribution applied by the Working Group.195 (This too is confirmed in EPA's Draft SC-GHG Update.196) In other words, the mean ECS value should be higher than the median ECS value, and the Working Group applied an appropriate distribution. Criticisms to the contrary are meritless. [EPA-HQ-OAR-2022-0985-1643-A1, p. 29]

195 Id. at 25.

196 Draft SC-GHG Update, supra note 9, at 29 tbl.2.2.1 (reporting mean ECS of 3.18 °C and median of 2.95 °C).

4. The Working Group Applied a Reasonable Range of Emission Baselines

Critics sometimes argue that the Working Group's valuations are an overestimate because they apply outdated emission scenarios that exaggerate the baseline level of atmospheric greenhouse gas levels. Using a higher baseline level of emissions raises the social cost estimates because the harm from an additional unit of emissions increases with the baseline atmospheric emissions level. However, the Working Group used a reasonable emissions baseline that reflects different possible mitigation scenarios. [EPA-HQ-OAR-2022-0985-1643-A1, p. 29]

While the Working Group assumed a baseline emissions range of 13–118 gigatons of carbon dioxide emitted per year by 2100,197 recent projections from the Climate Action Tracker indicate that baseline emissions will reach between 14–175 gigatons of carbon dioxide by 2100 under a range of scenarios reflecting different levels of mitigation.198 Thus, the baselines used by the Working Group potentially understate baseline emissions rather than overvalue them as opponents argue. Several of the Working Group's supposedly "business-as-usual" scenarios are actually more consistent with baseline estimates reflecting policy projections.199 Accordingly, the criticism that the Working Group overestimated future greenhouse gas concentrations in the atmosphere falls flat. [EPA-HQ-OAR-2022-0985-1643-A1, p. 29]

197 2010 TSD, supra note 169, at 16 tbl.2.

198 Climate Action Tracker, Global Emissions Time Series (Dec. 1, 2020), available at https://perma.cc/B4X2-RAWA.

199 Compare id. (projecting 35-48 gigatons of emissions in 2100 under "current policy projections" scenarios and 83-175 gigatons under business-as-usual scenario) with 2010 TSD, supra note 169, at 16 tbl.2 (incorporating supposedly business-as-usual scenarios of 42.7 and 60.1 gigatons in 2100).

Moreover, this choice does not particularly affect the social cost valuations. In comparison to the Working Group's central social cost of carbon estimate in 2020 of $51 per ton, the average social cost of carbon under the Working Group's supposed business-as-usual emissions scenarios is $53 per ton and $41 per ton under the emissions scenario that is consistent with sustained and widespread mitigatory action.200 While relying less on the Working Group's supposed business-as-usual scenarios would therefore modestly decrease the interim social cost valuations in a vacuum, more holistic updates to the metrics as recommended by the National Academies of Sciences would very likely increase the social cost valuations overall—as confirmed by EPA's Draft SC-GHG Update—due to the omitted damages discussed above and recent evidence regarding intergenerational discount rates.201 At best, therefore, this argument makes a mountain out of a molehill. [EPA-HQ-OAR-2022-0985-1643-A1, pp. 29 - 30]

200 See Peter Howard et al., Option Value and the Social Cost of Carbon: What Are We Waiting For? (Inst. for Pol'y Integrity Working Paper No. 2020/1) at 16 tbl.1 (2020), available at https://policyintegrity.org/files/publications/Working_paper_06.22.20.pdf.

201 See 2021 TSD, supra note 4, at 4 (Working Group acknowledging that its current social cost valuations "likely underestimate societal damages from [greenhouse gas] emissions").

5. The Working Group Applied Scientifically-Based Damage Models

Critics sometimes claim that the IAMs—the damage functions for translating climate impacts into economic losses—are flawed and arbitrary. While newer data has enabled the development of updated damage models that EPA applies in the Draft SC-GHG Update, the Working Group's damage functions nonetheless are based on reasonable assumptions made by a range of experts.202 They have also withstood scientific scrutiny, and while opponents of climate reform frequently highlight criticism of the damage functions by a notable economist, they take this criticism out of context. [EPA-HQ-OAR-2022-0985-1643-A1, p. 30]

202 Response to Comments, supra note 116, at 8 ("While the development of the DICE, FUND and PAGE models necessarily involved assumptions and judgments on the part of the modelers, the damage functions are not simply arbitrary representations of the modelers' opinions about climate damages.").

The Working Group selected three models of climate damages that, when the Working Group selected them in 2010, were the most widely used and cited models in the economics literature linking physical climate impacts to economic damages203: the DICE, FUND, and PAGE models.204 These models were developed by outside experts, published in peer-reviewed economic literature,205 and were the product of extensive scholarship and expertise. One of the models, DICE, was developed by William Nordhaus, an economics professor and former provost of Yale University who won a Nobel Memorial Prize in Economic Sciences for developing the model. And PAGE's developer, Chris Hope, was a lead author and review editor for the Third and Fourth Assessment Reports of the IPCC, which shared the Nobel Peace Prize in 2007 with former U.S. Vice President Al Gore.206 [EPA-HQ-OAR-2022-0985-1643-A1, p. 30]

203 Response to Comments, supra note 116, at 4 (stating the models "remain the most widely cited"), 8 (quoting the National Academies of Sciences for recognizing that the chosen models represent "the most widely used impact assessment models" available).

204 2010 TSD, supra note 169, at 5.

205 Response to Comments, supra note supra note 116, at 4.

206 See Chris Hope faculty bio page, University of Cambridge Judge Business School, https://www.jbs.cam.ac.uk/faculty-research/research-teaching-staff/chris-hope/.

The three models reflect a wide diversity of methodological assumptions about a range of key parameters and inputs.207 This reflects, in part, different judgments about the experts who developed the models. For instance, Richard Tol, who developed the FUND model, has stated that "[t]he impact of climate change is relatively small," and dismissed much of the research behind climate change as "scaremongering" rather than "sound science."208 Unsurprisingly, his model produces the lowest damage estimates of the three models incorporated by the Working Group.209 William Nordhaus, who developed the DICE model, is widely credited with popularizing the goal that global temperatures increase no more than 2° Celsius (or 3.6° Fahrenheit) below pre-industrial levels210—a goal now considered conservative by the global community.211 His model produces higher damage estimates that are close to the Working Group's average damage valuations.212 [EPA-HQ-OAR-2022-0985-1643-A1, pp. 30 - 31]

207 See 2010 TSD, supra note 169, at 6 (discussing how "[t]he parameters and assumptions embedded in the three models vary widely").

208 Richard S.J. Tol, Why Worry About Climate Change?, ESRI Research Bulletin 2009/1/1, at 3, 5 (2009).

209 See 2010 TSD, supra note 169, at 50 tbl.A5 (reporting that FUND model has the lowest mean estimate of the three models at all discount rates, including a negative social cost of carbon estimate at a 5% discount rate).

210 The 2° C Limit on Global Warming, The Economist (Dec. 6, 2015), https://www.economist.com/theeconomist-explains/2015/12/06/the-2degc-limit-on-global-warming.

211 For instance, the Paris Agreement calls for governments to "hold[] the increase in the global average temperature to well below 2°C above pre-industrial levels and pursu[e] efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change." Paris Agreement to the United Nations Framework Convention on Climate Change, Art. 2(1)(a), Dec. 12, 2015, T.I.A.S. No. 16-1104.

212 Compare 2010 TSD, supra note 169, at 50 tbl.A5 with id. at 1.

Opponents of climate mitigation policy sometimes point to criticisms from Robert S. Pindyck, a noted climate economist who has been critical of the Working Group's choice of damage functions. But as Professor Pindyck has himself stated, his "writings continue to be taken out of context by some to unfairly attack the Interagency Working Group's methodology and its interim estimates."213 While Professor Pindyck has questioned the shape of the models' damage functions,214 he has acknowledged that the damage functions reflect "common beliefs" about the effects of two or three degrees of warming. [EPA-HQ-OAR-2022-0985-1643-A1, p. 31]

213 Robert S. Pindyck, Comments on "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990" at 1 (June 15, 2021), available at https://www.regulations.gov/comment/OMB-2021-0006-0012.

214 Robert S. Pindyck, Climate Change Policy: What do the Models Tell Us? (Nat'l Bureau of Econ. Research, Working Paper No. 19244) 16 (2013), available at https://perma.cc/G25M-MA7W.

And Pindyck states that uncertainty about the social cost estimates, including the damage functions, "does not imply that [their] value should be set to zero until the uncertainty is resolved."215 In fact, he actually advocates for an even higher social cost value than that produced by the Working Group,216 and declared in 2017 (prior to the release of the Draft SCGHG Update) that "the federal government should continue to use the [Working Group's] interim estimates . . . as lower bound estimates."217 [EPA-HQ-OAR-2022-0985-1643-A1, p. 31]

215 Robert S. Pindyck, Comments to Ms. Catherine Cook, Bureau of Land Management, on Proposed Rule and Regulatory Impact Analysis on Delay and Suspension of Certain Requirements for Waste Prevention and Resource Conservation 3 (Nov. 6, 2017), available at https://perma.cc/8MY5-58P5; see also Pindyck, supra note 214, at 16 (My criticism of IAMs should not be taken to imply that because we know so little, nothing should be done about climate change right now, and instead we should wait until we learn more. Quite the contrary.").

216 Pindyck, supra note 213, at 1 ("My work instead strongly suggests that the estimates of the social cost of greenhouse gases should be higher than the February 2021 interim estimates[.]") In 2019, Pindyck's own estimate of the average social cost of carbon dioxide was between $80 to $100, with plausible values going up to $200. Robert S. Pindyck, The Social Cost of Carbon Revisited, 94 J. ENV'T ECON. & MGMT. 140, 140, 154–55 (2019). This is far higher than the Working Group's current central estimate of $51.

217 Pindyck, supra note 213, at 1.

In other words, the best critic of the Working Group's methodology that opponents could find supports the continued use of the Working Group's estimates and considers them to be conservative underestimates of the true cost to society of greenhouse gas emissions. His conclusion is supported by EPA's Draft SC-GHG Update, which provides conclusive evidence that the Working Group's climate-damage valuations are underestimates. Accordingly, criticisms of the Working Group's valuations from opponents of sensible climate policy are groundless. [EPA-HQ-OAR-2022-0985-1643-A1, p. 31]

IV. EPA Should Conduct Additional Analysis Using the Climate-Damage Estimates from the Draft SC-GHG Update and the Discounting Approach from the Draft Circular A-4 Update

While EPA's application of the Working Group's climate-damage valuations as conservative underestimates is legally justified, the agency should conduct additional analysis using the draft climate-damage valuations that EPA recently published.218 EPA's draft valuations faithfully implement the roadmap laid out in 2017 by the National Academies of Sciences for updating the social cost of greenhouse gases219 and apply recent advances in the science and economics on the costs of climate change. EPA's methodology and valuations are consistent with those applied by a range of expert independent researchers. And while EPA's draft valuations remain underestimates,220 they more fully account for the costs of climate change by incorporating the latest available research on climate science, damages, and discount rates. While EPA should apply the Draft SC-GHG Update in sensitivity analysis if it finalizes this regulation prior to its finalization of that update, it should consider applying those valuations in its primary analysis (with the Working Group's estimates in sensitivity analysis) should it finalize the SCGHG Update before this rule. [EPA-HQ-OAR-2022-0985-1643-A1, p. 32]

218 Draft SC-GHG Update, supra note 9.

219 Nat'l Acads. Sci., Engineering & Med., Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide (2017).

220 Draft SC-GHG Update, supra note 9, at 4 ("[B]ecause of data and modeling limitations . . . estimates of the SCGHG are a partial accounting of climate change impacts and, as such, lead to underestimates of the marginal benefits of abatement."); id. at 72.

Likewise, EPA should also conduct additional analysis using the discounting approach from the Draft Circular A-4 Update. The Draft Circular A-4 Update would ensure that long-term benefits and costs receive proper consideration in regulatory impact analysis. Specifically, the Draft Circular A-4 Update proposes to lower the default, risk-free consumption discount rate used in regulatory impact analysis from the current 3% to 1.7%, based on updated data and extensive economic scholarship.221 Also reflecting current economic literature, the update would eliminate the use of the opportunity cost of capital discount rate (i.e., the 7% rate in the current Circular A-4) and replace it with the shadow price of capital approach.222 These updates are consistent with the best available evidence and widely supported by the leading experts in the field.223 Once again, EPA should apply the discounting approach from the Draft Circular A-4 Update in sensitivity analysis if it finalizes this regulation prior to OMB's finalization of that update, and consider applying that approach in its primary analysis should OMB finalize the Circular A-4 Update before this rule is finalized. [EPA-HQ-OAR-2022-0985-1643-A1, p. 32]

221 Draft Circular A-4 Update, supra note 10, at 75–76.

222 Id. at 78–80.

223 Howard et al., supra note 132.

By applying the latest available science and evidence on both discounting and valuing climate damages, EPA will ensure a more complete presentation and analysis of the benefits and costs of the Proposed Rule and any alternatives that it considers. As other commenters have noted, EPA should be sure to consider a full range of alternatives, including alternative(s) reflecting the potential for deeper decarbonization of heavy-duty trucks. [EPA-HQ-OAR-2022-0985-1643-A1, p. 32]

Organization: Moving Forward Network (MFN) et al.

Second, EPA acknowledges that the assumptions it uses to calculate the social cost of carbon benefits are an underestimate, yet still fails to update these estimates using the most recent science. 49 EPA itself has recommended a much higher social cost of carbon value than is being utilized here – at $190 per metric ton of CO 2, using a 2 percent discount rate. 50 [EPA-HQ-OAR-2022-0985-1608-A1, p. 26-27]

49 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). (“The social cost of carbon calculations included estimating global social benefits of CO2, CH4, and N2O emission reductions using social cost of GHG estimates from the February 2021 Technical Support Document (TSD): Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under E.O. 13990 (IWG 2021). These SC-GHG estimates are interim values developed under E.O. 13990 for use in benefit-cost analyses until updated estimates of the impacts of climate change can be developed based on the best available climate science and economics.”).

50 U.S. EPA. EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances. Docket ID No. EPA-HQ-OAR-2021-0317. (Sept. 2022). p. 3. https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf.

The SAB also found that “there are new studies showing that the health damages of climate change are significantly higher than estimated in earlier studies.” 51 EPA should utilize its own analysis, the reports cited by the SAB (listed below), and any more recent information that can offer a more accurate estimate of the social cost of carbon:

- Rennert, K., Errickson, F., Prest, B.C., et al. 2022. Comprehensive evidence implies a higher social cost of CO2. Nature 610, 687–692. https://doi.org/10.1038/s41586-022-05224-9. This study recommends a much higher social cost of carbon – at $185 per metric ton of CO 2, at a 2 percent discount rate.
- Carleton, T., Jina, A., Delgado, M., Greenstone, M., Houser, T., Hsiang, S., Hultgren, A., Kopp, R.E., McCusker, K.E., Nath, I., Rising, J., Rode, A., Seo, H.K., Vianene, A., Yuan, J., and Zhang, A.T. 2022. Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits. The Quarterly Journal of Economics 1–69. https://doi.org/10.1093/qje/qjac020. Advance Access publication on April 21, 2022. [EPA-HQ-OAR-2022-0985-1608-A1, p. 27]

51 Science Advisory Board. Regulatory Review of Science Supporting EPA Decisions for the Proposed Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards. No. EPA-SAB-23-001. (December 15, 2022). https://sab.epa.gov/ords/sab/f?p=100:12:17203034137454 [hereinafter ”SAB Review of Heavy Duty Truck Rule”].

Third, EPA should conduct a more robust assessment of health benefits, following the guidance from the SAB’s recent report. As discussed in more detail below, EPA relied on a national-average benefit-per-ton (BPT) approach to calculate PM 2.5 health benefits and conducted no air modeling in connection with the rule. This approach prevents EPA from analyzing the health benefits of ambient ozone reduction and NO X health impacts, mobile air toxics, improved ecosystem effects, or visibility, severely underestimating the benefits of the rule. 52 In particular, EPA conducts no analysis of the health benefits from reducing ozone and nitrogen oxides pollution 53 despite the SAB’s report, which provides in great detail the causal connection between near-roadway nitrogen oxides pollution and health impacts, and urges EPA to conduct local-scale analysis of these impacts in future rulemakings. 54 EPA should update its analysis to consider a vast portion of the health benefits that will result from the rule that are currently not being counted. [EPA-HQ-OAR-2022-0985-1608-A1, p. 27-28]

52 U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3. EPA-420-D-23-004. (Apr. 2023). p. 451, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

53 Id. Table 7-20. p. 466-67.

54 SAB Review of Heavy Duty Truck Rule. p. 1-7.

Organization: State of California et al. (2)

C. EPA Recognizes Some of the Limitations of the Interim Value for the Social Cost of GHGs that Underestimate the Costs of Climate Change, But It Should Engage in a Fuller Discussion of Those Limitations

In the Proposal, EPA recognizes that the interim value for SC-GHG established in the 2021 TSD likely underestimates the true cost of climate change impacts, both in its use of discount rates and in the assumptions made by the underlying climate models.272 The undersigned States and Cities urge EPA to run additional evaluations with lower discount rates and expand its discussion of non-quantified impacts from climate change. [EPA-HQ-OAR-2022-0985-1588-A1, p.41]

272 88 Fed. Reg. at 26,075.

Previously, the States and Cities urged EPA to use lower discount rates (below 3 percent) in order to account for the long-term, intergenerational impacts of climate change. When there are important benefits or costs that affect multiple generations of the population, EPA and OMB allow for low but positive discount rates (e.g., 0.5 to 3 percent noted by U.S. EPA, 1 to 3 percent by OMB).273 Further, as the IWG now recognizes, “the 3 percent discount rate used by the IWG to develop its range of discount rates is likely an overestimate of the appropriate discount rate.”274 Indeed, recent studies show support for a long-term discount rate of “no higher than 2 percent.”275 [EPA-HQ-OAR-2022-0985-1588-A1, p.41]

273 RIA, supra note 267 at 436.

274 2021 TSD, supra note 250 at 17.

275 See Tamma Carleton, et al., Updating the United States Government’s Social Cost of Carbon, Energy Policy Institute at the University of Chicago, Working Paper No. 2021-04, at 23 (Jan. 2021), https://epic.uchicago.edu/wp-content/uploads/2021/01/BFI_WP_202104_Final.pdf; accord Expert Report, The Use of the Social Cost of Carbon in the Federal Proposal “Safer Affordable Fuel-Efficiency (SAFE) Vehicles Rule,” (attached to comments of California Air Resources Board on EPA Docket No. EPA-HQ-OAR-2017-0355), Maximilian Auffhammer, Oct. 24, 2018, at 12; Council of Economic Advisers, Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate, Issue Brief, at 3 (Jan. 2017), https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf.

We thus support EPA’s proposal, in its External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances (Draft Report), to use dynamic discount rates with three near-term target rates of 1.5 percent, 2 percent, and 2.5 percent.276 We believe a near-term target rate of 1.5 percent is the most appropriate, because it incorporates a near-zero pure rate of time preference.277 The Draft Report notes that “Ramsey (1928), for example, argued that it is ‘ethically indefensible’ to apply a positive pure rate of time preference to discount values across generations.”278 Individual human beings’ preference for short-term over long-term benefits in the course of their own lifetimes should not be relevant to evaluating multigenerational impacts. We recommend that EPA identify as the most accurate SC-GHG estimates those estimates which include a pure rate of time preference of zero or near zero. [EPA-HQ-OAR-2022-0985-1588-A1, pp.41-42]

276 EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances (Sept. 2022) (hereinafter, "Draft Report") at 60 (Table 2.4.2), EPA-HQ-OAR-2021-0317-1549.

277 Id. at 54 ("The pure rate of time preference, ρ, is the rate at which the representative agent discounts utility in future periods due to a preference for utility sooner rather than later. The elasticity of marginal utility with respect to consumption, η, defines the rate at which the well-being from an additional dollar of consumption declines as the level of consumption increases.").

278 Id. at 52.

We also urge EPA to highlight the fact that the SC-GHG does not reflect significant damage categories that have not yet been monetized. Economists reviewing the SC-GHG models have extensively analyzed areas of damages that are not quantified or are otherwise underestimated.279 As New York's evaluation of appropriate SC-GHG values observed, "[t]he [climate models] only partially account for, or omit, many significant impacts of climate change that are difficult to quantify or monetize, including ecosystems, increased fire risk, the spread of pests and pathogens, mass extinctions, large-scale migration, increased conflict, slower economic growth, and potential catastrophic impacts."280 We have in previous comments, highlighted several areas of unquantified damages that are particularly important to the States. We will reiterate our discussion of two of those: (1) impacts from wildfires, and (2) loss of culturally and historically significant assets. Neither the Proposal nor the DRIA mentions that these impacts are omitted from the SC-GHG. [EPA-HQ-OAR-2022-0985-1588-A1, p.42]

279 See, e.g., Ruth DeFries, et al., The missing economic risks in assessments of climate change impacts (Sept. 2019), https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2019/09/The-missing-economic-risks-in-assessments-of-climate-change-impacts-2.pdf; Institute for Policy Integrity, A Lower Bound: Why the Social Cost of Carbon Does Not Capture Critical Climate Damages and What that Means for Policymakers (Feb. 2019), https://policyintegrity.org/files/publications/Lower_Bound_Issue_Brief.pdf; Peter Howard, Omitted Damages: What's Missing from the Social Cost of Carbon, at 30 (Mar. 13, 2014).

280 Resources for the Future, Estimating the Value of Carbon: Two Approaches, at 3 (Oct. 2020, revised April 2021), available at https://media.rff.org/documents/RFF_NYSERDA_Valuing_Carbon_Synthesis_Memo.pdf.

The climate models underlying the SC-GHG values do not account for impacts from wildfires, which include both health and economic effects.281 Each year, millions of Americans suffer through lengthy episodes of extremely unhealthy air due to wildfires, as the wildfire season becomes lengthier and more destructive due to climate change. Indeed, the Fourth National Climate Assessment highlighted health risks from wildfires as a major consequence of climate change, stating that "[e]xposure to wildfire smoke increases the risk of respiratory disease and mortality… Wildfires are projected to become the principal driver of summertime PM2.5 concentrations, offsetting even large reductions in emissions of PM2.5 precursors."282 It is reasonable to expect that any effort to account for SC-GHG would include such a high-profile effect of climate change.283 [EPA-HQ-OAR-2022-0985-1588-A1, pp.42-43]

281 See Lower Bound, supra n.293, at 5; Omitted Damages, supra n.293, at 20, 30.

282 Fourth National Climate Assessment, supra note 9, at 521–22.

283 See Peter Howard, Flammable Planet: Wildfires and the Social Cost of Carbon (2014), https://costofcarbon.org/files/Flammable_Planet__Wildfires_and_Social_Cost_of_Carbon.pdf.

Another area of unquantified damages identified by the National Academy of Sciences is the "loss of goods and services that are not traded in markets and so cannot be valued using market prices," such as "loss of cultural heritage, historical monuments, and favored landscapes."284 The Union of Concerned Scientists has identified many historic sites and landmarks at risk from climate change:

- Boston historic districts and Faneuil Hall, MA
- The Statue of Liberty and Ellis Island, NY and NJ
- Harriet Tubman National Monument, MD
- Historic Annapolis, MD
- Historic Jamestown, VA
- Fort Monroe National Monument, VA
- NASA's Coastal Facilities, FL and TX
- Cape Hatteras Lighthouse, NC
- Historic Charleston, SC
- Historic St. Augustine, FL
- Mesa Verde National Park, CO
- Bandelier National Monument, NM
- Cesar Chavez National Monument, CA.285 [EPA-HQ-OAR-2022-0985-1588-A1, p.43]

284 Nat'l Academy of Sciences, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, at 152 (2017), available at https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of.

285 Union of Concerned Scientists, National Landmarks at Risk: How Rising Seas, Floods, and Wildfires Are Threatening the United States' Most Cherished Historic Sites, at 4–32, 36–40, 44 (2014).

The loss of these unique sites would exceed the monetary value of the land upon which they are located. Landmarks such as these are not the only culturally and historically significant resources at risk. Climate change also, in many cases, threatens the cultural traditions of Indigenous communities.

286 The DRIA mentions that climate change threatens tribal cultural resources, stating that "Native American Tribal communities possess unique vulnerabilities to climate change, particularly those impacted by degradation of natural and cultural resources,"287 but does not mention that degradation of cultural resources is not captured by the SC-GHG. [EPA-HQ-OAR-2022-0985-1588-A1, pp.43-44]

286 See e.g., Carson Viles, Tribal Climate Change Profile: First Foods and Climate Change (Dec. 2011) ("Because of the vital role that first foods play in the physical, mental, and spiritual health of native communities, impacts from climate change on first foods may negatively affect tribal culture and livelihood."), http://www7.nau.edu/itep/main/tcc/docs/tribes/tribes_FirstFoodsCC.pdf

287 RIA, supra note 267 at 394.

We urge EPA to disclose that the SC-GHG does not take into account impacts to historically significant locations or to culturally significant resources; to consider those impacts in its evaluation of the benefits of the Proposal; and to acknowledge that these impacts are not accounted for in the SC-GHG and other variants of the SC-GHG. We note that OMB Circular A-4 calls on agencies to address such important non-monetized factors in cost-benefit analysis:

A complete regulatory analysis includes a discussion of non-quantified as well as quantified benefits and costs. A non-quantified outcome is a benefit or cost that has not been quantified or monetized in the analysis. When there are important nonmonetary values at stake, you should also identify them in your analysis so policymakers can compare them with the monetary benefits and costs.288 [EPA-HQ-OAR-2022-0985-1588-A1, p.44]

288 OMB Circular A-4 (OMB, 2003) at 3.

We believe that the damage caused by the increased frequency and severity of wildfires, and the ongoing loss of culturally and historically significant resources, are important non-quantified costs of climate change, and that ameliorating such damages will be an important benefit of the Rule. For these reasons, we urge EPA to acknowledge and discuss significant “omitted damages,” including damages from wildfire, and damages to culturally and historically important resources, whenever EPA refers to the SC-GHG in rulemaking. [EPA-HQ-OAR-2022-0985-1588-A1, p.44]

EPA Summary and Response:

Summary:

Arizona State Legislature, Steven Bradbury and the Clean Fuels Development Coalition et al. all criticized the EPA’s approach to calculating the SC-GHG. Both *Arizona and Steven Bradbury* cited work by Dr Kevin Dayaratna. *Arizona* criticized the Integrated Assessment Models (IAMs) used for estimating climate damages as incapable of projecting conditions 300 years into the future, the use of purported unrealistic Business as Usual (BAU) scenarios, the use of purported outdated estimates of climate sensitivity, and not including sufficient benefits to agriculture resulting from higher CO2 concentrations. *Steven Bradbury* also criticized the assumptions regarding CO2 fertilization and asserted that using more appropriate assumptions would show a social cost of carbon dioxide emissions that effectively approaches zero. The *Clean Fuels Development Coalition* stated that the calculations of the social cost of carbon are incorrect, and that relying on such estimates in the proposal exceeds EPA’s statutory authority.

In contrast, the *Institute for Policy Integrity* (IPI) defended EPA’s process and results against many common criticisms, such as too much uncertainty, ignoring positive climate impacts, too high climate sensitivities, too high emission baselines, or flawed IAMs. IPI specifically defended EPA’s monetization of climate impacts as a consequence of the 2007 Massachusetts v. EPA Supreme Court decision and the Center for Biological Diversity v. National Highway Traffic Safety Administration Ninth Circuit decision, and as a balance to EPA’s estimates of the costs of the policy. IPI found that common criticism of EPA’s social cost methodologies lack merit, citing both the responses to public comments in 2013 through the Working Group process, but also new information that has been published in the decade since that time. Recognizing that some uncertainty should not preclude EPA from using the SC-GHG, IPI noted that much of the uncertainty is more likely to increase the estimates of climate damages rather than decrease it, due to omitted damage categories. Similarly, IPI defended the EPA estimates against accusations that the EPA was biased against inclusion of positive impacts of climate change. In sum, IPI found that the interim IWG estimates of the SC-GHG were conservative, and encouraged EPA to adopt the estimates produced in the draft SC-GHG update.

The Institute for Policy Integrity, the Moving Forward Network, and the State of California all urged EPA to update the SC-GHG approach to include advances consistent with the draft SC-GHG update from the Oil and Gas rule (2023). They argued that the interim SC-GHG underestimates climate damages by omitting key damage sectors. *The State of California* specifically highlights damage from wildfires and damages to culturally and significant assets as two key areas that are not accounted for in the NPRM's SC-GHG.

Response:

As discussed in preamble Section IV and RIA Chapter 4, EPA has updated its approach and now uses estimates of the SC-GHG that reflect recent advances in the scientific literature on climate change and its economic impacts and incorporate recommendations made by the National Academies of Science, Engineering, and Medicine[1023,1024]. The EPA presented these updated estimates in a sensitivity analysis in the December 2022 Supplemental RIA that address recommendations of the National Academies of Sciences, Engineering, and Medicine (2017), and invited public comment on the sensitivity analysis and on the technical report, titled External Review Draft: Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances, explaining the methodological updates that was included as Supplementary Material to the Oil and Gas Supplemental Proposal RIA. The EPA published and used these estimates in the main analysis of the RIA for the December 2023 Final Oil and Gas NSPS/EG Rulemaking, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review" and responded to public comments received on the new estimates in the Response to Comments document for the Final Oil and Gas Rulemaking. These estimates have taken on the latest and most up to date science, including updates to the climate model, the socioeconomic, and the damage estimation components. With respect to climate sensitivity, EPA's updated modeling approach includes representation of climate sensitivity uncertainty consistent with the most recent IPCC assessment, addressing that concern from *Arizona*. Regarding the comments about emissions projections and time horizon of analysis, EPA's updated modeling is now relying on socioeconomic and emissions projections developed under the Resources for the Future (RFF) Social Cost of Carbon Initiative (referred to as the RFF-SPs). As described in the "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances" (included as a supplement to the 2023 Final Oil and Gas rule) the RFF-SPs are a set of probabilistic projections of population, GDP, and GHG emissions (CO_2, CH_4, and N_2O) to 2300. Consistent with the National Academies' recommendation, the RFF-SPs were developed using a mix of statistical and expert elicitation techniques to capture uncertainty in a single probabilistic approach, taking into account the likelihood of future emissions mitigation policies and technological developments, and unlike other sources of projections, they provide inputs for estimation out to 2300 without further extrapolation assumptions. This is a suitable time horizon consistent with the National Academies' recommendation[1025] and OMB Circular A-4 (2003) guidance[1026], since in the modeling conducted for this report 2300 is far enough in the future to

[1023] National Academies of Sciences, Engineering, and Medicine (National Academies). 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. National Academies Press.

[1024] National Academies of Sciences, Engineering, and Medicine (National Academies). 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. National Academies Press.

[1025] The National Academies (2017) recommended that socioeconomic scenarios used to estimate the SC-GHG should: "extend far enough in the future to provide inputs for estimation of the vast majority of discounted climate damages".

[1026] Regarding the analytic time horizon for regulatory benefit-cost analysis, OMB Circular A-4 (2003) advises "The ending point should be far enough in the future to encompass all the significant benefits and costs likely to result from the rule" (OMB 2003). OMB Circular A-4 (2023) similarly advises "The ending point for your analysis should be far enough in the future to encompass, to the extent feasible, all the important benefits and costs likely to result from all regulatory alternatives being assessed" (OMB 2023).

capture the majority of discounted climate damages. See Section 2.1 and 3 of the "Report on the Social Cost of Greenhouse Gases" for more discussion. The approach to estimating damages has also advanced – see the "Report on the Social Cost of Greenhouse Gases" for more discussion on the damage modules and the approach to accounting for carbon fertilization.

Please see also EPA's response in RTC Section 20.2 in this document for our response regarding SC-GHG estimates and setting of the HD GHG Phase 3 final standards under our CAA section 202(a)(1)-(2) authority.

20.4 Process Level SC-GHG

Comments by Organizations

Organization: Arizona State Legislature

As noted above, EPA claims that it need not engage in any cost-benefit analysis to justify the proposed rule. Yet, in Section VII, to comply with Executive Order 12866, EPA gives a clear indication of what such a cost-benefit analysis would look like if EPA admitted that it were required to conduct one. That cost-benefit analysis rests heavily on the so-called 'Social-Cost of Greenhouse Gases.' If adopted by EPA as justification for the proposed rule, it is equally unlawful, unconstitutional, arbitrary, and capricious. [EPA-HQ-OAR-2022-0985-1621-A1, p. 9]

EPA's calculation of the so-called 'Social Cost of Greenhouse Gases' ('SC-GHG') plays a pivotal role in the analysis conducted in Section VII. See 88 Fed. Reg. 26,074-76. Avoiding the supposed 'social costs' of greenhouse gases is the first and principal benefit of the new emissions standards proposed by EPA. See id. Indeed, it is clear that reducing greenhouse gas emissions is the driving force behind the proposal. See id. But EPA's approach is baseless. EPA's continued reliance on the 'social cost of greenhouse gases' metric, as calculated by the 'Interagency Working Group' convened by Executive Order 13990, to predict future climate damages is unlawful, unconstitutional, arbitrary and capricious. It violates the separation of powers and the Major Questions Doctrine, and suffers from glaring methodological deficiencies. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 9-10]

EPA uncritically adopts the Interagency Working Group's values for the SCGHG, as it was instructed to do by Section 5(b) of E.O. 13990. [EPA-HQ-OAR-2022-0985-1621-A1, p. 10]

In its Section VII discussion, EPA uncritically adopts the values for the SC-GHG provided by the Interagency Working Group convened by Executive Order 13990. EPA states: 'We estimate the global social benefits of CO2, CH4, and N2O emission reductions expected from the proposed rule using the SC-GHG estimates presented in the February 2021 Technical Support Document (TSD): Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under E.O. 13990 (IWG 2021).' 88 Fed. Reg. 26,075 (emphasis added). EPA claims that '[w]e have evaluated the SC-GHG estimates in the TSD and have determined that these estimates are appropriate for use in estimating the global social benefits of CO2, CH4, and N2O emission reductions expected from this proposed rule.' Id. However, EPA's substantive discussion of the Interagency Working Group's values includes only statements recognizing their 'limitations.' See id. For example, EPA states that 'these interim SC-GHG estimates have a number of limitations, including that the models used to produce them do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate-change literature and that several modeling input assumptions are outdated.' Id. Further, EPA admits that 'more robust methodologies for estimating damages from [greenhouse gas] emissions' are available, and that there is room to 'further improve SC-GHG estimation going forward.' Id. Nevertheless, with scant analysis, EPA uncritically adopts the Interagency Working Group's values for the 'Social Costs' of carbon dioxide, methane, and nitrous oxide:

- Table VII–1 presents the estimated annual, undiscounted climate benefits of reduced GHG emissions, and consequently the annual quantified benefits (i.e., total GHG benefits), for each of the four interim social cost of GHG (SC-GHG) values estimated by the interagency working group for the stream of years beginning with the first year of rule implementation, 2027, through 2055 for the proposed program. Id. (emphasis added). [EPA-HQ-OAR-2022-0985-1621-A1, p. 10]

Why so? Why does EPA adopt SC-GHG values that it admits are subject to numerous 'limitations,' are based on 'outdated' modeling assumptions, and compare poorly with 'more robust methodologies'? Id. Moreover, why does it appear that every other federal agency to quantify the 'social costs' of carbon dioxide, methane, and/or nitrous oxide since February 2021 used the Interagency Working Group's 'interim estimates'?16 What explains the astonishing, persistent persuasive power of these admittedly flawed numbers? [EPA-HQ-OAR-2022-0985-1621-A1, p. 10]

16 At least twelve agency actions have expressly used the Working Group's 'interim estimates' from the 2021 TSD since it was published in February 2021. See, e.g., Doc. 98, Louisiana v. Biden, Case No. 2:21-cv-01074, at 16-18 (W.D. La. Feb. 11, 2022) (citing nine such agency actions, including action by EPA, DOE, BLM, FAR, CEQ, NHTSA, and DOI, addressing issues such as light-duty vehicle emissions standards, general service lamps, oil and gas new and modified sources, fossil fuel leasing, and manufactured housing, among others); see also, e.g., Office of Energy Efficiency and Renewable Energy, Department of Energy, Energy Conservation Program: Energy Conservation Standards for General Service Lamps, Final Rule, 87 Fed. Reg. 27,439 (May 9, 2022), at 27,456/1 ('DOE used the estimates for the SC–GHG from the most recent update of the IWG in its February 2021 TSD.'); Office of Energy Efficiency and Renewable Energy, Department of Energy, Energy Conservation Program: Energy Conservation Standards for Manufactured Housing, Final Rule, 87 Fed. Reg. 32,728 (May 31, 2022), at 32,733/1-2 ('DOE used interim SC-GHG values developed by an Interagency Working Group on the Social Cost of Greenhouse Gases (IWG).'); National Highway Traffic Safety Administration, Department of Transportation, Corporate Average Fuel Economy Standards for Model Years 2024-2026 Passenger Cars and Light Trucks, Final Rule, 87 Fed. Reg. 25,710 (May 2, 2022), id. at 25,724/1 ('In this final rule, NHTSA employed the SC–GHG values from the Interim Revised Estimates developed by the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG), and discounted it at values recommended by the IWG for its main analysis.'). By contrast, commenters are not aware of any agencies that are not independent of the President that have declined to adopt the Interagency Working Group's 2021 recommendations on this point.

The answer to this question is obvious: EPA and the other federal agencies use the Interagency Working Group's 'Interim Estimates' because they have been ordered to do so by the President. Section 5 of Executive Order 13990 directs that the 'Working Group shall …publish an interim SCC, SCN, and SCM within 30 days of the date of this order, which agencies shall use when monetizing the value of changes in greenhouse gas emissions resulting from regulations and other relevant agency actions until final values are published.' E.O. 13990, 5(b)(ii)(A), 86 Fed. Reg. 7040 (emphasis added). The Executive Order is not ambiguous: It provides that 'agencies shall use' the Interagency Working Group's values 'until final values are published,' id. (emphasis added)—which, as EPA concedes, has never happened and is now long overdue. [EPA-HQ-OAR-2022-0985-1621-A1, p. 11]

The meaning of the word 'shall' in this context is perfectly plain—it is an auxiliary verb 'used to express a command or exhortation.' Shall, Merriam-Webster Online, at https://www.merriam-webster.com/dictionary/shall (defining 'shall' as 'used to express a command or exhortation'); see also, e.g., Kingdomware Technologies, Inc. v. United States, 579 U.S. 162, 171 (2016) ('Unlike the word 'may,' which implies discretion, the word 'shall' usually connotes a requirement.'); Lexecon Inc. v. Milberg Weiss Bershad Hynes & Lerach, 523 U.S. 26, 35 (1998) (recognizing that 'shall' is 'mandatory' and 'normally creates an obligation impervious to judicial discretion'). The President 'used the word 'shall' in' E.O. 13990, and that functions 'as a command.' Kingdomware, 579 U.S. at 172. [EPA-HQ-OAR-2022-0985-1621-A1, p. 11]

Thus, in Executive Order 13990, the President gave a command to the agencies—a binding directive that they 'shall' use the Interagency Working Group's interim values (and, later, its final values, if they are ever published) in any 'regulations and other relevant agency actions' that involve the calculation of SC-GHG. See E.O. 13990, 5(b)(ii)(A), 86 Fed. Reg. 7040. And every federal agency since then has interpreted it as a command—acting in lockstep with each other in adopting the Interagency Working Group's interim estimates whenever they quantify the benefits of reducing emissions of CO2, CH4, and N2O. [EPA-HQ-OAR-2022-0985-1621-A1, p. 11]

This situation is unlawful, for at least three reasons. First, it involves an unconstitutional arrogation of legislative power to the Working Group, in violation of the separation of powers. Second, it violates the Major Questions Doctrine. Third, the Interagency Working Group's methodology is profoundly flawed, such that any reliance on its numbers is inherently arbitrary and capricious—as EPA all but concedes by recognizing that its numbers are 'outdated' and fraught with 'limitations.' 88 Fed. Reg. 26,075. [EPA-HQ-OAR-2022-0985-1621-A1, p. 11]

The Interagency Working Group's promulgation of binding values for the SCGHG violates the separation of powers and Major Questions Doctrine. [EPA-HQ-OAR-2022-0985-1621-A1, p. 12]

In litigation about the status of the Interagency Working Group, the U.S. Department of Justice admitted: 'No statute establishes it, nor delegates it any legislative authority.' Doc. 28, Missouri v. Biden, No. 4:21-cv-00287-AGF (E.D. Mo.), at 54. This is undeniably true. There is no statute that either creates or delegates power to an 'Interagency Working Group on Social Cost of Greenhouse Gases'—it is purely a creature of E.O. 13990. Yet, pursuant to the plain terms of E.O. 13990, the Working Group purports to exercise legislative authority—the authority to dictate to all federal agencies the specific values that they must use when they monetize the costs of future greenhouse-gas emissions. This is quintessentially legislative power, exercised without any delegation from Congress.v [EPA-HQ-OAR-2022-0985-1621-A1, p. 12]

Article I, Section 1 of the Constitution provides: 'All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.' U.S. Const. art. I, 1. The Interagency Working Group's interim estimates in the 2021 Technical Support Document constitute specific, mandatory numerical values on a policy question of great import, which federal agencies are bound to use in 'regulations and other relevant agency actions' under the plain terms of E.O. 13990. E.O. 13990, 5(b)(ii)(A), 86 Fed.

Reg. 7040; see also Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990 (Feb. 2021), at https://www.whitehouse.gov/wpcontent/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf ('2021 TSD'). [EPA-HQ-OAR-2022-0985-1621-A1, p. 12]

This is legislation, plain and simple. '[W]hen an agency wants to state a principle 'in numerical terms,' terms that cannot be derived from a particular record, the agency is legislating and should act through rulemaking.' Catholic Health Initiatives v. Sebelius, 617 F.3d 490, 495 (D.C. Cir. 2010) (quoting Henry J. Friendly, Watchman, What of the Night?, BENCHMARKS 144– 45 (1967)). As Judge Posner wrote, adopting '[a] rule that turns on a number' is a 'legislative function.' Hoctor v. USDA, 82 F.3d 165, 170 (7th Cir. 1996). 'Legislators have the democratic legitimacy to make choices among value judgments, choices based on hunch or guesswork or even the toss of a coin, and other arbitrary choices. When agencies base rules on arbitrary choices they are legislating, and so these rules are legislative….' Id. When it adopts specific numbers for the so-called 'social costs' of gases, the Interagency Working Group is 'legislating.' Id. The Working Group adopts specific numbers, set forth in tables, for SC-GHG at four specific discount rates. 2021 TSD, at 4-6. It is unquestionable that the Working Group's adoption of these specific numbers as binding estimates is 'legislative.' Id. The calculations do not involve the application of simple arithmetic; rather, they involve (as the Working Group admits) 'issues of uncertainty and ethics,' and 'highly contested and exceedingly difficult questions of science, economics, ethics, and law.' 2021 TSD, at 17, 21. '[T]he range of discount rates reflects both uncertainty and, at least in part, different policy or value judgments.' Id. at 27 (emphasis added). And, as EPA admits here, they involve 'outdated' assumptions, inputs with significant 'limitations,' and the use of a less 'robust methodology' than even EPA admits is available. [EPA-HQ-OAR-2022-0985-1621-A1, p. 12]

Thus, the adoption of specific values against a wide range of possibilities, based on assumptions that involve widely disputed scientific methodologies and value judgments at the intersection of 'politics' and 'ethics,' is a legislative action. But no Executive agency may exercise legislative authority without a delegation from Congress. 'It is axiomatic that an administrative agency's power to promulgate legislative regulations is limited to the authority delegated by Congress.' Bowen v. Georgetown Univ. Hosp., 488 U.S. 204, 208 (1988). So when 'there is no statute conferring authority, a federal agency has none.' Michigan v. EPA, 268 F.3d 1075, 1081 (D.C. Cir. 2001). Here, the Working Group is purely a creature of Executive authority—it was created solely by Executive Order, not by Congress, and it exercises no delegated authority. The President lacks any independent legislative authority to bestow on the Working Group. See U.S. Const. art. I, 2 ('The executive Power shall be vested in a President of the United States of America.'). Therefore, it has none, and its exercise of legislative power encroaches on the exclusive authority of Congress. [EPA-HQ-OAR-2022-0985-1621-A1, p. 13]

This violates the separation of powers, the most fundamental structural guarantee of liberty. As the Supreme Court has held for decades, '[t]he President's power, if any, to issue [an] order must stem either from an act of Congress or from the Constitution itself.' Youngstown Sheet & Tube Co. v. Sawyer, 343 U.S. 579, 585 (1952). Where '[t]here is no statute that expressly authorizes the President to take' an action, '[n]or is there any act of Congress … from which such a power can fairly be implied,' the action is not authorized by an act of Congress. Id. In the absence of such an express or implied authorization by act of Congress, 'if the President had authority to issue the order he did, it must be found in some provision of the Constitution.' Id. at 587. But the vesting Clauses of Article I and Article II reflect a careful separation of the Legislative and Executive Branches into their respective spheres. There is no provision of the Constitution that confers purely legislative authority—of the sort exercised by the Interagency Working Group—on the President. For the Executive Branch to exercise such authority, it must be delegated by Congress. Congress has not done so here. [EPA-HQ-OAR-2022-0985-1621-A1, p. 13]

The separation of powers is the most fundamental and profound feature of our unique structure of government. The vesting clauses of Article I and Article II reflect the Founders' insights that 'the legislative, executive, and judiciary departments ought to be separate and distinct,' and that this separation is an 'essential precaution in favor of liberty.' The Federalist No. 47 (Madison) (C. Rossiter ed. 1961), p. 301. As James Madison stated, '[n]o political truth is certainly of greater intrinsic value, or is stamped with the authority of more enlightened patrons of liberty.' Id. 'The accumulation of all powers, legislative, executive, and judiciary, in the same hands, whether of one, a few, or many, and whether hereditary, self-appointed, or elective, may justly be pronounced the very definition of tyranny.' Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 13]

This principle of separation of powers is the most crucial safeguard of liberty. 'It is the proud boast of our democracy that we have 'a government of laws, and not of men.'' Morrison v. Olson, 487 U.S. 654, 697 (1988) (Scalia, J., dissenting). 'The Framers of the Federal Constitution . . . viewed the principle of separation of powers as the absolutely central guarantee of a just Government.' Id. 'Without a secure structure of separated powers, our Bill of Rights would be worthless, as are the bills of rights of many nations of the world that have adopted, or even improved upon, the mere words of ours.' Id. 'The purpose of the separation and equilibration of powers in general . . . was not merely to assure effective government but to preserve individual freedom.' Id. at 727. 'While the separation of powers may prevent us from righting every wrong, it does so in order to ensure that we do not lose liberty.' Id. at 710. [EPA-HQ-OAR-2022-0985-1621-A1, pp. 13-14]

The Working Group created by EO 13990, therefore, reflects the Executive Branch's naked arrogation of legislative power to itself. 'Frequently,' a threat to the separation of powers 'will come … clad, so to speak, in sheep's clothing…. But this wolf comes as a wolf.' Id. at 699. [EPA-HQ-OAR-2022-0985-1621-A1, p. 14]

Furthermore, for similar reasons, the Working Group's promulgation of binding values for the so-called 'Social Cost of Greenhouse Gases' violates the Major Questions Doctrine. As noted above, the Major Questions Doctrine requires 'clear congressional authorization' for federal agencies to make decisions on questions of major political, social, and economic significance. West Virginia, 142 S. Ct. at 2609. Here, dictating binding values for the 'social costs' of gases that apply to all federal agencies making all 'regulations and other relevant agency actions,' E.O. 13990, 5(b)(ii)(A), 86 Fed. Reg. 7040, decides a matter of enormous economic and political significance, all at one stroke. Cass Sunstein, one of the architects of the 'social cost of carbon' analysis in the Obama Administration, describes the SC-GHG as 'the most important number you've never heard of.' Cass R. Sunstein, The Arithmetic of Climate Change (Aug. 18, 2021), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3906854. This description is apt because ‘within the executive branch, the stringency of regulation of greenhouse gases emissions often depends on that number.’ Id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 14]

In fact, the ‘social cost of carbon’ was cited in regulatory decisions at least eighty-three times during the Obama Administration alone. Howard & Schwartz, Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon, 42:S COLUM. J. ENVT’L LAW 203, 219–20 & appx. A (2017). This included a wide array of agencies—including, but not limited to, EPA, DOE, DOT, DOI, and USDA, see id.—that applied the predecessor Working Group’s analysis to formulate federal regulations, policies, and regulatory actions related to vending machines, light trucks, dishwashers, dehumidifiers, microwave ovens, kitchen stoves, clothes washers, small electric motors, residential water heaters, ozone standards, residential refrigerators and freezers, sewage guidelines, medium and heavy-duty vehicles, mercury emissions, industrial boilers, solid waste incineration units, fluorescent lamps, residential clothes dryers, room air conditioners, residential furnaces, residential central air conditioners, battery chargers, dishwashers, petroleum refineries, halide lamps, walk-in coolers and freezers, commercial refrigeration units, commercial clothes washers, commercial ice makers, and heat pumps. See id. [EPA-HQ-OAR-2022-0985-1621-A1, p. 14]

The ability to decide this set of numbers for all federal agencies engaged in all such regulatory actions is a matter of enormous political and economic significance, which requires clear authorization from Congress. West Virginia, 142 S. Ct. at 2609. But here, not only is there no ‘clear’ delegation from Congress, there is no delegation at all—as the U.S. Department of Justice admits, when it comes to the Interagency Working Group, ‘[n]o statute establishes it, nor delegates it any legislative authority.’ Doc. 28, Missouri v. Biden, No. 4:21-cv-00287-AGF (E.D. Mo.), at 54. [EPA-HQ-OAR-2022-0985-1621-A1, p. 14]

The Interagency Working Group’s promulgation of so-called ‘interim’ estimates for SC-GHG violated the APA. [EPA-HQ-OAR-2022-0985-1621-A1, p. 15]

For similar reasons, the Working Group’s promulgation of the so-called ‘interim’ estimates—which have served as the definitive values for all federal agencies for two and a half years, with no end in sight—violated the Administrative Procedure Act because it was arbitrary, capricious, contrary to law, unconstitutional, and adopted without agency procedures required by law. See 5 U.S.C. 706(2)(A)-(D). [EPA-HQ-OAR-2022-0985-1621-A1, p. 15]

First, just as the Interim Estimates constitute a de facto exercise of binding legislative authority, they constitute ‘legislative rules’ under the APA, which can only be promulgated through observance of notice-and-comment procedures. As Judge Posner wrote in Hoctor, ‘[p]rovided that a rule promulgated pursuant to such a delegation is intended to bind, … the rule would be the clearest possible example of a legislative rule, as to which the notice and comment procedure not followed here is mandatory….’ Hoctor, 82 F.3d at 169. ‘When agencies base rules on arbitrary choices they are legislating, and so these rules are legislative or substantive and require notice and comment rulemaking, a procedure that is analogous to the procedure employed by legislatures in making statutes.’ Id. at 170-71. [EPA-HQ-OAR-2022-0985-1621-A1, p. 15]

‘Notice of a proposed rule must include sufficient detail on its content and basis in law and evidence to allow for meaningful and informed comment.’ Am. Med. Ass’n v. Reno, 57 F.3d 1129, 1132 (D.C. Cir. 1995). ‘The purpose of the comment period is to allow interested members of the public to communicate information, concerns, and criticisms to the agency during the rule-making process.' Connecticut Light & Power Co. v. Nuclear Regul. Comm'n, 673 F.2d 525, 530 (D.C. Cir. 1982). The Interagency Working Group, however, did not seek any public comment before issuing the 2021 SC-GHG estimates. Instead, it provided notice and comment for not-yet-promulgated SC-GHG estimates for future use—preventing the public from commenting on the 2021 SC-GHG estimates that federal agencies currently use. Thus, the Interim Estimates were adopted 'without observance of procedure required by law,' 5 U.S.C. 706(2)(D), and they violate the APA. [EPA-HQ-OAR-2022-0985-1621-A1, p. 15]

Likewise, the Working Group's Interim Estimates are 'not in accordance with law,' 'contrary to constitutional right, power, privilege, or immunity,' and 'in excess of statutory jurisdiction, authority, or limitations.' 5 U.S.C. 706(2)(A), (B), (C). They are unconstitutional and unlawful because they violate the separation of powers and constitute legislative rules that were adopted without notice and comment. And they are in excess of statutory authority because the Working Group has no statutory authority whatsoever—least of all, authority to promulgate binding legislative rules that apply to all federal agencies on a hotly disputed policy question that has enormous practical consequences. [EPA-HQ-OAR-2022-0985-1621-A1, p. 15]

Organization: Clean Fuels Development Coalition et al.

Executive Order 13990 directs that agencies "shall use" the SC-GHG Estimates "when monetizing the value of changes in greenhouse gas emissions resulting from regulations and other relevant agency actions." 86 Fed. Reg. 7037, 7040 (Jan. 25, 2021). Consistent with this order, the Biden Administration has been applying the SC-GHG Estimates throughout its rulemakings, often to large effect. But the proposal—or indeed any other action undertaken by the Biden Administration—provides no statutory authority for its estimates. Further, these estimates, which are made binding through the dozens of rulemakings and adjudications they are incorporated in, have never undergone notice and comment rulemaking procedure. Because such estimates were made without statutory authority and in violation of the Administrative Procedure Act, their incorporation into the proposal would be unlawful. [EPA-HQ-OAR-2022-0985-1585-A1, p. 37]

Organization: Delek US Holdings, Inc.

IV. The Proposed Rule Overstates The Benefits of Transitioning to BEVs

The economic benefits of EPA's proposal are based on the flawed, inflated interim social cost of greenhouse gas estimates or "SC-GHGs," including estimates of the "social cost of carbon" or "SCC."19 EPA should refrain from relying on the Interagency Working Group's ("IWG") Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates,20 which suffer from major procedural defects. The interim estimates are not the product of a full and legally adequate administrative process, including a robust and independent peer review. While the administration provided an opportunity for public comment on the SC-GHG estimates in 2021, the interim estimates EPA relies upon in the Proposed Rule were released without any prior notice or public comment period.21 Further, interim estimates failed to account for the recommendations of the National Academies of Sciences, Engineering, and Medicine ("NAS") which called for a new IWG framework and changes to the methodologies used to calculate the SCC estimates.22 Consideration of the recommendations of the NAS is critical for any robust social cost analysis –

and is in fact mandated by President Biden's executive order that directed the IWG to develop interim SC-GHG estimates, E.O. 13990.23 The interim estimates also conflict with longstanding Office of Management and Budget ("OMB") guidance on information quality, which require rigorous peer review and heightened transparency for such "influential scientific information" as the SC-GHG estimates.24 For these and other reasons, EPA should not rely upon the interim SC-GHG estimates. [EPA-HQ-OAR-2022-0985-1561-A1, pp. 5 - 6]

19 Proposed Rule at 26,074–75 (citing the February 2021 Technical Support Document (TSD): Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under E.O. 13990 (Interagency Working Group on the Social Cost of Greenhouse Gases ("IWG")).

20 Id.

21 Off. of Mgmt. & Budget, Notice of Availability and Request for Comment on the "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990," 86 Fed. Reg. 24,669 (May 7, 2021).

22 National Academies of Sciences, Engineering, and Medicine. 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. Washington, DC: The National Academies Press.

23 Exec. Order 13990 of Jan. 20, 2021, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, 86 Fed. Reg. 7,037, 7,041 (Jan. 25, 2021) (Sec. 5 (iii) Methodology states: "In carrying out its activities, the Working Group shall consider the recommendations of the National Academies of Science, Engineering, and Medicine as reported in Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide (2017)."

24 Off. of Mgmt. & Budget, Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies, 67 Fed. Reg. 8,452 (Feb. 22, 2002); Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub. L. No. 106-554.

Here, EPA's reliance on these SC-GHG estimates result in overstated benefits in terms of potential GHG emissions reductions achieved domestically while ignoring the increased GHG emissions elsewhere and how those global GHG emissions are distributed amongst a domestic ZEV fleet. [EPA-HQ-OAR-2022-0985-1561-A1, p. 6]

Organization: State of California et al. (2)

V. EPA'S COST-BENEFIT ANALYSIS SUPPORTS THE PROPOSAL

Our States and Cities support EPA's use of the social cost of greenhouse gases ("SC-GHG") established in the Interagency Working Group on Social Cost of Greenhouse Gases' ("IWG") recently published Technical Support Document ("2021 TSD")249 in evaluating the costs and benefits of the Proposal. Although the IWG is currently in the process of reviewing comments on how to improve and update the SC-GHG,250 for now the interim value for SC-GHG established in the 2021 TSD represents the best available estimate of the long-term cost to society of increasing GHG emissions now.251 Moreover, the SC-GHG does not dictate the outcome of any specific agency rulemaking, including this one. Here, EPA considers the SC-GHG in evaluating the costs and benefits of the Proposal, but nowhere suggests that those values will be determinative of its ultimate decision.252 [EPA-HQ-OAR-2022-0985-1588-A1, p.38]

249 Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimate Under Executive Order 13,990 (Feb. 2021), EPA-HQ-OAR-2021-0317-0005 (hereinafter, "2021 TSD").

250 See Notice of Availability and Request for Comment on "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13,990," 86 Fed. Reg. 24,669, 24,670 (May 7, 2021).

251 88 Fed. Reg. at 26,075.

252 Id.

A. EPA's Cost-Benefit Analysis Appropriately Relies on the Interim Value for the Social Cost of GHGs Established by the Interagency Working Group, Which Reflects the Best Available Science for Assigning a Monetary Value to the Impact of GHGs

As EPA appropriately describes, the interim value for the SC-GHG in the 2021 TSD is based on the SC-GHG established in a 2016 TSD, which was reached following a comprehensive, multi-year process of peer review and public comment. The IWG comprises economic and scientific experts from across the federal government.253 Estimates of the SC-GHG are based on the best available, peer-reviewed literature and economic models.254 These estimates were developed using the three leading climate models that link greenhouse gas emissions to physical changes and economic damages; each model has been published and extensively reviewed in the scientific literature.255 The IWG has thoroughly and transparently discussed the models, inputs, and assumptions used, and has acknowledged the uncertainties of climate science.256 The U.S. Government Accountability Office reviewed the IWG's process and concluded that the IWG:

(1) Used consensus-based decision making; (2) relied largely on existing academic literature and models, including technical assistance from outside resources; and (3) took steps to disclose limitations and incorporate new information by considering public comments and revising the estimates as updated research became available.257 [EPA-HQ-OAR-2022-0985-1588-A1, p.39]

253 2021 TSD, supra note 250 at 1, 10–12.

254 Id. at 10–12.

255 Id.

256 Id. at 26–32.

257 U.S. Gov't Accountability Off., Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates, at 8 (July 2014), https://www.gao.gov/assets/gao-14-663.pdf.

Courts have also accepted, and sometimes required, the use of the SC-GHG in valuing climate-change related impacts. The Seventh Circuit upheld the Department of Energy's ("DOE") use of the SC-GHG in evaluating the benefits of its refrigeration efficiency standards.258 The Court concluded that DOE's use of the SC-GHG to conduct an assessment of the rule's environmental benefits was authorized by the Energy Policy and Conservation Act ("EPCA"),259 which provided for consideration of "the need for national energy . . . conservation."260 The Court also turned aside a variety of objections to the development and reliability of the SC-GHG, concluding that DOE had appropriately responded to those objections and determined that the SC-GHG could be used to assess environmental benefits.261 [EPA-HQ-OAR-2022-0985-1588-A1, p.39]

258 Zero Zone, Inc. v. U.S. Dep't of Energy, 832 F.3d 654, 678-80 (7th Cir. 2016).

259 49 U.S.C. §§ 32901–19.

260 Zero Zone, Inc., 832 F.3d at 677.

261 Id.

Moreover, courts have rejected agency action for failure to consider the SC-GHG. For example, in Center for Biological Diversity v. National Highway Traffic Safety Administration, the Ninth Circuit held that the National Highway Traffic Safety Administration ("NHTSA") had acted arbitrarily and capriciously when it established vehicle efficiency standards under EPCA, without monetizing the benefits of greenhouse gas emissions reductions.262 The Court rejected NHTSA's argument that the value of reducing greenhouse gas emissions was "too uncertain" to quantify.263 The Court stressed that "while the record shows that there is a range of values, the value of carbon emissions reduction is certainly not zero."264 Moreover, the Court observed that NHTSA had monetized the value of other uncertain benefits, including the reduction of criteria pollutants, crashes, and increases in energy security.265 [EPA-HQ-OAR-2022-0985-1588-A1, p.40]

262 538 F.3d 1172, 1198–1203 (9th Cir. 2008).

263 Id. at 1200.

264 Id.

265 Id. at 1202.

Other courts have held that, if an agency quantifies the economic benefits of an action that could increase GHGs, it must also employ the SC-GHG to quantify the costs of increased emissions.266 These court decisions recognize that the SC-GHG is a reliable and scientifically validated approach to monetizing climate change impacts that should be incorporated into federal decision-making. It is therefore appropriate for EPA to employ the SC-GHG in evaluating the benefits of the proposed rule. [EPA-HQ-OAR-2022-0985-1588-A1, p.40]

266 See Montana Envt'l Info. Ctr. v. U.S. Office of Surface Mining, 274 F.Supp.3d. 1074, 1095–99 (D. Mt. 2017); High County Conservation Advocates v. U.S. Forest Serv., 52 F.Supp.3d 1174, 1189–92 (D. Col. 2014).

EPA Summary and Response:

Summary:

The Arizona State Legislature, the Clean Fuels Development Coalition, and Delek US Holdings all criticized the use of the interim SC-GHG for what they claim are violations of administrative process requirements. *Arizona* claims that the adoption of the IWG estimate for the SC-GHG was based solely on the instruction from EO 13990, that it violates the major questions doctrine and the separation of powers, that it never was subject to public comment, and that it is therefore unlawful, unconstitutional, arbitrary, and capricious. Moreover, they claim that it suffers from glaring methodological deficiencies. *The Clean Fuels Development Coalition (et al.)* similarly argues that the SC-GHG estimates have never undergone notice and comment rulemaking procedure, that there is no statutory authority for the IWG interim estimates, and that they are in violation of the APA. Finally, *Delek US Holdings, Inc*. also highlight a claimed lack of public comment, and also criticize the SC-GHG for not incorporating the recommendations of the NAS to update the SC-GHG.

In contrast, the State of California support the use of the interim value for the SC-GHG while the process to develop new values is ongoing. California describes the comprehensive, multi-year process of peer review and public comment that was involved in the development of the 2016 SC-GHG, which served as the basis for the 2021 interim value. California also notes that the value of the SC-GHG is not determinative for this rulemaking.

Response:

Please see EPA's response in RTC Section 20.1 in this document for our response regarding SC-GHG estimates and setting of the HD GHG Phase 3 final standards under our CAA section 202(a)(1)-(2) authority.

As we explain in preamble Section VII.A and RIA Chapter 5.2, the SC-GHG is based on a voluminous record, significant public process, an external expert peer review, as well as being responsive to the recommendation from the National Academy of Sciences, Engineering, and Medicine (NAS, 2017). EPA's use of SC-GHG for purposes of assessing the climate benefits of this rulemaking is clearly reasonable.

We disagree with commenters, such as *Arizona, Clean Fuels Development Coalition, and Delek US Holdings* that the Interagency Working Group (IWG) was required to undertake notice and comment rulemaking in order to recommend values for SC-GHG to EPA. The -IWG is not an "agency" for purposes of the APA, and it does not violate the separation of powers for the President to provide guidance to agencies on how to perform benefit-cost analyses when appropriate and consistent with applicable law. Commenters are free, as demonstrated by the docket for this rulemaking, to comment on EPA's approach to estimating SC-GHG and the role those estimates should play in EPA's decisionmaking about the final standards adopted in this rule. ~~SC-GHG values did not satisfy requirements of the Administrative Procedure Act (APA),~~ However, EPA notes that it did not primarily use the IWG estimates in this final rule (though they are included as Appendix C of the RIA~~?]~~), because EPA concluded it would be more appropriate to use estimates of the SC-GHG that reflect recent advances in the scientific literature on climate change and its economic impacts and incorporate recommendations made by the National Academies of Science, Engineering, and Medicine. EPA also notes, as explained above, that the benefit-cost analysis for this rule played a very limited role in decision-making for the standards. EPA did not rely on benefit-cost analysis to *identify* the appropriate standards. That is, EPA did not seek to select standards that would maximize net benefits as calculated by the benefit-cost analysis. As described in section V of the preamble, and explained above in responding to Stephen Bradbury's comment, the selection of the final standards was made based on judgments about the feasibility of further emissions reductions, in light of the cost of compliance, available lead time and other factors, and not specifically on estimates of the SC-GHG.[1027]

EPA considers its use of estimates of the SC-GHG entirely consistent with its authority under the CAA 202(a) to establish standards, and has fully complied with applicable requirements,

[1027] For example, EPA would have adopted the same standards had it considered the IWG estimates to be more appropriate. EPA presents IWG estimates of the SC-GHG for the final standards in Appendix C to the RIA. Indeed, as explained above, the rule would be net beneficial even if no monetized climate benefits were included.

including Section 307(d) of the Clean Air Act in this rulemaking. Unless a statute requires a different approach, it is entirely permissible for agencies to consider costs and benefits when deciding whether or how to regulate. See, e.g., *Entergy Corp. v. Riverkeeper*, 556 U.S. 208, 226 (2009). The costs and benefits of these final standards plainly include the effects of the standards on emissions of GHG. Any attempt to consider monetized net benefits of this rulemaking must at least attempt to monetize the effect of GHG emissions such as through estimates of SC-GHG. Indeed, courts have held that it may be arbitrary and capricious for agencies not to use SC-GHG in their benefit-cost analyses (see the 2023 Final Oil and Gas NSPS RIA for a more complete history of government use of the SC-GHG).

As discussed in preamble Section VII.A and RIA Chapter 4, EPA has updated its approach and now uses estimates of the SC-GHG that reflect recent advances in the scientific literature on climate change and its economic impacts and incorporate recommendations made by the National Academies of Science, Engineering, and Medicine[1028]. The EPA published and used these estimates in the RIA for the December 2023 Final Oil and Gas NSPS/EG Rulemaking, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review." This directly addressed the comment by *Delek US Holdings* suggesting that the EPA follow the NAS recommendations, and makes a number of the comments by *Arizona and the Clean Fuels Development Coalition* moot, as there was an opportunity to provide comment on these new values during the Oil and Gas NSPS/EG Rulemaking process. The EPA gave notice in the proposal for this rule that these updated SC-GHG values were under consideration.

[1028] National Academies of Sciences, Engineering, and Medicine (National Academies). 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. National Academies Press.

21 Criteria Pollutant Health Benefits

Comments by Organizations

Organization: Allergy & Asthma Network et al.

Health Benefits of Zero-Emission Heavy-Duty Vehicles In 2022, the American Lung Association released a report, "Zeroing in on Healthy Air," modeling the health impacts of a future in which 100% sales of new light-duty vehicles were zero-emission by 2035; 100% of sales of new medium- and heavy-duty vehicles were zero-emission by 2040; and 100% of electricity generation was clean and non-combustion by 2035. We offer this report to provide a supplement to EPA's regulatory impact analysis with this proposal to help understand the enormous health benefits of EPA's more stringent alternatives. [EPA-HQ-OAR-2022-0985-1532-A1, p. 2]

The transition modeled in the report would result in 110,000 premature deaths prevented; nearly 3 million asthma attacks avoided; more than 13 million lost workdays avoided; and $1.2 trillion in health benefits (all figures nationwide, 2020-2050). The transition would provide $1.7 trillion in additional climate benefits (global, 2020-2050).4 With regard to the vehicles policies specifically, the benefits come from both dramatic reductions in tailpipe emissions and upstream emissions reductions. [EPA-HQ-OAR-2022-0985-1532-A1, pp. 2 - 3]

4 American Lung Association. Zeroing in on Healthy Air: Health and Climate Benefits of Zero-Emission Transportation and Electricity. March 2023. https://www.lung.org/clean-air/electric-vehicle-report/zeroing-in-on-healthy-air

The scenario modeled in the report sees decreases of 14% in on-road greenhouse gas pollution reductions by 2030, 66% by 2040 and 93% by 2050. For heavy-duty vehicles specifically, those percentages are 7% in 2030, 58% in 2040 and 92% in 2050. [EPA-HQ-OAR-2022-0985-1532-A1, p. 3]

The Lung Association also released a follow-on report, "Delivering Clean Air," which focused in on the benefits of the zero-emission transition across the electricity and heavy-duty vehicles sectors, looking just in counties home to heavily trafficked truck routes. The report found that the transition to zero-emission heavy-duty transportation and clean, non-combustion energy by 2050 in counties with major truck routes would result in up to $735 billion in cumulative health benefits, 1.75 million fewer asthma attacks, 8.5 million fewer lost workdays and 66,800 avoided deaths.5 The analysis looked at the 921 U.S. counties with trucking routes carrying 8,500 or more trucks per day. These counties represent less than one-third of all U.S. counties but are home to more than three-quarters of the U.S. population, with a disproportionate percentage being people of color compared to the population at large. [EPA-HQ-OAR-2022-0985-1532-A1, p. 3]

5 American Lung Association. Delivering Clean Air: Health Benefits of Zero-Emission Trucks and Electricity. October 2022. https://www.lung.org/clean-air/electric-vehicle-report/delivering-clean-air

Even for communities not located near a source of heavy truck traffic such as a major truck route or distribution center, cleaning up heavy-duty vehicles represents an enormous health opportunity for vulnerable groups. Reducing exposure to harmful emissions from diesel school buses is an important priority for children's health. There are 480,000 school buses on the road nationwide, traveling 3.5 billion miles annually. About 95% of school buses are diesel powered. Diesel emissions contain a variety of toxics, including nitrogen oxides, particulate matter, benzene, and 1,3-butadiene. Diesel soot from school buses has been associated with reduced lung function and increased incidences of pneumonia in children. Exposure to diesel emissions can be especially harmful for children with asthma, and accelerating progress already underway to more zero-emission school buses on the road is a critical public health opportunity. [EPA-HQ-OAR-2022-0985-1532-A1, p. 3]

Organization: American Thoracic Society (ATS)

Reducing GHGs and harmful traffic-related air pollutants will reduce cardiopulmonary morbidity and mortality. Specifically, reductions in PM2.5 will reduce heart attacks, heart failure admissions, asthma and COPD exacerbations, and respiratory infections.22 Importantly, marginalized populations will benefit more from reductions in PM2.5, having the greatest improvement in PM2.5 associated mortality.23 Long term reductions in PM2.5 will reduce incidence of childhood asthma, improve childhood lung function, and reduce childhood asthma exacerbations. Reducing GHG emissions will also help to limit heat-induced increases in ambient ozone that results from climate change (otherwise known as the 'ozone penalty').24 Ozone is the most well described respiratory toxicant, causing both short- and long-term respiratory health harms including decreased lung function, respiratory tract infections, and respiratory exacerbations. Therefore, policies that mitigate climate change through reductions in GHG emissions will directly reduce ozone levels, consequently reducing human health harms and healthcare associated costs. [EPA-HQ-OAR-2022-0985-1517-A1, p. 3]

22. US Environmental Protection Agency. Integrated Science Assessment for Particulate Matter. 61 (2019).

23. Josey, K. P. et al. Air Pollution and Mortality at the Intersection of Race and Social Class. N Engl J Med Mar 24, 1–9 (2023).

24. Nolte, C.G. et al. Air Quality. Impacts, Risks, and Adaptation in the United States. Fourth Natl. Clim. Assess. II, 512–538 (2018).

Organization: CALSTART

NOx Reductions Co-Benefits from Accelerating ZE-MHDVs

The accelerated penetration of ZE-MHDVs can have a meaningful impact on further reducing nitrogen oxide (NOx) and other criteria emissions beyond the reductions to be gained from EPA's recently enacted Clean Trucks Plan. Indeed, a regulation driving the zero-emission penetration rates identified in CALSTART's Drive to Zero assessment would reduce NOx emissions to a level near to what implementation of a California Heavy-Duty Engine and Vehicle Omnibus Regulation at the national level would have delivered. Further accelerating this rate could produce net NOx reductions even over a national version of California's standards. [EPA-HQ-OAR-2022-0985-1656-A1, p. 25]

Importantly, these additional reductions would be concentrated in communities overburdened by transportation pollution because of the preponderance of ZE-MHDV early use applications that are urban and regionally based. [EPA-HQ-OAR-2022-0985-1656-A1, p. 25]

Evaluation of EPA NOx regulation versus potential CA national regulation: These observations come from a high-level directional assessment CALSTART recently performed comparing the expected in-use NOx reductions from EPA's Clean Trucks Plan to the potential NOx reductions that enactment of California's Omnibus NOx standards would have achieved during 2027–2030. The assessment used EPA and CARB engine-based standards and translated those emissions to vehicle-level emissions, based on accepted use profiles, engine workloads, and mileage data. It estimates a significant level of additional NOx emissions from commercial diesel vehicles sold from 2027–2030 between EPA's results and CARB's results. However, this additional NOx could be reduced by roughly two-thirds by adopting CALSTART's ZE-MHDV penetration rates discussed earlier in these comments. By performing an additional step in the assessment, CALSTART identified that the remaining excess NOx could be eliminated and reductions exceeding the California standards achieved by introducing additional ZEV units in specific segments. These introductions take the form of accelerating the ZE-MHDV adoption curve—moving it forward in time—from the 2031–2034 period to the 2027–2030 period. This is a feasible action, though not inconsequential, requiring nearly 500,000 additional ZE-MHDVs deployed across vehicle categories based on their likely adoption rates during this period.56 [EPA-HQ-OAR-2022-0985-1656-A1, p. 25]

56 "High Level Assessment: Using Faster ZEV Adoption to Achieve NOx Reductions Equivalent to a National CARB Standard", CALSTART, June 2023

Accelerated ZE-MHDVs provide disadvantaged community benefits: Overall, the findings suggest that while the EPA's NOx standards result in more NOx emissions compared to a CARB-equivalent standard, the accelerated introduction of ZE-MHDVs can compensate for the difference and even generate NOx reductions beyond CARB levels, while significantly reducing carbon emissions and mitigating criteria emissions, particularly in urban areas. A greater reduction of urban and regional pollution from this regulation would directly align with the vision and stated goals of the Justice40 Initiative. All federal agencies, including EPA, have pledged to ensure 40 percent of the benefits of federal investments flow to "disadvantaged communities that are marginalized, underserved, and overburdened by pollution."57 Given that the EPA Phase 3 GHG regulation would via its stringency and timing essentially direct where IRA and BIL funding investments would be used, it is incumbent on EPA to consider this critical benefit which would provide cleaner air to priority and underserved communities. [EPA-HQ-OAR-2022-0985-1656-A1, pp. 25 - 26]

57 https://www.whitehouse.gov/environmentaljustice/justice40/

According to all estimates, road freight demand rises dramatically in the near future—nearly 46 percent from 2020 to 2040 according to recent estimations in the 2023 BloombergNEF Electric Vehicle Outlook.62 This growth rate threatens to outpace conventional emissions control measures and underscores the benefit from more rapid introduction of zero-emission technologies. It also underscores the public health benefits of this transition: studies have shown that aggressive savings by adopting regulations similar to ACT would prevent 2,600 premature deaths and 140,000 lost workdays each year by 2040 and prevent as many as 57,000 premature deaths in total through 2050, as well as provide up to $485 billion in health and environmental benefits alone as a result of pollution reductions.63 [EPA-HQ-OAR-2022-0985-1656-A1, pp. 26 - 27]

62 https://about.bnef.com/electric-vehicle-outlook/

63 https://www.edf.org/sites/default/files/2021-03/HD_ZEV_White_Paper.pdf

Put another way, the American Lung Association estimates the health benefits of ZETs and renewable electricity between 2020–2050 to be equal to $375 billion in public health benefits in counties and 64 These counties represent one-third of all counties and communities most impacted by trucking pollution nationally. [EPA-HQ-OAR-2022-0985-1656-A1, p. 27]

64 https://www.lung.org/clean-air/electric-vehicle-report/zeroing-in-on-healthy-air

Organization: Environmental Defense Fund (EDF)

VII. EPA's Assessment of Benefits is Overly Conservative

EPA has projected that its standards will deliver overwhelming net benefits, including significant climate and pollution reduction benefits. We agree with that assessment and identify several conservative assumptions and approaches EPA has taken that, when adjusted, demonstrate that the standards would deliver even greater benefits. [EPA-HQ-OAR-2022-0985-1644-A1, 86]

a) EPA's benefit-per-ton methodology for calculating the health and air quality benefits of this rule is conservative and underestimates the ultimate benefits

EPA uses the benefit per ton (BPT) approach to estimate the economic savings from health-related impacts of the proposal. EPA estimates the present value of PM2.5-related benefits of the proposed program to be $140 to $280 billion at a 3% discount rate and $63 to $130 billion at a 7% discount rate.226 BPT approaches provide important insights into the value of pollution reductions and we encourage EPA to consider pairing this assessment with a fuller health impact assessment. A health impact assessment takes into consideration the spatial distribution of air pollutant concentrations and the spatial distribution of baseline disease of the population, both of which influence the magnitude of the health benefits estimated. [EPA-HQ-OAR-2022-0985-1644-A1, 86-87]

226 RIA at 7-36.

EDF has also taken a number of approaches to quantify the health benefits attributable to transportation electrification scenarios in a number of different studies. For example, in 2022, EDF completed a white paper documenting the reasonableness and feasibility of performance-based standards that ensure 40 percent of new Class 4-7 and Class 8 short haul tractors and 80 percent of school and transit bus sales are ZEVs by 2029.229 The paper analyzed the climate, health, and economic benefits of standards that achieve these goals and found such standards would avoid more than 1.6 billion tons of GHG emissions and 840,000 - 2.2 million tons of ozone-forming NOx pollution through 2050.230 This pollution reduction would prevent between 7,500 and 9,600 premature deaths through 2050 and provide the nation with up to $34 billion in economic benefits annually in 2040, with a cumulative savings of $650-680 billion through 2050. The New York and Atlanta studies discussed above also use fine spatial resolution modeling approached to ascertained localized disparities in health impacts.231 We encourage EPA to consider the results of these approaches and employ a variety of assessment methodologies, including fine scale modeling, to better understand the benefits of its standards. [EPA-HQ-OAR-2022-0985-1644-A1, 87-88]

229 EDF Comments on Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 87 Fed. Reg. 17414. May 16, 2022. EPA-HQ-OAR-2019-0055-1265. Available at: https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1265. Environmental Defense Fund, The Opportunity for Near-Term Electrification of Medium- and Heavy-Duty Vehicles (May 2022), https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2022/05/FINAL-EDF-HD-ZEV-report-5.17.22.pdf.

230 Attachment A. EDF Comments on Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 87 Fed. Reg. 17414. May 16, 2022. EPA-HQ-OAR-2019-0055-1265. Available at: https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1265.

231 See supra note 7.

i. Direct NO2 emissions

EPA's benefits analysis reflects only the PM2.5-related benefits associated with reductions in NOX, SO2, and direct PM2.5 emissions.232 This approach underestimates the total health benefits of the Proposed Rule by not quantifying the health benefits of reductions in air pollutants other than PM2.5 and PM2.5 precursors. Accordingly, we encourage EPA to incorporate the significant health impacts of nitrogen dioxide (NO2) to more accurately estimate the benefits of the Proposed Rule. In the studies described above in New York City and Atlanta233, NO2-attributable health impacts were a significant portion of the health benefits of the analyzed electrification scenarios and excluding NO2 would have resulted in significantly underestimated benefits. In New York City, 85 percent of the air pollutant-attributable deaths and 97 percent of childhood asthma ED visits are attributable to NO2 exposure.234 The study found that 12 percent of NO2 impacts could be preventable in the first scenario (which assumed 100 percent EV sales for transit and school buses by 2030 and 30 percent EV sales by 2030 and 100 percent sales by 2040 for all other heavy-duty vehicles) and 23 percent of NO2 impacts could be preventable in the second scenario (which assumed 100 percent electrification of all vehicles by 2040). In Atlanta, though PM2.5 reductions account for 68 percent of the estimated mortality benefits, full electrification of heavy-duty vehicles by 2040 (Scenario 2) could reduce up to 71 percent of total NO2 impacts. Using a high-resolution chemical transport model, another recent study in Chicago found that 30 percent electrification of all heavy-duty vehicles could prevent 580 deaths annually as a result of NO2 emissions reductions and prevent 70 deaths per year from reduced PM2.5.235 [EPA-HQ-OAR-2022-0985-1644-A1, 88-89]

232 RIA at 7-36.

233 See supra note 7.

234 See supra note 7.

235 Camilleri S, Montgomery A, Visa M, Schnell J, Adelman Z, Janssen M, Grubert E, Anenberg S, Horton D. 2023. Air quality and health implications of electrifying heavy-duty vehicles assessed at equity-relevant neighborhood-scales. Pre-print available at : https://assets.researchsquare.com/files/rs-2399309/v1/50dfcfe1856da6c10964ae70.pdf?c=1674171815

In comments on EPA's March 28, 2022 Proposed Rule, commenters similarly raised the importance of quantifying health benefits of NO2, and EPA indicated it "intends to continue to consider how best to quantify this endpoint in future regulatory actions."236 Accordingly, we urge EPA to quantify the health impacts for NO2. [EPA-HQ-OAR-2022-0985-1644-A1, 89]

236 Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards Response to Comments at 1216. Available at: https://www.regulations.gov/document/EPA-HQ-OAR-2019-0055-2993

ii. Near-roadway impacts

It is also important that EPA capture pollution exposure disparities in its analysis so it can better estimate the neighborhood-level impacts of the rulemaking. Use of fine spatial resolution results in higher estimates for exposures in urban areas and among historically marginalized populations.237 EPA's current analysis uses a course spatial scale of 12km x 12km that is less suitable for capturing exposure disparity and near-road transportation emissions. Use of this coarse resolution smooths clusters of minority populations and reduces the number of attributable cases in urban areas.238 [EPA-HQ-OAR-2022-0985-1644-A1, p. 89-90]

237 Paolella, D. A., Tessum, C. W., Adams, P. J., Apte, J. S., Chambliss, S., Hill, J., Muller, N. Z., & Marshall, J. D. (2018). Effect of Model Spatial Resolution on Estimates of Fine Particulate Matter Exposure and Exposure Disparities in the United States. Environmental Science & Technology Letters, 5(7),

436–441. https://doi.org/10.1021/acs.estlett.8b00279.

238 Korhonen, A., Lehtomäki, H., Rumrich, I., Karvosenoja, N., Paunu, V.-V., Kupiainen, K., et al. (2019). Influence of spatial resolution on population PM2.5 exposure and health impacts. Air Quality, Atmosphere & Health, 12(6), 705–718. https://doi.org/10.1007/s11869-019-00690-z.

Various commenters to EPA's March 28, 2022, Proposed Rule pointed out that much more highly resolved data is available for EPA to use, and that this data better captures the spatial variation of air pollutants than the 12km x12km resolution model employed by EPA at the time.239 EPA responded:

"We agree that the chemical transport model simulations that were conducted at a 12km x 12km grid cell spatial resolution are too coarse to capture neighborhood-scale impacts. EPA is considering how to better estimate the near-roadway air quality impacts of its regulatory actions and how those impacts are distributed across populations."240 [EPA-HQ-OAR-2022-0985-1644-A1, p. 90]

239 EPA-HQ-OAR-2019-0055-1220. Available at: https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1220.

240 EPA, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards Response to Comments, Page 1215. Available at: https://www.regulations.gov/document/EPA-HQ-OAR-2019-0055-2993

In the current Proposed Rule, EPA has not included better estimates of near-roadway air quality impacts by refining its photochemical air quality modeling, rather, EPA has employed a reduced form model with limited quantification of the spatial impacts (i.e., the BPT approach). Use of equity relevant spatial scales is crucial. In our research in both NYC and Atlanta discussed above, EDF observed wide variation in the distribution of air quality benefits from electrification of medium- and heavy-duty across census tracts. By a single BPT approach, EPA does not account for variation in benefits of the Proposed Rule and therefore fails to fully identify the areas and neighborhoods that would most benefit from this rulemaking. [EPA-HQ-OAR-2022-0985-1644-A1, p. 90]

Organization: Environmental Protection Network (EPN)

In addition, air pollution continues to be a public health problem in many communities across the U.S., with exposure to ozone, particulate matter, and other pollutants leading to premature death, asthma, and other negative health and environmental effects. By increasing the use of zero-emission HDV, the proposed Phase 3 program would reduce emissions of smog and soot-forming pollutants by:

- 650 tons of particulate matter,
- 72,000 tons of nitrogen oxides, and
- 21,000 tons of volatile organic compounds, compared to 2055 levels without the proposal. [EPA-HQ-OAR-2022-0985-1523-A1, p. 2]

Organization: MCS Referral & Resources

Comment 6

At https://www.federalregister.gov/d/2023-07955/p-15llll06

EPA writes that "A limited number of epidemiologic studies considered co-pollutants such as ozone, SO2, and PM in two-pollutant models and found that CO risk estimates were generally robust, although this limited evidence makes it difficult to disentangle effects attributed to CO itself from those of the larger complex air pollution mixture." [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

While the evidence for CO is limited, the same is true but not said of all other pollutants. Critically, studies in which two-pollutant (and multi-pollutant) models were used do NOT make it difficult to disentangle the effects attributed to CO. These types of study are preferred because they allow the effects attributed to CO to be disentangled from those caused by other pollutants. [EPA-HQ-OAR-2022-0985-1629-A1, p. 3]

Comment 7

At https://www.federalregister.gov/d/2023-07955/p-1507

EPA again describes the evidence for CO health effects as limited, and again mischaracterizes the significance of co-pollutant studies: "… limited evidence is available to evaluate cause-specific mortality outcomes associated with CO exposure. [EPA-HQ-OAR-2022-0985-1629-A1, p. 4]

In addition, the attenuation of CO risk estimates which was often observed in co-pollutant models contributes to the uncertainty as to whether CO is acting alone or as an indicator for other combustion-related pollutants. " Any attenuation of CO risk estimates seen in multipollutant models compared to single pollutant models is to be expected and is seen for all pollutants. This is why multipollutant studies that adjust for confounding by other pollutants are considered more accurate. They do not contribute "to the uncertainty as to whether CO is acting alone or as an indicator …" and are instead the best study design to resolve such uncertainty. [EPA-HQ-OAR-2022-0985-1629-A1, p. 4]

Critically, the only two studies of PM2.5 cited in this proposed rule as the basis for all of EPA's PM-related estimates –Wu et al (2020) and Pope et al (2019), refs 1008 and 1009 respectively—are not adjusted for confounding by co-pollutants. As such, they are both undermined by uncertainty as to whether PM2-5 is acting alone or as an indicator for other combustion-related pollutants. [EPA-HQ-OAR-2022-0985-1629-A1, p. 4]

Comment 9

At https://www.federalregister.gov/d/2023-07955/p-1908

In a discussion of Criteria Pollutant Health Benefits, EPA acknowledges that:

"A chief limitation to using PM2.5 -related BPT values is that they do not reflect benefits associated with reducing ambient concentrations of ozone. The PM2.5 -related BPT values also do not capture the benefits associated with reductions in direct exposure to NO2 and mobile source air toxics, nor do they account for improved ecosystem effects or visibility. The estimated benefits of this proposal would be larger if we were able to monetize these unquantified benefits at this time." [EPA-HQ-OAR-2022-0985-1629-A1, pp. 4 - 5]

We suggest that the chief limitation of the PM2.5-related BPT values is that they do not reflect the arguably much larger benefits associated with reducing ambient carbon monoxide, given that CO is more abundant and toxic than ozone. As shown in Comment 1 above (see Table DD1), CO emissions exceed those of all other criteria and toxic air pollutants combined. [EPA-HQ-OAR-2022-0985-1629-A1, p.5]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

NESCAUM and OTC strongly support EPA's initiative to develop Phase 3 heavy-duty vehicle (HDV) greenhouse gas (GHG) emissions standards. The proposed standards, when implemented, have the potential to substantially reduce HDV emissions of GHGs, NOx, VOCs, fine particulate matter (PM2.5), and air toxics.3 [EPA-HQ-OAR-2022-0985-1562-A1, p. 2]

3 U.S. EPA, "Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3," Draft Regulatory Impact Analysis, April 27, 2023, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf, p. 328. According to EPA's RIA, implementation of the proposed standards will reduce HDV CO2 30%, NOx by 28%, PM2.5 by 39%, VOC by 37%, formaldehyde by 31%, and 1,3-butadiene by 51% by 2055.

The Need for GHG and Criteria Air Pollutant Reductions from Heavy-Duty Vehicles

Earth's climate is changing faster than it has at any point in the history of modern civilization, driven primarily by GHG emissions from human activities. The impacts—including more frequent and intense precipitation and wind events, flooding, heat waves, drought, wildfires, retreating snow and ice packs, ocean warming and acidification, accelerating sea level rise, and large-scale biodiversity loss—are being felt by communities across the globe and will worsen in coming years. Because GHGs can persist in the atmosphere for decades to centuries, the degree to which these impacts will worsen depends on how deeply and rapidly humanity can decarbonize all economic sectors.4 The transportation of freight and people is the largest source of GHGs in the United States. [EPA-HQ-OAR-2022-0985-1562-A1, p. 2]

4 Intergovernmental Panel on Climate Change (IPCC), AR6 Synthesis Report, Climate Change 2023, https://www.ipcc.ch/report/ar6/syr/.

In addition to being a major contributor to GHG emissions, on-road diesel vehicles, including HDVs, are the third largest NOx emissions source in the Northeast and Mid-Atlantic5 and contribute the majority of on-road tailpipe-related PM2.5 emissions. They also emit air toxics such as formaldehyde and acetaldehyde. Though emission control devices including particulate filters and selective catalytic reduction can be used to reduce emissions, these technologies cannot eliminate emissions. And, efforts to reduce NOx and direct PM2.5 may lead to other emissions such as ammonia, additional GHGs, or the creation of additional particulates through secondary processes.6 [EPA-HQ-OAR-2022-0985-1562-A1, p. 2]

5 National Emissions Inventory Collaborative (2019). 2016v1 Emissions Modeling Platform. Retrieved from http://views.cira.colostate.edu/wiki/wiki/10202.

6 Kuternowski, F.; Staszak, M.; Staszak, K. "Modeling of Urea Decomposition in Selective Catalytic Reduction (SCR) for Systems of Diesel Exhaust Gases Aftertreatment by Finite Volume Method," Catalysts, 10:749 (2020). DOI: 10.3390/catal10070749, https://www.mdpi.com/2073-4344/10/7/749.

The NESCAUM and OTC regions include the New York City (NYC) Combined Statistical Area (CSA) – the largest CSA in the United States by population – with over 20 million people living across portions of Connecticut, New Jersey, New York, and Pennsylvania. The NYC metropolitan area and surrounding regions continue to persistently exceed federal health-based air quality standards for ground-level ozone. The chronically persistent high ozone concentrations compromise the health and welfare of the individuals living in the NYC CSA and elsewhere in the region. [EPA-HQ-OAR-2022-0985-1562-A1, p. 2]

Epidemiological studies provide strong evidence that exposure to ground-level ozone is associated with respiratory effects, including increased asthma attacks, as well as increased hospital admissions and emergency department visits for people suffering from respiratory diseases. Ozone can cause chronic obstructive pulmonary disease (COPD), and long-term exposure may result in permanent lung damage, such as abnormal lung development in children. There is also consistent evidence that short-term exposure to ozone increases risk of death from respiratory causes.7 [EPA-HQ-OAR-2022-0985-1562-A1, p. 3]

7 U.S. EPA, "Health Effects of Ozone Pollution," last updated May 24, 2023, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution (accessed June 2, 2023).

While ozone is largely a summertime issue in the Northeast, NOx emissions are a year-round problem. NOx emissions contribute to acid deposition, eutrophication, and visibility impairment in the NESCAUM and OTC regions. During colder seasons, NOx emissions play a role in producing secondary PM2.5 through the formation of nitrates. [EPA-HQ-OAR-2022-0985-1562-A1, p. 3]

Both tailpipe and secondary PM2.5 exposure from HDVs is associated with a variety of health effects, including reduced lung function, irregular heartbeat, asthma attacks, heart attacks, and premature death in people with heart or lung disease.8 Low-income communities and communities of color are often located near trucking corridors, ports, fleet garages, warehouses, and other trucking hubs. Consequently, these communities are affected by disproportionate amounts of diesel exhaust emissions and worsened health burdens due to poor air quality in US cities.9,10 Health and economic impacts include increases in asthma and other respiratory illnesses, especially in children and older adults, leading to additional trips to doctors and emergency rooms, missed days of school and work, and thousands of premature deaths each year. [EPA-HQ-OAR-2022-0985-1562-A1, p. 3]

8 U.S. EPA, "Health and Environmental Effects of Particulate Matter (PM)," last updated August 30, 2022, https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm (accessed June 2, 2023).

9 Demetillo, M.A.G.; Harkins, C.; McDonald, B.C.; Chodrow, P.S.; Sun, K.; Pusede, S. E. "Space-Based Observational Constraints on NO2 Air Pollution Inequality From Diesel Traffic in Major US Cities," Geophys. Res. Lett. 48: e2021GL094333 (2021). DOI: 10.1029/2021GL094333, https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GL094333.

10 Hunter Kerr, G.; Goldberg, D.L.; Anenberg, S.C. "COVID-19 pandemic reveals persistent disparities in nitrogen dioxide pollution," PNAS 118(30): e2022409118 (2021). DOI: 10.1073/pnas.2022409118, https://www.pnas.org/doi/suppl/10.1073/pnas.2022409118.

Truck ton-miles are projected to grow by approximately 30 percent over the next 25 years (Figure 1). This growth in activity, if not counteracted by increased stringency of new emission standards, will result in significantly increased HDV emissions. We also note that highway trucks often travel long distances and can be registered in states far from where they operate. Therefore, a strong national program is needed to reduce highway truck emissions and maximize public health benefits in our regions and nationally. [EPA-HQ-OAR-2022-0985-1562-A1, p. 3] [See Docket Number EPA-HQ-OAR-2022-0985-1562-A1, p. 4, for Figure 1]

Organization: Southern Environmental Law Center (SELC)

II. EPA must adopt the strongest possible GHG emissions standards for heavy-duty vehicles.

Given these significant impacts, bold action is needed to put the heavy-duty vehicle fleet on the path to eliminating GHG tailpipe emissions. Cleaner heavy-duty vehicles that produce fewer GHG emissions will simultaneously reduce concentrations of other harmful pollutants and their related negative health effects.45 In SELC's region alone, the widespread implementation of ZEVs in the transportation sector would generate $150.5 billion in public health benefits and prevent 13,580 premature deaths, 294,180 asthma attacks, and 1.67 million lost workdays.46 Stringent tailpipe emission standards are also needed to meet U.S. climate goals and commitments, including the economy-wide target of reducing net GHG emissions by 50 to 52 percent below 2005 levels by 2030 to maintain alignment with the international Paris Agreement.47 [EPA-HQ-OAR-2022-0985-1554-A1, p. 5-6]

45 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 25935 (Apr. 27, 2023).

46 Zeroing in on Healthy Air, AM. LUNG ASSN. 9-10 (2022), https://www.lung.org/clean-air/electric-vehiclereport#truck (aggregating the predicted cumulative health benefits from 2020 to 2050 in Alabama, Georgia, North Carolina, South Carolina, Tennessee, and Virginia).

47 UNITED NATIONS, NDC Registry: The United States of America Nationally Determined Contribution 1 (2021), https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf.

Organization: Tesla, Inc. (Tesla)

While comprising less than 10 percent of all vehicles on the road, medium- and heavy-duty trucks account for more than 60 percent of tailpipe NOX and PM emissions from the on-road fleet; these emissions contribute to poor air quality in many urban areas, including areas with vulnerable populations.64 [EPA-HQ-OAR-2022-0985-1505-A1, p.11]

64 See generally, MJ Bradley, Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness (Aug. 11, 2022) at 4 available at https://www.mjbradley.com/reports/medium-heavy-duty-vehicles-market-structureenvironmental-impact-and-ev-readiness; See also, Union of Concerned Scientists, Ready for Work Now Is the Time for Heavy-Duty Electric Vehicles (Dec. 11, 2019) at 2 available at https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf (While heavy-duty vehicles make up only 10 percent of all vehicles on roads in the United States, they contribute 45 percent of the transportation sector's nitrogen oxide pollution, 57 percent of its fine particulate matter pollution, and 28 percent of its global warming emissions).

Indeed, the public health, climate, and economic benefit from much more stringent, BEV-based GHG emission standards cannot be understated. Air pollution is estimated to cause over 200,000 premature deaths in the U.S. each year; with more than half are caused by transportation emissions.65 Recent findings indicate that the U.S. health care costs of air pollution and climate change exceed $800 billion per year.66 Air pollution impacts with pollutants like PM2.5 that are associated with the medium- and heavy-duty sector not only cause premature mortality, cardiovascular disease and respiratory disease but also can affect neurological disorders.67 Other studies suggest that exacerbation of air pollution and heat exposure related to climate change may be significantly associated with risk to pregnancy outcomes in the U.S.68 [EPA-HQ-OAR-2022-0985-1505-A1, p.11]

65 Atmospheric Environment, Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005 (Nov. 2013) available at https://www.sciencedirect.com/science/article/abs/pii/S1352231013004548; See also, PNAS, Fine-scale damage estimates of particulate matter air pollution reveal opportunities for location-specific mitigation of emissions (April 8, 2019) available at https://www.pnas.org/doi/10.1073/pnas.1816102116 (Over 100,000 premature death just from PM 2.5).

66 Medical Society Consortium, The Costs of Inaction: The Economic Burden of Fossil Fuels and Climate Change on Health in the United States (May 20, 2021) available at https://subscriber.politicopro.com/f/?id=00000179-8a79-de79-a9ffae7dbc420000&source=email

67 The Lancet, Long-term effects of PM2·5 on neurological disorders in the American Medicare population: a longitudinal cohort study (Oct. 19, 2020). available at https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30227-8/fulltext#.X44Xfg2Mloo.twitter

68 Bekkar, et al. JAMA Open Network, Association of Air Pollution and Heat Exposure with Preterm Birth, Low Birth Weight, and Stillbirth in the USA Systematic Review (June 18, 2020). available at https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2767260

These negative effects of air pollution disproportionately harm the most vulnerable populations, including children, the elderly, and residents in low-income and disadvantaged communities.69 Indeed, two-thirds of Americans who live near high-volume roads are people of color and the median household income in these places is roughly 20% below the national average.70 Emissions from heavy-duty diesel trucks are roughly the equivalent to those of 20 to 55 light-duty vehicles on the road. Repeatedly, peer reviewed, government and inter-governmental studies point toward electrification as key to addressing criteria air pollutants, improving air quality, and lower the risk of respiratory illness.71 [EPA-HQ-OAR-2022-0985-1505-A1, p. 11]

69 UN Environmental Programme, Young and old, air pollution affects the most vulnerable (Oct. 16, 2018). available at https://www.unep.org/news-and-stories/blogpost/young-and-old-air-pollution-affects-mostvulnerable#:~:text=Since%20children%20are%20still%20growing,of%20conditions%20such%20as%20asthma

70 Union of Concerned Scientists, Delivering Opportunity: How Electric Buses and Trucks Can Create Jobs and Improve Public Health in California,' (Oct. 11,2016), at 10. available at https://www.ucsusa.org/resources/delivering-opportunity

71 See e.g., International Panel on Climate Change (IPCC), AR 6 Climate Change 2022: Impacts, Adaptation and Vulnerability (Feb. 28, 2022) at 7-120 available at https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_FinalDraft_FullReport.pdf; USGCRP, National Climate Assessment 4, Volume II, Chapter 29 at Box 29.2 available at https://nca2018.globalchange.gov/chapter/29/ (In transportation, for example, switching away from petroleum to potentially lower GHG fuels, such as electricity and hydrogen, is projected to reduce local air pollution. In California, drastic GHG emissions reductions have been estimated to improve air quality and reduce local particulate matter emissions associated with freight transport that disproportionately impact disadvantaged communities').

By removing diesel from the heavy-duty equation altogether, BEVs represent a superior solution relative to other approaches that seek to reduce emissions by increasing the efficiency of diesel trucks or via post-combustion treatment. As one recent analysis recognized, fully addressing harmful air pollution from trucks used in urban and community areas by 2035 and eliminating pollution from all new trucks and buses by 2040, can provide tremendous public health and welfare benefits, including preventing 57,000 premature deaths by 2050, reducing NOX emission by more than 10M tons, eliminating almost 200,000 tons of PM by 2050, and avoiding 4.7B tons of GHG emissions.72 [EPA-HQ-OAR-2022-0985-1505-A1, p. 12]

72 EDF, Clean Trucks, Clean Air, American Jobs (Mar. 4, 2021) at 1 available at https://nam11.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.edf.org%2Fsites%2Fdefault%2Ffiles%2F2021-03%2FHD_ZEV_White_Paper.pdf&data=04%7C01%7Csstein%40edf.org%7Cb7dc4ef595074e112f5d08d8df3e7b02%7Cfe4574edbcfd4bf0bde843713c3f434f%7C0%7C0%7C637504807460091524%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=UPgNYC4LF3GtszY7nDccfix4bHula4YkDlcxnZ83naU%3D&reserved=0;EDF, Clean Trucks, Clean Air, American Jobs (Mar. 4, 2021) at 1 available at https://nam11.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.edf.org%2Fsites%2Fdefault%2Ffiles%2F2021-03%2FHD_ZEV_White_Paper.pdf&data=04%7C01%7Csstein%40edf.org%7Cb7dc4ef595074e112f5d08d8df3e7b02%7Cfe4574edbcfd4bf0bde843713c3f434f%7C0%7C0%7C637504807460091524%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=UPgNYC4LF3GtszY7nDccfix4bHula4YkDlcxnZ83naU%3D&reserved=0

Indeed, one recent report estimates that wide-spread transportation electrification across the U.S. translates into $72 billion in avoided health effects. Electrification would save approximately 6,300 lives per year and avoid more than 93,000 asthma attacks, and 416,000 lost workdays annually due to significant reductions in transportation-related pollution.73 Other studies have found dramatic localized air quality and public health benefits will result for electrifying the heavy-duty fleet.74 [EPA-HQ-OAR-2022-0985-1505-A1, p. 12]

73 American Lung Association, The Road to Clean Air Benefits of a Nationwide Transition to Electric Vehicles (March 31, 2022) at 5-6 available at https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehiclereport.pdf; See also, ZETA, Medium- and Heavy Duty Electrification: Weighing the Opportunities and Barriers to Zero Emission Fleets (Jan. 26, 2022) at 8-9 available at https://fs.hubspotusercontent00.net/hubfs/8829857/ZETA-WP-MHDVElectrification_Opportunities-and-Barriers_Final3.pdf?utm_medium=email&_hsmi=201943899&_hsenc=p2ANqtz-8eoZgga7znbaZR7rKv1BaBniH18i3bFI9C8FLIYVA9UYMBZ-H5_7edvGf11_aMiDLUt4tVYShiR--I9VYfDXozCMAQgQ&utm_content=201943899&utm_source=hs_email

74 See, Texas A&M, Tailpipe Emission Benefits of Medium- and Heavy-Duty Truck Electrification in Houston, TX (Apr 14, 2021) available at https://carteehdata.org/library/document/tailpipe-emission-benefit-7ea6 (Finding that by electrifying 40% of the predominantly diesel-fueled MHDVs in the eight-county area, Texans could avoid 21 tons per day of NOX — over a quarter of the 80 tons per day emitted by greater Houston's on-road traffic. This could be achieved by electrifying a little over 60,000 MHDVs, about 1% of all the vehicles in greater Houston. By comparison, it would take 3.8 million light duty vehicles to achieve the same amount of NOX reductions. Electrification of MHDVs is the quickest way to take the biggest bite out of greater Houston's NOX emissions.)

EPA Summary and Response:

Summary:

Many commenters made general statements stating that actions to control emissions from heavy-duty vehicles are necessary to improve public health and welfare. Commenters also noted the non-GHG emissions impacts and health-related benefits of the proposed GHG standards, as well as the emissions impacts and benefits that could be achieved if a different or more stringent program had been proposed. Some commenters cited reports and assessments of alternative regulations and the non-GHG health impacts that could be achieved with different assumptions regarding compliance pathways and stringencies. One commenter suggested that EPA's approach to monetizing the benefits associated with the proposal underestimated benefits, asserting that we omitted the benefits associated with reductions in CO and did not appropriately choose benefits estimates using studies that adjusted for confounding by co-pollutants. Another commenter asserted that the air quality benefits of this rule are conservative and underestimate the ultimate benefits and encouraged EPA to incorporate health impacts related to nitrogen dioxide (NO_2) to more accurately estimate the benefits of the proposed GHG standards. The same commenter also noted that the BPT approach utilized by EPA has limited quantification of spatial impacts.

Response:

In this RTC section's response, the EPA is focusing on addressing comments related to the health benefits associated with the non-GHG impacts of the proposal. To the extent that these commenters raise other issues, those issues are addressed elsewhere in this RTC or in the final rule's preamble for this action.

As set forth in sections VI.A and VI. B of the final rule preamble, we project that this rule will result in significant reductions of emissions of GHGs, criteria pollutants, and air toxics from the HDV sector. The reduction of emissions in criteria pollutants from onroad sources and refineries will lead to $PM_{2.5}$-related health benefits that can be monetized and comprise a portion of the total benefits associated with the final rule. Upstream impacts associated with the final rule also include health disbenefits associated with increased criteria pollutant emissions from EGUs. Depending on the discount rate used, the annualized value of the stream of $PM_{2.5}$ health benefits may either be positive or negative. These criteria pollutant related health benefits are presented in Section VII.B of the preamble that accompanies this rule.

EPA notes that, consistent with CAA section 202, in evaluating potential GHG standards, we carefully weigh the statutory factors, including GHG emissions impacts of the GHG standards, and the feasibility of the standards (including cost of compliance in light of available lead time). We monetize benefits of the GHG standards, including criteria pollutant benefits, and evaluate other costs in part to better enable a comparison of costs and benefits pursuant to EO 12866, but we recognize that there are benefits that we are currently unable to fully quantify. As explained in preamble sections II.G and VII, EPA did not rely on benefit-cost analysis to *identify* the appropriate standards. That is, EPA did not seek to select standards that would maximize net benefits as calculated by the benefit-cost analysis. As explained in Section II.G of the preamble, even to the extent that EPA considers the positive monetized net benefits as supportive of the final standards (regardless of magnitude of the net benefits), positive monetized net benefits do not depend on which of the final rule's discounted stream of $PM_{2.5}$ health benefits is used, or whether the final rule's SC-GHG estimates or the IWG SC-GHG estimates are used (see the Appendix to Chapter 8 of the RIA for the latter in the final rule); EPA would still find the emissions reductions, in light of the cost of compliance, available lead time and other factors, justify adoption of these standards. In sum, while the positive net benefits figure supports EPA's final standards, we do not consider it necessary to the justification. EPA finds that this approach, of placing weight on judging the appropriate level of emissions reductions, in light of the costs of compliance and lead time, while still evaluating and considering total social costs and benefits, is consistent with both the Supreme Court's decision in Michigan v EPA, 576 US 743 (2015) and with section 202 of the CAA. As further explained in this response below, after consideration of comments, we did not alter our discussion and consideration of criteria pollutant health benefits from the proposal. Furthermore, we did not conduct any new analyses for the final rule, such as air quality modeling, that would further inform the analysis of criteria pollutant emissions impacts.

In general, EPA agrees with commenters that actions to control emissions from heavy-duty vehicles are necessary to improve public health and welfare. EPA follows applicable guidance and best practices when conducting its benefit-cost analyses, including the currently applicable OMB Circular A-4 and EPA's Guidelines for Preparing Economic Analyses. We therefore consider our analysis methodologically rigorous and a best estimate of the projected benefits and costs associated with the final rule. In response to commenters who identify potential health or welfare effects of criteria pollutants from heavy-duty vehicles, or other scientific information, views, or analyses that were not specifically incorporated into our discussion in the proposed or final action (such as those conducted by the American Lung Association, CALSTART, EDF, and others), the EPA thanks the commenters for their submissions and notes that the health and welfare evidence regarding the health impacts of the proposed and final rulemakings is adequately described in Section VI and Section VII of the preamble that accompanies this rule. In response to comments regarding our modeled potential compliance pathway (which includes ZEV and ICE vehicle technologies), and alternative standards the Agency should consider, as we explain in the preamble, as in prior rules the HD GHG Phase 3 standards are performance-based standards and there are many compliance pathways for the standards, including compliance pathways not utilizing ZEV technologies (and EPA expects, consistent with past practice, that different manufacturers will choose different compliance pathways). We recognize that resulting emission reductions and related benefits would differ from those presented in the preamble in such cases (as was true for prior rules).

The EPA does not interpret these comments as indicating disagreement with the evidence on criteria pollutant health or welfare effects information that was presented in the proposal, but rather understands these comments to suggest that the additional information they provide adds support for finalizing the rulemaking. To the extent that the information introduced by commenters was intended to advocate for more stringent or different standards, we refer the reader to Section 2 of this RTC document. For responses related to environmental justice, see Section 18 of this RTC document. For responses related to GHGs and the social cost of GHGs, see Section 20 of this RTC document. In response to the commenter that stated that the EPA Phase 3 GHG regulation would, via its stringency and timing, essentially direct where IRA and BIL funding investments would be used, we reject this as an unsupported assertion with no information provided to support the claim or to explain how this would affect the agency's decisions regarding the proposed standards.

In response to the commenter who suggested that EPA is omitting benefits associated with reductions in CO by not considering studies that adjusted for confounding by co-pollutants, EPA disagrees. EPA draws its assessment of the strength of evidence on the relationship between exposure to criteria pollutants and potential health endpoints from the Integrated Science Assessments (ISAs) that are developed for the NAAQS process. EPA quantifies and monetizes all health effects that the ISA draws conclusions regarding the causal relationship between a pollutant and a given effect, noting whether the effect is "causal" or "likely to be causal," following scientific assessment methods described in the ISAs. The focus on categories identified as having a "causal" or "likely to be causal" relationship with the pollutant of interest is to estimate the pollutant-attributable human health benefits in which we are most confident.

As described in Section VI.B of the preamble, there is a robust and comprehensive amount of scientific evidence spanning animal toxicological, controlled human exposure, and epidemiologic studies that demonstrate that exposure to ambient PM is associated with a broad range of health effects, including premature mortality. The same is true for health effects associated with exposure to ambient ozone. The scientific literature regarding the health effects associated with exposure to ambient CO is far less robust and comprehensive. As presented in the January 2010 ISA for CO, the CO ISA concludes that a causal relationship is likely to exist only between short-term exposures to CO and cardiovascular morbidity. It also concludes that available data are inadequate to conclude that a causal relationship exists between long-term exposures to CO and cardiovascular morbidity. The evidence is suggestive of a causal relationship with both short- and long-term exposure to CO and central nervous system effects. The evidence is also suggestive of a causal relationship between short-term CO exposure and respiratory morbidity, and inadequate to conclude that a causal relationship exists between long-term exposure and respiratory morbidity. Finally, the CO ISA concludes that the epidemiologic evidence is suggestive of a causal relationship between short-term concentrations of CO and mortality. Taken together, the weight of evidence across study types (animal toxicological, controlled human exposure, and epidemiologic) and across different study models (single or multipollutant), supports that benefits from reductions in PM and ozone exposure are much larger than those associated with reductions of CO. However, if CO benefits could be monetized, we believe those benefits would complement the criteria pollutant analysis, instead of acting as a substitute, and would not change our evaluation of the GHG standards.

We also disagree with the same commenter's assertion that EPA's use of PM mortality-related estimates (based on Wu et al., 2020 and Pope III et al. 2019) are "undermined by uncertainty as to whether $PM_{2.5}$ is acting alone or as an indicator for other combustion-related pollutants" because they are not adjusted for confounding by co-pollutants such as CO. We note that EPA follows a systematic approach to identifying the studies and risk estimates most appropriate to inform a $PM_{2.5}$ benefit analysis for an RIA, and we take into consideration a number of minimum and preferred study attributes that include whether specified models from individual studies are single- or multi-pollutant, among many other factors.[1029] Clearly specifying criteria for identifying such studies helps ensure EPA transparently specifies its scientific judgement. These criteria are similar to those applied in previous EPA RIAs with the primary goal of identifying risk estimates that best characterize risk from $PM_{2.5}$ exposure among the total population located throughout the U.S.

The systematic approach led EPA to identify two studies that best characterize mortality risk across the U.S. (Wu et al., 2020 and Pope III et al., 2019). These two studies used data from two cohorts; an analysis of Medicare beneficiaries (Medicare) and the National Health Interview Survey (NHIS). For the Wu study (Medicare), EPA selected the results of a Cox proportional hazards model that adjusted for numerous individual-level and community-level confounders, and sensitivity analyses suggest that the results are robust to unmeasured confounding bias. For the Pope study (NHIS), EPA selected Hazard Ratio results calculated using the complex model for the subcohort, which controls for individual-level covariates including age, sex, race-ethnicity, inflation-adjusted income, education level, marital status, rural versus urban, region, survey year, BMI, and smoking status. The choice of these two estimates has undergone thorough public comment and expert review. Without further evidence provided by the commenter, we have not changed our approach to estimating $PM_{2.5}$ benefits based on the selection of the two estimates of premature mortality.

In response to the comment that EPA's assessment of benefits is overly conservative, we agree that the $PM_{2.5}$ -related benefit-per-ton approach to monetizing the benefits of pollution reduction attributable to the proposal is a conservative estimate of criteria pollutant benefits. In addition to not being able to monetize the benefits related to reductions in ozone, we also are unable to quantify benefits associated with reduced exposure to ambient NO_2 and other air pollutant reductions, such as air toxics, using this approach. However, as stated above, EPA's consistent practice has been to set standards to achieve improved air quality consistent with CAA section 202, and not to rely on cost-benefit calculations, with their uncertainties and limitations, in identifying the appropriate standards. Nonetheless, our conclusion that total estimated benefits exceed total estimated costs of the final program reinforces our view that the GHG standards represent an appropriate weighing of the statutory factors and other relevant considerations.

Finally, we acknowledge that the BPT approach utilized by EPA has limited quantification of spatial impacts and agree that there is variability at the local scale. We appreciate the local-scale analyses that were submitted to the record, and we are continuing to consider how to better estimate the near-roadway air quality impacts of its regulatory actions and how those impacts are distributed across populations. The Agency continues to research highly resolved air quality data and intends to incorporate new methods and modeling techniques for national mobile source regulatory analyses after they become available.

[1029] Such attributes include estimated risks of population exposure to one or more pollutants across a variety of geographic locations, age groups, population attributes, methods for estimating exposure, $PM_{2.5}$ concentrations, time periods, study sizes, follow-up durations, as well as other attributes. See the following for full details regarding EPA's study selection criteria and benefits analysis methods: U.S. Environmental Protection Agency (U.S. EPA). 2023. Estimating $PM_{2.5}$- and Ozone-Attributable Health Benefits. Technical Support Document (TSD) for the PM NAAQS Reconsideration Proposal RIA. EPA-HQ-OAR-2019-0587.

22 Energy Security

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

Finally, EPA may be substantially overestimating the decrease in refinery emissions. The agency "assumed refinery activity decreases with decreased demand for liquid fuel from heavy-duty vehicles." 88 Fed. Reg. at 26,040. But at the same time, EPA "recognize[d] that there is significant uncertainty in the impact reduced fuel demand has on refinery emissions." Draft RIA at 327. "If refineries do not decrease production in response to lower domestic demand" and "increase exports instead," then the agency "would project no emission reductions from refineries" rather than the ones they include in their analysis. Id. (emphasis added); see also id. at 345, 350. EPA must explain the basis for its assumption that refineries will decrease production before it factors these sizeable reductions into the calculation. See Int'l Harvester Co., 478 F.2d at 645 (explaining that EPA must "support its methodology as reliable" with more than "speculation"). [EPA-HQ-OAR-2022-0985-1660-A1, p. 60]

Organization: American Petroleum Institute (API)

e. Energy Security

i. Support energy security through production of U.S. energy

U.S. energy security would also undergo a dramatic paradigm shift if vehicle technologies were shifted from ICEVs to ZEVs in the exponential rate that the proposal would likely entail. The U.S. would move from being energy secure to being dependent largely upon foreign sources for the minerals needed to make ZEV technologies such as batteries. [EPA-HQ-OAR-2022-0985-1617-A1, p. 13]

We also have concerns with the methodology EPA uses to estimate energy security benefits which were originally developed by Oak Ridge National Laboratory's (ORNL) 2008 study entitled, "The Energy Security Benefits of Reduced Oil Use, 2006-2015" (Draft RIA Section 7.3.5). We believe that portions of this methodology are outdated and are no longer applicable given the current structure of global oil markets. [EPA-HQ-OAR-2022-0985-1617-A1, p. 15]

In ORNL's study, a significant portion of the estimated security premium is the potential reduction of "the transfer of U.S. wealth to foreign producers" which "can lead to macroeconomic contraction, dislocation, and GDP losses" during an oil supply disruption. In 2008, when ORNL calculated energy security premiums, net U.S. crude and product imports were over 50 percent of U.S. liquid petroleum consumption. However, since ONRL's calculations the U.S. has become, and is projected to be, a net oil and product exporter, thus an increase in global oil prices would likely lead to a net transfer of wealth to the U.S. not away from it. Without modifications that account for the transfer of wealth to the U.S. during a supply disruption, EPA's calculated energy security premium estimates are likely overstated and not meaningful. [EPA-HQ-OAR-2022-0985-1617-A1, p. 15]

Furthermore, EPA's analysis assumes that lower domestic fuel demand, due to increased usage of HD ZEVs, will result in reduced refinery throughput. However, this assumption may not hold true as the U.S. has emerged as a major player in the global market for refined products, actively exporting significant quantities. While the EPA assumes that a gallon of reduced domestic demand would reduce net crude and product imports by 0.864 (Draft RIA Section 6.5), their assumption fails to consider the possibility that refinery throughput could remain steady while the U.S. simultaneously increases its exportation of refined products. [EPA-HQ-OAR-2022-0985-1617-A1, p. 14]

EPA justifies its assumption that imports will fall 86.4 percent by comparing the AEO 2022 Reference case with the AEO 2022 Low Economic Growth case. This comparison is not suitable for drawing these conclusions because in the Low Economic Growth case, U.S. refined product exports are lower compared to the Reference Case, suggesting a decline in global demand for refined products. Regardless of the assumption's merits, the EPA doesn't explicitly state, in its regulatory impact analysis, that the reduced global demand for refined products is, in part, an assumption based on the forecasts EPA uses for its analysis and not attributable to its regulation. [EPA-HQ-OAR-2022-0985-1617-A1, p. 14]

Organization: Chevron

While EPA addresses the potential for reduced petroleum imports, the heavy-duty proposal does not address the potential for biofuel use to create energy security benefits. EPA should consider options to reduce the nation's dependence on a single transportation energy resource infrastructure while it supports a reliable and affordable decarbonization plan for transportation. EPA can support the use of diversified fuels in the nation's transportation fleet and decrease GHG emissions in support of nationwide GHG reduction goals. [EPA-HQ-OAR-2022-0985-1552-A1, p.5]

Organization: Clean Fuels Development Coalition et al.

Even by its own logic, EPA's rule fails because it fails to account for decreased energy security owing to an increased demand for natural gas, which currently makes up 40 percent of our grid's electricity generation. This share—or at least the volume of energy generated—will need to grow dramatically to make up for the increased electricity demand.14 [EPA-HQ-OAR-2022-0985-1585-A1, p. 36.]

14 Of course, "[t]he United States is [also] the leading producer of natural gas," and so increasing reliance on natural gas does little to move the needle on energy security. C. Boyden Gray, American Energy, Chinese Ambition, and Climate Realism, 4 American Affairs Journal (Winter 2021), https://americanaffairsjournal.org/2021/11/american-energy-chinese-ambition-and-climate-realism/. But if the proposal intends to count decreases in petroleum in its favor it is completely unreasonable to ignore the concomitant increases in natural gas consumption.

Organization: Electrification Coalition (EC)

We urge this Administration to adopt the strongest policy that will accelerate our path to transportation electrification. [EPA-HQ-OAR-2022-0985-1558-A1, p. 2]

The national and economic security concerns that persist from our nation still exposed to a global oil market characterized by volatility and instability are critical to consider when considering a regulation such as the EPA's Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3. The U.S.'s exposure is most recently exemplified by the global ramifications of Russia's invasion of Ukraine in February 2022, and of Russia's willingness to use petroleum resources as a weapon, which sent oil prices to their highest point since 2008.1 Despite the U.S.'s increased prominence in the world's oil markets – which includes a roughly six-fold increase in oil exports between 2015 and 2019 – the oil market is only as strong as its weakest links, which the U.S. must expend considerable resources to defend to minimize market disruptions. More broadly, the nation's costs to protecting the flow of oil includes the roughly $81 billion spent annually by the U.S. taxpayer – which proportionally represents 16 percent of the current defense budget – but also less quantifiable losses of global strength and leadership and distorted American diplomacy goals which must prioritize the global flow of oil.2 [EPA-HQ-OAR-2022-0985-1558-A1, p. 2]

1 https://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm

2 http://safe2020.wpenginepowered.com/wp-content/uploads/2020/09/The-Commanding-Heights-of-Global-Transportation.pdf

In short, the underlying factors that led to record oil prices in 2008 and 2022 have not substantially changed, nor will they in the future as there are additional influencing factors for the global oil market. These influencing factors include a growing demand for oil from emerging markets, geopolitical instability that causes global oil shocks, market manipulation across many oil-producing nations, limited access to reserves owned by national oil companies, and the higher cost of production of fields that are available to international oil companies. While oil has facilitated the rise of the modern era, these persistent national and economic security threats indicate it is past time to shift to a better, more stable fuel source: electricity. [EPA-HQ-OAR-2022-0985-1558-A1, pp. 2-3]

To mitigate the impacts of climate change and to reduce national and economic security threats, the U.S. needs a solution that will decarbonize our economy, reduce dependence on oil and position the U.S. to maintain our status as a global leader in a new economy that is based on minerals. The shift to electricity as a fuel, also called transportation electrification, is the solution to this triad of concerns. [EPA-HQ-OAR-2022-0985-1558-A1, p. 3]

For these reasons, while the proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 does not require that vehicle manufacturers make EVs, the adoption of the strongest possible proposal would significantly limit the greenhouse gas emissions from diesel vehicles and force them to be cleaner, bringing the market for these diesel vehicles to the tipping point and thereby accelerating the adoption of EVs. The EPA forecasts that the proposed rule would lead to 35-57% of new sales of HD vehicles being zero-emission (electric) in 2032, depending on the vehicle type. In terms of national and economic security impacts, the EPA also notes that adoption of the strongest proposal could lead to $12 billion in benefits due to reductions in energy security externalities cause by U.S. petroleum consumption and imports.5 Therefore, the EC supports the adoption of the strongest possible proposal, as it will accelerate the adoption of EVs in the HD sector. [EPA-HQ-OAR-2022-0985-1558-A1, p. 3]

5 See page 25937 of the Environmental Protection Agency's (EPA) proposed rule for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3 in the Federal Register: https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf

Organization: Moving Forward Network (MFN)

We agree with EPA's conclusion that vehicle electrification, including the electrification of heavy, medium, and light-duty fleets, will not lead to energy security risks or dependence on foreign imports in the U.S., but will instead provide the potential for a low impact and domestic energy supply. 88 Fed. Reg. at 25962.

Organization: National Association of Convenience Stores, NATSO and SIGMA

The Agency's stated goal of reducing GHG emissions is best achieved by allowing the market to gravitate towards EVs as technology allows. Sound policy is grounded in science and recognizes that the state of technology can change rapidly. That is why incentives for alternative fuel technologies should be tied to those technologies' lifecycle environmental attributes rather than the underlying technology itself – which is the result of an exclusive focus on tailpipe emissions. No one solution will decarbonize transportation energy. The best solution today may be surpassed by subsequent ingenuity and innovation. Mandating a specific technology will ultimately only stifle innovation and progress. It also undermines energy security. [EPA-HQ-OAR-2022-0985-1603-A1, p. 2]

Organization: Valero Energy Corporation

3. EPA's action would undermine the Renewable Fuel Standard and Congress' goals for renewable fuels and energy security.

EPA's proposal and ZEV sales mandate are also inconsistent with the broader statutory scheme and Congress's plan for tackling climate change. When Congress sought to address greenhouse-gas emissions from the transportation sector, it did so by promoting renewable liquid fuels, which are used in conventional vehicles and which—unlike electric-vehicle components—are in abundant domestic supply. See, e.g., Inflation Reduction Act of 2022, Pub. L. No. 117-169. §§ 13202, 13404, 22003, 136 Stat 1818, 1932, 1966-69, 2020 (2022). Indeed, Congress has consistently legislated against the background expectation that conventional vehicles powered by liquid fuels will remain on the market. [EPA-HQ-OAR-2022-0985-1566-A2, p. 70]

The Clean Air Act also includes the Renewable Fuel Standard (RFS) program, which "requires that increasing volumes of renewable fuel be introduced into the Nation's supply of transportation fuel each year." Americans for Clean Energy v. EPA (ACE), 864 F.3d 691, 697 (D.C. Cir. 2017). Two goals animate the RFS: (1) to "move the United States toward greater energy independence and security," and (2) to "increase the production of clean renewable fuels." Id. (quoting Pub. L. No. 110-140, 121 Stat. 1492, 1492 (2007)). To these ends, "Congress ordained the inclusion of 4 billion gallons of renewable fuel in the Nation's fuel supply" for calendar year 2006, and required that, "[b]y 2022, the number will climb to 36 billion gallons." HollyFrontier Cheyenne Refining, LLC v. Renewable Fuels Ass'n, 141 S. Ct. 2172, 2175 (2021). [EPA-HQ-OAR-2022-0985-1566-A2, p. 70]

In other words, through the RFS, which is also in the Clean Air Act, Congress mandated that "fuel sold or introduced into commerce in the United States" must contain increasing shares of renewable fuels and specifically increasing shares of advanced biofuel, cellulosic biofuel, and biomass-based diesel. 42 U.S.C. § 7545(o)(2)(A)(i). For these fuels, Congress called for not simply a percentage of the fuel market but mandated a minimum volume of biofuel in the market. The proposed HDV standard, on the other hand, would reduce the use of renewable fuels, particularly renewable diesel and other advanced biofuels, cellulosic biofuels, and biomass-based diesel, and make it impossible to meet the mandates of the RFS. EPA is thus working at cross-purposes with Congress, which has required a move toward increases in liquid renewable fuels at the same time that EPA is seeking to eliminate vehicles that use such fuels. Congress has never mandated, nor authorized, that EPA issue regulations to phase out the use of liquid fuels. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 70 - 71]

The congressional intent underlying these mandated obligations under the RFS was to incentivize liquid fuels with lower lifecycle greenhouse gas emissions. For example, renewable diesel generates credits under the RFS, whereas traditional diesel generates an obligation. Here, however, treating renewable diesel and traditional diesel the same—giving no recognition of or benefit to manufacturers based on use of liquid fuels with lower lifecycle greenhouse gas emissions—underscores EPA's failure to read its statutory authority as a whole and emphasizes the conflict between the proposal and the RFS. [EPA-HQ-OAR-2022-0985-1566-A2, p. 71]

Congress also cited national energy security as one of the primary reasons for implementing the RFS. In the proposal, EPA deigns to resolve energy security concerns by reducing use of liquid fuels without accounting for the impact on renewable fuels. EPA has also not adequately accounted for increased energy security risks associated with battery production and use in the transportation of the nation's commerce and in all the industries that use HDVs. See supra at XX. [EPA-HQ-OAR-2022-0985-1566-A2, p. 71]

With no apparent recognition that its proposed vehicle standards will reduce consumption of both nonrenewable and renewable fuels, EPA continues to mandate increasing volumes of renewable fuels consistent with its mandates under the RFS, proposing a 2.05 billion gallon increase in all renewable fuels by 2025 in its proposed "RFS Set" rule.254 [EPA-HQ-OAR-2022-0985-1566-A2, p. 71]

254 85 FR 80582 (December 30, 2022).

When proposing rules to implement the phase-out of liquid fuels, a foundational issue to address is the impact(s) of numerous refinery shutdowns. In the proposed EV rules, EPA takes credit for reduced emissions from oil production and refinery operation and places points on the positive ledger for energy security in dollar amounts as a result of reduced reliance on oil. But EPA does not account for the loss of jobs or other impacts related to refinery shutdowns, reduced renewable fuel production, and the loss of liquid fuel supplies. [EPA-HQ-OAR-2022-0985-1566-A2, p. 46]

Finally, as discussed in detail below, EPA must consider the consequences of reduced demand for and production of renewable fuels such as renewable diesel and biodiesel. By phasing out the vehicles that consume these fuels, the proposed rule stands in direct conflict to EPA's statutory obligations under the Energy Independence and Security Act of 2007 (EISA), which was designed to reduce greenhouse gas emissions from the domestic transportation sector while enhancing energy security by promoting increased volumes of renewable fuel production, including a requirement that EPA provide for specific minimum volumes of advanced biofuel (including renewable diesel) and biomass-based diesel from 2022 onward. In response to the incentives created by the RFS as well as state programs like the California Low Carbon Fuel

Standard, Valero as well as some of our competitors have responded by investing heavily in renewable fuel production capacity. EPA must consider the chilling effect the proposed action will have on production of renewable diesel and biodiesel and the corresponding loss of jobs in the agricultural and fuel production sectors. [EPA-HQ-OAR-2022-0985-1566-A2, p. 47]

230 42 U.S.C. § 7545(o)(2)(B)(iii),(v).

Organization: Zero Emission Transportation Association (ZETA)

As EPA notes in the proposed rule, the Phase 3 HD GHG standards would reduce U.S. oil imports by 4.3 billion gallons through 2055, meaning American consumers would be more insulated from foreign geopolitical turmoil and associated oil price volatility. Mark Zandi, chief economist at Moody's, has noted that fossil fuels were a major cause of every period of inflation since World War II, stating that "every recession since World War II has been preceded by a jump in oil prices."26 As discussed further below, reducing exposure to such volatility through freight sector electrification may have the additional effect of stabilizing consumer product costs, as these are often heavily affected by transportation fuel costs.27 [EPA-HQ-OAR-2022-0985-2429-A1, p. 8]

26 "Fight climate change. End fossilflation. Here's how." Vox, (August 12, 2022) https://www.vox.com/science-and-health/2022/8/12/23290488/fight-climate-change-end-fossil-fuel-inflation American Free Enterprise Chamber of Commerce (AmFree) et al.

27 Melodia, Lauren; Karlsson, Kristina. 2022. 'Energy Price Stability: The Peril of Fossil Fuels and the Promise of Renewables.' Roosevelt Institute. Accessed May 24, 2023. https://rooseveltinstitute.org/wpcontent/uploads/2022/05/RI_EnergyPriceStability_IssueBrief_202205.pdf

EPA Summary and Response:

Summary:

Two commenters (American Petroleum Institute, American Free Enterprise Chamber of Commerce et al.) suggested that even with the reduced refined product demand as a result of the proposed rule that EPA estimated in the proposal, U.S. petroleum refinery throughput could be maintained. According to the commenters, the U.S. could instead increase its exportation of refined oil products to offset the decline in U.S. refined oil products consumption resulting from this rule. If the U.S. increases its exports of refined products instead of reducing refinery throughput, EPA's estimates of changes in U.S. net oil imports from this rule may be inaccurate, according to one of the commenters. Different estimates about U.S. net oil imports from this rule would, in turn, influence EPA's estimates of the energy security benefits of this final rule.

Response:

After carefully reviewing comments on refinery throughput for the proposed rule and after consultation with DOE and NHTSA, EPA is updating its assessment of the impact of this final rule on U.S. refinery throughput and, in turn, the impacts on net imports of oil and refined oil. In brief, in the proposal we estimated that the reduction in demand for refined oil arising from the proposal would correspond to an equivalent reduction in refinery throughput. In our final rule analysis, we instead estimate that, of the estimated reduction in demand for refined oil, half (50 percent) corresponds with decreased refinery throughput, while increases in refined product exports (i.e., a decline in net refined product imports) account for the other half (50 percent). In other words, refinery throughput is assumed to decrease by half of the reduction in demand for refined oil. We also looked at an additional case as a sensitivity analysis in RIA Chapter 4.9, where, of the estimated reduction in demand for refined oil, 20 percent corresponds with decreased refinery throughput while increases in product exports account for 80 percent. See Section 13 of this RTC document and Chapter 4.2.5 of the RIA accompanying the final rule for more discussion of how EPA updated its refinery throughput assumptions from the proposal and, in turn, updated the estimated air quality impacts from refinery emissions of the final rule under the modeled potential compliance pathway.

The above-described updates to EPA's refinery throughput assumptions influence EPA's estimate of the net oil import reductions and, in turn, EPA's energy security analysis for the final rule. In the proposed rule, EPA used an oil import reduction factor based on a comparison of two AEO 2022 cases to estimate how changes in U.S. refined product demand from the proposal would influence net U.S. oil imports. For the proposed rule, EPA used an oil import reduction factor of 86.4 percent. In other words, for every gallon of petroleum consumption reduced as a result of the proposal, EPA estimated that net U.S. oil imports (including crude oil and refined oil) would be reduced by 0.846 gallons.

However, for the final rulemaking, as we briefly described earlier in this response, we estimated that U.S. refineries will not reduce their throughput to the same extent and would instead increase exports of refined oil. Thus, for the final rulemaking, we needed to update how we estimated the impacts of the rule on net U.S. imports of oil. This revised analysis is described in detail in RIA Chapter 7.3.4. In short, by assumption, half of decreased U.S. refined oil demand corresponds with maintained refinery throughput and increased refined product exports (i.e., decreased refined product imports). For the reduction in refinery throughput (corresponding with the other 50 percent of reduced U.S. demand), we use an oil import reduction factor of 89.6 percent, calculated using the equivalent methodology used in the proposal, but based on AEO 2023 cases. The combined oil import reduction factor is calculated as:

$$(0.5 * 1.00) + (0.5 * 0.896) = 0.948$$

i.e., the combined effective oil import reduction factor for the final rule is 94.8 percent. In summary, we have revised our analysis after consideration of the commenters' claim that declines in U.S. refined oil products consumption would be offset, at least in part, by U.S. exports. This results in a higher oil import reduction factor in the final rule than in the proposal. The higher import reduction factor results in greater energy security benefits per gallon of decreased refined oil demand in the final rule.

Summary:

One commenter (American Petroleum Institute) raised concerns that the Oak Ridge National Laboratory (ORNL) oil security premium estimates that EPA used in the proposed rule are too high. The commenter stated that, thus, the estimated energy security benefits of the proposed rule were overstated and not meaningful. More specifically, this commenter suggested that the energy security methodology developed by ORNL entitled, *Estimating the Energy Security Benefits of Reduced U.S. Oil Imports* (2008), is outdated and no longer applicable to the current structure of global oil markets.[1030] When the oil security premium methodology was developed, net U.S. crude oil and refined product imports were roughly 50 percent of U.S. petroleum consumption, according to the commenter. The commenter stated that currently the U.S. is, and is projected to continue to be, a net crude oil and refined product exporter. The commenter stated that since a significant portion of the estimated oil security premium is the transfer of U.S. wealth to foreign producers resulting in GDP losses during an oil supply shock, wealth transfers have been reduced since the U.S. is now a net crude oil and refined products exporter, which should lower the oil security premium estimates.

Response:

The commenter fundamentally misunderstands the ORNL model as well as how EPA is applying it in this final rule. The ORNL model is a flexible economic model that allows for changes in input parameters to account for the kinds of changes the commenter is describing. Specifically, the ORNL model accounts for the fact that the U.S. is a net crude oil and refined product exporter, which reduces the oil security premium estimates used in both the proposal and final rule. The ORNL model also accounts for other key changes, such as oil price responsiveness and U.S. GDP sensitivity, to accurately model oil security premiums and energy security benefits. We further explain each of these points below.

The ORNL energy security model used to estimate oil security premiums in this rule is structurally the same version of the model described in the 2008 documentation cited by the commenter. However, as described below and in RIA Chapter 7.3, assumptions and data used to parameterize the ORNL model have been updated for the energy security analysis in this rule. These updates represent the U.S.'s current position with respect to petroleum and refined product exports and several other developments in oil markets since 2008.

The ORNL energy security methodology calculates oil security premiums based upon the macroeconomic disruption/adjustment import costs, which are numerically estimated with a compact model of the oil market by performing simulations of market outcomes using probabilistic distributions for the occurrence of oil supply shocks, calculating marginal changes in economic welfare with respect to changes in U.S. oil import levels in each of the simulations, and summarizing the results from the individual simulations into a mean and 90 percent confidence intervals for the oil security premium estimates. The macroeconomic disruption/adjustment import cost component is the sum of two parts: the marginal change in expected import costs during disruption events and the marginal change in gross domestic product due to the macroeconomic disruption of an oil supply shock.

The ORNL energy security model was peer reviewed in March 2008 before it was utilized in EPA rules.[1031] EPA's use of the ORNL energy security model underwent public comment and

[1030] Leiby, P., *Estimating the Energy Security Benefits of Reduced U.S. Oil Imports: Final Report*. March 2008. Oak Ridge National Laboratory. ORNL/TM-2007/028.

[1031] Transmittal of the Peer Review Document and Peer Review Comments Document, both in support of the Oak Ridge National Laboratory Report, "*Estimating the Benefits of Reduced U.S. Oil Imports*", March 2008. ORNL/TM-2007/2008.

review in the HD GHG Phase 1 rule in 2011.[1032,1033] While the ORNL model structure is unchanged since the HD GHG Phase 1 rule, ORNL has regularly updated data and other quantitative inputs to the model to account for new and emerging oil market trends. ORNL estimates revised oil security premiums based upon the most recent Annual Energy Outlooks (AEOs), which were used in support of each of the HD vehicle rulemakings undertaken by EPA. As the U.S. has gone from a net importer to a net crude oil and refined product exporter, as noted above, the oil security premiums have steadily declined over the timeframe of the different EPA HD vehicle rules, in part due to this evolving oil market trend. The value of the oil security premium remains positive because of its GDP disruption cost premium component. It continues to hold that a reduction in U.S. imports results in a lower amount of "at risk" oil supply susceptible to disruption and mitigates the price increase during a supply shock and the resulting GDP losses. Moreover, a decrease in oil imports partly results in a decrease in consumption, and the GDP losses with respect to the disrupted oil price decrease with reductions in the level of oil consumption.

In addition, two key parameters that influence the size of the impacts of oil supply disruptions on U.S. GDP have been updated since the ORNL model was first used in the EPA's HD GHG Phase 1 rule in 2011.[1034] The first parameter updated is the oil price responsiveness (i.e., the short-run price elasticity of demand for oil). In the HD GHG Phase 1 rule, EPA used a short-run price elasticity of demand for oil of –0.045. In the proposed and final HD GHG Phase 3 rule, we used a short-run elasticity of demand for oil of –0.07, a 56 percent increase (in absolute value) compared to the value used in the HD GHG Phase 1 rule. The effect of the increase in the short-run price elasticity of demand is to lower the impacts of an oil price shock on U.S. GDP. It is thought that consumers of oil in the U.S. are likely to be more responsive and consume less oil when the price of oil rises than previously estimated in the older version of the ORNL model.

The second parameter that has been updated is the U.S. GDP sensitivity (i.e., the elasticity of GDP to an oil price shock) discussed above. This parameter has been updated to be more inelastic, i.e., there is less sensitivity of U.S. GDP to an oil price shock. In other words, for a given oil price shock, there will be a smaller loss of U.S. GDP. In the HD GHG Phase 1 rule, EPA used an elasticity of U.S. GDP to an oil shock of –0.032. For the proposal and this final HD GHG Phase 3 rule, we used an elasticity of U.S. GDP with respect to an oil price shock of –0.021, a 34 percent reduction (in absolute value) compared to the value used in the HD GHG Phase 1 rule. The paper by Oladosu et al., *Impacts of oil price shocks on the U.S. economy: a meta-analysis of oil price elasticity of GDP for net oil-importing economies*, provides the basis for the

[1032] Final Rulemaking to Establish Greenhouse Gas Standards and Fuel Efficiency Standards for Medium-Heavy-Duty Engines and Vehicles, Regulatory Impact Analysis, Office of Transportation and Air Quality, U.S. EPA, and National Highway Traffic Safety Administration, US DOT, EPA-420-R-11-901. August 2011.
[1033] We are generally retaining and did not reopen EPA's use of the ORNL energy security model in EPA's HD vehicle rulemakings. We provide the following description of the model and previous updates for background and informational purposes, and to respond to commenters, only.
[1034] Ibid.

updated GDP elasticity.[1035] Thus, for an equivalent oil price shock, there will be less adverse impacts on the U.S. economy than with the older version of the ORNL model.

A variety of developments over the last decade are thought to have reduced the impacts of oil shocks on the U.S. economy. First, the U.S. is less dependent on imported oil than in the early 2000s due in part to the "fracking revolution" (i.e., increased U.S. production of tight/shale oil), and to a lesser extent, increased U.S. production of renewable fuels such as ethanol and biodiesel. As the commenter noted, the increase in U.S. tight oil production, and the resulting expansion of the U.S.'s net oil export position over roughly the last decade, has resulted in less of a wealth transfer from the U.S. to foreigners during an oil price shock, lowering the oil security premium. In addition, it is thought that the U.S. economy is more resilient to oil shocks than in the earlier 2000s timeframe because of increased global financial integration and greater flexibility of the U.S. economy (especially labor and financial markets). In summary, EPA believes that the updates used in this rulemaking in the ORNL model account for concerns raised by the commenter in this rule.

Summary:

Two commenters (Valero, Chevron) suggested that since the proposed rule promotes the wider use of electric vehicles, it limits the potential for liquid renewable fuels (i.e., biofuels) to create energy security benefits. According to the commenters, the greater use of biofuels can diversify the U.S.'s HD vehicle fuel use and is consistent with decreasing GHG emissions as well as energy security goals. The commenters suggested that the EPA should also consider more options to reduce the U.S.'s dependence on a "single transportation energy resource structure" to support GHG reductions from HD vehicles. The reduction in the dependence on a "single transportation energy structure" would lead to energy security benefits, according to the commenters. One commenter (Valero) suggested that the proposed rule focuses on the promotion of electric vehicles at the expense of liquid fuels and will therefore make it more difficult to meet the renewable fuel mandates of the Renewable Fuel Standards (RFS). The commenter stated that when the U.S. Congress created the RFS program by passing the Energy Independence and Security Act of 2007 (EISA), one of its goals was to promote U.S. energy security and energy independence. Thus, according to this commenter, the proposed HD GHG Phase 3 rule is at odds with the Congressional intent of the RFS requiring renewable fuels to achieve U.S. energy security and independence objectives. In addition, one commenter (Valero) suggested that EPA accounts for the energy security impacts of reduced U.S. oil consumption from this proposed rule but does not consider the impacts of the proposed rule on refinery shutdowns in the U.S., which would reduce the U.S.'s energy security.

Response:

As explained in preamble Section II.G, EPA is setting the final Phase 3 standards under our CAA section 202(a)(1)-(2) authority. EPA also evaluated the impacts of the final HD GHG standards on energy, in terms of oil conservation and energy security through reductions in fuel consumption. EPA considers this final rule to be beneficial from an energy security perspective and thus this factor is considered to be a supportive and not constraining consideration.

[1035] Oladosu et al., *Impacts of oil price shocks on the U.S. economy: a meta-analysis of oil price elasticity of GDP for net oil-importing economies*, Energy Policy, 2018.

EPA agrees with the commenters that use of renewable fuels can further the U.S.'s energy security and energy independence when use of those fuels results in reduced consumption and reduced net imports of petroleum. A reduction of U.S. petroleum consumption and imports reduces both financial and strategic risks caused by potential sudden disruptions in the supply of imported petroleum to the U.S., thus increasing the U.S.'s energy security. Also, the wider use of renewable fuels increases the U.S.'s energy independence, since most renewable fuels are expected to be almost exclusively produced in the U.S. We also note that renewable fuels also may have some energy security risks, for example, as a result of weather-related events (e.g., droughts). The energy security risks associated with the use of renewable fuels are not well-studied.

All energy sources, including petroleum-based fuels and renewable biomass-based fuels, have associated potential energy security risks that depend on their domestic availability, price volatility, and the regionality and global integration of their markets and associated vulnerabilities to market disruption events. However, EPA is aware of robust quantitative methods for estimating energy security benefits of reductions in petroleum use only; we are not aware of any published estimates of the energy security risks associated with increased use of renewable fuels. Thus, in this final rule we are not able to quantify any potential energy security risks associated with use of non-petroleum-based fuels in our method of estimating energy security impacts. In general, however, we consider the energy security risks of renewable fuels to be lower than petroleum-based fuels because they are less likely to have supply disruptions and include a diversity of energy sources.

EPA most recently addressed the issue of the role that renewable fuels can play in reducing GHG emissions in the U.S. transportation sector in the recently finalized Renewable Fuel Standard rule, i.e., the RFS Set Rule. On June 21st, 2023, EPA announced this final rule to establish biofuel volume requirements and associated percentage standards for cellulosic biofuel, biomass-based diesel, advanced biofuels, and total renewable fuel for the 2023–2025 timeframe.[1036]

Additionally, EPA disagrees with the commenter regarding their claims on the interaction of this final rule with the RFS program. First, as we explain further in RTC Section 2, Congress specifically determined that the RFS provisions do not limit EPA's authority to regulate GHGs under any other provision of the Clean Air Act, including section 202(a)(1).[1037] Second, the recently finalized RFS Set Rule and the final HD GHG Phase 3 rule are complimentary in achieving GHG reductions in the U.S. transportation sector. The RFS Set rule is relevant to renewable fuel volumes in the 2023–2025 timeframe, and this final rule sets GHG emissions standards for HD vehicles in the 2027–2032 timeframe. As a result, the RFS Set rule and the HD

[1036] Renewable Fuel Standard (RFS) Program: Standards for 2023–2025 and Other Changes. Federal Register / Vol. 88, No. 132 / Wednesday, July 12, 2023.

[1037] Notwithstanding the savings clause noted above, to the extent the RFS statute is of any relevance, we think it clearly is consistent with this rulemaking. For years after 2022, Congress conferred significant discretion on the Administrator to establish the standards based on his analysis of various factors. Congress mandated only a single numeric floor for renewable fuel use: the requirement that the minimum volume of biomass-based diesel (BBD) be not less than one billion gallons. CAA section 211(o)(2)(B)(v). This requirement can be met by BBD used in any kind of transportation fuel, including fuel used in motor vehicles, nonroad vehicles, jet fuel, and home heating oil. The commenters did not explain with any specificity how the proposed standards would be an impediment to meeting the one-billion-gallon statutory floor for BBD.

GHG Phase 3 rule's GHG emissions standards do not have overlapping timeframes. We also note that the commenter did not provide any supporting information or analysis for their claim that the proposed standards would result in lower consumption of biofuels. Finally, any impacts of the increasing use of advanced vehicle technologies, including BEV technologies, in U.S. vehicle fleets on renewable fuel volumes can be taken into consideration in future RFS rules under the RFS program. Both programs, vehicle standards and renewable fuel standards, are critical to meeting our nation's GHG goals.

We project that this final rule results in a steady, gradual reduction in the demand for petroleum-derived fuels from new HD vehicles in the U.S. through the timeframe of analysis of the rule, 2027-2055. Yet we also project and anticipate that there will be significant, ongoing need for petroleum-derived fuels in the U.S. through 2055. Sources of petroleum-derived fuel demand in the U.S. include: new and existing gasoline- and diesel-powered passenger vehicles, new and existing gasoline- and diesel-powered heavy-duty vehicles, new and existing gasoline- and diesel-powered nonroad vehicles, and fuels for use in the aviation sector of the U.S. economy. Also, as explained in an earlier response in this section of the RTC document, EPA estimates that the U.S. will likely increase its exports of refined products as a result of this final rule, so refineries will continue to operate at a fairly high level, even with the decreases in the demand for refined products.[1038]

As discussed in Chapter 6.4 of the RIA, we are unable to estimate the future decisions of refineries to keep operating, shut down or convert away from fossil fuels because that analysis would depend on the economics of individual refineries, economic conditions of parent companies, long-term strategies for each company, and on the larger macroeconomic conditions of both the U.S. and the global refinery market. Therefore, we are unable to estimate the possible effect this rule will have on employment in the petroleum refining sector. However, because the petroleum refining industry is material intensive and not labor intensive, and we estimate that only part of the reduction in liquid fuel consumption will be met by reduced refinery production in the U.S., we expect that any employment effect due to reduced petroleum demand from this rule will be small.

Summary:

One commenter (Clean Fuels Development Coalition et al.) suggested that the proposed rule does not address the U.S. energy security impacts of the greater use of natural gas in the U.S. electricity sector stemming from the wider use of electric HD vehicles from the proposed rule.

Response:

As discussed in RIA Chapter 4.2.4, EPA used the IPM model to assess the impacts of this rule on U.S. electricity generation. In the IPM modeling, natural gas use for electricity generation declines by roughly 52 percent between 2028 and 2050 in the reference (no action) case, and 49 percent in the central case, representing the standards in the final rule.[1039] In other words, over

[1038] For context, the projected effect of the final rule on refinery throughput in 2055 is roughly 1.3 percent of U.S. refinery throughout in 2023.

[1039] Because of the lead times necessary to complete our IPM modeling for the final rulemaking analysis, it was necessary to run IPM on interim versions of the reference (no action) and central cases which we expect overestimate the impact of the final standards on energy demand. Therefore, these estimates of increased use of natural gas should be considered conservative; an updated IPM analysis aligned with the final standards would be the timeframe assessed in this rule and in either case, use of natural gas for electricity generation is projected to decline substantially in both absolute and relative terms, due to projected expansion of alternative and renewable generation capacity.

The United States has been the world's largest producer of natural gas since 2011 and is a substantial net exporter of natural gas.[1040,1041] Proven U.S. reserves of natural gas substantially exceed projected U.S. demand in the coming decades, and are not expected to be a constraint on the ability of U.S. production to meet the marginally larger natural gas demand for electricity generation estimated to result from these standards in the IPM analysis.[1042]

The IPM analysis does not provide estimated impacts of the rule on U.S. trade of natural gas, and specific quantitative estimates of this potential effect were not readily available for our analysis of this rule. While the magnitude of the effect of the final rule on natural gas trade remains uncertain without additional energy sector modeling specific to the reference and central cases, some insight can be drawn from considering differences in natural gas use and trade in different Annual Energy Outlook scenarios. When we consider the difference in U.S. consumption and net imports of natural gas between the AEO 2023 Reference and Low Economic Growth cases – the two cases compared in EPA's methodology for estimating its oil import reduction factor (see RIA Chapter 7.3.4) – we calculate that cumulative differences in net imports (i.e., reduced net exports) account for only 18 percent of the cumulative difference in U.S. consumption of natural gas over the time period covered by the AEO (2022-2050).[1043] In other words, a significant portion – more than 80 percent – of marginal increases in U.S. demand for natural gas demand may be expected to be met by increased domestic (i.e., U.S.) production.

While the effect of this rule on trade of natural gas is uncertain, based on the current domestic production, exports, proven reserves, the projected decline in natural gas as a proportion of overall U.S. electricity generation, and trends seen in AEO cases discussed above, we expect that any increase in U.S. net imports of natural gas (i.e., decrease in net exports) will be small relative to the size of reduced oil consumption expected to result from this rule. Additionally, we are not aware of, nor has the commenter provided, a methodology sufficient to quantify the energy security risks associated with trade of natural gas. We note that natural gas markets are more regionally distinct than oil markets, meaning prices and potential disruptions of natural gas markets outside of North America are less correlated with price impacts on U.S. consumers.[1044] Thus, while we are not aware of existing estimates of probabilities of disruptions of North American natural gas supply – a necessary component of any extension of EPA's oil security premium methodology to natural gas – one might expect the probabilities of significant global

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expected to show a decline in natural gas use for electricity generation from 2028 to 2050 somewhere between 49 percent and 52 percent. The IPM modelling done for this final rule is described in RIA section 4.2.4.

[1040] U.S. Energy Information Administration (EIA). "Dry Natural Gas Production: International." Accessed January 23, 2024. Available online: https://www.eia.gov/international/data/world/natural-gas/dry-natural-gas-production.

[1041] U.S. Energy Information Administration (EIA). "Natural gas explained: Natural gas imports and exports." Last updated June 30, 2023. Available online: https://www.eia.gov/energyexplained/natural-gas/imports-and-exports.php

[1042] U.S. Energy Information Administration (EIA). "U.S. Crude Oil and Natural Gas Proved Reserves, Year-end 2021." December 30, 2022. Available online: https://www.eia.gov/naturalgas/crudeoilreserves/

[1043] U.S. Energy Information Administration (EIA). "Annual Energy Outlook 2023". March 16, 2023. Available online: https://www.eia.gov/outlooks/aeo/

[1044] U.S. Energy Information Administration (EIA). "Natural gas markets remain regionalized compared with oil markets." April 29, 2020. Available online: https://www.eia.gov/todayinenergy/detail.php?id=43535 events impacting U.S. natural gas supply to be relatively lower than the existing estimates for globally integrated oil markets. Lower disruption probabilities, all else equal, would result in lower potential energy security premia. In summary, while we are not able to quantify the potential energy security risks associated with an increased use of natural gas for electricity generation, for the reasons above, we believe these impacts would be relatively small when compared with the energy security impacts of decreased use and net imports of petroleum.

Summary:

Two commenters (Electrification Coalition, Moving Forward Network) recommended that EPA promote HD vehicle electrification since the wider use of electricity in the HD vehicle sector will result in energy security benefits for the U.S.

Response:

As explained throughout the Preamble and in RTC Section 2, this final rule establishes performance-based HD vehicle standards and does not require the use of any particular technology or compliance pathway. EPA agrees with the commenters to the extent that our analysis of the modeled compliance pathway for the final rule estimates that the use of BEV and FCEV technologies in HD vehicles will increase the U.S.'s energy security and energy independence by reducing the U.S.'s petroleum consumption and imports. A reduction of U.S. petroleum consumption and imports reduces both financial and strategic risks caused by potential sudden disruptions in the supply of imported petroleum to the U.S., thus increasing the U.S.'s energy security.

Summary:

Several commenters (National Association of Convenience Stores, National Association of Truck Stop Operators, SIGMA/America's Leading Fuel Marketers) suggested that EPA is undermining U.S. energy security by promoting electric HD vehicles in the proposed rule. Mandating a specific technology such as electric vehicles stifle's innovation and progress, according to the commenters.

Response:

As explained throughout the final rule Preamble and in RTC Section 2, this final rule establishes performance-based HD vehicle standards and does not require the use of any particular technology or compliance pathway. This final rule maintains the flexible structure created in the previous HD vehicle GHG rules, which is effectively designed to reflect the diverse nature of the heavy-duty vehicle industry. EPA expects manufacturers will choose to use a range of engine and vehicle technologies for compliance. These technologies will play an important role in reducing greenhouse gas emissions and in reducing U.S. oil consumption and U.S. oil imports. A reduction of U.S. petroleum consumption and imports reduces both financial and strategic risks caused by potential sudden disruptions in the supply of imported petroleum to the U.S., thus increasing the U.S.'s energy security.

23 Benefit-cost analysis

Comments by Organizations

Organization: American Free Enterprise Chamber of Commerce (AmFree) et al.

EPA projects that its overhaul of the heavy-duty-vehicle market would yield net benefits of approximately $320 billion and result in a net reduction of GHG emissions. 88 Fed. Reg. at 26,002–04, 26,082. As discussed below, however, EPA's assessments of the proposed rule's costs and benefits, its projection of the proposed rule's likely effects on GHG emissions, and many other aspects of the analysis accompanying the proposed rule are deeply flawed. [EPA-HQ-OAR-2022-0985-1660-A1, p. 8]

D. EPA's Cost-Benefit Analysis Is Seriously Flawed In Several Respects

EPA estimates that the proposed rule will have vast net benefits of approximately $320 billion, assuming a 3 percent discount rate. 88 Fed. Reg. at 26,082. This figure is the net of an estimated $56 billion in costs and $376 billion in benefits. Id. Yet EPA's process for arriving at these amounts contains several serious flaws, detailed below, that unduly inflate the rule's purported benefits and depress its costs. Where an agency conducts a cost-benefit analysis as part of the justification for a proposed rule, as EPA has here, serious flaws like these render the rule arbitrary and capricious. See Nat'l Ass'n of Home Builders v. EPA, 682 F.3d 1032, 1040 (D.C. Cir. 2012). [EPA-HQ-OAR-2022-0985-1660-A1, pp. 61 - 62]

Finally, "[a]gencies always bear the affirmative burden of examining a key assumption when promulgating and explaining a non-arbitrary, non-capricious rule." Hispanic Affs. Project v. Acosta, 901 F.3d 378, 389 (D.C. Cir. 2018) (quotation marks omitted). Yet here, EPA's analysis is peppered with unfounded assumptions that are nowhere justified nor accounted for in the proposed rule's breakdown of costs and benefits. To take just a few examples:

- EPA "assume[s] full pass-through of the IRA battery tax credit from the manufacturer to the purchaser." 88 Fed. Reg. at 26,030; see Draft RIA at 284.
- EPA "assume[s] that [electric vehicle supply equipment] costs are incurred by purchasers." 88 Fed. Reg. at 26,030.
- EPA "assume[s] that gasoline and CNG vehicles ha[ve] the same maintenance and repair costs curves as diesel vehicles." Id. at 26,034.
- EPA "expect[s] uncertainty related to [ZEV] technologies will diminish over time." Id. at 26,072. [EPA-HQ-OAR-2022-0985-1660-A1, p. 66]

Removing any one (or more) of these assumptions would have a substantial effect on EPA's cost-benefit analysis. For instance, if the first assumption is incorrect, and purchasers do not actually receive the pass-through benefit of the IRA battery tax credit, then they will have to pay significantly more for each vehicle than estimated in the rule—thus increasing the "cost" side of the equation. If the EPA is to proceed to a final rule, it must "justify" these and other assumptions in order to meet its duty to follow a reasoned decision-making process. Okla. Dep't of Envt'l Quality v. EPA, 740 F.3d 185, 192 (D.C. Cir. 2014) (citation omitted). [EPA-HQ-OAR-2022-0985-1660-A1, p. 66]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

5. EPA relies on an inadequate cost analysis.

EPA claims that the Proposed Rule will somehow result in $180 billion to $230 billion in net benefits, which represents a five-fold increase over the cost in vehicle technology and associated electric vehicle supply equipment (“ESVE”) required to meet the associated standards.112 As industry experts have asserted, “the derivation of these cost estimates is murky and fundamentally not credible,” especially as EPA’s estimate of the no-action alternative to which all other proposals are compared ignores the regulatory costs of the Administration’s current efforts to rapidly escalate electrification and automatically assumes that “American car buyers will suddenly drop their resistance to EVs.”113 [EPA-HQ-OAR-2022-0985-1659-A2, pp. 29 - 30]

112 88 Fed. Reg. at 25,937

113 Steven G. Bradbury, Distinguished Fellow, The Heritage Foundation, Prepared Statement for the hearing entitled “Driving Bad Policy: Examining EPA’s Tailpipe Emissions Rules and the Realities of a Rapid Electric Vehicle Transition,” before the Subcommittee on Economic Grown, Energy Policy, and Regulatory Affairs of the U.S. House of Representatives Committee on Oversight and Accountability, at 10 (May 17, 2023) available at https://oversight.house.gov/wp-content/uploads/2023/05/Bradbury-Prepared-Statement-for-17-May-2023-Oversight-Hearing.pdf

Organization: Center for Regulatory Effectiveness (CRE)

CRE Statements on Income Distribution in Rulemaking

The Bottom Line: (1) An analysis conducted pursuant to OMB Circular A-4 should include a disclosure of the “conventional “ B/C ratio and (2) A demonstration of positive net benefits, however defined, should be a necessary but not a sufficient condition for the adoption of a proposed rule until which time the said rule is included in a regulatory budget. A regulatory budget compels the disclosure of the opportunity cost of a decision rule. See the Opportunity Cost of Neglect in Public Policy and here. In addition there is ample evidence to suggest that decisions made pursuant to bounded institutions, such as the regulatory budget, yield superior results relative to unbounded institutions. [Jim Tozzi, Office of Information and Regulatory Affairs: Past, Present, and Future, 11 J. BENEFIT COST-ANALYSIS 1, 24–37 (2020); Yair Listokin, Bounded Institutions, 124 YALE L.J. 336, 367 (2014)] [EPA-HQ-OAR-2022-0985-1485-A1, p. 1]

A Related Link: Opportunity Cost Neglect in Public Policy [EPA-HQ-OAR-2022-0985-1485-A1, p. 1]

Out of Sight, out of Mind: How Opportunity Cost Neglect Undermines Democracy [EPA-HQ-OAR-2022-0985-1485-A1, p. 1]

Where Has The Economic Profession Been For The Past Fifty Years On Measuring Income Distribution In Rulemaking? [EPA-HQ-OAR-2022-0985-1485-A1, p. 1]

March 25, 2021 A Response to the Presidential Executive Order on Modernizing Centralized Regulatory Review [EPA-HQ-OAR-2022-0985-1485-A1, p. 1]

March 17, 2021 An In-Process Recommendation to the Biden Administration [EPA-HQ-OAR-2022-0985-1485-A1, p. 1]

Organization: Clean Air Task Force et al.

IV. Cost-Benefit Analysis Supports Stronger Emission Standards.

The health and environmental benefits from HDV GHG emission standards are extensive and warrant stronger overall standards. Commenters address EPA's accounting for the social cost of GHGs in its cost-benefit analysis in a separate comment letter by Institute for Policy Integrity et al. But while EPA calculates some of the benefits of its rule, it undercounts the climate and health benefits in several ways. First, EPA does not account for the rule's impact on upstream GHG emissions from refineries that produce fuel for combustion vehicles. Reductions in these emissions reflect greater benefits of a stringent rule. And accounting for these emissions reductions would treat fuel production for BEVs and combustion vehicles equally, which EPA's current cost-benefit analysis fails to do. Additionally, OMB is in the process of revisiting Circular A-4 for the first time in over 20 years. Its proposed revisions include a substantially lower default discount rate for calculating future benefits. EPA must account for this lower discount rate, either by using it in the final rule or by conducting sensitivity analyses using the proposed default discount rate if Circular A-4 has not been finalized. Making these changes to the benefits calculations for the final rule will support stronger overall emission standards. [EPA-HQ-OAR-2022-0985-1640-A1, p. 79]

B. The lower discount rates in the proposed revisions to Circular A-4 would support stronger emission standards.

Citing OMB Circular A-4 (2003), EPA generally uses 3 percent and 7 percent discount rates when analyzing costs and benefits (other than climate benefits) for the proposed standards. 88 Fed. Reg. at 26027 (cost analysis); 26077-78 (criteria pollutant health benefits); 26079-82 (comparison of benefits and costs). OMB's recently-proposed revisions to Circular A-4, however, would lower the recommended "default" discount rate to 1.7 percent to reflect the social rate of time preference for effects that occur within 30 years. 88 Fed. Reg. 20915 (Apr. 7, 2023).351 (The proposed revisions include separate recommendations for longer-term discounting.) We support lowering the default discount rate well below 3 percent and 7 percent, including for many of the reasons expressed in OMB's preamble.352 If OMB finalizes a lower default discount rate before EPA finalizes the Phase 3 standards, EPA should use that lower rate, consistent with OMB guidelines, in its analyses for the final standards.353 Even if the revisions to Circular A-4 are not finalized by that time, we request that EPA conduct sensitivity analyses using the proposed default discount rate of 1.7 percent when analyzing costs and benefits (other than climate benefits354) for the final rule. A discount rate lower than 3 percent and 7 percent would more accurately reflect the benefits and costs of the standards and any alternatives EPA considers. [EPA-HQ-OAR-2022-0985-1640-A1, pp. 80 - 81]

351 OMB, Circular A-4: Draft for Public Review 76 (Apr. 6, 2023), https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf.

352 OMB, Preamble: Proposed OMB Circular No. A-4, "Regulatory Analysis" 17-34 (2023), https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4Preamble.pdf.

353 By making this request, we are not waiving our rights to challenge OMB's final revisions to Circular A-4 or to challenge agencies' reliance on any final revisions to Circular A-4 in their regulations.

354 We address EPA's treatment of the social cost of GHGs in a separate comment letter. See Institute for Policy Integrity et al., Comments on the Consideration of the Social Cost of Greenhouse Gases in Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926 (proposed Apr. 27, 2023), to be filed in Docket EPA-HQ-OAR-2022-0985 on June 16, 2023.

Organization: Clean Fuels Development Coalition et al.

VII. The Proposed Rule Fails to Adequately Consider Costs.

When an agency relies "on a cost-benefit analysis as part of its rulemaking, a serious flaw undermining that analysis can render the rule unreasonable." National Ass'n of Home Builders v. EPA, 682 F.3d 1032, 1040 (D.C. Cir. 2012). As detailed above, the proposed rule would be staggeringly expensive. The proposal estimates $56 billion in costs: $9 billion in "vehicle technology costs" and $47 billion in "electric vehicle supply equipment (EVSE) costs." 88 Fed. Reg. 25,936 (Apr. 27, 2023). EPA nevertheless concludes that the benefits of the proposed rule would outweigh this cost. Id. But this cost-benefit analysis suffers from "serious flaw[s]" on both sides of the ledger. First, the proposal dramatically underestimates the costs: ignoring most of the costs of the rule, projecting unreasonably low battery and vehicle costs, and ignoring most of the cost for charging infrastructure. Second, the proposal dramatically inflates the benefits of the rule: ignoring emissions when convenient, relying on outrageous social costs of carbon calculations that rely on projections of benefits hundreds of years in advance to inflate the present benefit, and gerrymandering vehicle class and compliance timelines to obscure the real impacts of the rule. [EPA-HQ-OAR-2022-0985-1585-A1, p. 31]

These flaws render the proposed rule unreasonable. [EPA-HQ-OAR-2022-0985-1585-A1, p. 31]

H. The proposal manipulates timelines and vehicle categories to inflate the benefits of the rule.

EPA extends its cost-benefit calculations to 2055 because it says that this is the "year when the program would be fully implemented and when most of the regulated fleet would have turned over." 88 Fed. Reg. 26,079. This is, conveniently, a long enough time frame to allow many abstract and speculative benefits to accrue while the costs imposed by the rule are averaged out or ameliorated by the assumed adoption of currently nonexistent technologies, efficiencies, and improvement. For example, the proposal estimates that the retail price equivalents for the (currently much more expensive) electric vehicles will go negative, indicating a savings, beginning in 2041. DRIA at 287–88. By extending the cost-benefit analysis to allow 15 years of negative values to accumulate, the $15.76 billion in purchaser RPE through 2040 is offset with a claimed $12.48 billion over the remaining years, bringing the total RPE to only $5.7 billion after applying a 3 percent discount rate. Id. This is just making things up. There is no technology that EPA can point to today that would result in savings. Instead, EPA resorts to predicting future commercial technology, with hypothetical cost savings, to justify these numbers. [EPA-HQ-OAR-2022-0985-1585-A1, p. 37]

Organization: Our Children's Trust

We also ask that the EPA revise its Draft Regulatory Impacts Analysis so that it reflects the true costs of climate change, the true benefits of more swiftly electrifying the transportation sector, and utilizes no discount rate or a discount rate that does not discriminate against children and future generations. EPA must align its rulemaking with the best available science to protect children. [EPA-HQ-OAR-2022-0985-1633-A1, p. 1]

EPA Summary and Response:

Summary:

EPA received several comments related to the cost-benefit analysis. Some of those comments stated that the cost and/or benefit analysis was inadequate or that certain assumptions were not supported or justified in the proposal. Other comments contend that our consideration of appropriate standards was arbitrary and capricious, claiming EPA did not appropriately consider the cost-benefit analysis when choosing the standard, while others suggested we should consider the costs and benefits of alternative and/or more stringent compliance pathways.

One commenter suggested that EPA should include a benefit/cost ratio in our analysis, pursuant to OMB Circular A-4 guidance, and that "a demonstration of positive net benefits, however defined, should be a necessary but not a sufficient condition for the adoption of a proposed rule until which time the said rule is included in a regulatory budget." Another commenter referenced updates to OMB's Circular A-4 guidance and suggested that EPA account for a lower discount rate in its analyses, while another commenter suggested that EPA use a discount rate "that does not discriminate against children" or no discount rate at all. This same commenter said that EPA "must align its rulemaking with the best available science to protect children."

One commenter also accused EPA of manipulating timelines to inflate the benefits of the rule by extending calculations to 2055.

Response:

In this RTC section's response, the EPA is focusing on addressing comments related to the general benefit-cost methodology used in the proposal. To the extent that these commenters raise other issues, those issues are addressed elsewhere in this RTC or in the final notice for this action.

EPA follows applicable guidance and best practices when conducting its benefit-cost analyses, including the currently applicable OMB Circular No. A-4 and EPA's Guidelines for Preparing Economic Analyses. We therefore consider our analysis to be methodologically rigorous and a best estimate of the projected benefits and costs associated with the final rule.

In setting the final standards, EPA appropriately assessed the statutory factors specified in CAA section 202. EPA's assessment of the relevant statutory factors in CAA section 202 justify the final standards. We also evaluated additional factors, including factors to comply with E.O. 12866; our assessment of these factors lends further support to the final rule. Our analyses conclude that the total benefits of both the proposal and the final rule outweigh the total costs and therefore result in positive net benefits.

After consideration of comments, we did not fundamentally alter our benefit-cost analysis from the proposal. In general, EPA agrees with those commenters who stated that the benefits of controlling emissions from heavy-duty vehicles far outweigh the costs. However, we did make three changes to the analysis that are responsive to comments. We monetized the $PM_{2.5}$-related benefits associated with reductions in refinery emissions. We estimated the present and annualized value of costs and benefits using a 2 percent discount rate, in addition to a 3 and 7 percent discount rate, and we used updated Social Cost of Greenhouse Gas (SC-GHG) values to monetize climate benefits. Responses to comments related to refinery emissions can be found in Section 13 of this RTC document and responses to comments about the SC-GHGs can be found in Section 20. We expand our response to comments about the discount rate later in this section.

We generally respond to commenters who claimed that the benefit-cost analysis was seriously flawed by noting that the benefit-cost analyses of the proposed and final rulemakings follow all appropriate best practices and our methods are described and supported, in detail, in the preamble and RIA that accompany the final rule.

To the extent that the information introduced by commenters was intended to advocate for more stringent standards, we refer the reader to Section 2 of this RTC document. For responses related to component and compliance costs, see Section 3 of this RTC document, for responses related to EVSE and infrastructure costs, see Sections 6 and 7 of this RTC document, and for responses related to program costs see Section 12 of this RTC document. For responses related to emissions from both onroad and upstream sources, see Section 13.

The EPA disagrees with commenters who claim that the Agency's benefit-cost analysis contains serious flaws that either underestimate the benefits (or costs) or render the rule arbitrary and capricious. [American Free Enterprise Chamber of Commerce].

- EPA disagrees with the commenter's assertion that our analysis that includes a full pass-through of the IRA battery tax credit to purchasers significantly underestimates the purchase cost of the vehicles (see RIA Chapter 2.4.3). Additionally, as shown in RIA Chapter 2.9.2, the majority of the 101 vehicles evaluated would not receive the full $40,000 IRA purchaser tax credit in our analysis. Even assuming the battery tax credit is not fully passed along to the purchaser, we note that the IRA purchaser tax credit would make up for the resulting difference for many of these vehicles. See Sections 2.7 and 3 of this RTC for responses related to our handling of the IRA tax credits.
- For the final rule, EPA allocated the EVSE costs to purchasers in two ways. For the vehicles that are expected to utilize depot charging, the EVSE costs were assessed as upfront costs to the purchaser. For vehicles that will utilize public charging, the EVSE costs were amortized and included in the public charging rates. The commenter did not suggest alternative methods and/or parties that would incur these EVSE costs. See Chapter 2 and Chapter 3 of the RIA.
- As shown in RIA Chapter 4.3.3, the vast majority of the heavy-duty fleet is diesel-powered and therefore it is reasonable for our assessment to evaluate maintenance and repair costs for diesel-powered vehicles. Furthermore, the commenter did not provide additional data to support alternative maintenance and repair costs for gasoline or CNG-powered vehicles.
- We discuss in RIA Chapter 6.2 the economic research related to the energy paradox and several possible explanations, including uncertainty surrounding new technologies, and

how some of these may impact the adoption of HD ZEVs as well as factors that may mitigate them.

Regarding the comment that our rule is arbitrary and capricious, we take this comment to mean that the commenter asserts standards should be determined by which alternative generates the maximum net benefits. While we did conduct a full cost-benefit analysis in accordance with guidelines provided by OMB Circular A-4, as explained in the preamble and in our response to comments in RTC Sections 20 and 21, EPA's statutory authority under CAA section 202(a)(1)-(2) does not require the determination of the maximum net benefits or that standard-setting be based on a cost-benefit analysis.

In response to commenters who suggested that EPA use a discount rate lower than 3 and 7 percent, or no discount rate whatsoever, we note that we have applied a 2 percent discount rate in the benefit cost analysis to accompany discount rates of 3 and 7 percent. While we were conducting the analysis for the final rule, OMB finalized an update to Circular A-4, in which it recommended the general application of a 2 percent discount rate to costs and benefits. The effective date of the updated Circular A-4 guidance does not apply to the final rule; however, we updated the analysis to reflect the updated discount rate guidance and to be consistent with discount rate assumptions used to estimate the SC-GHGs (see Section 20 of this RTC document). The application of a lower discount rate did not affect our consideration of the final standards, nor did it change our conclusion that the total benefits of both the proposal and the final rule far outweigh the total costs and therefore result in positive net benefits. Current guidance does not recommend that federal agencies utilize a discount rate of zero in their benefit cost analyses.

We disagree with the commenter regarding the suggestion that we include a benefit-cost ratio pursuant to OMB Circular A-4 guidance. The guidance does not prescribe that all regulatory benefit-cost analyses must include such a ratio. In fact, Section 2.a of the guidance says, "A distinctive feature of BCA is that both benefits and costs are expressed in monetary units to the extent feasible, which allows you to evaluate different regulatory options with a variety of attributes using a common measure. …The size of net benefits is the absolute difference between the projected benefits and costs. The ratio of benefits to costs is not a meaningful indicator of net benefits and should not be used for that purpose. Considering such ratios alone can yield misleading results, as such ratios do not clarify which alternative yields the greatest net benefits and are sensitive to whether negative willingness to pay (WTP) or willingness to accept (WTA) valuations are subtracted from benefits or added to costs." The same commenter also asserted that "a demonstration of positive net benefits, however defined, should be a necessary but not a sufficient condition for the adoption of a proposed rule until which time the said rule is included in a regulatory budget." Such a regulatory budget does not exist and the consideration of such a budget, and how it might affect the evaluation of proposed standards, is beyond the scope of this rulemaking.

Regarding assertions that EPA manipulated timelines by extending calculations to 2055, we disagree. EPA has followed long-standing practice for mobile source rules of conducting our analysis far enough into the future such that the majority of the on-road fleet can be reasonably expected to be "turned over" to vehicles meeting the revised emissions standards. In this case, we selected an analysis year of 2055, which is 23 years in advance of the final year of phase-in of the revised standards, 2032. Because new vehicles tend to continue operating in the fleet for over 23 years, it is likely that the fleet will not be fully "turned over" by 2055, meaning that

EPA's analysis is somewhat conservative and not capturing the fullest representation of emissions reductions under the final standards. This practice is also consistent with OMB Circular A-4 guidance that states "…the time frame for your analysis should cover a period long enough to encompass all the important benefits and costs likely to result from the rule."

24 Technical Amendments

24.1 Amendments for 40 CFR part 1036

24.1.1 OBD and Inducements

Comments by Organizations

Organization: Allison Transmission Inc.

1. On-board diagnostics for Heavy-Duty Hybrids

In the Phase 2 GHG rulemaking, Allison worked with the EPA to address on-board diagnostic ("OBD") regulations for heavy duty hybrid vehicles. The issue in that rulemaking was a lack of regulatory certainty with respect to how the hybrid system would be subject to OBD regulations. In Part XIII (Other Regulatory Provisions) of the Phase 2 preamble, the EPA addressed this issue, and Allison recommends that the EPA consider adding that same language to the Phase 3 Greenhouse Gas preamble or associated regulatory text, as follows:

[D]iagnostic requirements apply for engine systems or components; as such, we generally apply those diagnostic requirements to hybrid powertrain systems and components only if the engine manufacturer includes those features or parameters as part of the certified configuration for their engines.1 [EPA-HQ-OAR-2022-0985-1657-A2, pp. 1 - 2]

1 81 Fed. Reg. 73,478, 73,936 (Oct. 25, 2016).

Allison believes that the clarification that EPA provided in 2016 is still relevant and needed within a Phase 3 program and requests that EPA continue the same policy and interpretation forward in any final rule the Agency promulgates. [EPA-HQ-OAR-2022-0985-1657-A2, p. 2]

Organization: California Air Resources Board (CARB)

Part II. HDE Provisions

A. On-Board Diagnostic (OBD) Amendments

Affected page: 26021

Because U.S. EPA is proposing changes to the OBD provisions in 40 CFR 1036.110 only to make clarifications and corrections, CARB staff in general does not have any issues with U.S. EPA's proposed amendments. However, CARB staff believes the wording of the proposed amendment to 40 CFR 1036.110(b)(9) is not clear because it lists both component-based parameters (i.e., sensor signals and output commands) and parameters that are not simply a sensor signal or output command (e.g., modelled values like soot load and ash load). U.S. EPA indicated that the proposed amendment was meant to clarify that the list of parameters readable by a generic scan tool is required if the engine is equipped "with the relevant components and OBD monitoring is required for those components." CARB staff believes the usage of "relevant component" is not detailed or clear enough in the context of the list provided and that tying the list to monitored components may allow manufacturers to avoid supporting these additional parameters in certain cases. For example, one of the required parameters involves particulate filter parameters, specifically the filter soot load. This parameter is usually a modeled value and is not directly sensed or outputted by a specific component. Manufacturers may interpret the regulation language to mean that they would not have to make available the filter soot load since this value does not involve a "relevant" monitored component. [EPA-HQ-OAR-2022-0985-1591-A1, pp.69-70]

Organization: Cummins Inc.

5. Cummins supports the technical amendments to 40 CFR §1036.110 and §1036.111.

EPA proposed minor updates within the OBD and SCR inducement sections, clarifying language, and intent of requirements. Additionally, they proposed technical updates to their newly finalized SCR inducement algorithm in Table 1 of 40 CFR §1036.111. These changes are sensible and appropriate modifications to the newly codified SCR inducement algorithm. [EPA-HQ-OAR-2022-0985-1598-A1, p. 8]

As part of EPA's new OBD and SCR inducement sections, there were new data stream and freeze frame requirements finalized. Cummins fully supports EPA's intent to work with the appropriate SAE Committees (J1939 Protocol, J1979-2 Protocol, etc.) and industry to provide these requirements in a standardized format. [EPA-HQ-OAR-2022-0985-1598-A1, p. 8]

23. Cummins recommends improvements to hybrid OBD certification procedures.

CARB's 2019 HDOBD requirements, adopted and incorporated by reference in EPA's 2027 HD Low NOx Final Rule at 40 CFR §1036.110 (with some EPA deviations), implement more stringent MY 2027 OBD requirements for hybrids. Cummins highlighted the following concerns in our previous comments with a recommendation that would help reduce barriers to hybrid certification:

"Hybrid vehicle IUMPR increases from 0.1 to 0.3 in MY 24 per CCR 1971.1. We propose that EPA includes IUMPR relief for the hybrid applications and keep IUMPR at 0.1. The higher limit of 0.3 can be a more difficult requirement to meet for hybrid applications and has the potential to push manufacturers to need more investments in new technologies and complex software in order to meet this requirement. That in turn would delay the implementation of hybrid technology and the emissions reduction that would be achieved." [EPA-HQ-OAR-2022-0985-1598-A1, p. 14]

Cummins reiterates our previous comments and recommendation here in an effort to improve industry's ability to develop more hybrid solutions while the nation builds infrastructure to support fully zero-emissions technologies. [EPA-HQ-OAR-2022-0985-1598-A1, p. 15]

Also, the cycles used for emissions certification and OBD certification should be aligned. EPA should update OBD regulations in 40 CFR 1036.110 to require that OBD testing is performed on the same test cycles that are used for emissions certification. For example, if hybrid powertrain cycles vFTP/vSET are used for emissions certification, the OBD demonstration should be performed on these same test cycles. [EPA-HQ-OAR-2022-0985-1598-A1, p. 15]

Organization: Truck and Engine Manufacturers Association (EMA)

EMA recommends the following revisions to the proposed OBD regulations included in the Phase 3 NPRM:

§ 86.1806-27 Onboard diagnostics.

Proposal to Update the Introductory Section:

1) Modify this language to match EPA's 2027 HDOBD language, i.e., vehicles may optionally comply with "any or all" of the requirements of this section...
a. Note that the HDOBD language includes "any" of the requirements, which provides greater flexibility to manufacturers for their pre-MY 27 products. [EPA-HQ-OAR-2022-0985-2668-A1, p. 60]

Proposal to Update Section: § 86.1806-27 (a):

2) The proposal to link the new high GCWR MDV (Class 2b/3 Vehicles) classification to the appropriate engine-dyno OBDELs identified in Part 1036 has the potential to double the demonstration testing for previously chassis-certified LDV/MDV products, where they could need to be engine-certified as well (i.e., dual-certified product in this category could be subject to both chassis certification by CARB and engine certification by EPA starting in MY2027). Modify the language as follows:

a. Add new section – § 86.1806-27 (a)(10) – to align with EPA's 2027 HDOBD 1036.110(b)(11) language to address EPA OBD certification for LD/MDV

b. Specifically modify § 86.1806-27 (a)(10) (aligned w/ 1036(b)(11)) to include new language – "… we may rely on that executive order to evaluate whether you meet federal OBD requirements for that same engine family or an equivalent engine family. Engine families are equivalent if they are identical in all aspects material to emission characteristics: for example, we would consider different inducement strategies, different OBD demonstration test procedures/cycles, and different warranties not to be material to emission characteristics relevant to these OBD testing requirements…"

3) Since no retroactive deficiency language is included in EPA's LD/MDV regulations, modify the relevant provisions to align with the EPA 2027 HDOBD language, and remove the In-Use Compliance Requirements (LD/MDV PVE Requirements) as applicable. Thus, include the following:

a. Add new section – § 86.1806-27 (a)(11) – to align with EPA 2027 HDOBD 1036.110(b)(6) language to address EPA's In-Use Compliance Programs (remove PVE Requirements for EPA-only products)

1. Note that a new Section (§ 86.1806-27 (a)(10)) proposed above, would also align with EPA 2027 HDOBD's requirement to submit any PVE Test Results executed on an equivalent CARB family to EPA [EPA-HQ-OAR-2022-0985-2668-A1, p. 60]

Proposal to Update Section: § 86.1806-27 (b):

4) EPA should include language that provides the option for chassis-certified products to align their SCR Inducement Algorithm with 40 CFR 1036.111, with the caveat that the same

Tampering Failure Modes called out for HD products may/may not apply to LD/MDV products (e.g., warning provided when DEF quantity is equivalent to 3 hours remaining in the tank). [EPA-HQ-OAR-2022-0985-2668-A1, pp. 60 - 61]

Proposal to Correct Section: § 86.1806-27 (g)(3):

5) Clarifying question: EPA plans to remove (as obsolete) this regulation (presumably by the effective date of the Phase 3 Regulation). Accordingly, EPA's reference to this provision (86.1806-05) seems to be a mistake. [EPA-HQ-OAR-2022-0985-2668-A1, p. 61]

EMA would like to encourage EPA to continue working with CARB and industry to develop a harmonized SCR Inducement Algorithm Strategy that aligns both engine and chassis-dyno certified products with the SCR Algorithm Inducement Principles discussed in the Preamble to EPA's Phase 3 NPRM. [EPA-HQ-OAR-2022-0985-2668-A1, p. 61]

EPA Summary and Response:

Summary:

Allison commented that EPA should provide regulatory certainty with respect to how the hybrid system would be subject to OBD regulations.

CARB commented that EPA should consider providing further clarity with regards to 40 CFR 1036.110(b)(9) to ensure manufacturers make available required parameters that are not based on installed components.

Cummins supports the technical amendments EPA made to 40 CFR 1036.110 and 1036.111. Cummins also reiterates their request that EPA work with industry and the proper SAE Committees to ensure the new requirements are standardized.

Cummins commented that EPA adopted and incorporated by reference CARB hybrid OBD requirements that make hybrid OBD requirements more stringent for MY2027. Cummins stated that EPA should have kept the In-Use Monitor Performance Ratio (IUMPR) for hybrid applications at 0.1 instead of harmonizing with CARB to raise it to 0.3.

Cummins also commented that EPA should modify the requirements to ensure that hybrid OBD testing is performed using the same test cycles as emission certification uses.

EMA comments that EPA should add the word "any" to 40 CFR 86.1806-27 to provide greater flexibility to manufacturers for their pre-MY 27 products.

EMA commented that EPA should provide a similar provision for LDV/MDV products as in 1036.110(b)(11) which allow for certain engine families to be considered equivalent for the purposes of determining OBD demonstration testing requirements.

EMA also requests that EPA as a new paragraph 40 CFR 86.1806-27(a)(11) to provide retroactive deficiency language to align with EPA's HD highway program in 40 CFR part 1036 and remove the in-use compliance requirements as applicable and allow for submission to EPA of any equivalent PVE test result performed for CARB.

EMA comments that EPA should include language that provides the option for chassis-certified products to align their SCR Inducement Algorithm with 40 CFR 1036.111, with the caveat that the same Tampering Failure Modes called out for HD products may/may not apply to LD/MDV products.

EMA comments that EPA should correct 40 CFR 86.1806-27(g)(3) to remove the reference to the recently removed 40 CFR 86.1806-05.

EMA encourages EPA to continue working with CARB and industry to develop a harmonized SCR Inducement Algorithm Strategy that aligns both engine and chassis-dyno certified products with the SCR Algorithm Inducement Principles discussed in the Preamble to EPA's HD Phase 3 NPRM.

Response:

EPA agrees with CARB's comments and has included additional language in 40 CFR 1036.110(b)(9) to clarify that manufacturers must make the required parameters available even if they are not directly related to installed components (e.g., a modeled or calculated value).

We are aware of a similar issue with respect to emergency vehicles and are clarifying in 40 CFR 1036.601(c) that for the in-cab display requirements in 40 CFR 1036.110(c)(1), where a derate or inducement is overridden on an emergency vehicle, it would not be expected for information to be displayed in the cab about the timing or extent of a pending derate if an AECD will override the derate. Since we are aware that there may be other diagnostic-related complications that may conflict with the emergency vehicle modifications allowed under 40 CFR 85.1716, the amendment in 40 CFR 1036.601c is written more broadly to resolve any inconsistency between the two regulatory provisions.

EPA appreciates the comments made in support of the proposed modifications to 40 CFR 1036.110 and 1036.111 that were limited to specific aspects of paragraphs within 40 CFR 1036.110 and 1036.111 to add clarifications and correct minor errors in the OBD and inducement provisions adopted in the HD2027 final rule. We also note that EPA has started to be involved with the relevant SAE committees to begin the process to ensure the new requirements are standardized.

EPA explained in the Phase 3 NPRM preamble that EPA was not reopening any aspect of our OBD and inducement provisions other than those proposed clarifications and corrections specifically identified in the specified preamble section. 88 FR 26021, footnote 615. EPA acknowledges concerns from Allison and Cummins regarding the hybrid OBD certification process and appreciates the comments on changes we can consider to improve outcomes of OBD certification for hybrid vehicles; however these comments are outside of the scope of this rulemaking. We requested comment on this topic in our HD2027 proposal but did not take any final action at the time of the HD2027 final rule on this topic.[1045] There was not sufficient time for further consideration on this topic prior to the publication of the Phase 3 NPRM, which we note was not quite three months after the final HD2027 rule was published. We may continue to evaluate whether to adopt such changes in a future rulemaking.

With respect to Cummins' request to align the OBD and certification test cycles, this requested revision is also outside the scope of this rulemaking as EPA did not propose and is not

[1045] EPA's Response to Comments: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards Response to Comments (pdf) (December 2022, EPA-420-R-22-036). Available here: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1016AMU.pdf finalizing changes to this requirement but may continue to evaluate whether to adopt such changes in a future rulemaking.

EMA's comments are focused on EPA's "Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles" proposed rule published on May 5, 2023.[1046] These comments are out of the scope of the proposed amendments to the OBD requirements in 40 CFR 1036.110 and the inducement provisions in 40 CFR 1036.111. However, note that we address similar comments in the final rule related to Light- and Medium-Duty Vehicles.

With respect to EMA's comment about adding a new provision at 40 CFR 86.1806-27(a)(11) to align with EPA HD2027 OBD 40 CFR 1036.110(b)(6) language to address EPA's In-Use Compliance Programs (removal of PVE Requirements for EPA-only products), EPA is noting here that as described in both the HD2027 FRM preamble and the NPRM to this rule, EPA only intended to remove Manufacturer Self-Test requirements, not all Production Engine/Vehicle Evaluation Testing.[1047] Specifically, in this NPRM EPA proposed to correct a referenced CARB regulation to be consistent with our intent as described in the preamble of the HD2027 final rule (see 88 FR 4372) to not require the manufacturer self-testing and reporting requirements in 13 CCR 1971.1(l)(4) as opposed to the typographical error included in the HD2027 FRM which was 13 CCR 1971.1(l).

24.1.2 Level of Standards

Comments by Organizations

Organization: Cummins Inc.

1. Cummins supports EPA's proposal to maintain the Phase 2 model year 2027 and later engine GHG standards.

In Phases 1 and 2, EPA regulated engine GHG standards separately from the rest of the vehicle. Cummins supports maintaining this regulatory framework for Phase 3. Cummins also supports EPA's proposal in 40 CFR §1036.108 to retain the stringency of the MY 2027 and later engine GHG standards for Phase 3. Engine manufacturers will be adding technology and implementing other changes to meet the more stringent MY 2027 engine NOx standards finalized by EPA in December 2022 and to offset any fuel efficiency losses associated with NOx reductions, so it is appropriate for EPA not to increase the stringency of the engine GHG standards at the same time. [EPA-HQ-OAR-2022-0985-1598-A1, p. 6]

EPA Summary and Response:

Summary:

Cummins supports maintaining regulation of engine GHG emissions separately from the rest of the vehicle for HD GHG Phase 3. Cummins supports EPA's proposal in 40 CFR §1036.108 to retain the stringency of the MY 2027 and later engine GHG standards for Phase 3. They state

[1046] 81 FR 26021 available here: https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-multi-pollutant-emissions-standards-model

[1047] See 81 FR 26021

that is appropriate for EPA not to increase the stringency of the engine GHG standards as manufacturers will be implementing engine changes to reduce NOx further starting in MY 2027 and will have to implement changes GHG changes to offset the effect of NOx mitigation strategies.

Response:

We thank Cummins for supporting our approach to separate GHG standards for heavy-duty engines and vehicles and our proposal to retain the current MY 2027 and later GHG standards for heavy-duty engines. We did not reopen and did not propose new GHG standards for heavy-duty engines. The MY 2027 and later engine standards remain in place under the existing regulations.

24.1.3 Interim Provisions 40 CFR 1036.150

Comments by Organizations

Organization: Cummins Inc.

9. Cummins supports engines fueled with “neat” hydrogen being eligible to earn Averaging, Banking, and Trading engine CO2 credits.

Cummins agrees with EPA’s proposal to deem CO2 emissions from engines fueled with neat hydrogen as zero in 40 CFR §1036.150(f) and to allow those engines to generate engine CO2 credits for ABT in Part 1036. Allowing for credit generation will incentivize manufacturers to develop engines fueled with neat hydrogen, which can play an important role in contributing near-term carbon reductions, creating demand for heavy-duty refueling infrastructure, and paving the way for commercial adoption of hydrogen fuel cell vehicles. [EPA-HQ-OAR-2022-0985-1598-A1, p. 9]

Organization: Truck and Engine Manufacturers Association (EMA)

Allowance for H2-ICE – The NPRM appropriately acknowledges that hydrogen-fueled internal combustion engines (H2-ICEs) produce zero hydrocarbon (HC), carbon monoxide (CO), methane (CH4), or carbon dioxide (CO2) emissions. H2-ICEs are in the prototype stage of implementation but show great promise as zero-GHG emission engines for MHD vehicles. They are similar to existing internal combustion engines, and to develop them engine manufacturers can leverage existing engineering and testing expertise, vehicle designs, production facilities, and suppliers. Of course, H2-ICEs must meet EPA’s criteria pollutant emission standards, and since some NOX is present in the exhaust of H2-ICEs, they may require selective catalyst reduction (SCR) aftertreatment systems. [EPA-HQ-OAR-2022-0985-2668-A1, p. 52]

While an H2-ICE mounts in a MHD vehicle chassis in a similar manner as a diesel engine, the vehicle will require new hydrogen storage and delivery systems. The storage tanks will need to be designed for either compressed gaseous hydrogen (3,500 – 10,000 psi) or cryogenic liquid hydrogen (-423° F). The design of those on-vehicle storage systems, and the infrastructures needed to refuel the vehicles, will be similar to what is needed for FCEVs. [EPA-HQ-OAR-2022-0985-2668-A1, p. 52]

As noted above, commercial vehicles are purchased by trucking businesses for the sole purpose of providing a financial return on the investment. Since trucking fleets demand that a new vehicle perform the work of their business in a cost-effective manner, they often are hesitant to invest in new or unproven technologies that may not perform as well or efficiently as existing technologies. Since the engine is so crucial to the operation of a commercial vehicle, and it makes up a significant part of the overall life-cycle costs of the vehicle, fleets often are especially hesitant to adopt new powertrain technologies. Accordingly, the familiar aspects of H2-ICEs may make them more desirable to trucking fleets than adopting the all-new FCEV technology. [EPA-HQ-OAR-2022-0985-2668-A1, p. 52]

H2-ICEs also may have a better chance of being successfully implemented in the timeframe anticipated by the NPRM. Due to a smaller number of new designs and components compared to a FCEV powertrain, it may take less time for manufacturers to complete the design and testing necessary to ensure that H2-ICEs will achieve acceptable levels of performance, durability, and reliability. [EPA-HQ-OAR-2022-0985-2668-A1, p. 52]

Unfortunately, vehicles with an H2-ICE are unlikely to achieve nearer-term higher levels of deployment. That is because the primary limiting factor for H2-ICEs will be the same as for FCEVs: the build-out of the hydrogen fueling infrastructure. Until hydrogen fuel is available where trucking fleets need it to be, they are as equally unlikely to purchase an H2-ICE-fueled vehicle as a FCEV. [EPA-HQ-OAR-2022-0985-2668-A1, p. 52]

For the above reasons, we support the proposed Interim Provision in 40 C.F.R. § 1036.150(f), Testing exemption for qualifying engines. The provision would allow manufacturers to consider developing H2-ICEs as a viable GHG-reduction technology that may suit their fleet customers' needs. [EPA-HQ-OAR-2022-0985-2668-A1, p. 52]

EPA Summary and Response:

Summary:

Cummins agrees with EPA's proposal to deem CO2 emissions from engines fueled with neat hydrogen as zero in 40 CFR §1036.150(f) and to allow those engines to generate engine CO2 credits for ABT in Part 1036.

EMA supports the NPRM acknowledgment that hydrogen-fueled internal combustion engines (H2-ICEs) produce zero hydrocarbon (HC), carbon monoxide (CO), methane (CH4), or carbon dioxide (CO2) emissions. They note that H2-ICE propelled vehicles will require new hydrogen storage and delivery systems.

EMA notes that trucking fleets are often hesitant to invest in new or unproven technologies that may not perform as well or efficiently as existing technologies. They stated that this is especially true for new powertrain technologies; however they asserted that H2-ICE will be more desirable to trucking fleets than adopting FCEV technology. They stated that H2-ICE vehicles are unlikely to achieve nearer-term higher levels of deployment because the primary limiting factor for H2-ICEs will be the same as for FCEVs: the build-out of the hydrogen fueling infrastructure. They support the proposed Interim Provision in 40 CFR 1036.150(f) which provides testing exemption for qualifying engines. They stated that the provision would allow manufacturers to consider developing H2-ICEs as a viable GHG-reduction technology that may suit their fleet customers' needs.

Response:

EPA thanks Cummins for their support of our proposal to deem CO_2 emissions from engines fueled with neat hydrogen as zero in 40 CFR1036.150(f) and to allow those engines to generate engine CO_2 credits for ABT in Part 1036. After considering the comments and CO_2 emissions analysis for engines fueled with neat hydrogen, we are finalizing to deem CO_2 emissions from engines fueled with neat hydrogen as 3 g/hp-hr. See preamble Section III.C.2.xviii for more information.

While we appreciate EMA's interest in lowering barriers to commercializing hydrogen-fueled engines, we note that we are exempting those engines from testing purely based on the fact that those engines use a fuel that inherently burns without producing carbon-containing compounds. As a result, any measured value would not provide a meaningful assessment of how the engine controls CO_2, CO, or other carbon-containing compounds.

24.1.4 Test Procedures

Comments by Organizations

Organization: California Air Resources Board (CARB)

Part II. HDE Provisions

C. 40 CFR 1036.520. Determining power and vehicle speed values for powertrain testing

Affected pages: 26020 and 26106

U.S. EPA is "proposing to revise 40 CFR 1036.520(d)(2) to address the possibility of clutch slip when performing the full load acceleration with maximum driver demand at 6.0 percent road grade where the initial vehicle speed is 0 miles per hour." U.S. EPA is also proposing to revise 40 CFR 1036.520(d)(3) to address situations where the powertrain does not reach maximum power in the highest gear 30 seconds after the grade setpoint has reached 0.0 percent. CARB staff agrees these changes in the procedure seem reasonable from the technical standpoint as described in the NPRM. [EPA-HQ-OAR-2022-0985-1591-A1, pp.70-71]

Organization: Cummins Inc.

2. Fuel map in-use audit test procedures should align with confirmatory test procedures and thresholds, and remedial actions for overall in-use fuel map audit exceedances should align with vehicle-level CO_2 in-use compliance remedial actions.

We support the recently finalized amendments to EPA's engine fuel map audit test procedures and the applicability for those test procedures to both confirmatory tests, and Selective Enforcement Audits. See 40 CFR §1036.235(c) and §1036.301(b)(1). We also appreciate that §1036.401(a) states that EPA may perform testing of in-use engines consistent with the provisions of §1036.235. However, it is still unclear at what threshold an overall fuel map in-use test audit would lead to remedial actions and what those remedial actions might be. That lack of clarity has led manufacturers to apply undue compliance margins to fuel maps, in excess of EPA's expectations. That has led to EPA's projected Phase 2 engine technology improvements not being realized via GEM certification to EPA's vehicle CO2 standards. [EPA-HQ-OAR-2022-0985-1598-A1, p. 6]

To resolve that inconsistency with our shared goal for Phase 2 and Phase 3 to embody performance based, technology-neutral standards, we request that specifically §1036.235(c) be amended to clarify its applicability to fuel map in-use audit testing of in-use engines (in addition to its applicability to fuel map confirmatory testing of emissions-data engines). We also request that the interim provision of §1036.150(q) be amended to clarify its applicability for determining exceedances of in-use testing thresholds (in addition to its applicability to confirmatory testing and the threshold for replacing engine maps). We further request that amendments to §1036.235(c) include the minimum number of individual in-use engines and the pass rate, or sequential sampling plan, needed to make a final determination if remedial actions are required as a result of an overall fuel map in-use audit (e.g., a minimum of ten individual engines exceeding the fuel map in-use test threshold). That level of clarity would help manufacturers establish fuel map compliance margins consistent with EPA expectations. [EPA-HQ-OAR-2022-0985-1598-A1, pp. 6 - 7]

We also support EPA making the interim provision, §1036.150(q), permanent for both confirmatory and in-use audit testing. Recent EMA-Emissions Measurement and Testing Committee (EMTC) round-robin engine testing, for which EPA is an active participant, has further validated the results of the 2019 EPA funded research report, entitled, "Measurement Variability Assessment of the GHG Phase 2 Fuel Mapping Procedure" (U.S. EPA Contract No. EP-C-15-006, OMB Clearance Number 2031-2005, Work Assignments 2-08, 3-08, and 4-03). EPA's own recent round-robin testing at EPA's National Vehicle and Fuel Emissions Laboratory and that report both support making §1036.150(q) permanent. [EPA-HQ-OAR-2022-0985-1598-A1, p. 7]

Furthermore, we request that §1036.235(c) be amended to clarify the remedial actions for exceeding an overall fuel map in-use audit test. §1036.235(c) currently prescribes that the remedial action for exceeding the confirmatory test threshold is that EPA replaces the engine manufacturer's fuel map with EPA's measured map. That remedial action is appropriate for a confirmatory test, prior to an engine family being introduced into commerce. However, once in-use, an engine's fuel map will have been used as one or more vehicle OEMs' GEM inputs to certify one or more vehicle families to EPA's vehicle-level CO2 standards. Therefore, fuel map in-use audit remedial actions should be consistent with those prescribed in EPA's vehicle-level CO2 emissions program, specifically, §1037.645, "In-use compliance with family emission limits (FELs)." We request that EPA amend §1036.235(c) to prescribe that the remedial actions for exceeding an overall fuel map in-use audit follow §1037.645. That level of clarity would help manufacturers establish fuel map compliance margins consistent with EPA expectations. [EPA-HQ-OAR-2022-0985-1598-A1, p. 7]

7. EPA should allow the use of engine broadcasted torque and speed for off-cycle testing for carbon-containing fuels.

Per the Preamble at 88 FR 26021 and in 40 CFR §1036.530(j), EPA is proposing for off-cycle testing in the field on engines using at least one fuel that is not carbon-containing, manufacturers can use engine broadcasted speed and torque to calculate power in lieu of using CO2 as a surrogate for power. This is because for fuels other than carbon-containing fuels, there will be no fuel-related CO2 emissions to correlate to power. Cummins supports this approach of using engine broadcasted parameters and requests EPA to allow it for field testing of engines using carbon-containing fuels as well. Cummins shared confidential data with EPA in May 2020 showing inaccuracies between CO2 and power, even for engines using carbon-containing fuel. CO2 does not always correlate well to power produced, such as when excess fuel is burned for thermal management, or for hybrid operation when the battery/motor assists the engine and less or no fuel is burned. Allowing the use of engine broadcasted speed and torque would eliminate the need to use the FTP CO2 FCL to normalize measured CO2 in the 2B-MAW calculations which are used for placing windows into bins and for determining the brake specific emissions for a bin. The FTP CO2 FCL is not always representative of engine thermal efficiency on other duty cycles such as those encountered during off-cycle testing. Additionally, using the FTP CO2 FCL results in higher emissions calculated for more efficient duty cycles, which penalizes manufacturers with more efficient engines. Cummins supports the use of engine (or powertrain) broadcasted parameters such as speed and torque to provide more accurate off-cycle emissions calculations. [EPA-HQ-OAR-2022-0985-1598-A1, p. 9]

15. The methodology for determining criteria pollutants for plug-in hybrids and plug-in hybrid powertrains can be improved.

Cummins has recommendations for improvements to the SET and FTP test sequences for plug-in hybrids. See 40 CFR §1036.510(d)(4) Figure 1: [EPA-HQ-OAR-2022-0985-1598-A1, p. 11.] [See Docket Number EPA-HQ-OAR-2022-0985-1598-A1, page 11, for Figure 1.]

The current methodology in this section is appropriate for greenhouse gas emissions determination but not for criteria pollutant emissions. Figure 1 seems to indicate SET 5 cycle would be a cold cycle. This is not equivalent to the engine SET test procedure where engine and aftertreatment are pre-conditioned before running the emission test. Cummins recommends that for criteria emissions determination, the charge-sustaining sequence shall be run separately. In this sequence, SET is run at least twice and until the end-of-test criteria is met. The first test interval is warm-up, and the highest criteria emissions are reported from any of the rest of the test intervals. For example, highest NOx and HC emissions could come from test interval 2 and 4, respectively. See also 40 CFR §1036.512(d)(4) Figure 1: [EPA-HQ-OAR-2022-0985-1598-A1, pp. 11 - 12.] [See Docket Number EPA-HQ-OAR-2022-0985-1598-A1, page 12, for Figure 1.]

The current methodology in this section is appropriate for greenhouse gas emissions determination but not for criteria emissions. To determine criteria emissions, Cummins recommends that charge-sustaining only mode shall be run separately where the first test interval is a cold interval and subsequent intervals are hot intervals until the end-of-test criteria is met. The emission result for each criteria pollutant could come from the combination of different test intervals. For example, NOx highest emission is from the combination of test intervals 1 (cold) and 4 (hot), and for HC emissions, combination of 1 (cold) and 3 (hot) leads to highest emissions. [EPA-HQ-OAR-2022-0985-1598-A1, p. 12]

16. A simulation of the traction and battery systems for testing and certification of hybrids is needed.

Like battery electric vehicles, series hybrid traction systems have a wide range of architectures. Series hybrids that have the same traction system as battery electric such as hybrids using e-axles, should be able to execute their testing and certification requirements in 40

CFR Part 1036 and 1037 using a simulated traction system. The availability of test facilities that can accommodate e-axles is extremely limited and it is not practical to include them in the certification boundary. Similarly, the availability of test facilities that can accommodate batteries (which can be of a larger capacity especially for PHEVs that meet CARB ACT/ACF 75-mile All-Electric Range) is extremely limited and it is not practical to include them in the certification boundary. Creating a simulation of the traction and battery systems would remove a significant barrier to the challenging certification of hybrids. We would like EPA to work with industry to develop a simulation for the traction and battery systems for the testing and certification of hybrids. [EPA-HQ-OAR-2022-0985-1598-A1, p. 12]

17. EPA should define a utility factor for hybrids.

40 CFR §1036.545(a)(6) states that manufacturers must get approval in advance for their utility factor curve. Utility factors are essential to early development of new technologies, and the delay in receiving confirmation from EPA can lead to uncertainty on emissions values when developing new technologies. We would like EPA to work with industry to define a set utility factor curve as it would be one additional item that would ease the certification and testing burden of hybrids. [EPA-HQ-OAR-2022-0985-1598-A1, p. 13]

18. Additional details are needed for the vehicle C speed definition in 40 CFR §1036.520(j).

The vehicle C speed definition criteria as it currently exists introduces the potential for significant CO2 penalty relative to the conventional SET approach. Improvements in the methodology used to identify measured vehicle C speed are required to avoid introducing CO2 penalties for hybrid engines. Cummins will continue to work with EPA and EMA's EMTC to develop additional criteria. [EPA-HQ-OAR-2022-0985-1598-A1, p. 13]

19. Additional language is needed when setting CITT to zero for idle neutral feature when stationary.

The additional language is needed when setting CITT to zero to represent real-world scenarios for vehicles with neutral idle features. We propose the following additional language for 40 CFR §1036.512(b)(2)(ii):

"If the system is primarily intended for vehicles with transmission with Neutral-When-Stationary feature that automatically shifts the transmission to neutral after the vehicle is stopped for a designated time and automatically shifts back to drive when the operator increases demand (i.e., pushes the accelerator pedal), then enable neutral idle feature in GEM HIL model." [EPA-HQ-OAR-2022-0985-1598-A1, p. 13]

We also propose the following additional language for 40 CFR §1036.514(b)(2)(ii)(2):

"If the system is primarily intended for vehicles with transmission with Neutral-When-Stationary feature that automatically shifts the transmission to neutral after the vehicle is stopped for a designated time and automatically shifts back to drive when the operator increases demand (i.e., pushes the accelerator pedal), then enable neutral idle feature in GEM HIL model." [EPA-HQ-OAR-2022-0985-1598-A1, p. 13]

20. Cummins supports the test procedure flexibility in 40 CFR §1036.501(g) on engines that use regenerative braking to power an electric heater.

Cummins supports the improvement proposed within section 40 CFR §1036.501(g) that provides flexibility for testing engines that use regenerative braking through the crankshaft to only power an electric heater for aftertreatment devices as long as the recovered energy is less than 10 percent of the total positive work. This proposed improvement continues to ensure that the test procedure is representative of real-world emissions while simultaneously providing flexibility for the manufacturer regarding test methodology. [EPA-HQ-OAR-2022-0985-1598-A1, p. 13]

21. Cummins supports 40 CFR §1036.510(b)(2)(vii) limitations on selected axle ratio/tire size and the opportunity to request preliminary approval.

Cummins supports the improvements proposed within section 40 CFR 1036.510(b)(2)(vii), which provides additional clarity regarding the selection of drive axle ratio and tire radius for performing emissions testing via powertrain test procedures and introduces the potential to request preliminary approval for the selected drive axle ratio and tire size. The additional clarity regarding the selection of vehicle drive axle ratio and tire size is necessary to ensure that the system is capable of achieving the minimum reference vehicle speed defined within the transient duty cycle. The potential to request preliminary approval provides opportunity to reduce uncertainty regarding selected vehicle characteristics during development and prior to certification testing. [EPA-HQ-OAR-2022-0985-1598-A1, p. 14]

22. Cummins requests to work with EPA to develop an EPA hybrid powertrain software simulation program to augment GEM to streamline hybrid certification, and to avoid testing and reporting proliferation, and hybrid powertrain family proliferation.

Some of the major components of hybrid powertrains include internal combustion engines, electrical generators, electric motors, and electric batteries. Vehicle OEMs optimize the specifications of these major components for a particular application and to meet customer requirements such as duty cycle and range. That can lead to many minor variations of the same basic hybrid powertrain configuration. For example, the same hybrid powertrain configuration could be specified with several different kilowatt-hours of on-board electric battery storage capacity. EPA's current approach for defining hybrid powertrain families and for prescribing each family's pre-certification testing and in-use reporting requirements can lead to a massive proliferation of hybrid powertrain families and subsequent certification and in-use reporting burdens that discourage investment in developing and optimizing hybrid powertrain families. To eliminate such regulatory barriers to technology, Cummins requests to work with EPA to develop an EPA hybrid powertrain software simulation program to augment GEM vehicle certification. The software program would be designed to allow for aggregation of many variants of a basic hybrid powertrain configuration into one EPA hybrid powertrain family. The software program would generate "analytically derived inputs" for input into GEM to represent the overall family. [EPA-HQ-OAR-2022-0985-1598-A1, p. 14]

Engine lubricating oil temperature should be added to test procedures in 40 CFR 1036 and 1065.

Cummins has found through past testing experience that engine lubricating oil temperature can be an important criterion in determining warmup times. Historically, EPA has agreed with following the same test procedures for warmup as recommended by the manufacturer. Cummins would like this historic practice to be added to the regulation so that there is no confusion during future testing if the use of lubricating oil temperature as one of the criteria for engine warmup is valid. [EPA-HQ-OAR-2022-0985-1598-A1, p. 16.]

Cummins' Suggested Edits:

Carry out the test as described in this paragraph (d). Warm up the powertrain by operating it. We recommend operating the powertrain at any vehicle speed and road grade that achieves approximately 75 % of its expected maximum power. Continue the warm-up until the engine coolant, block, engine lubricating oil, or head absolute temperature is within ±2 % of its mean value for at least 2 min or until the engine thermostat controls engine temperature. Within 90 seconds after concluding the warm-up, operate the powertrain over a continuous trace meeting the following specifications: [EPA-HQ-OAR-2022-0985-1598-A1, p. 16]

Warm up the engine by operating it. We recommend operating the engine at any speed and at approximately 75 % of its expected maximum power. Continue the warm-up until the engine coolant, block, engine lubricating oil, or head absolute temperature is within ±2 % of its mean value for at least 2 min or until the engine thermostat controls engine temperature. [EPA-HQ-OAR-2022-0985-1598-A1, p. 16]

Warm up the engine by operating it. We recommend operating the engine at approximately 75 % of the engine's expected maximum power. Continue the warm-up until the engine coolant, block, engine lubricating oil, or head absolute temperature is within ±2 % of its mean value for at least 2 min or until the engine thermostat controls engine temperature. [EPA-HQ-OAR-2022-0985-1598-A1, p. 16]

For hot-start duty cycles, first operate the engine at any speed above peak-torque speed and at (65 to 85) % of maximum mapped power until either the engine coolant, block, engine lubricating oil, or head absolute temperature is within ±2 % of its mean value for at least 2 min or until the engine thermostat controls engine temperature. Shut down the engine. Start the duty cycle within 20 min of engine shutdown. [EPA-HQ-OAR-2022-0985-1598-A1, p. 16]

Engine coolant, block, engine lubricating oil, or head absolute temperatures for water-cooled engines. [EPA-HQ-OAR-2022-0985-1598-A1, p. 16]

Organization: MEMA

In exploratory R&D projects, a MEMA member has found some unique challenges to releasing efficiency technology on conventional vocational vehicles. While manufacturers may release vehicles with new GHG-saving technology, certifiers have more challenges capturing the GHG benefits via powertrain certification due to the need to contain vehicle specification details in the model (for example, axles ratios) to reliably quantify GHG credits and limit complexity. [EPA-HQ-OAR-2022-0985-1570-A1, p. 17]

Organization: Ford Motor Company

PHEV Utility Factor

EPA has proposed in 40 CFR § 1036.545(a)(6) that manufacturers use the methodologies described in SAE J2841 to develop an approved utility factor curve for plug-in hybrid powertrains based on in-use data. Ford supports this flexibility for manufacturers to create application-specific utility factor curves but recommends that EPA define a standard utility factor curve for each segment (LHD/MHD/HHD) for manufacturers to use for the first two years of the rule to give sufficient time to get representative in-use vehicle data. Heavy-duty electrification is in its infancy, and it is too early to determine what the use cases might be for these products compared to their current ICE counterparts. [EPA-HQ-OAR-2022-0985-1565-A1, p. 8]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Missing Appendices

We support moving the requirements of 40 CFR 1037.550 for new engines to 40 CFR 1036.545 for existing and new engines. Appendix A and Appendix D, however, continue to be referenced in the new location as being part of the new section, but the appendices were not moved. We request references to the values that existed in Part 1037 or, alternatively, we request that EPA move the existing Appendices A and D from Part 1037 to Part 1036. [EPA-HQ-OAR-2022-0985-1562-A1, p. 13]

Organization: ROUSH CleanTech

We appreciate and fully support EPA's proposal to allow chassis dynamometers to be utilized for powertrain testing (1037.550/1036.545). We need further study to determine whether this is practical, but we appreciate the flexibility and think it could significantly reduce costs of GHG transient mapping relative to traditional powertrain dynamometers. [EPA-HQ-OAR-2022-0985-1655-A1, p.4]

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

EPA should not be conservative on calculating the utility factor for PHEVs based a truck manufacturer's data.1 There are two mitigating factors that should contribute to EPA's utility factor analysis in an informal way: PHEVs weigh less than BEVs and have substantially less GHG emissions from battery manufacturing than BEVs due their much smaller batteries. Appendix C below illustrates this for light duty PHEVs and BEVs and points to a similar issue for heavy duty PHEVs and BEVs. In addition, PHEVs should have better fuel economy for each mode than comparable BEVs or internal combustion engine vehicles due to their lower mass and hybridization. [EPA-HQ-OAR-2022-0985-1647-A2, p. 2]

1 Assuming a PHEV with an internal combustion engine rather than a battery – fuel cell PHEV.

9) EPA should consider modifying its test cycles to further encourage the truck use case where a work truck uses the battery primarily at a work site to power a boom or recharge equipment (e.g., lawn and garden). Utility trucks with boom and power-take-off operations were the first use case for PHEVs. And new use cases for PHEVs in this use case are likely to emerge especially with CARB's regulation requiring zero emission lawn and garden equipment (e.g., small off-road engine regulation). For example, battery powered lawn, garden and construction equipment can be recharged (e.g., battery swapping) on-site and on-board the truck from the Strong PHEV batteries. [EPA-HQ-OAR-2022-0985-1647-A2, pp. 7 - 8]

EPA Summary and Response:

Summary:

CARB supported amendments proposed to 40 CFR part 1036 to address clutch slip when performing the full load acceleration and to address situations where the powertrain does not reach maximum power.

Cummins commented that fuel map in-use audit test procedures should be aligned with confirmatory test procedures and thresholds, and remedial actions for overall in-use fuel map audit exceedances should align with vehicle-level CO2 in-use compliance remedial actions, as it is not clear at what threshold an overall fuel map in-use test audit would lead to remedial actions and what those remedial actions might be. The commentor stated that 40 CFR 1036.235(c) should be amended to make it applicable to fuel map in-use audit testing of in-use engines (in addition to fuel map confirmatory testing of emissions-data engines). They also requested amendments to §1036.235(c) to include the minimum number of individual in-use engines and the pass rate, or sequential sampling plan, needed to make a final determination if remedial actions are required as a result of an overall fuel map in-use audit (e.g., a minimum of ten individual engines exceeding the fuel map in-use test threshold). The commentor also requested that EPA amend §1036.235(c) to prescribe that the remedial actions for exceeding an overall fuel map in-use audit follow §1037.645.

Cummins requested that the interim provision of §1036.150(q) be amended to clarify its applicability for determining exceedances of in-use testing thresholds (in addition to its applicability to confirmatory testing and the threshold for replacing engine maps). They also requested that EPA make the interim provision in §1036.150(q) permanent for both confirmatory and in-use audit testing.

Cummins supported the approach of using engine broadcasted parameters for determination of off-cycle emissions for field-tested engines where at least one fuel is not carbon-containing and requested that EPA allow the same for field testing of engines using carbon-containing fuels as well. The commentor states that the current approach of using CO2 FCL as a surrogate for power leads to inaccuracies for engines using carbon-containing fuel. They state that CO2 does not always correlate well with power produced, such as when excess fuel is burned for thermal management, or for hybrid operation when the battery/motor assists the engine and less or no fuel is burned.

Cummins provided recommendations for improvements to the SET and FTP test sequences for plug-in hybrids. The commenter stated that what EPA proposed is appropriate for greenhouse gas emissions determination but not for criteria pollutant emissions. The commenter stated that Figure 1 of 40 CFR 1036.510 indicated that SET cycle 5 would be a cold cycle, which is not equivalent to the engine SET test procedure where you start from a hot running condition. Cummins recommends that the charge-sustaining sequence be run separately from the charge-depleting test for criteria pollutant emission determination. Under the commenter's recommendation, the SET would be run at least twice, with the initial SET serving as warm-up, and until the end-of-test criteria is met. The commenter stated that the reported emissions would be the highest criteria emissions from any of the post warm-up test intervals. The commenter stated that the FTP emission result for each criteria pollutant would come from the combination of different test intervals, where the initial test interval would be the cold start interval. The commenter stated that, for example, the highest FTP NOx emissions could be from the combination of test interval numbers 1 (cold) and 4 (hot), while the HC emissions could be from a combination of test interval numbers 1 (cold) and 3 (hot).

Cummins commented that series hybrids that have the same traction system as battery electric vehicles, like e-axles, should be able to certify using a simulated traction system. They cite a shortage of available test facilities to test both e-axles and large batteries. They would like to work with EPA to develop a simulation of the traction and battery systems for the testing and certification of hybrids.

Cummins commented that it would like EPA to work with industry to define a set utility factor curve for hybrid engines to ease the certification and testing burden.

Cummins commented that the vehicle C speed definition criteria in 40 CFR 1036.512 as it currently exists introduces the potential for significant CO2 penalty relative to the conventional SET engine C speed approach. The commentor requested improvements in the methodology used to identify measured vehicle C speed to avoid introducing CO2 penalties for hybrid engines. The commentor stated that they will continue to work with EPA and EMA's EMTC to develop additional criteria.

Cummins commented that additional language is needed to represent real-world scenarios for vehicles with neutral idle features when setting CITT to zero and they proposed the following additional language for 40 CFR 1036.512(b)(2)(ii) and 40 CFR 1036.514(b)(2)(ii)(2): "If the system is primarily intended for vehicles with transmission with Neutral-When-Stationary feature that automatically shifts the transmission to neutral after the vehicle is stopped for a designated time and automatically shifts back to drive when the operator increases demand (i.e., pushes the accelerator pedal), then enable neutral idle feature in GEM HIL model."

Cummins supported the improvement proposed within 40 CFR 1036.501(g) that provides flexibility for testing engines that use regenerative braking through the crankshaft to only power an electric heater for aftertreatment devices as long as the recovered energy is less than 10 percent of the total positive work.

Cummins supported the improvements proposed within 40 CFR 1036.510(b)(2)(vii), which provides additional clarity regarding the selection of drive axle ratio and tire radius for performing emissions testing via powertrain test procedures and introduces the potential to request preliminary approval for the selected drive axle ratio and tire size.

Cummins requested that EPA work with them to develop a hybrid powertrain software simulation program to augment GEM to streamline hybrid certification, to avoid testing and reporting proliferation, and hybrid powertrain family proliferation. The commenter stated that the software program would be designed to allow for aggregation of many variants of a basic hybrid powertrain configuration into one EPA hybrid powertrain family and would generate "analytically derived inputs" for input into GEM to represent the overall family. The commenter stated that this would allow vehicle OEMs optimize the specifications of major components such as internal combustion engines, electrical generators, electric motors, and electric batteries without leading to a massive proliferation of hybrid powertrain families and subsequent certification and in-use reporting burdens under the current approach, which requires a manufacturer to prescribe hybrid powertrain families including each family's pre-certification testing and in-use reporting requirements.

Cummins commented that through past testing experience they believe that engine lubricating oil temperature can be an important criterion in determining engine warmup times. They state that historically, EPA has agreed to follow the same test procedures for warmup time determination as that recommended by the manufacturer. The commentor proposed to add engine lubricating oil temperature to 40 CFR part 1036 and 1065 as one of the criteria for engine warmup. They propose the following changes to 40 CFR 1065.520(d): "Carry out the test as described in this paragraph (d). Warm up the powertrain by operating it. We recommend operating the powertrain at any vehicle speed and road grade that achieves approximately 75 % of its expected maximum power. Continue the warm-up until the engine coolant, block, engine lubricating oil, or head absolute temperature is within ±2 % of its mean value for at least 2 min or until the engine thermostat controls engine temperature. Within 90 seconds after concluding the warm-up, operate the powertrain over a continuous trace meeting the following specifications:"

The commentor requested similar changes to 40 CFR 1036.510(b)(2), 40 CFR 1065.510(d)(2), 40 CFR 1065.530(a)(2)(ii), and 40 CFR 1065.530(a)(2)(iii)(A).

Ford stated that in 40 CFR § 1036.545(a)(6) EPA proposes that manufacturers use methodologies described in SAE J2841 to develop an approved utility factor curve for plug-in hybrid powertrains based on in-use data. Ford supports this flexibility but recommends that EPA define a standard utility factor curve for each segment (LHD/MHD/HHD) for manufacturers to use for the first two years of the rule to give sufficient time to get representative in-use vehicle data.

MEMA commented than one of their members has found some unique challenges to releasing efficiency technology on conventional vocational vehicles due to challenges with including vehicle specification details in the model.

NESCAUM and OTC supported moving 40 CFR 1037.550 to 40 CFR 1036.545, but noted that the references to Appendix A and Appendix D in 40 CFR part 1037 were inadvertently changed to 40 CFR part 1036. They requested that these be corrected to correctly reference 40 CFR part 1037.

Roush CleanTech commented that it supported EPA's proposal to allow chassis dynamometers to be utilized for powertrain testing in 40 CFR 1036.545. They believe this option could significantly reduce costs of GHG transient mapping relative to traditional powertrain dynamometers.

Strong PHEV Coalition commented that EPA should not be conservative on calculating the utility factor for PHEVs. The commenter stated that PHEVs weigh less than BEVs and have substantially less GHG emissions from battery manufacturing than BEVs due to their much smaller batteries which should contribute to EPA's utility factor analysis. The commenter stated that PHEVs should have better fuel economy for each mode than comparable BEVs or internal combustion engine vehicles due to their lower mass and hybridization.

Strong PHEV Coalition commented that EPA should modify its test cycles to encourage cases where a work truck uses the battery primarily at a work site to power a boom or recharge equipment. They stated that battery powered lawn, garden and construction equipment can be recharged (e.g., battery swapping) on-site and on-board the truck from the PHEV battery.

Response:

We thank CARB for their support of the amendments proposed to 40 CFR 1036.520(d)(2) to address clutch slip when performing the full load acceleration and to address situations where the powertrain does not reach maximum power. We proposed two options for minimizing clutch slip. We are finalizing the option to increase initial vehicle speed up to 5 mi/hr to minimize clutch slip as we believe that the option to decrease road grade for the first 30 seconds of the duty cycle is not as effective.

Cummins commented that fuel map in-use audit test procedures should be aligned with confirmatory test procedures and thresholds, and remedial actions for overall in-use fuel map audit exceedances should align with vehicle-level CO2 in-use compliance remedial actions. These procedures are already aligned per 40 CFR 1036.401(a) where it states that we may perform in-use testing of any engine family subject to the standards of this part, consistent with the Clean Air Act and the provisions of § 1036.235. That link to 30 CFR 1036.235 aligns both the confirmatory and in-use test procedures and the interim accuracy margin in 40 CFR 1036.150(q). EPA is not amending in this rulemaking 40 CFR 1036.235(c) to include that remedial actions for exceeding an overall fuel map in-use audit follow 40 CFR 1037.645, as we did not reopen this provision and this requested revision is outside the scope for this rule. In the event of a failure, under the existing regulations we would expect the manufacturer to enter into discussion with EPA to resolve the failure, including the potential for recall.

EPA is finalizing a change, based on consideration of Cummins' request, to clarify that the interim provision of §1036.150(q) is also applicable for determining compliance exceedances for in-use testing. This means that if the fuel map results from an in-use test are at or below 2.0 % of the results from Eq. 1036.235-1, we will not replace the manufacturer's fuel maps. It is appropriate and was intended that this 2.0% margin be applied to in-use testing as well because the testing is conducted in an emission laboratory just like a confirmatory test and is subject to the same lab-to-lab measurement variability as a confirmatory test. EPA is not finalizing a change to make the interim provision in §1036.150(q) permanent as we did not reopen this issue and this requested revision is outside the scope of this rule.

EPA is only finalizing the use of engine broadcasted parameters for determination of off-cycle emissions for field-tested engines where at least one fuel is not carbon-containing. EPA disagrees with Cummins that the current approach of using CO2 FCL as a surrogate for power leads to greater inaccuracies in the determination of power from engine broadcast parameters for engines using carbon-containing fuel. EPA transitioned to the use of FCL CO2 for MY 2027 and later engines for field testing to reduce the variability in the brake-specific NOx determination at ultra-low NOx levels. Cummins' analysis was focused on the instantaneous effect the use of CO2 FCL could have on power determination and failed to look at the effect that their stated FCL error has on the ultimate field test shift-day NOx emission results. We note that that error was accounted for in the stringency of the final off-cycle standards in existing 40 CFR 1036.104, and also note that this comment is outside the scope of this rulemaking.

EPA does not agree with Cummins' comment that the criteria pollutant emissions determination of the charge-depleting test procedure for plug-in hybrid powertrains over the FTP and SET is not comparable to the engine test procedure. EPA recognizes that the potential for engine starting to occur in the middle of the test interval is not consistent with how traditional testing is carried out, but we do not believe this will have an adverse effect on the test result as test interval emissions will be divided by the total test interval work, not just the work done while the engine was running. We recognize that the SET duty-cycle does not include a cold start. We anticipate the use of electric heaters in conjunction with the catalyst system to elevate the aftertreatment system temperature in advance of the engine starting will minimize the contribution of cold start emissions over the duty cycle.

While Cummins' comment was outside the scope of this rule, EPA is constantly reviewing its test procedures and in the future EPA intends to work with Cummins, other manufacturers, and stakeholders to simplify the testing of series hybrid systems with e-axles. For example, this could be done by simulating the traction systems, such that more widely available test facilities could be used.

While Cummins' comment was outside the scope of this rule, EPA is constantly reviewing its test procedures and in the future EPA intends to work with Cummins, other manufacturers, and stakeholders to develop a defined set of utility factor curves for hybrid powertrains which we understand would ease the certification and testing burden. We note that a key consideration will be that the ability of manufacturers or other stakeholders to provide sufficient in-use data on daily vehicle miles traveled by vocation.

We agree with Cummins' comment that the vehicle C speed definition criteria in 40 CFR 1036.512, as it currently exists, introduces the potential for significant CO2 penalty relative to the conventional SET engine C speed approach. We are finalizing changes to 40 CFR 1036.520(j) to address Cummins' concern, making the procedure more robust at determining a representative vehicle C speed. A discussion of the changes can be found in Section III.C of the preamble. We are committed to continue to work with stakeholders on considering developing improvements to the powertrain test procedures through EMA's Emission Measurement Test Committee.

EPA does not agree with Cummins' comment that additional language is needed to represent real-world scenarios for vehicles with neutral idle features when setting CITT to zero. EPA does not allow this option for conventional engines or hybrid engines and prescribed curb-idle and neutral idle has been the historical policy with respect to carrying out testing over the FTP and LLC duty-cycles. EPA considers this a substantial change from how engines are currently certified and this requested revision is outside the scope for this rule because we did not reopen this aspect of our existing regulations in the proposal.

EPA thanks Cummins for their support of the improvements we are finalizing within 40 CFR 1036.501(g) to provide flexibility for testing engines that use regenerative braking through the crankshaft to power an electric heater for aftertreatment devices.

EPA thanks Cummins for their support of the improvements proposed within 40 CFR 1036.510(b)(2)(vii).

While Cummins' comment was outside the scope of this rule, EPA is constantly reviewing its test procedures and in the future EPA intends to work with Cummins, other manufacturers, and stakeholders toward the development of a hybrid powertrain software simulation program to augment GEM to streamline hybrid certification.

EPA is finalizing changes to the criteria for engine warm-up after consideration of Cummins' comment as we agree that lubricant oil temperature can serve as a valid metric for determination of engine warm-up. We have included engine lubricating oil as one of the criteria in 40 CFR 1036.520(d), 1065.510(d)(2), 1065.530(a)(2)(ii), and 1065.530(a)(2)(iii)(A). We note that no change was needed in 40 CFR1036.510(b)(2) as it references 40 CFR 1036.545, which in turn references 40 CFR 1036.520(d) for the warm-up procedure.

EPA thanks MEMA for their comment on getting credit for additional technologies, however there is not enough information at this time to make a change in this rule.

EPA thanks Ford for their support of the provision in 40 CFR 1036.545 that allows manufacturers to use methodologies described in SAE J2841 to develop an approved utility factor curve for plug-in hybrid powertrains based on in-use data. EPA does not have enough representative in-use vehicle data at this time to finalize utility factor curves for each of the vehicle subcategories and this comment was outside the scope of this rule, but we intend to work with manufacturers in the future to develop these curves, while noting that a key consideration will be the ability for manufacturers or other stakeholders to provide sufficient in-use data on daily vehicle miles traveled by vocation.

EPA thanks NESCAUM and OTC for their support of moving 40 CFR 1037.550 to 40 CFR 1036.545. During the transition, we inadvertently changed the references for 40 CFR 1037 Appendix A and Appendix D to 40 CFR part 1036. We are finalizing changes to 40 CFR 1036.545(f)(3), (g)(1)(ii), and (g)(1)(iii) to correct all these references back to the originally intended 40 CFR part 1037.

EPA thanks Roush CleanTech for their support of EPA's proposal to allow chassis dynamometers to be utilized for powertrain testing in 40 CFR 1036.545.

Strong PHEV Coalition commented that EPA should not be conservative on calculating the utility factor for PHEVs. This comment was outside the scope of this rule. EPA does not have sufficient data at this time to calculate utility factor curves for each of the vehicle subcategories and as a result, we are not finalizing specific utility factor curves in our regulations at this time.

EPA did not propose a duty cycle to address operation where a work truck would be used to charge batteries used to power external equipment. This comment was outside the scope of this rule. Our GHG standards are based on three duty-cycles and two idle cycles. None of the duty cycles account for external accessories like the charging of batteries that could power lawn, garden and construction equipment as described by the Strong PHEV Coalition. Therefore, EPA is not finalizing any changes at this time to the duty cycles to account for external accessory load.

24.2 Amendments for 40 CFR part 1037

24.2.1 A/C

Comments by Organizations

Organization: California Air Resources Board (CARB)

F. Other Program Elements

1. A/C Leakage Requirements

a. A/C Leakage Standards

Affected page: 26124

CARB staff recommends that U.S. EPA require manufacturers to report the following detailed A/C system information to demonstrate compliance with the A/C leakage standard:

- A/C system schematics to show the topological layout of the system components; and
- SAE J2727 spreadsheets to show the system component specifications and system leak rate calculation. [EPA-HQ-OAR-2022-0985-1591-A1, pp.54-55]

The California Phase 2 GHG regulation requires the submittal of these documents. During the certification process for MYs 2021 through 2023 vehicles, CARB staff has found that having the system schematics and actual SAE J2727 spreadsheets was critical to adequately evaluate compliance with the leakage standard. A/C systems for HDVs vary significantly in leakage-related parameters, such as fitting numbers and hose lengths. Without schematics and J2727 spreadsheets, there would be insufficient system information to verify the leakage calculation. Requiring the schematics and SAE J2727 spreadsheets has enabled CARB staff to identify problems that were required to be fixed by the manufacturers before receiving an Executive Order; if U.S. EPA does not require the schematics and spreadsheets, CARB staff expects that U.S. EPA staff will miss the opportunity to identify and correct such problems. [EPA-HQ-OAR-2022-0985-1591-A1, p.55]

b. Clarification for self-contained A/C units

Affected page: 26124 (1037.113(e)(1))

CARB staff appreciates U.S. EPA's NPRM to clarify a self-contained A/C unit. However, CARB staff believes this definition is still unclear and could be left up to manufacturer's interpretation. CARB staff suggests adding a clear definition of a self-contained A/C unit to 40 CFR 1037.801, which makes it clear to manufacturers. For example, a self-contained A/C unit could be defined as a factory-manufactured A/C unit that completely encloses the refrigerant circuit in its own housing without connections to outside the housing to enable modification of the refrigerant circuit. [EPA-HQ-OAR-2022-0985-1591-A1, p.55]

Similarly, a self-contained refrigeration unit (for cooling batteries and other vehicle components and not for cooling cargo) could be defined as a factory-manufactured refrigeration unit that completely encloses the refrigerant circuit in its own housing without connections to outside the housing to enable modification of the refrigerant circuit. [EPA-HQ-OAR-2022-0985-1591-A1, p.55]

c. A/C systems for passenger cooling

Affected page: 26124

CARB staff recommends including A/C systems for passenger cooling and refrigeration systems for cooling battery and vehicle components, unless they are designed as self-contained systems, under the Phase 3 A/C leakage requirements. The existing Phase 2 GHG regulation does not clearly address whether the A/C systems for cooling passengers would be subject to the A/C leakage standard. Furthermore, during the implementation of the California Phase 2 GHG regulation, CARB staff came across refrigeration systems designed for battery cooling in electric vehicle applications. As the industry increasingly shifts towards electric vehicles, the prevalence of such refrigeration systems is expected to rise. The A/C systems for passenger cooling and refrigeration systems for cooling batteries, if they are not self-contained, use similar components and parts to the A/C systems for driver cabin cooling and should have similar leakage attributes. Failing to subject A/C systems for passenger cooling and refrigeration systems for cooling batteries to the Phase 3 A/C leakage requirements would cause unnecessary increases in leakage of high global warming potential refrigerants. [EPA-HQ-OAR-2022-0985-1591-A1, pp.55-56]

EPA Summary and Response:

Summary:

CARB recommends that EPA require that manufacturers report A/C system schematics to show the topological layout of the system components and SAE J2727 spreadsheets to show the system component specifications and system leak rate calculation to demonstrate compliance with the A/C leakage standard. These are required in the California Phase 2 GHG regulation. CARB has found that having the system schematics and SAE J2727 spreadsheets was critical to adequately evaluate the leakage calculation and compliance with the leakage standard.

CARB appreciates the proposal's clarification on what constitutes a self-contained A/C unit, however the definition is still unclear and could be left up to manufacturer's interpretation. CARB suggests EPA add a clear definition of a self-contained A/C unit to 40 CFR 1037.801 and provide the following example: "a self-contained A/C unit could be defined as a factory-manufactured A/C unit that completely encloses the refrigerant circuit in its own housing without connections to outside the housing to enable modification of the refrigerant circuit." This definition could also be applied for self-contained A/C units that cool batteries and other vehicle components that don't cool cargo.

CARB recommends including A/C systems for passenger cooling and refrigeration systems for cooling battery and vehicle components under the Phase 3 A/C leakage requirements, unless they are designed as self-contained systems. They state that the existing Phase 2 GHG regulations do not clearly address whether the A/C systems for cooling passengers would be subject to the A/C leakage standard. As the industry increasingly shifts towards electric vehicles, the prevalence of refrigeration systems for battery cooling is expected to rise. The non-self-contained versions of these A/C systems for passenger cooling and refrigeration systems for cooling batteries use similar components and parts to the A/C systems for driver cabin cooling.

Failure to include these systems could cause unnecessary increases in leakage of high global warming potential refrigerants.

Response:

We appreciate CARB's suggestion for new definitions of "self-contained" in reference to A/C and refrigeration units. We did not propose and are not finalizing a new definition for "self-contained". At this time, we are finalizing as proposed the revisions to 40 CFR 1037.115(e) and may consider revising in the future if we see a need for additional clarification as more manufacturers certify vehicles with these systems.

We agree with CARB that additional information, such as A/C schematics and calculation spreadsheets, could help EPA staff identify A/C system problems. We also appreciate CARB's recommendation that EPA expand the A/C leakage requirements to apply for passenger cooling and refrigeration systems. However, we did not propose that manufacturers report additional A/C related data or to expand the applicability of the leakage requirements and are not finalizing such a requirements at this time. We may consider new reporting and leakage requirements in a future rulemaking.

24.2.2 Labeling

Comments by Organizations

Organization: California Air Resources Board (CARB)

3. Labeling Requirements

Affected page: 26125 (1037.135)

In CARB's comments to the HD2027 NPRM,193 CARB staff recommended consolidating the location for all the labeling requirements in one central place. It would be beneficial to have a singular location for labeling requirements. Consolidating the regulations would make it simpler to edit language, find where labels are not meeting the requirements, and make it clear where all labeling requirements are located. The proposed idea is to either refer to the special requirements of 40 CFR 1037.630(b)(3), 1037.622(d)(3), 1037.631(d), 1037.150(c), 1037.150(r), and 1037.105(h) in 1037.135 or create 1037.136 as "Additional Labeling" where all the consolidated labeling requirements are posted. [EPA-HQ-OAR-2022-0985-1591-A1, p.57]

193 Comment submitted by California Air Resources Board (CARB) Posted by the Environmental Protection Agency on May 15, 2022. https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1186

a. Regulatory subcategory on label

Affected page: 26125 (1037.135(c))

CARB staff proposes to add "State the regulatory subcategory that determines the applicable emission standards for the vehicle family (see definition in § 1037.801)" as 40 CFR 1037.135(c)(4). This provision was present in previous versions of this regulation. [EPA-HQ-OAR-2022-0985-1591-A1, p.57]

EPA Summary and Response:

Summary:

CARB recommends consolidating the location for all the labeling requirements in one central place to make it simpler to edit language, find where labels are not meeting the requirements, and make it clear where all labeling requirements are located. They provide two options, either refer to the special requirements of 40 CFR 1037.630(b)(3), 1037.622(d)(3), 1037.631(d), 1037.150(c), 1037.150(r), and 1037.105(h) in 1037.135 or create a new 1037.136 titled "Additional Labeling" where all the consolidated labeling requirements would be posted.

CARB would like EPA to add a new 40 CFR 1037.135(c)(4) which states: "State the regulatory subcategory that determines the applicable emission standards for the vehicle family (see definition in § 1037.801)". CARB provides no reason for adding this other than the provision was present in previous versions of this regulation.

Response:

CARB's suggested approach of consolidating labeling requirements into a single location is a good example of drafting the regulation to serve the interests of the regulator, at the expense of making the regulatory provisions clear and accessible for the regulated community. It is best for anyone needing to comply with regulatory requirements by having the labeling and other relevant requirements spelled out in the place where the context establishes all the relevant requirements together. Moreover, we would expect EPA compliance activities to focus on a particular circumstance where labeling and other related requirements apply together, rather than broadly assessing compliance with labeling requirements in isolation from those other related requirements for a particular circumstance.

We disagree with CARB's comment on adding the regulatory subcategory to the label, since this is information provides limited additional information inspectors could use to quickly determine if the vehicle is in its certified condition and would take up valuable space on the label. See 86 FR at 34337 (June 29, 2021) for more information on our original decision to remove regulatory subcategory from the label.

24.2.3 Interim Provisions 40 CFR 1037.150

Comments by Organizations

Organization: California Air Resources Board (CARB)

6. Transition to Updated GEM

Affected page: 26126 (1037.150(x))

The NPRM's proposed language:

"(x) Transition to updated GEM. (1) Vehicle manufacturers may demonstrate compliance with Phase 2 greenhouse gas standards in model years 2022 through 2023 using GEM Phase 2, Version 3.0, Version 3.5.1, or Version 4.0 (all incorporated by reference, see § 1037.810). Manufacturers may change to a different version of GEM for model years 2022 and 2023 for a given vehicle family after initially submitting an application for certification; such a change must be documented as an amendment under § 1037.225. Manufacturers may submit an end-of year report for model year 2021 using any of the three regulatory versions of GEM, but only for demonstrating compliance with the custom-chassis standards in § 1037.105(h); such a change must be documented in the report submitted under § 1037.730. Once a manufacturer certifies a vehicle family based on GEM Version 4.0, it may not revert back to using GEM Phase 2, Version 3.0 or Version 3.5.1 for that vehicle family in any model year." [EPA-HQ-OAR-2022-0985-1591-A1, p.58]

Manufacturers may take advantages of 40 CFR 1037.150(x) to use the GEM version that is most beneficial to them. CARB staff suggests that the existing GEM Phase 2, Version 3.0 and Version 3.5.1 should only be allowed for use on carryover applications. For new submissions for certification, manufacturers should follow the requirement of GEM version in 40 CFR 1037.520. [EPA-HQ-OAR-2022-0985-1591-A1, p.58]

EPA Summary and Response:

Summary:

CARB is concerned that manufacturers may take advantages of 40 CFR 1037.150(x) and use the GEM version that is most beneficial to them. CARB staff suggests that existing GEM Phase 2 versions 3.0 and 3.5.1 only be allowed for use on carryover applications. New submissions for certification should follow the requirements for GEM version in 40 CFR 1037.520.

Response:

EPA provided the flexibility of allowing manufacturers to use either GEM Phase 2 Version 3.0, Version 3.5.1, or Version 4.0 through MY 2023, since we have heard from manufacturers that it takes significant time and resources for a manufacturer to switch to a different version of GEM and as such, we determined that MY 2024 was the appropriate model year to require all manufacturers to use GEM Phase 2 Version 4.0. In addition, EPA has put significant effort to make each version of GEM output similar CO2 emissions results for all heavy-duty vehicles and we have demonstrated that on average the different versions of GEM provide equivalent results (see 87 FR 45257, July 28, 2022). So, in summary we disagree with the comments from CARB that GEM Phase 2 Versions 3.0 and 3.5.1 only be allowed for use on carryover applications.

24.2.4 Test Procedures

Comments by Organizations

Organization: Allison Transmission Inc.

3. Improvements needed in GEM modeling of CO2 emissions

The following comments pertaining to GEM were provided by Allison for Proposed Rule: Control of Air Pollution From New Motor Vehicles: Heavy Duty Engine and Vehicle Standards ("Proposed Rule"), 87 Fed. Reg. 17,414 (Mar. 28, 2022) and are reiterated here as they apply to GHG Phase 3 as well:

EPA should consider crediting methodologies that would make it easier for OEMs to apply CO2 technology for GHG credits across a wide range of vehicle configurations. And this effort should additionally be accompanied by additional review of the duty cycles used for the certification of different vehicle types. [EPA-HQ-OAR-2022-0985-1657-A2, p. 2]

1. Vocational applications like transit bus with lower average speed, more frequent stops, and technology advancements such as hybrid with all-electric range can realize greater CO2 benefits than reflected in GEM model. This results in an underestimation of resulting CO2 emissions, and EPA should include cycles like Manhattan or OCTA in Optional Custom Chassis designation for transit bus to better measure hybrid technology benefits for transit bus (see Appendix B).

a. Specifically, eGen Flex™ hybrid systems can realize up to a 25 reduction in CO2 emissions compared to conventional powertrains, yet this performance is not recognized in GEM. Hybrid drive cycles include engine-off run time which is entirely out of scope of the current certification cycles. Transit agencies can use geofencing, green EV zones, and Engine Start Stop features to increase percentage of operating time where vehicle is moving, but engine is off.
b. GEM model does not capture these effects when modeling CO2 reduction because GEM model instead reflects a mix of high speed 55-65 mph steady state cycles and ARB transient, compared with Manhattan cycle with top speeds of 25 mph. Neither custom chassis certification nor powertrain testing certification include certification cycles that reflect the real-world operation of transit buses or other unique drive cycles representative of vocational operation. [EPA-HQ-OAR-2022-0985-1657-A2, p. 2.] [See Docket Number EPA-HQ-OAR-2022-0985-1657-A2, page 6, for Appendix B.]

2. Allison's Neutral at Stop Standard feature is another example of a fuel efficiency feature that reduces conventional CO2 emissions but does not have this benefit reflected in OEM GEM score.

a. GEM's neutral idle capability recognizes only torque reduction at idle that is equivalent to true neutral, and thus, Neutral Idle is incorporated in GEM with a binary yes-no selection. It is unfair to allow no benefit in the GEM logic to OEMs utilizing such features as Neutral at Stop Standard which utilizes approximately 70% torque reduction at idle while optimizing vocational productivity and therefore increasing adoption rates by end users.

b. EPA could change Neutral-idle technology within GEM to recognize this CO2 reduction with an analog, high-medium-no setting, or possibly off-cycle technology credit with a clearly defined process to achieve a partial credit neutral idle benefit. EPA could address this crediting issue within the context of this rulemaking and the broad request for comments that EPA has solicited. [EPA-HQ-OAR-2022-0985-1657-A2, p. 3]

3. A third example exists with respect to DynActive™ Shifting

a. This feature is specified by end-users desiring fuel savings, but advanced shifting strategies are currently not a technology improvement option for vocational customers in the GEM model. EPA should therefore consider this technology for inclusion in GEM with a high-regular-no setting of efficiency bias input to reflect the different levels vocational customers set to balance their productivity needs with reduced fuel usage.

b. This feature utilizes an algorithm to learn the engine's torque curve, allowing shifting decisions to be made to maximize performance when performance is needed, all while delivering fuel economy benefit when there is opportunity (part throttle, light weight, downhill operation, etc.). [EPA-HQ-OAR-2022-0985-1657-A2, p. 3]

Organization: Cummins Inc.

3. Cummins supports tractor and vocational chassis weight reduction GEM inputs for engines with displacement greater than 14.0 liters.

§1037.520(e)(4)(iii) prescribes applying a 300-pound weight reduction in GEM for tractors with installed engines with displacement below 14.0 liters. EPA used displacement as a proxy for actual weight reduction, and EPA has described this as an engine "downsizing" weight reduction credit. Since EPA finalized that weight reduction GEM input in 2016, manufacturers have designed and developed new engine platforms with displacements greater than 14.0 liters that are at least 300 pounds lighter than their predecessors of very similar displacement. We request that EPA prescribes in §1037.520(e) tractor, and vocational chassis engine weight reduction inputs for GEM, based on EPA approving certification data manufacturers would submit to document actual engine weight reductions relative to model 2016 engines of very similar displacement. That approach would be more representative of real-world weight reductions than using engine displacement as a proxy. Cummins requests to meet with EPA technical staff to share confidential business information regarding how Cummins has achieved real-world engine weight reductions at very similar displacements and the type of documentation that could be submitted for certification of engine weight reductions. [EPA-HQ-OAR-2022-0985-1598-A1, p. 7]

4. Cummins requests a representative test procedure option for vocational vehicles with Medium Heavy-Duty Engines (MHDE) that are in Class 8 Medium Heavy-Duty Vehicles (Class 8 MHDV)

According to EPA's engine and vehicle primary intended service class definitions, MHDE can be installed in vocational MHDV that are Class 8 (>33,000 pounds gross vehicle weight rating). However, EPA's prescribed fuel mapping test procedures and GEM MHDV vehicle masses lead to unrepresentative simulated engine operation in GEM for Class 8 MHDV. Using GEM's vocational heavy heavy-duty (HHDV) vehicle masses for MHDE fuel mapping and GEM simulation for Class 8 MHDV would lead to a more representative test option. It would be appropriate to maintain such MHDE and Class 8 MHDV within their existing primary intended service classes for useful life, warranty, and ABT averaging sets. It also would be appropriate to maintain the existing MHDV GEM duty cycle weighting factors, GEM payload, and EPA technology improvement factors, and market adoption rates EPA used for Phase 2 MHDV CO2 standard stringency setting. However, we expect that EPA using the HHDV vehicle masses in its MHDV stringency-setting process still would lead to different CO2 stringencies. Therefore, Cummins requests to work with EPA technical staff between now and EPA's final rule to provide EPA any data and other technical support that would be needed to establish such a representative test option—and new stringencies, if needed. [EPA-HQ-OAR-2022-0985-1598-A1, p. 8]

6. Cummins supports EPA's proposed definition of "neat" hydrogen and the associated testing exemptions.

EPA's definition of "neat" hydrogen allows internal combustion engines running on hydrogen that is not mixed with other fuels to be recognized as having zero carbon tailpipe emissions without testing. Cummins supports this approach. Distinguishing between fuels that are carbon-containing and fuels that do not contain carbon such as hydrogen is appropriate to identify the applicable test procedures, and to waive testing for engines and vehicles using fuels that do not contain carbon and would not produce CO_2. Excluding engines that use a diesel pilot for combustion from the definition of "neat" and from the testing exemptions ensures that tailpipe CO_2 emissions will be measured and accounted for appropriately for such engines. As discussed previously, hydrogen engines will play an important role in near term carbon reductions. Accelera by Cummins PEM electrolyzer systems are advancing the adoption of large-scale electrolysis to drive green hydrogen forward. When partnered with our hydrogen internal combustion engine, we are working towards a zero-carbon solution for fleets. [EPA-HQ-OAR-2022-0985-1598-A1, p. 8]

Organization: Dana Incorporated

Axle Efficiency Test

Dana has reviewed the axle efficiency test procedure and largely agrees with the full process. To help achieve a more valid power-loss map, Dana requests that EPA add the following sentence to Section (2) under 1037.560 Axle efficiency test; "For interpolated maps, the temperature at a given test point must be the same for all inputs to that interpolation." [EPA-HQ-OAR-2022-0985-1610-A1, p. 4]

The suggested correction would read: (2) Maintain gear oil temperature at (81 to 83) °C. You may alternatively specify a lower range by shifting both temperatures down by the same amount for all test points or on a test point-by-test point basis. We will test your axle assembly using the same temperature range you specify for your testing. For interpolated maps, the temperature at a given test point must be the same for all inputs to that interpolation. You may use an external gear oil conditioning system, as long as it does not affect measured values. [EPA-HQ-OAR-2022-0985-1610-A1, p. 4]

Organization: Eaton

Finally, we recommend the EPA requires ZEV trucks to be certified through GEM, even if the GHG emissions number is automatically zero (as it should be). Based on the efficiency ranges in batteries (94% – 96%), power electronics (95% – 99%), motor (92% – 96%) and gearing (0% – 20% improvement) and different architectures, ZEV efficiency can vary more than 25%. This variation has also been observed in Light Duty ZEV where efficiencies of similar higher volume sales models vary from 240 wh/mile to 430 wh/mile. GEM can calculate the vehicle efficiency in terms of kWh / ton-mile on regulatory cycles. This is an important metric to help inform consumers of the efficiency of the vehicle and let the EPA understand the grid and infrastructure impact of ZEV vehicles for possible future regulations or incentive programs. Such an approach is already drafted in Europe as part of the updated VECTO certification method, which is relevant to the rule as VECTO is very similar to GEM. Computing the energy consumption per ton-mile would be analog to the mp-ge calculation in LD Corporate Average Fuel Economy implemented in the US today for ZEV cars. A reliable and consistent record of such a metric will offer the foundation for informing the Agency and the market of actual performance, enabling future adjustments to the rule, assessment of impact and needs for infrastructure policy, and enabling end-customer informed choice. [EPA-HQ-OAR-2022-0985-1556-A1, pp. 6-7]

Extend GEM certification to ZEV. Recognizing the large variability in electrical efficiency (or Hydrogen consumption), we recommend certifying ZEV trucks in GEM even if the CO2 emissions are clearly 0 g/ton-mile. However, GEM should record the energy use and the EPA can thus gather data on the actual impact of ZEV on the grid and/or Hydrogen infrastructure. Such data can be used for informing the market for total cost of ownership, e.g., as an energy efficiency label, or be used in a future implementation of a voluntary program similar to the successful “Smart Way” program. [EPA-HQ-OAR-2022-0985-1556-A1, p. 7]

Adjust the “Intelligent Controls” GEM credit for CDA. We suggest adjusting the GEM credit from 1.5 to 2.5 for all vehicles that implement full engine cylinder deactivation during coasting, to account for the reduction in aftertreatment heating after the coasting events. [EPA-HQ-OAR-2022-0985-1556-A1, p. 7]

Organization: Ford Motor Company

Changes to Test Procedures

Ford supports EPA’s updates of the test procedures to accommodate heavy-duty electrified products but would like to highlight the increased testing burden this will have on emissions test laboratories especially for the GEM fuel mapping test procedures. Table 3 compares an ICE vehicle with a PHEV with an all-electric range of 50 miles which is a reasonable assumption that heavy-duty vehicles could achieve this over the timeframe of the proposed rule given that CARB requires a minimum all-electric range of 75 miles starting in 2030 to qualify for their near-zero emission vehicles credit. Using cycle distances given in 40 CFR § 1037.510 for the transient, 55 mph, and 65 mph cycles, based on the 50-mile all-electric range assumption, a test lab would have to run 19 transient cycles, five 55 mph cycles, and five 65 mph cycles to reach the end of test criterion proposed in this regulation. This equates to an increase of over 800% in total test time compared to an ICE vehicle to create the fuel map. [EPA-HQ-OAR-2022-0985-1565-A1, p. 8] [Refer to Table 3 on page 9 of docket number EPA-HQ-OAR-2022-0985-1565-A1]

We encourage EPA to consider solutions to this issue in order to eliminate unreasonable test burden for all parties and would welcome further engagement with EPA on this matter. [EPA-HQ-OAR-2022-0985-1565-A1, p. 8] [Refer to Table 3 on page 9 of docket number EPA-HQ-OAR-2022-0985-1565-A1]

Organization: Howmet Wheel Systems

Comments on Wheel Lightweighting

We support and applaud EPA for continuing to recognize the contributions of wheel-related weight reductions as noted in Table 6 of § 1037.520 Wheel-Related Weight Reductions (‘Table 6’) and Paragraph (e)(1) that immediately precedes it within the NPRM. It appears that the NPRM relies on the assumptions regarding wheel weights that were part of the Regulatory Impact Analysis for Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2 as weight reduction credits for Phase 2 have been extended to Phase 3.5 Howmet Wheel Systems would request several changes to entries on Table 6 and Paragraph (e)(1) to reflect advancements to lightweight aluminum wheel technologies we have made available to the market in recent years. [EPA-HQ-OAR-2022-0985-1599-A1, p. 3]

5 “Regulatory Impact Analysis: Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2,” U.S. Environmental Protection Agency, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NS.PDF?Dockey=P100P7NS.PDF, August 2016.

The NPRM defines a lightweight alloy wheel – within Paragraph (e)(1) – as follows, “...an aluminum alloy qualifies as light-weight if a [steer or] dual-wide drive wheel made from this material weighs at least 21 pounds less than a comparable conventional steel wheel.” We would request that this assumption should be upgraded to at least 25 pounds less than a conventional steel wheel as this reflects the state of product development and availability in the market today. For example, the Alcoa® ULA18 22.5” x 8.25” forged aluminum wheel at 39 pounds and Alcoa® ULT36 22.5” x 8.25” lightweight aluminum alloy wheel at 36 pounds are 25 pounds and 29 pounds lighter than conventional steel wheels, respectively. [EPA-HQ-OAR-2022-0985-1599-A1, p. 3]

A corresponding change should be made to Table 6 which currently indicates that a steer or dual wide drive aluminum wheel and light-weight aluminum alloy wheel is eligible for a weight reduction credit of 25 pounds. We would propose the table be changed to reflect that a steer or dual wide light-weight aluminum alloy wheel is eligible for a weight reduction credit of 29 pounds because this also reflects the state of products available in the market today. This can be seen in the difference between a standard steel wheel such as the Accuride 51487 22.5” x 8.25” steel wheel at 65 pounds and the Alcoa® ULT36 22.5” x 8.25” lightweight aluminum alloy wheel at 36 pounds (65 lbs – 36 lbs = 29 lbs). [EPA-HQ-OAR-2022-0985-1599-A1, p. 3]

We would also propose that the NPRM provide a separate definition of wide-base lightweight aluminum alloy wheel that reflects the introduction of the Alcoa® 84U61 wide base 22.5” x 14” wheel that weighs 49 pounds. This would see the following text added to Paragraph (e)(1): “Similarly, a wide-base wheel qualifies as light-weight if a wheel made from this material weighs at least 81 pounds less than two conventional steel dual-wide drive wheels.” This can be seen in the difference between dual width drive wheel sets of Accuride 51487 22” x 8.5” steel wheels at 65 pounds and the Alcoa 84U61 22.5” x 14” aluminum wheel at 49 pounds (130 lbs – 49 lbs = 81 lbs). [EPA-HQ-OAR-2022-0985-1599-A1, pp. 3 - 4]

This proposed change to the definition of a wide base ‘Light-Weight Aluminum Alloy Wheel’ would then be reflected on Table 6 by providing a weight reduction credit for a wide base ‘Light-Weight Aluminum Alloy Wheel’ drive wheel/tire sets of 154 pounds. Supporting calculations for these values are shown below and reflect the lower weight of wide base tires. The reduction of 154 pounds is based on a wide base wheel/tire set which replaces two conventional steel dual-wide wheel/tire sets. [EPA-HQ-OAR-2022-0985-1599-A1, p. 4]

Proposed Revisions to Table 6 of 1035.520 Wheel-Related Weight Reductions and Paragraph (e)(1)

(1) Vehicle weight reduction inputs for wheels are specific relative to dual-wide tires with conventional steel wheels. For purposes of this paragraph (e)(1), an aluminum alloy qualifies as light-weight if a dual-wide drive wheel made from this material weighs at least 25 pounds less than a comparable conventional steel wheel. Similarly, a wide-base wheel qualifies as light-weight if a wheel made from this material weighs at least 81 pounds less than two conventional steel dual-wide drive wheels. The inputs are listed in Table 6 of this section. For example, a tractor or vocational vehicle with aluminum steer wheels and eight (4x2) dual-wide aluminum

drive wheels would have an input of 250 pounds (2X25 + 8x25). [EPA-HQ-OAR-2022-0985-1599-A1, p. 4.] [See Docket Number EPA-HQ-OAR-2022-0985-1599-A1, pages 4-5, for tables of proposed revisions.]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Missing Appendices

We support moving the requirements of 40 CFR 1037.550 for new engines to 40 CFR 1036.545 for existing and new engines. Appendix A and Appendix D, however, continue to be referenced in the new location as being part of the new section, but the appendices were not moved. We request references to the values that existed in Part 1037 or, alternatively, we request that EPA move the existing Appendices A and D from Part 1037 to Part 1036. [EPA-HQ-OAR-2022-0985-1562-A1, p. 13]

Organization: PACCAR, Inc.

E. EPA Should Not Require OEMs to Submit GEM Input/Output Data for ZEV Vehicle Families

EPA proposes to require ZEVs to submit certain vehicle information such as tires, axle ratio, etc. EPA should not require manufacturers to submit GEM input/output data for vehicle families that do not produce CO2 emissions (i.e., battery electric vehicles or fuel cell vehicles). These vehicles are not scored in GEM (no simulation is required). [EPA-HQ-OAR-2022-0985-1607-A1, p. 12]

Organization: ROUSH CleanTech

We appreciate and fully support EPA's proposal to allow chassis dynamometers to be utilized for powertrain testing (1037.550/1036.545). We need further study to determine whether this is practical, but we appreciate the flexibility and think it could significantly reduce costs of GHG transient mapping relative to traditional powertrain dynamometers. [EPA-HQ-OAR-2022-0985-1655-A1, p.4]

EPA Summary and Response:

Summary:

Allison transmission requested that EPA consider crediting methodologies that would make it easier for OEMs to apply CO2 technology (multiple examples given) for GHG credits across a wide range of vehicle configurations and that EPA perform additional review of the duty cycles (examples provided) used for the certification of different vehicle types. They state that custom chassis certification nor powertrain testing certification include certification cycles that reflect the real-world operation of transit buses or other unique drive cycles representative of vocational operation. They state that GEM's neutral idle capability recognizes only torque reduction at idle that is equivalent to true neutral, and should update GEM to credit technologies that utilize approximately 70% torque reduction at idle. They would also like a credit added for advanced shifting strategies that utilizes an algorithm to learn the engine's torque curve, allowing shifting decisions to be made to maximize performance when performance is needed, but deliver a fuel economy benefit when there is opportunity.

Cummins supported tractor and vocational chassis weight reduction GEM inputs for engines with displacement greater than 14.0 liters. They request that EPA prescribe in 40 CFR 1037.520(e) tractor, and vocational chassis engine weight reduction inputs for GEM, based on EPA approving certification data manufacturers would submit to document actual engine weight reductions relative to model year 2016 engines of very similar displacement. They state that approach would be more representative of real-world weight reductions than using engine displacement as a proxy.

Cummins requested a representative test procedure option for vocational vehicles with Medium Heavy-Duty Engines (MHDE) that are in Class 8 Medium Heavy-Duty Vehicles (Class 8 MHDV). They state that EPA's prescribed fuel mapping test procedures and GEM MHDV vehicle masses lead to unrepresentative simulated engine operation in GEM for Class 8 MHDV. They state that using GEM's vocational heavy heavy-duty (HHDV) vehicle masses for MHDE fuel mapping and GEM simulation for Class 8 MHDV would lead to a more representative test option. They state that using the HHDV vehicle masses to set MHDV stringency would still lead to different CO2 stringencies, and as such, new Class 8 MHDV stringencies will be needed.

Cummins supported EPA's definition of "neat" hydrogen as they stated that it allows internal combustion engines running on hydrogen that is not mixed with other fuels to be recognized as having zero carbon tailpipe emissions without testing.

Dana Incorporated reviewed the axle efficiency test procedure and largely agrees with the full process. They request that EPA add the following sentence prior to the last sentence in 40 CFR 1037.560€(2): "For interpolated maps, the temperature at a given test point must be the same for all inputs to that interpolation.", to achieve more valid power loss maps.

Eaton recommend EPA require ZEV truck certification through GEM, even if the GHG emissions number is automatically zero (as it should be). They stated that ZEV efficiency can vary more than 25% based on the efficiency ranges in batteries (94% – 96%), power electronics (95% – 99%), motor (92% – 96%) and gearing (0% – 20% improvement) and different architectures. They stated that GEM can be used to calculate the vehicle efficiency in terms of kWh/ton-mile on regulatory cycles, the result of which can be used by consumers to help inform them of the efficiency of the vehicle and let EPA understand the grid and infrastructure impact of ZEV vehicles for possible future regulations or incentive programs. They stated that this approach would be similar to what already exists in the European VECTO model.

Eaton suggested adjusting the "intelligent controls" GEM credit from 1.5 to 2.5 for all vehicles that implement full engine cylinder deactivation during coasting, to account for the reduction in aftertreatment heating after the coasting events.

Ford Motor Company supported EPA's updates to the test procedures to accommodate heavy-duty electrified products. They highlight the increased test burden this will have on emission test laboratories especially for the GEM fuel mapping test procedures. They stated that, for example, using cycle distances given in 40 CFR 1037.510 for the transient, 55 mph, and 65 mph cycles, based on the 50-mile all-electric range assumption, a test lab would have to run 19 transient cycles, five 55 mph cycles, and five 65 mph cycles to reach the end of test criterion proposed in this rule. This equates to an increase of over 800% in total test time to create a fuel map when compared to an ICE vehicle. They would like EPA to consider solutions to this issue in order to eliminate purportedly unreasonable test burden for all parties.

Howmet Wheel Systems supported EPA continuing to recognize the contributions of wheel-related weight reductions. They note that the NPRM relies on the assumptions regarding wheel weights that were part of the RIA for the HD GHG Phase 2 rule as weight reduction credits for Phase 2 have been extended to Phase 3. The commentor requested several changes to entries in Table 6 of 40 CFR 1037.520 and paragraph (e)(1) to reflect recent advancements to lightweight aluminum wheel technologies. They would like the lightweight alloy wheel light-weight qualifier in 40 CFR 1037.520(e)(1) to be increased from 21 pounds to at least 25 pounds less than a conventional steel wheel as this reflects the state of product development and availability in the market today. They would like Table 6 changed to reflect that a steer or dual wide light-weight aluminum alloy wheel is eligible for a weight reduction credit of 29 pounds because this also reflects the state of products available in the market today.

Howmet Wheel Systems also requested that EPA provide a separate definition of wide-base lightweight aluminum alloy wheels that reflects the introduction of the Alcoa® 84U61 wide base 22.5" x 14" wheel that weighs 49 pounds via the following text addition to 40 CFR 1037.520(e)(1): "Similarly, a wide-base wheel qualifies as light-weight if a wheel made from this material weighs at least 81 pounds less than two conventional steel dual-wide drive wheels." They stated that this can be seen in the difference between dual width drive wheel sets of Accuride 51487 22" x 8.5" steel wheels at 65 pounds and the Alcoa 84U61 22.5" x 14" aluminum wheel at 49 pounds (130 lbs – 49 lbs = 81 lbs). They stated that this would also require an addition to 40 CFR 1037.520 Table 6 by providing a weight reduction credit of 154 pounds for wide base 'Light-Weight Aluminum Alloy Wheel' drive wheel/tire sets.

NESCAUM and OTC supported moving the requirements of 40 CFR 1037.550 to 40 CFR 1036.545, but noted that the references to Appendix A and Appendix D in 40 CFR part 1037 were inadvertently changed to 40 CFR part 1036. They requested that these be corrected to correctly reference 40 CFR part 1037.

PACCAR stated that EPA should not require manufacturers to submit GEM input and output data for vehicle families that do not produce CO2 emissions since these vehicles are not scored in GEM and no simulation is required.

Roush CleanTech supported EPA's proposal to allow chassis dynamometers to be utilized for powertrain testing in 40 CFR 1036.545. They believe this option could significantly reduce costs of GHG transient mapping relative to traditional powertrain dynamometers.

Response:

EPA thanks Allison transmission for their comments on including additional crediting methodologies for GHG on EPA performing additional review of the duty cycles. EPA did not propose additional test procedures to provide credit for the technologies Allison transmission provided, however we have existing provisions in 1037.610 that allow manufacturers to generate credit for off-cycle technologies.

EPA did not propose changes to 40 CFR 1037.520(e). Cummins has requested an allowance for EPA to approve additional tractor and vocational chassis engine weight reduction inputs for GEM based on EPA approving certification data manufacturers would submit to document actual engine weight reductions relative to model year 2016 engines of very similar displacement. EPA already provides a pathway for this approval in existing 40 CFR 1037.520(e)(5), which states: “You may ask to apply the off-cycle technology provisions of § 1037.610 for weight reductions not covered by this paragraph (e).”

In response to Cummins request for a representative test procedure option for vocational vehicles with Medium Heavy-Duty Engines (MHDE) that are in Class 8 Medium Heavy-Duty Vehicles (Class 8 MHDV), EPA didn’t reopen this and as noted in Cummins comment, such a change would result in a change in stringency. Due to these two factors, we are not taking final action on these requested changes in this final rule. We note that the existing provisions in 40CFR 1065.10(c) allow manufacturers to request that EPA consider an alternative procedure in cases where the specified test procedure produces unrepresentative emission measurements for an engine.

EPA thanks Cummins for their support of EPA’s definition of “neat” hydrogen, which allows internal combustion engines running on hydrogen that is not mixed with other fuels to be recognized as having low carbon tailpipe emissions without testing. See preamble section III.C.3.ii on EPA finalizing as proposed that vehicles with engines fueled with neat hydrogen are deemed to be zero under 40 CFR 1037. Also, see preamble section III.C.2.xviii on the final change to 40 CFR 1036.150(f) for engines fueled with neat hydrogen, to deem tailpipe CO2 emissions to be 3 g/hp·hr and tailpipe CH_4, HC, and CO emissions as deemed to comply with the applicable engine standard.

EPA thanks Dana Incorporated for their review of the axle efficiency test procedure in 40 CFR 1037.560 and their comments to our proposed changes to 40 CFR 1037.560(e)(2). In response to their comment, we are updating the proposed revision to 40 CFR 1037.560(e)(2) to allow a manufacturer to specify an alternate lower temperature range by shifting both temperatures down by the same amount for any or all test points. To achieve more accurate power loss maps, EPA is adding the following sentence as the last sentence in 40 CFR 1037.560(h)(1): “Test all axle assemblies using the same temperature range for each setpoint as described in paragraph (e)(2) of this section.” This will ensure that any map that includes interpolation of some test points will generate inputs to the interpolation at the same temperature.

EPA did not propose changes to account for powertrain efficiency of zero emission vehicle (ZEV) technology and are not finalizing changes requested by Eaton that would require ZEV truck certification through GEM (see RTC Chapter 17 on EPA’s response to life cycle assessment comments).

In response to PACCAR, we are not requiring manufacturers submit vehicle information from BEVs and FCEVs to be used as GEM inputs; however, manufacturers will still be required to submit certain vehicle information for these vehicles as this information is used to determine the vehicle family and the credits generated for each family. See 40 CFR 1037.205 for the information, if applicable for their vehicles, that we require manufacturers submit as part of their application for certification.

EPA does not have the data to support an increase in credit requested by Eaton for "intelligent controls" technology that implement full engine cylinder deactivation during coasting, to account for reduction in aftertreatment heating after the coasting event. We recognize that there is a potential benefit, but the magnitude of the benefit is unclear absent data. Therefore we are not finalizing any changes to the credit value based on this request.

EPA recognizes the additional test burden associated with testing plug-in hybrid test vehicles as described by Ford Motor Company. EPA intends to work with Ford Motor Company and other stakeholders to develop improved, less burdensome test procedures in a future rulemaking action. EPA notes that manufacturers may request alternate test procedure approval from our compliance division using the provisions in 40 CFR 1065.10.

EPA appreciates the suggestions provided by Howmet Wheel Systems for weight reduction updates in 40 CFR 1037.520. We recognize that wheel technology continues to advance and that some of those advancements are not currently reflected in the wheel options in our current regulations. However, we did not propose to update general wheel weights or define a new wheel type and are not finalizing updated weight reduction values for any technologies at this time. We may consider updates in a future rulemaking.

EPA thanks NESCAUM and OTC for their support of moving 40 CFR 1037.550 to 40 CFR 1036.545. During the transition, we inadvertently changed the references for 40 CFR 1037 Appendix A and Appendix D to 40 CFR part 1036. We are finalizing changes to 40 CFR 1036.545(f)(3), (g)(1)(ii), and (g)(1)(iii) to correct all these references back to the originally intended 40 CFR part 1037.

EPA thanks Roush CleanTech for their support of EPA's proposal to allow chassis dynamometers to be utilized for powertrain testing in 40 CFR 1036.545.

24.2.5 Intentionally Left Blank

24.2.6 Standards and confirmatory testing

Comments by Organizations

Organization: California Air Resources Board (CARB)

Finally, CARB staff recommends the following minor corrections to the custom chassis provision language:

- Please correct the number of specific vehicle types included in the custom chassis provision. On page 25591, it was specified as "seven," however on page 25996, it was "eight."
- The "assigned vehicle service class" available under the existing Phase 2 GHG regulation is missing in Table 5 of paragraph (h)(1) of 40 Code of Federal Regulation (CFR) 1037.105.
- The footnote in Table 5 is also missing.
- CARB staff suggests changing the footnote for "mixed-use vehicle" in Table 5 of paragraph (h)(1) of 40 CFR 1037.105 under the existing Phase 2 GHG regulation to "A

"mixed-use vehicle" is one that meets at least one of the criteria specified in § 1037.631(a)(1) or (2), but not both." [EPA-HQ-OAR-2022-0985-1591-A1, p.27]

Organization: Daimler Truck North America LLC (DTNA)

EPA should revise 40 C.F.R. 1037.140(g)(5) to allow manufacturers to determine ZEV service classes using good engineering judgment. [EPA-HQ-OAR-2022-0985-1555-A1, p. 72]

EPA's proposal to classify ZEVs solely according to weight class unfairly creates regulatory burdens for certain ZEVs compared to their ICE equivalents. DTNA recommends that EPA allow manufacturers to use weight class to initially classify ZEVs as LHD, MHD, or HHD, but use good engineering judgment to reclassify vehicles to match the ICE vehicles they are intended to replace. [EPA-HQ-OAR-2022-0985-1555-A1, p. 72]

In dividing vehicle services classes into 'Light HDV,' 'Medium HDV,' and 'Heavy HDV,' 40 C.F.R. 1037.140(g) distinguishes conventional vehicles from vehicles with no installed propulsion engine, such as electric vehicles. Specifically, in Section 1037.140(g)(3) and (g)(4), vehicles that have GVWR > 33,000 lbs. can be classed as Medium HDV based on the installed engine. EPA provides this flexibility to allow manufacturers to accurately classify vehicles to most appropriately represent their intended service class. Thus, a school bus, sold at 33,500 lbs., can be classed as Medium HDV due to the presence of an SI engine, or a medium-duty CI engine, and thereby avoid the extended useful life and other requirements that would typically apply to a Class 8 vehicle. However, under Section 1037.140(g)(5), ZEVs are not subject to the same allowance, and are classified according solely to their weight class. Following the example above, a school bus, sold at 33,500 lbs., equipped with a zero-emission powertrain instead of a conventional engine, is subject to the more stringent requirements and longer useful life periods of a Heavy HDV. To extend this example, a school bus with a conventional engine would have a useful life requirement of 185,000 miles, while the same vehicle equipped with a zero-emission powertrain would have a useful life requirement of 435,000 miles, according to the provisions in 40 C.F.R. 1037.105(e). [EPA-HQ-OAR-2022-0985-1555-A1, p. 72]

This discrepancy inappropriately burdens certain ZEVs with requirements that would not apply to comparable conventional vehicles. This could add significant cost to ZEVs, making them even less likely to be adopted over their conventional counterparts. EPA should address this issue by allowing manufacturers to optionally certify ZEVs to the class that best represents the vehicle they are intended to replace. DTNA believes 40 C.F.R. 1037.140(g)(5) should be revised to read:

(5) Heavy-duty vehicles with no installed propulsion engine, such as electric vehicles, are divided as follows, except as otherwise provided in 1037.140(g)(6):

(i) Class 2b through Class 5 vehicles are considered 'Light HDV'.

(ii) Class 6 and 7 vehicles are considered 'Medium HDV'.

(iii) Class 8 vehicles are considered 'Heavy HDV'.

(6) In lieu of classification under 1037.140(g)(5), heavy-duty vehicles with no installed propulsion engine may be optionally classified in an alternate, lower vehicle service class if good engineering judgment indicates that the vehicle type is best represented by that service class; for

example, if the vehicle would be assigned to a lower vehicle service class under 1037.140(g)(3) or (g)(4) when equipped with a conventional engine. [EPA-HQ-OAR-2022-0985-1555-A1, p. 73]

EPA should clarify its intent with respect to 40 C.F.R. 1037.205(q).

EPA states in the Proposed Rule preamble that it intends to ‘correct an inadvertent error’ made in the process of finalizing the Low-NOx Proposed Rule by ‘remov[ing] the existing 40 C.F.R. 1037.205(q).’142 Yet instead of reflecting deletion of this subsection, EPA’s proposed regulatory amendments include new language for Section 1037.205(q), which would require manufacturers to ‘describe the recharging procedures and methods for determining battery performance, such as state of charge and charging capacity’ and to ‘include the certified usable battery energy for each battery durability subfamily’ in their certificate applications for BEVs and plug-in hybrid electric vehicles.143[EPA-HQ-OAR-2022-0985-1555-A1, p. 73]

142 Proposed Rule, 88 Fed. Reg. at 26,023.

143 Id. at 26,127.

DTNA requests clarification on whether EPA in fact intended to propose these changes to Section 1037.205(q), which are not discussed in the Proposed Rule preamble, or whether the inclusion of this modified language was inadvertent given EPA’s stated intention to ‘remove’ the existing Section 1037.205(q). If EPA’s intention was to propose new requirements in Section 1037.205(q), DTNA requests the Agency clarify the phrase ‘battery durability subfamily.’ This term is not defined elsewhere in 40 C.F.R 1037 or the Proposed Rule text. Furthermore, EPA has not proposed requirements related to ‘battery durability subfamilies’ in this Proposed Rule. [EPA-HQ-OAR-2022-0985-1555-A1, p. 73]

Adding Full Cylinder Deactivation to 40 CFR 1037.520(j)(1)

DTNA supports EPA’s proposal to revise 40 C.F.R. 1037.520(j)(1) to credit vehicles with engines that include full cylinder deactivation during coasting; however EPA’s clarification in the Proposed Rule preamble—that only engines where both exhaust and intake valves are closed when coasting will qualify for the credit—is overly restrictive and should not be codified in the regulations. [EPA-HQ-OAR-2022-0985-1555-A1, p. 82]

EPA notes in the Proposed Rule the potential for cylinder deactivation to eliminate pumping losses when the engine is motoring.148 DTNA has used cylinder deactivation to reduce pumping losses and to increase fuel economy since 2016, and has experience implementing this technology across multiple engine platforms. [EPA-HQ-OAR-2022-0985-1555-A1, p. 82]

148 See id. at 26,023.

EPA states in the Proposed Rule preamble, however, that only vehicles with engines where both exhaust and intake valves are closed when the vehicle is coasting would qualify for this credit.149 This would exclude systems that operate using DTNA’s proven and proprietary cylinder deactivation technology. This technology does not change intake and exhaust valve actuation but instead changes the exhaust and intake geometry, routing the exhaust gas of deactivated cylinders entirely back to the intake of engine, setting the conditions in the intake and exhaust manifold approximately equal to each other, and reducing the total gas volume pumped through the engine, thus lowering pumping losses according to the same principles as the system EPA describes. EPA already automatically accounts for DTNA's cylinder deactivation approach in fired modes, where actual fuel consumption is measured, and the engines are able to realize a significant fuel economy benefit by deactivating some cylinders. To date, DTNA has not been able to apply this same principle in coasting conditions, even though the effect exists according to the same principles of reduced pumping losses. [EPA-HQ-OAR-2022-0985-1555-A1, p. 82]

149 Id.

To summarize, EPA should not disqualify vehicles with cylinder deactivation technology from the 1.5% credit based on which valves, or where in the system, the reduction in pumping losses is achieved. Further, we propose that EPA scale the credit provided based on the number of cylinders that are deactivated at any time. For example, if 6 cylinders are deactivated in a 6-cylinder engine, EPA could provide the full 1.5% credit, and if a manufacturer deactivates 3 of its cylinders, EPA could provide a reduced 0.75% credit. [EPA-HQ-OAR-2022-0985-1555-A1, p. 82]

Needed Phase 2 GHG Program Updates

This rulemaking provides EPA an important opportunity to make changes to the existing Phase 2 GHG regulations in the interests of reduced complexity, improved flexibility, and reduced burden, as informed by several years of implementation and compliance experience. [EPA-HQ-OAR-2022-0985-1555-A1, p. 82]

- Production and In-Use Tractor Testing. EPA should remove the requirement for Production and In-Use Tractor Testing in 40 C.F.R. 1037.665. Manufacturers were required to start performing this testing in MY 2021. OEMs have found the testing onerous to perform, with unclear and undefined procedures for calculating the chassis dyno operational criteria. Data analysis shows that this testing does not correlate well with GEM results, and therefore provides no additional value to the program, at great expense. EMA has worked with EPA certification staff on this issue, and has further demonstrated the limited utility of this data in comparison to its expense. [EPA-HQ-OAR-2022-0985-1555-A1, p. 82]
- Eliminate Section 1037.150(z) and Allow Manufacturers to Use Good Engineering Judgment to Determine Appropriate Vocational Regulatory Subcategories. EPA should remove the constraints set forth in 40 C.F.R. 1037.150(z) regarding the determination of vocational regulatory subcategories as described in Section 1037.140(h). These constraints, which are based mostly on transmission type, are confusing and contradictory and undermine a manufacturer's ability to use good engineering judgment to assign the appropriate regulatory subcategory. For example, Section 1037.150(z)(5) states that a manufacturer 'may select the Multi-Purpose regulatory subcategory for any vocational vehicle, except as specified in paragraphs (z)(1) through (3) of this section.' However, Section 1037.150(z)(3) addresses which vehicles may not be classified as 'Urban,' but does not place any restrictions on when the Multi-Purpose subcategory may be selected. Additionally, Section 1037.150(z)(4), which is not referenced in Section 1037.150(z)(5), states that a manufacturer 'must select the regional regulatory subcategory for any vehicle with a manual transmission.' Section 1037.150(z)(4) and (z)(5) appear to be contradictory, and Section 1037.150(z)(3) and (z)(6) appear to be duplicates of each other. [EPA-HQ-OAR-2022-0985-1555-A1, p. 83]

- DTNA believes that transmission type is not a key criterion for determining the appropriate regulatory subcategory for a vocational vehicle. Many vehicles with manual transmissions or single-clutch automated transmissions are best described as ‘Urban,’ which conflicts with Section 1037.150(z)(3), (z)(4), and (z)(6). DTNA therefore recommends that EPA remove Section 1037.150(z) altogether and allow manufacturers to use good engineering judgment, as described in Section 1037.140(h), to determine appropriate regulatory subcategories for vocational vehicles. If EPA finds that a manufacturer’s assignments are not supported by good engineering judgment, it can request the manufacturer to provide justification of its judgments or require re-classification as necessary. [EPA-HQ-OAR-2022-0985-1555-A1, p. 83]
- Confirmatory Testing and Selective Enforcement Audits. DTNA recommends that EPA add a new 40 C.F.R. 1037.150(cc) to provide certainty for vehicle manufacturers regarding the process that EPA will use when determining the outcome of Confirmatory Testing and Selective Enforcement Audits. [EPA-HQ-OAR-2022-0985-1555-A1, p. 83]
- For engine-related testing of fuel map inputs to GEM results, 40 C.F.R. 1036.150(q) specifies that the Agency will not replace a manufacturer’s fuel maps when the results from Eq. 1036.235-1 for a confirmatory test are at or below 2.0%. EPA adds this margin in recognition of the test-to-test and article-to-article variability that is inherently present in testing when testing fuel economy. EPA has further studied this effect, including in a joint project with EMA and Southwest Research Institute, which measured the variability inherent in measuring given test articles multiple times at different facilities. [EPA-HQ-OAR-2022-0985-1555-A1, p. 83]
- Test data continues to support such a measurement allowance. EPA does not, however, include such a measurement allowance in 40 C.F.R. Part 1037 with regard to manufacturers’ declared GEM family emission limits (FELs), which can be dependent on measurement variability from engine fuel maps, but also dependent on variability in axles, transmissions, and other components. Vehicle manufacturers do not have control over the testing practices, nor the variability, of components provided to them by other manufacturers, and cannot know whether their component manufacturers have included any ‘compliance margin’ to account for these effects. [EPA-HQ-OAR-2022-0985-1555-A1, p. 83]

Vehicle manufacturers are forced to either take the risk of failing a Selective Enforcement Audit or Confirmatory Test due to measurement variability effects, or otherwise add their own ‘compliance margin’ to the output of their own GEM calculations, penalizing the CO2 result for all of the vehicles they build and effectively increasing the stringency of the GHG standards. When setting the Phase 2 CO2 standards, EPA did not factor any additional ‘compliance margin’ based on the predicted engine, transmission, axle, and other efficiencies. As the rules exist today, EPA protects manufacturers from this liability for engines using 40 C.F.R. 1036.150(q) but provides no such broader protection for vehicle manufacturers in Part 1037. DTNA recommends that EPA provide this protection by creating a new provision, analogous to 40 C.F.R. 1036.150(q), in 40 C.F.R. 1037.150(cc), that says:

- ‘For model years 2024 and later, where the results from Eq. 1037.150–1 for a confirmatory test or selective enforcement audit for any component considered an input to the determination of a manufacturer’s CO2 FELs are at or below 2.0%, we will not replace the manufacturer’s fuel maps.’ [EPA-HQ-OAR-2022-0985-1555-A1, p. 84]

[Refer to the equation on p. 84 of docket number EPA-HQ-OAR-2022-0985-1555-A1]

Alternatively, EPA should perform testing, similar to the engine round-robin testing, to determine the potential variability in axles, transmissions, and other input components, and determine the appropriate compliance margin to be applied to confirmatory testing or a selective enforcement audit—and make clear the Agency's intention that manufacturers of components and/or vehicles are not expected to apply additional compliance margin when providing their efficiency maps or setting their CO2 FELs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 84]

- Adjust the percentage CO2 emission reduction for intelligent controls for tractors with predictive cruise control. DTNA recommends that EPA adjust the current value of 2 in 40 C.F.R. 1037.520(j)(1) for the percentage CO2 emission reduction for tractors with predictive cruise control to a value more representative of the performance of predictive cruise control. DTNA has internal data suggesting that the CO2 emissions reductions associated with such technology can be much higher than the 2% EPA accounts for. DTNA believes that, even on relatively flat terrain, adaptive cruise control creates a benefit of 3 - 4%, and this value can increase dramatically in areas with more elevation changes. DTNA recommends that EPA adjust the value in 40 C.F.R. 1037.520(j)(1) for predictive cruise control to 4. DTNA is willing to share data with the EPA in a confidential setting that supports this value. At a minimum, DTNA recommends that EPA add a new provision, 40 C.F.R. 1037.520(j)(6), which allows manufacturers to request the Agency's approval to use alternate input values in GEM for technologies and vehicle configurations that they believe exceed the performance allowed by EPA in 40 C.F.R. 1037.520(j)(1)-(5). Specifically, DTNA recommends that EPA adopt the following new provision:
    - 40 C.F.R. 1037.520(j)(6). You may ask us to apply alternate input values in GEM for technologies described in paragraph (j) of this section if good engineering judgment dictates that the default value we assume in paragraphs (j) (1)-(5) does not adequately represent the CO2 emission reduction for the additional reduction technology. We will approve such alternate input values to the extent the manufacturer can demonstrate, with data, that its additional reduction technology exceeds the default values we assume, or that the additional reduction technology significantly outperforms similar equipment credited under this paragraph. [EPA-HQ-OAR-2022-0985-1555-A1, pp. 84-85]

EPA Request for Comment, Request #64: We request comment on the MY 2024 start [date for the proposed revised definition of 'U.S.-directed production volume'] and whether other options should be considered for transitioning to this new definition.

- DTNA Response: DTNA provides comment on this issue in Section III.B.2 of these comments, including proposed new language that the Company believes further clarifies EPA's intent regarding U.S.-directed production volumes for the purposes of calculating credits. [EPA-HQ-OAR-2022-0985-1555-A1, p. 170]

Organization: MCS Referral & Resources

Comment 12

At https://www.federalregister.gov/d/2023-07955/p-2505

"EPA proposes to Amend § 1037.102 by revising the section heading and paragraph (b) introductory text to read as follows:

§ 1037.102 Criteria exhaust emission standards—NOX, HC, PM, and CO.

(b) Heavy-duty vehicles with no installed propulsion engine, such as battery electric vehicles, are subject to criteria pollutant standards under this part. The emission standards that apply are the same as the standards that apply for compression-ignition engines under 40 CFR 86.007-11 (15.5 g/brake-hp-hour) and 1036.104 (6.0 g/brake-hp-hour) for a given model year." [EPA-HQ-OAR-2022-0985-1629-A1, p. 5]

We recommend that EPA specify that 86.007-11 applies through Model Year 2026, while 1036.104 applies from MY 2027. [EPA-HQ-OAR-2022-0985-1629-A1, p. 5]

Organization: PACCAR, Inc.

C. EPA Should Not Require Manufacturers to Perform Production and In-use Tractor Testing under Phase 3

EPA should not extend the chassis dynamometer in-use testing requirement to the Phase 3 standards. Section 1037.665 proposes to continue requiring chassis dynamometer testing for Phase 3 standards. Requiring OEMs to test five tractors annually on a chassis dynamometer – and to submit those test results to EPA – is costly and is not an effective means of evaluating component level improvements to GEM. Additionally, HD chassis dynamometers are a limited and in-demand resource, with high capital, operating, and maintenance costs. EPA's proposed testing requirement would require OEMs to use scarce resources for testing unrelated to certification or emissions compliance. These resources would be better utilized in developing more efficient vehicles and zero-emission powertrains of the future. [EPA-HQ-OAR-2022-0985-1607-A1, p. 10]

GEM is an effective simulation tool to calculate HD truck GHG emissions that EPA has continually refined and improved with input from industry. GEM sufficiently models varying truck configuration aspects and calculates relative GHG emission levels. In addition, GEM drive cycles are short and ideally suited for simulation. [EPA-HQ-OAR-2022-0985-1607-A1, p. 10]

In contrast, chassis dynamometer testing has significant sources of variation. For example, road load force curve determination introduces a significant variation source, due to differences in inflation, tread wear, and temperature of tires. There are also significant differences in testing and measuring equipment at the few existing facilities capable of HD truck testing resulting in the testing not being an effective means of evaluating component level improvements. [EPA-HQ-OAR-2022-0985-1607-A1, p. 11]

EPA has never quantified HD vehicle chassis dynamometer testing variability (for test-to-test, truck-to-truck, or lab-to-lab variability scenarios). The inherent test variation is therefore unknown and chassis dynamometer testing results are subject to varying interpretation. Because of the inherent variation in chassis dynamometer testing, PACCAR does not anticipate that EPA or OEMs will be able to discern any underlying trends through a model year chassis dynamometer testing program. [EPA-HQ-OAR-2022-0985-1607-A1, p. 11]

Organization: Truck and Engine Manufacturers Association (EMA)

Chassis Dynamometer Testing – EPA's Phase 2 GHG rule requires manufacturers to annually test five tractors on chassis dynamometers and report to EPA the measured emissions. See, 40 C.F.R. § 1037.665, Production and in-use tractor testing. The tractors must be operated over all of the applicable duty cycles in GEM, the tool used to demonstrate compliance to the GHG standards. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 52 - 53]

EPA has sought to justify the annual chassis dynamometer testing and reporting requirements by stating that the Agency needs "to have confidence in our simulation tool, GEM." See, 81 Fed. Reg. 73,637 (October 25, 2016). Acknowledging that the computer programing of GEM causes it to "produce emission rates different from what would be measured during a chassis dynamometer test," the Agency concluded that "the testing will be for informational purposes only." See, Id. at 73,638. EPA hoped that there would be "correlation in a relative sense" between emission results from chassis dynamometer testing and GEM outputs. See, Id. [EPA-HQ-OAR-2022-0985-2668-A1, p. 53]

Manufacturers have conducted the testing per § 1037.665 and reported the results to EPA. Unfortunately, that experience has validated the predictions in EMA's comments on the GHG Phase 2 NPRM. Chassis dynamometer testing is extraordinarily expensive and time-consuming, the emission measurements are inaccurate and inconsistent, and the results cannot be compared to GEM results in any scientific or statistical way – even in a relative sense. [EPA-HQ-OAR-2022-0985-2668-A1, p. 53]

One of the fundamental problems with chassis dynamometer testing is that the laboratories that can accommodate heavy-duty tractors are very expensive to construct, operate, and maintain. Because of those high costs, many truck manufacturers have not invested in their own facilities and instead must utilize third-party laboratories to conduct their testing. What they have found is that those laboratories are very expensive to rent and must be reserved long in advance. Additionally, since truck manufacturers cannot control when third-party laboratories change their equipment or test procedures, year-over-year testing may produce inconsistent results. Exacerbating the year-over-year inconsistencies, truck manufacturers may be forced to use a different laboratory from one year to the next due to cost and availability issues. Without any EPA standards to define the procedures and tolerances for chassis dynamometer testing, or any lab-to-lab variability testing to ensure that results from different laboratories will be consistent, it is impossible to compare test results over the years or across different chassis dynamometers with any reasonable degree of certainty. [EPA-HQ-OAR-2022-0985-2668-A1, p. 53]

Obtaining customer tractors for the testing can be prohibitively challenging as well. Fleets are reluctant to remove from service a commercial vehicle that is generating revenue, and even if the fleet can be convinced to relinquish a vehicle, the owner will demand that the manufacturer provide a suitable replacement. Additionally, testing an in-use vehicle, with inconsistent software updates and unknown maintenance performed, compounds the already high variability of chassis dynamometer testing. Without guidance in the regulatory requirements, it is not even clear whether manufacturers should test in-use tractors as they are, upgrade the engine software to the most recent updates, or return the software to as-built programming. [EPA-HQ-OAR-2022-0985-2668-A1, p. 53]

While GEM simulates most all of a vehicle's mechanical and electrical components, chassis dynamometers are limited to testing only some of the components. Important GHG-reducing technologies, like aerodynamics, tires, and certain driver control software are not measured on a chassis dynamometer. Chassis dynamometers primarily test only engines, transmissions and rear axles; and when testing them over the GEM duty cycles, the results are incomplete, inaccurate, or both. GEM is a computer program that includes compressed duty cycles with synthetically-generated grade profiles. A human driver often cannot accelerate and decelerate the vehicle quickly enough to follow the duty cycles on the chassis dynamometer, and robotic driver controls perform even worse. [EPA-HQ-OAR-2022-0985-2668-A1, pp. 53 - 54]

The mass of a tractor on a chassis dynamometer is not representative of the real-world operations of a tractor-semitrailer combination vehicles, or of what is simulated in GEM. On a dual-roller chassis dynamometer, only four wheel-ends conduct braking, compared to ten in the real world. The situation is significantly worse when testing on a single-roller chassis dynamometer, and the regulatory requirement provides no guidance on which type should be used. The limited braking performance on either type of chassis dynamometer makes following the decelerations in the GEM duty cycles very difficult or impossible. [EPA-HQ-OAR-2022-0985-2668-A1, p. 54]

Year-over-year trends in GHG reductions are impossible to accurately quantify. Differences in the tractor models tested each year, exacerbated by inconsistent chassis dynamometer outputs, result in emission measurements with much higher variability than the GHG reductions mandated by the GHG rules. [EPA-HQ-OAR-2022-0985-2668-A1, p. 54]

In sum, the chassis dynamometer testing requirements in § 1037.665 have proven to be extraordinarily burdensome, only to produce results that are inaccurate and inconsistent. The lab-to-lab and year-over-year variability is much too high for any meaningful comparisons of the results. Nonetheless, in the Phase 3 NPRM, EPA proposes to double-down and extend the testing requirements to include the GHG Phase 3 standards. EMA strongly opposes extending a test program that imposes significant burdens on manufacturers without producing any useful data. [EPA-HQ-OAR-2022-0985-2668-A1, p. 54]

Based on the data generated thus far on chassis dynamometer testing to the GHG Phase 2 standards, much more study is needed to design a test program that will produce meaningful data. EPA should analyze the results provided and develop a testing program that will produce accurate and useful data. EMA and its members stand ready to constructively contribute to such a study with technical expertise and data. Until that study can be conducted, and a cost-effective testing program can be developed and validated, we urge EPA suspend the § 1037.665 testing requirement. [EPA-HQ-OAR-2022-0985-2668-A1, p. 54]

EPA Summary and Response:

Summary:

CARB recommended corrections to the custom chassis provisions, noting that EPA neglected to add "assigned vehicle service class" and a footnote in the proposed Table 5 of 1037.105(h)(1).

DTNA commented that EPA should revise 40 CFR 1037.140(g)(5) to allow manufacturers to determine ZEV service classes using good engineering judgment. DTNA recommends EPA allow manufacturers to use weight class to initially classify ZEVs as LHD, MHD, or HHD, but use good engineering judgment to reclassify vehicles to match the ICE vehicles they are intended to replace. DTNA commented that this discrepancy inappropriately burdens certain ZEVs with requirements that would not apply to comparable conventional vehicles. DTNA provides revised text for 40 CFR 1037.140(g)(5) and a new paragraph (g)(6).

DTNA requests that EPA clarify the intent of 40 CFR 1037.205(q). DTNA commented that EPA proposed to correct an inadvertent error made in the process of finalizing the Low-NOx Proposed Rule by ‘removing the existing 40 CFR 1037.205(q). DTNA commented that EPA, however, proposed new language for 40 CFR 1037.205(q), which would require manufacturers to ‘describe the recharging procedures and methods for determining battery performance, such as state of charge and charging capacity’ and to ‘include the certified usable battery energy for each battery durability subfamily’ in their certificate applications for BEVs and plug-in hybrid electric vehicles. DTNA requests clarification on whether EPA in fact intended to propose these changes to Section 1037.205(q).

DTNA supports EPA’s proposal to revise 40 CFR 1037.520(j)(1) to credit vehicles with engines that include full cylinder deactivation during coasting; but states that only engines where both exhaust and intake valves are closed when coasting will qualify for the credit is overly restrictive and should not be finalized. DTNA commented that EPA should not disqualify vehicles with cylinder deactivation technology from the 1.5% credit based on which valves, or where in the system, the reduction in pumping losses is achieved. DTNA proposes that EPA scale the credit provided based on the number of cylinders that are deactivated at any time.

DTNA states that EPA should use this rulemaking to make changes to the existing Phase 2 GHG regulations in the interest of reduced complexity, improved flexibility, and reduced burden. Specifically DTNA commented that:

1. DTNA commented that EPA should remove the requirement for Production and In-Use Tractor Testing in 40 CFR 1037.665.
2. DTNA commented that EPA should eliminate 40 CFR 1037.150(z) and allow manufacturers to use good engineering judgment to determine appropriate vocational regulatory subcategories.
3. DTNA recommends that EPA add a new 40 CFR 1037.150(cc) to provide certainty for vehicle manufacturers regarding the process that EPA will use when determining the outcome of Confirmatory Testing and Selective Enforcement Audits.
4. DTNA states that EPA will not replace a manufacturer’s fuel maps when the results from Eq. 1036.235-1 for a confirmatory test are at or below 2.0%. DTNA commented that EPA adds this margin in recognition of the test-to-test and article-to-article variability that is inherently present in testing when testing fuel economy. DTNA commented that EPA does not, however, include such a measurement allowance in 40 CFR Part 1037 with regard to manufacturers’ declared GEM family emission limits (FELs), which can be dependent on measurement variability from engine fuel maps, but also dependent on variability in axles, transmissions, and other components. DTNA commented that EPA did not factor any additional ‘compliance margin’ based on the predicted engine, transmission, axle, and other efficiencies when setting the Phase 2 CO2 standards. DTNA recommends that EPA provide protection by creating a new provision, analogous to 40 CFR 1036.150(q), in 40 CFR 1037.150(cc), that says: “for model years 2024 and later, where the results from Eq. 1037.150–1 for a confirmatory test or selective enforcement

audit for any component considered an input to the determination of a manufacturer's CO_2 FELs are at or below 2.0%, we will not replace the manufacturer's fuel maps."

5. DTNA recommends that EPA adjust the current value of 2 in 40 CFR 1037.520(j)(1) for the percentage CO_2 emission reduction for tractors with predictive cruise control to a value more representative of the performance of predictive cruise control.
6. DTNA recommends that EPA add a new provision, 40 CFR 1037.520(j)(6), which allows manufacturers to request the Agency's approval to use alternate input values in GEM for technologies and vehicle configurations that they believe exceed the performance allowed by EPA in 40 CFR 1037.520(j)(1) through (5). DTNA provides language for a new 40 CFR 1037.520(j)(6).

EPA proposes to Amend § 1037.102 by revising the section heading and paragraph (b) introductory text to read as follows:

§ 1037.102 Criteria exhaust emission standards—NOX, HC, PM, and CO.

(b) Heavy-duty vehicles with no installed propulsion engine, such as battery electric vehicles, are subject to criteria pollutant standards under this part. The emission standards that apply are the same as the standards that apply for compression-ignition engines under 40 CFR 86.007-11 (15.5 g/brake-hp-hour) and 1036.104 (6.0 g/brake-hp-hour) for a given model year." [EPA-HQ-OAR-2022-0985-1629-A1, p. 5]

MCS Referral & Resources recommends that EPA modify 40 CFR 1037.102(b) to specify that 840 CFR 6.007-11 applies through Model Year 2026, while 40 CFR 1036.104 applies from MY 2027.

PACCAR and EMA comment that EPA should not extend the chassis dynamometer in-use testing requirement in 40 CFR 1037.665 to the Phase 3 standards. These commenters stated that requiring OEMs to test five tractors annually on a chassis dynamometer – and to submit those test results to EPA – is costly, burdensome, and is not an effective means of evaluating component level improvements to GEM.

Response:

Regarding CARB's requested corrections to the custom chassis provisions, we note that we are finalizing several revisions to how the custom chassis standards are presented in 40 CFR 1037.105(h), including the proposed table they referenced in their comment. We have removed reference to "assigned vehicle service class" in all of the tables presenting custom chassis standards. We are, instead, assigning the vehicle service class for custom chassis vehicles in a new 40 CFR 1037.140(g)(7) with other existing provisions for classifying vehicles. We also moved the footnote CARB referenced to a standalone paragraph in 1037.105(h) to cover all of the tables in 40 CFR 1037.105(h) instead of duplicating it in each table.

We disagree with DTNA's comment that EPA should revise 40 CFR 1037.140(g)(5) to allow manufacturers to determine ZEV service classes using good engineering judgment and that the current 40 CFR 1037.140(g)(5) inappropriately burdens certain ZEVs. For one, it is not clear what factors EPA, or the manufacturer, would use to determine if the ZEV should be classified to the lower vehicle class. The comment that this could be based on a similar vehicle with an engine doesn't provide enough detail for us to evaluate how this would be done, especially in the case where isn't a comparable ICE vehicle. Second, we are not finalizing minimum performance requirements for ZEVs, so it is not clear how the longer useful life of the higher vehicle class would increase the burden for ZEVs or increase their cost.

We disagree with DTNA's comment that 40 CFR 1037.150(z) (which is redesignated paragraph (v) in this final rule) should be eliminated, as it provides critical constraints to help ensure that vocational vehicles are categorized appropriately and to ensure that the flexibility in 40 CFR 1037.140(h) doesn't reduce the stringency of the standards. For example, allowing vehicles with a manual or single-clutch automated manual transmission to be certified as Urban, would have a significant impact on the stringency of the standards, since the Urban standards were based on the use of Automatic transmission which are less efficient under Urban operation. We note that we are revising paragraph 40 CFR 1037.150(v) to improve clarity as described in preamble section III.C.3.

We are not revising 40 CFR 1037.102(b) as requested by MCS Referral & Resources. The applicable model years for the compression-ignition standards referenced in paragraph (b) are noted in paragraph (a) of the same section.

24.3 Amendments for 40 CFR 1065

<u>Comments by Organizations</u>

Organization: American Association for Laboratory Accreditation (A2LA)

We are writing specific to your request for comment within section xiv. Miscellaneous Corrections and Clarifications in 40 CFR Part 1037 on page 26025. This is directed at the clause considering NIST calibration for the humidity generator. A2LA recommends that humidity generators used for Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3 be calibrated to the SI units from calibrations that are performed by laboratories Accredited to ISO/IEC 17025 through an accrediting body that is a signatory to the International Laboratory Accreditation Cooperation (ILAC). In the United States this typically means traceability through NIST and ultimately to the SI units which define humidity, which is verified by the accrediting body through regular assessments of the laboratory. Being an ILAC signatory means having regular oversight of the accrediting body itself. A2LA currently accredits over a dozen laboratories capable of calibrating humidity generating devices and typically well within the proposed +/- 3 % uncertainty for these devices stated in the CFR. [EPA-HQ-OAR-2022-0985-1481-A1, p. 1]

By requiring this approach, it provides users the flexibility to either rely directly on NIST or to use an ILAC-recognized accredited laboratory. This allows as an integral part the rule, the EPA can be assured of a program that is:

- Generating measurements that are reproducible and accurate;
- using appropriate methods and procedures; and
- likely results in costs savings for the user. [EPA-HQ-OAR-2022-0985-1481-A1, p. 1]

We ask that the EPA include in the rule a provision requiring testing laboratories to achieve and maintain ISO/IEC 17025 accreditation through an ILAC-recognized accreditation body. [EPA-HQ-OAR-2022-0985-1481-A1, p. 2]

Organization: California Air Resources Board (CARB)

Part II. HDE Provisions

D. 40 CFR 1065.277. NH3 measurement devices

Affected page: 26141

There is a typographical error in 40 CFR 1065.277(b)(1), “Nondispersive ultravoilet (NDUV) analyzer.” The “ultraviolet” was spelled incorrectly. [EPA-HQ-OAR-2022-0985-1591-A1, p.71]

E. 40 CFR 1065.375. Interference verification for N2O analyzers

Affected page: 26145

There is a grammatical error in 40 CFR 1065.375(d)(9). The proposed amendment to add “the concentration of the” is in singular form, hence the verb should be “is” rather than “are” in the phrase “If the concentration of the interference species used are higher than the maximum levels expected during testing,…” It should read as, “If the concentration of the interference species used is higher than the maximum levels expected during testing,” [EPA-HQ-OAR-2022-0985-1591-A1, p.71]

Organization: ROUSH CleanTech

We strongly believe that the corrections and clarifications included in this rule that are unrelated to the GHG program should be proposed and implemented separately (and removed from this rule). Many of the suggested changes to section 1036 and 1065 are relatively straightforward and important corrections/clarifications to fix errors/omissions in the emissions program; including them here only makes them more difficult to review, and more likely to be caught up in the finalization delays which are almost certain to occur with this program. We have observed in the past that including this type of content in an otherwise unrelated regulatory package results in unnecessary delays and insufficient review and comment, as the parties affected by the Part 1036/1065 changes may not be fully reviewing the proposed Phase 3 vehicle rules. [EPA-HQ-OAR-2022-0985-1655-A1, p.4]

We believe that EPA does not yet need to add specifications for alternative test fuels to 40 CFR part 1065, subpart H. We agree that 1065.701(c) is sufficient to deal with emerging fuels as they occur. We are active in the alternative fuel space, including research and development of multiple potential new low- or zero-carbon alternative fuel specifications, and we believe that defining test fuel specifications is not yet worth the effort. It would be far better for EPA to deal with emerging fuels using 1065.701(c) and add a formal specification to the CFR only when a broadly deployed fuel is apparent in industry. Only then will the properties of the actual dispensed commercial in-use fuel (including impurities, odorants, blend ratios, additives, etc.) be known, and therefore the properties of the test fuel can be chosen to represent it. [EPA-HQ-OAR-2022-0985-1655-A1, pp.4-5]

EPA Summary and Response:

Summary:

A2LA recommended that humidity generators used for HD GHG Phase 3 be calibrated to the SI units from calibrations that are performed by laboratories Accredited to ISO/IEC 17025 through an accrediting body that is a signatory to the International Laboratory Accreditation Cooperation (ILAC). They request that EPA include in the rule a provision requiring testing laboratories to achieve and maintain ISO/IEC 17025 accreditation through an ILAC-recognized accreditation body. They note that In the United States this typically means traceability through NIST and ultimately to the SI units which define humidity, which is verified by the accrediting body through regular assessments of the laboratory.

CARB commented on a typo and grammatical errors in 40 CFR 1065.277 and 40 CFR 1065.375.

Roush CleanTech stated that many of the suggested changes to section 1036 and 1065 are relatively straightforward and important corrections, however the corrections and clarifications included in this rule that are unrelated to the GHG program should be proposed and implemented separately. They state that including these types of changes in an otherwise unrelated regulatory package results in unnecessary delays and insufficient review and comment, as the parties affected by the Part 1036/1065 changes may not be fully reviewing the package.

Response:

A2LA's comment that laboratories that calibrate humidity generators should be required to have ISO/IEC 17025 accreditation through the International Laboratory Accreditation Cooperation (ILAC) did not address EPA's request on whether the calibration should be NIST traceable. We disagree with A2LA request as not all ISO/IEC 17025 accredited labs humidity generator calibrations are NIST traceable, as noted by the commenter. EPA is finalizing 40 CFR 1065.750 as proposed. What we are finalizing will allow ILAC accredited labs to calibrate humidity generators provided they are able to meet the ±3 % uncertainty.

We have corrected the typo and grammatical errors in 40 CFR 1065.277 and 1065.375 that CARB brought to our attention.

We do not support Roush CleanTech's claim that including technical amendments in this package will result in insufficient review and comment by interested stakeholders as this rulemaking process has provided a meaningful opportunity for notice and comment. We also note that many of the changes proposed to 40 CFR parts 1036 and 1065 are relevant to implementation of EPA's standards, including the HD GHG Phase 3 standards. We thank the commentor for their comment that 1065.701(c) is sufficient to deal with emerging fuels as they occur. We agree and are not finalizing the addition of any new fuels to 40 CFR 1065, subpart H.

24.4 ABT Reporting (Cross-Sector Applicability)

Organization: California Air Resources Board (CARB)

3. ABT Reporting

Affected pages: 26018, 26127 (1037.150(y)), and 26136 (1037.730(f))

In response to U.S. EPA's request for comment, CARB staff discourages the proposed allowance for correcting accounting, typographical, or GHG emissions model (GEM) based errors within 24 months after a manufacturer submits the 270-day final report. The proposed allowance for correcting ABT errors up to 24 months after the due date will significantly complicate recordkeeping. If this regulation is finalized as is, U.S. EPA will have to concurrently deal with three or more MYs of reporting corrections. [EPA-HQ-OAR-2022-0985-1591-A1, p.54]

Organization: Daimler Truck North America LLC (DTNA)

ABT Report Correction Allowance. The Company also supports EPA's proposal to allow manufacturers to correct previously-submitted vehicle and engine GHG ABT reports beyond the 270-day final report submission deadline.22 As EPA observes in the Proposed Rule, certifying an engine or vehicle fleet using the Greenhouse Gas Emissions Model (GEM) introduces greater complexity and potential for calculation errors than is the case under the criteria pollutant certification program. While the Company has in place rigorous quality assurance processes for generating ABT reports, there is always a possibility of unintentional errors that may negatively affect credit balances. DTNA thus appreciates EPA's recognition that a limited allowance for correcting reports is appropriate and, accordingly, supports the proposed revisions to Sections 1036.730(f) and 1037.730(f), including the 24-month notification deadline and the interim deadline applied to MY2020 and earlier. DTNA requests that this same allowance be applied to ABT reports submitted under the NOx credit program for engines certified to 40 C.F.R. Part 1036 standards. [EPA-HQ-OAR-2022-0985-1555-A1, p. 17]

22 See id. at 26,018.

Organization: Volvo Group

Credit Correction Allowance

Volvo Group firmly believes that there are both potential and realized unintentional errors that can occur with the amount of data handling for the reports that are required of manufacturers, and so it is imperative to have the ability to correct these errors and have fair and robust final reports behind EPA's datasets. Having only one-sided correction allowed does not produce fair and robust data, and therefore biases the overall dataset built from these reports. The Volvo Group acknowledges concern about potential use of corrections to unfairly and unjustly improve an OEM's position, however we maintain that the ability to correct can be firmly limited to demonstrable errors to prevent any such gaming. [EPA-HQ-OAR-2022-0985-1606-A1, p. 22]

The Volvo Group fully supports the proposed allowance to correct credit calculation errors submitted in the model year final report, but we believe the allowance should be extended indefinitely and without penalty, since limiting the allowance to demonstrable errors in no way allows an OEM to unfairly improve its position; but rather allows an OEM to justly recover those credits that were earned through proven compliance with the requirements of the regulation. [EPA-HQ-OAR-2022-0985-1606-A1, p. 22]

EPA Summary and Response:

Summary:

CARB discourages a proposed allowance for correcting accounting, typographical, or GHG emissions model (GEM) based errors within 24 months after a manufacturer submits the 270-day final report. The proposed allowance for correcting ABT errors up to 24 months after the due date will significantly complicate recordkeeping.

DTNA supports EPA's proposal to allow manufacturers to correct previously submitted vehicle and engine GHG ABT reports beyond the 270-day final report submission deadline. DTNA has rigorous quality assurance processes in place for generating ABT reports, however there is always a possibility of unintentional errors that may negatively affect credit balances. DTNA appreciates EPA's recognition that a limited allowance for correcting reports is appropriate. DTNA requests that this same allowance be applied to ABT reports submitted under the NOx credit program for engines certified to 40 C.F.R. Part 1036 standards.

Volvo Group states that there are both potential and realized unintentional errors that can occur with the amount of data handling for the reports that are required of manufacturers, and it is imperative to have the ability to correct these errors and have fair and robust final reports behind EPA's datasets. Volvo maintains that the ability to correct can be firmly limited to demonstrable errors to prevent any gaming. The Volvo Group supports the proposed allowance to correct credit calculation errors submitted in the model year final report, but believes the allowance should be extended indefinitely and without penalty, as limiting the allowance to demonstrable errors in no way allows an OEM to unfairly improve its position.

Response:

CARB did not address EPA's rationale from the proposed rule to allow more time for GHG-related credit corrections because of the greater complexity for assembling information to demonstrate compliance. EPA agrees that it is not good to add unnecessary complications for keeping records; however, we believe that making legitimate corrections as described in the proposed rule is neither unnecessary nor complicated.

EPA appreciates DTNA's support of the proposed change to allow more time for making GHG-related corrections to ABT reports. The proposed rule described why we were proposing to limit the extended deadline for corrections related to complying with GHG standards, which was largely due the additional information and complexity of information needed for GEM modeling across a vehicle manufacturer's fleet and the corresponding information from engine manufacturers for running GEM. Compliance with NOx standards is unrelated to vehicle manufacturers or modeling with GEM, and it involves a much less extensive set of information. We are amending the regulation at 40 CFR 1036.150 and 1036.730 for certifying engines to more carefully state that the extended deadlines for corrections apply only for GHG emissions, as described in the preamble to the proposed rule.

EPA has never had any intention to allow for correcting anything other than demonstrable errors. It is not clear how Volvo intends to narrow the scope of allowable corrections to justify their suggestion to remove any deadline for making corrections and to remove the proposed discount for corrections after the September 30 deadline for submitting the annual ABT report. The proposed rule described that the secondary deadline for corrections and the discount for those late corrections are appropriate in support of EPA's objective to encourage manufacturers to develop robust QA/QC processes in submitting accurate and timely reports. We are accordingly adopting the extended deadline and discount provisions as proposed.

24.5 General Amendments for the Regulations

Comments by Organizations

Organization: California Air Resources Board (CARB)

4. Amending Applications for Certification

Affected page: 26127 (1037.225)

CARB staff proposes to allow manufacturers to submit the amending applications for certification up to 30 days before the end of the MY. CARB staff generally does not issue an executive order after the calendar year corresponding to the MY ends. Requesting applications be submitted 30 days before the end of the MY would allow both CARB and U.S. EPA time for issuing a revised executive order if needed. [EPA-HQ-OAR-2022-0985-1591-A1, pp.57-58]

Part II. HDE Provisions

B. Correction to NOx ABT Family Emission Limit (FEL) Cap

Affected page: 26019

The NPRM is proposing to amend 40 CFR 1036.104(c)(2) to remove paragraph (iii), which corresponds to a FEL cap of 70 milligram per horsepower-hour (mg/hp-hr) for MY 2031 and later Heavy HDE. The FEL cap was proposed in the HD2027 NPRM, but U.S. EPA did not intend to include in the final regulation. [EPA-HQ-OAR-2022-0985-1591-A1, p.70]

CARB staff sees this as an editorial change to language that was never intended to be included in the final regulation as the current FEL cap of 50 mg/hp-hr for MY 2031 and later is already more stringent. Therefore, CARB staff supports U.S. EPA in correcting NOx FEL caps as part of this NPRM. [EPA-HQ-OAR-2022-0985-1591-A1, p.70]

Organization: Eaton

The regulations should aim at streamlining the HEV and PHEV certification process that is currently complex, although that can also be done through technical amendments as the Agency and stakeholders gain experience. [EPA-HQ-OAR-2022-0985-1556-A1, p. 6]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC)

Interim Provisions outlined in Sections 1036.150 and 1037.150

We encourage EPA to establish sunset dates for the proposed "interim provisions" outlined in Sections 1036.150 and 1037.150. As written, the proposal does not appear to propose a sunset date for these provisions. EPA in future rulemakings should continue to establish sunset dates for interim provisions. Alternatively, if EPA finds an interim provision does not require a sunset date the agency should not consider that provision “interim” and define it accordingly within its regulations. [EPA-HQ-OAR-2022-0985-1562-A1, p. 13]

Updating Equations and Sample Calculations

We wish to express the importance of EPA communicating technical information clearly and effectively. As such, we suggest EPA review its existing and proposed equations and regulations to ensure that they describe technical aspects in clear and fully descriptive language and are accessible to all readers. This includes adding units to substituted values within sample calculations, checking variable names and descriptions in equations for typos, numbering non-numbered equations, and reformatting equations for legibility and scale uniformity. Making these changes will ensure the regulations will be easier to understand for all readers. [EPA-HQ-OAR-2022-0985-1562-A1, p. 15]

Organization: Strong Plug-in Hybrid Electric Vehicle (PHEV) Coalition

Summary: In short, we support the proposed rule on class 4 to 8 heavy-duty vehicles and some class 2b and 3 vehicles including the rule’s proposed design with only a few exceptions listed below. For example, we support EPA not including the upstream emissions from battery and vehicle manufacturing and treating electric miles as zero greenhouse gases emitted. We also support having a plug-in hybrid truck’s utility factor (the number of electric only miles compared to total miles) calculated on a case-by-case basis using manufacturer submitted data that is approved by EPA. We only have a few requests for changes and new studies as summarized below, and in our comments below. We also provide why we think PHEVs are important to be included in this regulation. [EPA-HQ-OAR-2022-0985-1647-A2, p. 1]

We specifically support the following provisions in the proposed regulation: 1) allowing many technologies to qualify in the regulation based on performance of their GHG emission reductions including Strong PHEVs and other PHEVs, 2) stringent cold start emission requirements on PHEVs, 3) rewarding PHEVs based on their percentage of electric miles and assuming zero GHG emitted for electric miles, 4) not having a specific limit on the amount of PHEV produced by one or all manufacturers, 5) not limiting a PHEV’s all electric range, 6) categories of vehicles in the design of the standard, 7) keeping an averaging banking and trading system, and 8) dramatically limiting the use of bonus credits (multipliers). [EPA-HQ-OAR-2022-0985-1647-A2, p. 3]

Organization: ROUSH CleanTech

We strongly believe that the corrections and clarifications included in this rule that are unrelated to the GHG program should be proposed and implemented separately (and removed from this rule). Many of the suggested changes to section 1036 and 1065 are relatively straightforward and important corrections/clarifications to fix errors/omissions in the emissions program; including them here only makes them more difficult to review, and more likely to be caught up in the finalization delays which are almost certain to occur with this program. We have observed in the past that including this type of content in an otherwise unrelated regulatory package results in unnecessary delays and insufficient review and comment, as the parties affected by the Part 1036/1065 changes may not be fully reviewing the proposed Phase 3 vehicle rules. [EPA-HQ-OAR-2022-0985-1655-A1, p.4]

EPA Summary and Response:

Summary:

CARB staff would like EPA to disallow manufacturers submitting requests to amend an application for certification less than 30 days before the end of the model year. Requesting that such applications be submitted 30 days before the end of the model year would allow both CARB and U.S. EPA time for issuing a revised executive order if needed.

CARB supports removal of 40 CFR 1036.104(c)(2)(iii), which corresponds to an FEL cap of 70 milligram per horsepower-hour (mg/hp-hr) for MY 2031 and later Heavy HDE. CARB notes that this as an editorial change to language that was never intended to be included in the HD Highway Low NOx final regulation as the current FEL cap of 50 mg/hp-hr for MY 2031 and later is already more stringent.

Eaton states that regulations should aim at streamlining the HEV and PHEV certification process that is currently complex, through technical amendments as the Agency and stakeholders gain experience.

NESCAUM and OTC would like EPA to establish sunset dates for the "interim provisions" in 40 CFR 1036.150 and 1037.150. They would like EPA to establish sunset dates for interim provisions introduced in future rulemakings. They stated that any interim provisions that does not require a sunset date should be moved to other sections within the given Part. NESCAUM and OTC also expressed the importance of EPA communicating technical information clearly and effectively. They suggested EPA review its existing and proposed equations and regulations to ensure that they describe technical aspects in clear and fully descriptive language and are accessible to all readers.

Roush CleanTech stated that many of the suggested changes to section 1036 and 1065 are relatively straightforward and important corrections, however the corrections and clarifications included in this rule that are unrelated to the GHG program should be proposed and implemented separately. They state that including these types of changes in an otherwise unrelated regulatory package results in unnecessary delays and insufficient review and comment, as the parties affected by the Part 1036/1065 changes may not be fully reviewing the package.

Response:

EPA regulation currently states that a certificate of conformity is valid from the indicated effective date until December 31 of the model year for which it is issued, and that manufacturers may send an amended application any time before the end of the model year to include new or modified engine configurations. EPA regulation further allows manufacturers to start producing such a new or modified engine configurations when they send the amended application, though EP-A may require manufacturers to cease production of the new or modified configuration and recall affected engines if a problem arises. Since there is no requirement for EPA approval before the manufacturer takes action, it is unnecessary to add an artificial 30-day deadline before the end of the model year for requests to amend an application for certification. Furthermore, to the extent the manufacturer depends on EPA review, we would not want to create an expectation that EPA will conclude its review within 30 days. Since the certificate is not valid after December 31 of the model year, we would simply not approve amendments to a certificate if the review is not completed before the end of the year. Manufacturers must accordingly allow sufficient time for EPA review when that is needed.

EPA notes CARB's support for removal of 40 CFR 1036.104(c)(2)(iii). The FEL cap was proposed in the HD2027 NPRM, but we did not intend to finalize that provision. EPA is removing this inadvertently adopted paragraph in this final rule.

EPA is constantly reviewing its test procedures and while Eaton's requested changes were out of scope for this rule EPA intends to continue to work with manufacturers like Eaton to streamline the HEV and PHEV measurement procedures as additional experience is gained.

EPA thanks NESCAUM and OTC for their comments on the importance of communicating technical information clearly. EPA strives to provide sample calculations with appropriate units to make it easier to understand and carry out the calculations in 40 CFR parts 1036, 1037, 1065, and 1066; ensuring that the regulations are easy to understand for all readers.

Regarding NESCAUM and OTC's suggestion for interim provisions, we include sunset dates where we are finalizing a clear expiration for the provision. At this time, adding sunset dates for existing provisions is out of scope of this rulemaking. We may consider comments requesting specific sunset dates for interim provisions in future rules.

We do not support Roush CleanTech's claim that including technical amendments in this package will result in insufficient review and comment by interested stakeholders as sufficient time has been given for review and we have taken comment on many aspects of the proposed test procedure changes. We also note that many of the changes proposed to 40 CFR parts 1036 and 1065 are integral to implementation of the HD GHG Phase 3 standards.

25 Stakeholder Engagement

<u>Comments by Organizations</u>

Organization: BlueGreen Alliance (BGA)

Climate change, economic injustice, and racial inequity are the most fundamental challenges we face today— and we know they're inextricably intertwined. In the transportation sector, which accounts for nearly 30% of U.S. greenhouse gas emissions, this intersection is visible in the disproportionate impact of transportation emissions—particularly emissions from heavy-duty vehicles—on low-income and non-white communities.1 It's visible in the disparities in access to cleaner vehicles and other mobility options across income levels. And it's visible in the economic impacts of decades of disinvestment in auto manufacturing communities, which have seen good jobs offshored and anchor facilities shuttered due to ill-conceived policies that gutted the middle class. That's why it is critical that regulators, policymakers, and advocates coordinate standards, policies, investments, and infrastructure projects that engage and benefit all people—from the manufacturing workers who build the vehicles of the future, to the people who drive them, to the communities they drive through. Strong heavy-duty vehicle standards—accompanied by policies to rebuild manufacturing, protect and create good family supporting jobs, and revitalize communities—are critical to achieving these aims. [EPA-HQ-OAR-2022-0985-1605-A1, p. 1]

1 The Moving Forward Network, Making the case for zero-emission solutions in freight, May 2021. Available Online: https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-the-Case_Report_May2021.pdf.

Organization: Dana Incorporated

Dana supports the underlying goals of Phase 3 and appreciates EPA's receptiveness in receiving stakeholder input. Dana believes that these views on the proposed rule are consistent with Dana's customers and groups within the automotive and trucking industries, including truck renting and leasing companies. [EPA-HQ-OAR-2022-0985-1610-A1, p. 1]

Supporting the Full Industry

Dana serves and engages with fleets not only as the end users, but also as an aftermarket parts supplier serving fleets to reduce critical downtimes. While the Phase 3 rule is directed at original equipment manufacturers (OEMs), fleets are the final decision makers and the success or failure of the rule hinges on having fleets invest in new trucks with lower-carbon and/or zero emission truck technologies. [EPA-HQ-OAR-2022-0985-1610-A1, p. 1]

As a result, Dana believes the Phase 3 rulemaking should seek to address the concerns of fleets, including: minimize new technology purchase prices; do not increase maintenance and operational costs; ensure technology readiness and availability; maximize performance, durability, and driver satisfaction; maintain fleet flexibility in technology and fuel choices; do not re-open the final Phase 2 rule; avoid unintended consequences such as equipment pre-buys/low-buys or no-buys, alteration of fleet turnover cycles, increased insurance premiums, and decreased payloads; and account for the uniqueness of truck renting and leasing operations. [EPA-HQ-OAR-2022-0985-1610-A1, pp. 1 - 2]

Organization: Mayor Becky Daggett, City of Flagstaff, Arizona et al

Stakeholder involvement -- EPA must incorporate a robust and responsive stakeholder engagement process— particularly for frontline communities. Transportation is a leading source of air pollution and disproportionately harms people on lower incomes and people of color. EPA must work with environmental justice communities to ensure they are included in decision-making processes. [EPA-HQ-OAR-2022-0985-2007]

Organization: Moving Forward Network (MFN) et al.

In 2021 and 2022, MFN submitted a letter 5, 6 to Administrator Regan highlighting specific issues that warranted EPA's immediate attention. MFN's position and demands are within EPA's authority, will ensure public health benefits, and are economically feasible given zero-emission 7 trucks are commercially available, 8 economically compelling, 9 and the single most effective solution for reducing freight emissions. 10 [EPA-HQ-OAR-2022-0985-1608-A1, p. 4]

5 Moving Forward Network. Letter to Administrator Regan. (October 2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/11/MFN-Zero-Emission-in-Freight-Letter-to-EPA-10_26_21.pdf

6 Moving Forward Network. Letter to Administrator Regan. (November 2022). https://www.movingforwardnetwork.com/wp-content/uploads/2022/11/MFN-Zero-Emission-in-Freight-EPA-One-Year-in-Review-11_17-.pdf

7 MFN contextualizes zero-emission solutions as adhering to our framework of renewable energy. We cannot support solutions that do not account for upstream and downstream impacts. If we do so we risk trading pollution for more pollution and the same frontline and fenceline communities are left to suffer. Renewable energy may have many definitions based on the source of energy. MFN considers solar and wind to be renewable energy. However, there are important EJ and equity implications that come from these "cleaner" energy sources (i.e siting, manufacturing, shipping, etc). All of these must be considered with EJ leadership before endorsing specific renewable energy recommendations. Included in our definition of renewable energy is that recommended fuel sources including ZEV technology must take into account impacts from source, to tailpipe to grave. "To grave" means that how and where waste from retired zero emission and diesel vehicles is considered in the planning and implementation of zero emission policies and programs. (See MFN 2021 and 2022 letter to Administrator Regan and MFN comments on Document (EPA-HQ-OAR-2019-0055-0983)

8 MJ Bradley & Associates. Medium- & Heavy-Duty Vehicles. (July 2021). http://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf.

9 Amol Phadke et al. Why Regional and Long-Haul Trucks are Primed for Electrification Now. (March 2021). https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf

10 OECD. International Transport Forum, Transport Outlook - 2019. (May 2019). p.157. https://doi.org/10.1787/transp_outlook-en-2019-en

Organization: National Association of Chemical Distributors (NACD)

NACD strongly supports the objective of lowering the emissions of the United States trucking fleet; however, continually adding more aggressive, yet unproven emission requirements to heavy-duty trucks will significantly burden the chemical distribution industry and the American economy as a whole. [EPA-HQ-OAR-2022-0985-1564-A1, p. 2]

In order for this proposal to achieve its goal, end-users must purchase and operate the new vehicles that manufacturers are required to produce. End-users are also the ones who will be paying the higher costs for implementing these new technologies. For these reasons, it is critical that the EPA engage with end-users to ensure this rule sets forth reasonable standards and makes accurate predictions of future buying patterns. However, the agency neglected to interact with the end-users of these trucks, as noted by the EPA they instead consulted with "environmental NGOs, vehicle manufacturers, technology suppliers, dealers, utilities, charging providers, Tribal governments, and other organizations." NACD believes the EPA cannot in good faith move forward with this rulemaking without better consulting with the entire range of stakeholders impacted by this proposal. We urge the EPA to engage with end-users during their consideration of these standards and adopt a supplemental proposed rule with this input. [EPA-HQ-OAR-2022-0985-1564-A1, p. 5]

EPA Summary and Response:

Summary:

Several commenters provided responses to the stakeholder engagement process described in Preamble Section II.F. Several of these noted the importance of including environmental justice communities in the process. MFN provided several recommendations on how to improve the process to engage these communities more successfully. BlueGreen Alliance said that all people need to be included: people who make the vehicles, people who drive the vehicles, and the communities that host those vehicles. NACD recommended that vehicle users be included, and Dana stated that discussions should include not just fleets as end users, but also aftermarket parts suppliers.

Response:

As noted in the preamble for this rule, EPA had extensive engagement with a wide variety of stakeholders that would be affected by the rule, including labor unions, states, industry, environmental justice organizations and public health experts. We also engaged environmental NGOs, vehicle manufacturers, technology suppliers, dealers, utilities, charging providers, Tribal governments, and other organizations. While EPA did not meet with individual end users, many of the concerns raised by them were also raised by other stakeholders during the rule development process. Finally, EPA did incorporate many of the recommendations suggested by MFN in our regulatory process; see response to Section 27.

26 Regulatory Flexibility Act

<u>Comments by Organizations</u>

Organization: National Association of Chemical Distributors (NACD)

NACD commends the EPA for acknowledging the disproportionate impact this rule would have on small businesses by exempting small business manufacturers from the new requirements set forth in the proposal. However, this relief only extends to manufacturers of heavy-duty vehicles and does not extend to other small business stakeholders who will also be impacted by higher prices caused by this rulemaking. A significant portion of the heavy-duty trucking industry is operated by either independent contractors or small businesses, with 95.7% of fleets operating 10 or fewer trucks.1 These small businesses are the ones who will be forced to foot the bill of this rulemaking as manufacturers will pass on the higher costs of producing these trucks to their customers. [EPA-HQ-OAR-2022-0985-1564-A1, p. 2]

1 American Trucking Associations, "Economics and Industry Data," trucking.org, ATA, https://www.trucking.org/economics-and-industry-data

Organization: National Association of Convenience Stores (NACS), NATSO, and SIGMA

The Proposed Rule Is Contrary To The Small Business Regulatory Enforcement Fairness Act of 1996.

Finally, EPA's certification that the Proposed Rule will not have a significant economic impact on a substantial number of small entities is unsupported by the record.45 Our industry is one of small businesses. More than 60% of convenience stores are single-store operators. Less than 0.2 % of convenience stores that sell gas are owned by a major oil company and about 4% are owned by a refining company, meaning that independent businesses comprise more than 95% of the industry. Though small, our members in the industry process more than 165 million transactions every day. And while EPA considered effects on manufacturers it considered small businesses, EPA did not fairly assess the potential impacts of the Proposed Rule on non-manufacturer small businesses like our members—contrary to Congressional intent. [EPA-HQ-OAR-2022-0985-1603-A1, p. 13]

45 Proposed Rule at 26,097.

The Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act ('SBREFA'), requires agencies like EPA to determine, to the extent feasible, the rule's economic impact on small entities, explore regulatory options for reducing any significant economic impacts on a substantial number of such entities, and explain their ultimate choice of regulatory approach. But the Proposed Rule is accompanied by little to no information on potential impacts on these small businesses. There is no formal or informal analysis of the adverse economic impacts to small businesses, no SBREFA screening analysis, no analysis, advice, and no recommendation from a Small Business Advocacy Review ('SBAR') Panel. As reiterated throughout these comments, the impacts to our members are far from inconsequential. Thus, we urge EPA in any future rulemaking to further engage in a thorough review of adverse effects to small businesses like our members consistent with their charge under the SBREFA. [EPA-HQ-OAR-2022-0985-1603-A1, p. 13]

Organization: Truck Renting and Leasing Association (TRALA)

ZEV Purchases Will Disproportionately Impact Small Trucking Companies

The vast majority of truck renting and leasing company customers are characterized as small businesses and as such they meticulously track their business opportunity costs. This customer base is not dissimilar to the industry as a whole whereby 95.7% of companies operate 10 trucks or less.23 [EPA-HQ-OAR-2022-0985-1577-A1, p. 16]

23 American Trucking Trends 2022, American Trucking Associations, Page 4.

Small fleets considering ZEV vehicles will likely consider leasing or purchasing equipment in the secondary market. Fleets leasing ZEVs will pay a higher premium given the high up-front cost of ZEVs. From purely an economic standpoint, small fleet customers will likely trend towards traditional ICE vehicle leases for the foreseeable future. Fleets considering purchasing trucks in the secondary market will not benefit from financial incentives as new-vehicle buyers. Small fleets will also face bureaucratic and administrative hurdles since they lack the time, staffing, and expertise to take advantage of incentive programs and equipment optimization after purchase. [EPA-HQ-OAR-2022-0985-1577-A1, p. 16]

Organization: Valero Energy Corporation

F. EPA should consider the consequences of diminishing liquid fuel supplies as refineries and renewable fuel production facilities are shut down.

EPA acknowledges that existing ICEs will continue to operate but has not accounted for any increased burden on those owners of ICEs related to fewer options for fuel or decreased competition in the fuel market. The impacts to HDV owners and users may be different than those on LDV owners and users. It is important for EPA to consider such impacts and how those impacts will be addressed or if they call for a more measured approach for electrifying the HDV market. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 46 - 47]

Reducing volumes of liquid fuels also means a change in how vehicles frequent fueling stations and convenience stores. EPA has not provided information related to the expected loss of businesses that have depended on fuel stops for HDVs. These are important segments of the U.S. economy that EPA has not identified as affected industry for the proposal. EPA’s DRIA should account for impacts to these businesses. [EPA-HQ-OAR-2022-0985-1566-A2, p. 47]

H. EPA failed to identify and account for impacts on many affected industries and small businesses.

The proposal lists just six potentially affected industry groups, all of which are manufacturers. Yet it is undisputable that the trucking industry - those that buy HDVs, maintain them, use them for their business and livelihoods, and those that will be burdened with the radical changes to their business - is a significantly affected industry group. Similarly, other industries that use HDVs should be listed as potentially affected industry groups. Among the wide variety of industry groups that depend on HDVs or HD engines, EPA is also likely to find small businesses who will bear the burden of the proposed standards in the form of new HDVs or HD engines or increased costs associated with impacts on suppliers or contractors. EPA has not accounted for even just the industries most impacted by this proposal nor has EPA completed the appropriate analysis of impacts on small businesses. [EPA-HQ-OAR-2022-0985-1566-A2, p. 50]

EPA Summary and Response:

Summary:

EPA received two comments on the draft Regulatory Flexibility Act analysis performed for this rule, one on behalf of fleet operators and one on behalf of fuel providers. NACD, which represents chemical distributors, commented the heavy-duty trucking industry is operated by either independent contractors or small businesses, most of which operate 10 or fewer trucks. NACD further stated that the proposed rule's regulatory relief is available only to small manufacturers and there is no relief for the fleet operators, who they state will be impacted by higher prices. NACS, NATSO, and SIGMA, which represent the convenience store industry (NACS), travel centers and truck stops (NATSO), and independent chain retailers and marketers of motor fuel (SIGMA) commented that many of their members are single-store operators. They stated that these non-manufacturer small businesses, which together represent 9 percent of the motor fuel sold in the United States, should be included in EPA's Regulatory Flexibility Act analysis for this rule. The commenters stated that the proposed rule has little to no information on potential impacts on their small businesses, and there is no formal or informal analysis of the adverse economic impacts to small businesses, no SBREFA screening analysis, and no recommendation from a Small Business Advocacy Review ("SBAR") panel.

Two other commenters stated that there are two other sectors comprised of small businesses that should be considered. Truck Renting and Leasing Association commented that EPA failed to consider the impacts of the rule on their companies, which are small and will be adversely affected by any increase in prices. Valero Energy also commented on the impacts for small business users, especially through fewer options for fuel, decreased competition in the fuel market, and increased vehicle prices and operating costs.

Response:

Our assessment of small business impacts prepared to support EPA's certification that the rule will not have a significant economic impact on a substantial number of small entities was appropriately limited to small entities that would be regulated under the proposed rulemaking (i.e., engine and vehicle manufacturers). Other than those entities discussed in the final RIA Chapter 9, the rule does not impose any requirements on small businesses (for example, small trucking firms and small convenience store operators are not regulated entities under the final rule's requirements). The impacts on small businesses to which the commenters refer would not be effects of the rule on regulated entities, and thus are not impacts that we are required to analyze. See *Cement Kiln Recycling Coal. V. EPA*, 255 F.3d 855, 869 (D.C. Cir. 2001) (noting that "this court has consistently rejected the contention that the RFA applies to small businesses indirectly affected by the regulation of other entities"), *Mid-Tex Elec. Coop. v. FERC*, 773 F.2d 327, 342-43 (D.C. Cir. 1985) ("An agency may properly certify that no regulatory flexibility analysis is necessary when it determines that the rule will not have a significant economic impact on a substantial number of small entities that are subject to the requirements of the rule. . . . Congress did not intend to require that every agency consider every indirect effect that any regulation might have on small businesses in any stratum of the national economy."); see also *Coalition for Responsible Regulation v. EPA*, 684 F. 3d 102, 129 (D.C. Cir. 2012).

Though EPA is not required to include fleet or truck owner/operators/renters/lessors or owners of convenience stores, travel centers, truck stops, and independent chain operators in our Regulatory Flexibility Act analysis since they are not regulated entities under the rule, in our analyses for the final rule the Agency did consider concerns about purchaser costs as well as other concerns about infrastructure and refueling and charging facilities. EPA also considered projected economic impacts. These are discussed in the preamble and RIA for this rule as well as in Sections 2, 3, 6, 7, 8 and 19 of this RTC document.

27 General Comments on Rule Process

Comments by Organizations

Organization: American Bus Association (ABA)

We wish that the comment period had been extended, so that we could consider all of the items of material of the proposal. [EPA-HQ-OAR-2022-0985-1634-A1, p. 5]

Organization: American Fuel and Petrochemical Manufacturers (AFPM)

EPA is circumventing the public's ability to provide adequate comments to the Proposed Rule by limiting the comment period to 50 days, denying AFPM's request to extend the comment period, and concurrently proposing light- and medium-duty standards, and other significant rulemaking proposals related to vehicle electrification, fuels, and electricity generation. Significant time is required to read and respond to the sheer volume of the material covered in each rulemaking docket, particularly given EPA's evident lack of rigor and discipline in its citation and characterization of underlying sources. [EPA-HQ-OAR-2022-0985-1659-A2, p. 2]

I. The Proposal Fails to Provide Meaningful Opportunity for Public Comment.

AFPM welcomes the opportunity to meaningfully engage with regulators to discuss cost-effective, efficient, and feasible measures to reduce the carbon intensity of the transportation sector. Unfortunately, the concurrent comment periods for this rule and EPA's proposed light- and medium-duty vehicle tailpipe standards are insufficient to provide a reasonable opportunity to comment meaningfully on either proposal. Although AFPM requested that the comment period for both rules be extended, EPA declined to extend the comment period for either rule, claiming that its pre-publication release of material meant that the public in fact had 66 days to comment on the heavy-duty rule and 83 days to comment on the light/medium duty rule.12 Contemporaneously with these proposals were two related rules addressing electric vehicles: (1) the Department of Energy (DOE) published a proposal to revise its regulations regarding calculating a value for the petroleum-equivalent fuel (PEF) economy of electric vehicles (EVs) for use in determining compliance with the Corporate Average Fuel Economy (CAFE) program; 13 and (2) the Internal Revenue Service proposed regulations regarding the Inflation Reduction Act's New Clean Vehicle Credit. The table below illustrates that in the span of 88 days (April 11-July 5), interested parties were required to analyze 531 pages of proposed rules in the Federal Register and more than 30,000 pages of supporting material to understand the basis for each proposed rule. The page estimate excludes the voluminous amount of data supporting EPA's two proposed vehicle rules. [EPA-HQ-OAR-2022-0985-1659-A2, p. 5.] [See the Table, Proposed Rules, on page 6 of docket number EPA-HQ-OAR-2022-0985-1659-A2.]

12 June 2, 2023, letter from Joseph Goffman, EPA Principal Deputy Assistant Administrator, responding to Patrick Kelly, AFPM.

13 88 Fed. Reg. 21525, 21526 (April 11, 2023).

EPA's refusal to grant additional time to respond to this proposal and the light-duty vehicle rule denied the public ample time to formulate meaningful comments responsive to the underlying information in support of the Agency's proposal. The Agency's action is an arbitrary departure from its typical practice of granting reasonable extensions of time—often thirty days, but frequently sixty or even ninety—in order to provide for meaningful input from the public on proposed rules.14 [EPA-HQ-OAR-2022-0985-1659-A2, p. 6]

14 Around the same time AFPM's extension request was denied, EPA saw fit to grant an extension of time to submit comments on the "Commercial Sterilization Facilities NESHAP." See EPA Docket EPA-HQ-OAR-2019-0178-0154.

The Administrative Procedures Act requires opportunity for meaningful public input, and Executive Order 12866 states that, in most cases, agencies should provide a comment period "of not less than 60 days." Even counting the handful of additional days afforded by EPA's pre-publication release of the preambles, this period is not sufficient to adequately address the sweeping scope of EPA's proposal to force electrification of the nation's heavy-duty transportation fleet. Significant time is required simply to read and respond to the sheer volume of material covered in each rulemaking docket, particularly given EPA's evident lack of rigor and discipline in its citation and characterization of underlying sources. As illustrated in these comments, our review identified numerous instances in which examination of sources cited by EPA as support for its conclusions indicated that characterization of these sources is inaccurate, incomplete, or misleading. Thus, to meaningfully respond to EPA's proposal, the public must fact-check EPA's work. There are 1,040 footnotes in the text of the HDV rule preamble and 908 in the LD/MDV rule. Assuming it takes an average of one hour to identify, locate or acquire and read the underlying reference work cited, and draft a meaningful comment in response, that equates to 130 eight-hour workdays that would be required just to fact-check the HD rule (65 days if one assumes this work takes only half an hour per cite on average). For the LD/MDV rule, that would equate to 113.5 eight-hour workdays (or 57 based on assuming 30 minutes per citation). This analysis does not include the time required to verify sources cited in the DRIAs, much less the 1,420 supporting and related materials posted to the HDV docket and the 429 posted to the L/MDV docket. [EPA-HQ-OAR-2022-0985-1659-A2, pp. 6 - 7]

Further, the difficulties presented by the short and concurrent comment periods on these closely related rules are exacerbated by EPA's unduly narrow identification of industries affected by this rule. Under the heading "Does this action apply to me," EPA limits its identification of affected industries to entities with direct compliance obligations: vehicle manufacturers, engine manufacturers, automotive repair and maintenance, and state and local governments (with the qualification that "the proposed revisions do not impose any requirements that state and local governments must meet, but rather implement the Clean Air Act preemption provisions for locomotives"—suggesting that these entities are not otherwise expected to be affected).15 Although EPA notes that "this table is not intended to be exhaustive…other types of entities could also be affected," EPA is well aware that many entities necessarily rely on regulatory screening tools based on search terms tied to their own NAICS codes to alert them to new proposed rules that may impact them. [EPA-HQ-OAR-2022-0985-1659-A2, p. 7]

15 Proposed Rule at 25,927.

By narrowly limiting the identification of industries affected based on this extremely short and incomplete list of NAICS codes and by its arbitrary refusal to extend the comment periods, EPA has unreasonably constrained the number and types of entities that will find out about these proposed actions in time to comment. EPA appears to count on closing the comment period before retailers, farmers, food distributors, truckers, renewable fuel producers, original equipment manufacturers (OEMs), small businesses, emergency response providers, or any of the host of other interests who will be affected by the profound changes in how commercial goods are moved even realize what is at stake. This sort of gamesmanship is at odds with EPA's responsibility under the Administrative Procedures Act and the Due Process clause of the U.S. Constitution. Based on the limited time to review, analyze, and prepare a written response to EPA's proposed rule, AFPM submits the following comments. [EPA-HQ-OAR-2022-0985-1659-A2, p. 7]

Organization: American Trucking Associations (ATA)

Unfortunately, EPA's proposed rule is working on an expedited regulatory timeline with a mandate to finalize a regulation by the end of the year.1 Given a rule of this economic impact and technology forcing adoption on the proposed timelines, ATA and the American Truck Dealers submitted a request for a modest 45-day extension on May 26, 2023.2 EPA's 50 days for comment did not allow enough time to read this complex rule and supporting materials, schedule technical conversations with fleets, and complete impact studies. [EPA-HQ-OAR-2022-0985-1535-A1, p. 2]

1 U.S. Office of Management and Budget, Office of Information and Regulatory Affairs, Unified Agenda, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3, Spring 2023.

2 Goffman, Joseph, Denial of 45-day extension of comment period for EPA-HQ-OAR-2022-0985, June 7, 2023.

Organization: Bradbury, Steven G.

EPA should withdraw and reconsider these rulemaking proposals.

In light of the deficiencies in the cost analyses and underlying assumptions laid out above, EPA should withdraw and reconsider both of its proposed tailpipe rules. If EPA had more carefully considered its legal authorities under the Clean Air Act and more thoroughly accounted for the market realities and facts relevant to these proposals, I am confident EPA would not have proposed the radical and far-reaching approach to emissions control reflected in the current proposals. [EPA-HQ-OAR-2022-0985-2427-A2, pp. 21-22]

Even if EPA persists in proposing something along the same lines, at a minimum, it should put these concepts out for public comment in a much more preliminary form—for example, in an advanced notice of proposed rulemaking, or ANPRM. By setting out the general ideas it plans to consider in an ANPRM, EPA could suggest its own preliminary supporting analysis and view of the relevant facts and considerations and then ask for meaningful input on all aspects of the issues, seeking recommendations for alternative approaches from interested parties and the public. That would be more respectful of the American people and all interested stakeholders and would be more accommodating of the need for and the value of greater public input and deliberation. [EPA-HQ-OAR-2022-0985-2427-A2, p. 22]

Such an alternative process would provide the opportunity for EPA to receive deeper and broader information on all sides of the issues raised by these regulatory proposals, as well as a more probing analysis of the scope of EPA's authority to set emissions limits for automobiles and commercial trucks. In that way, an ANPRM process would help redirect EPA's thinking about the true costs, market disruptions, and secondary consequences of its preferred approach and about its authority to undertake these transformational proposals. [EPA-HQ-OAR-2022-0985-2427-A2, p. 22]

Organization: China WTO/TBT National Notification & Enquiry Center

1. It is suggested to extend the comment period. [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

This notification was issued on May 2, and receive submission of comments before June 16, which violated the transparency obligation under WTO of giving no less than 60 days for the comment period. It is suggested to extend the comment period. [EPA-HQ-OAR-2022-0985-1658-A2, p.3]

Organization: Dana Incorporated

HD TRUCS model

Dana has reviewed the new HD TRUCS model used to evaluate the design features needed to meet the energy and power demands of 101 representative HD vehicle types that cover the full range of weight classes within the scope of the proposed standards in this Phase 3 rulemaking (i.e., Class 2b through 8 vocational vehicles and tractors). Dana suggests that, for the HD TRUCS model to produce more precise projections for BEVs, FCEVs, and engines fueled by renewable net-neutral sources, EPA should consider conducting a second comment period or technical amendment after gathering additional data. This will offer improved guidance for evaluating the HD TRUCS model projections. [EPA-HQ-OAR-2022-0985-1610-A1, p. 4]

Organization: MCS Referral & Resources

At https://www.federalregister.gov/d/2023-07955/p-2054

EPA claims "This action is not a "significant energy action" because it is "not likely to have a significant adverse effect on the supply, distribution, or use of energy." But this is contradicted by EPA in the next paragraph:

This action proposes to reduce CO2 emissions from heavy-duty vehicles under revised GHG standards, which would result in significant reductions in the consumption of petroleum." [EPA-HQ-OAR-2022-0985-1629-A1, p. 5]

A significant reduction in the consumption of petroleum will inevitably have a significant adverse effect on the supply, distribution, and use of that energy from the perspective of companies selling less of it. EPA should acknowledge this is a significant energy action. [EPA-HQ-OAR-2022-0985-1629-A1, p. 5]

Organization: Moving Forward Network (MFN) et al.

13. Concerns With EPA's Public Comment Process

EPA's ability to effectively regulate environmental harms and enforce critical legislation, such as the Clean Air Act, depends on a public engagement process (including public comment periods) that is accessible to all stakeholders impacted by proposed regulations. If limitations in access to the Phase 3 public engagement process like those described below are not remedied, it is likely the rule will not be informed by valuable analysis and guidance from communities that are disproportionately impacted by heavy-duty vehicle pollution. In 2021, the White House issued its “Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-based Policymaking” and the Scientific Integrity Framework that lays out requirements for federal agencies, including EPA, to develop scientifically robust policies. 273 The OSTP report stressing the need to advance equitable data collection was released around the same time, 274 and the Science Advisory Board also provided recommendations for strengthening the evaluation of environmental justice impacts of air pollution regulations in the same month the HD Truck proposal was finalized. 275 The Biden administration understands the need for scientifically robust and equitable policymaking, but these tools have yet to be implemented effectively. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 120 - 121]

273 Biden, J. Memorandum on restoring trust in government through scientific integrity and evidence-based policymaking. (January 27, 2021). https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/; National Science and Technology Council. 2023. A framework for federal scientific integrity policy and practice, guidance by the Scientific Integrity Framework Interagency Working Group. https://www.whitehouse.gov/wp-content/uploads/2023/01/01-2023-Framework-for-Federal-Scientific-Integrity-Policy-and-Practice.pdf. These actions are summarized in Borkowski, L. Roundup: A new scientific integrity framework and overstretched EPA staff. The Equation. (May 12, 2023). https://blog.ucsusa.org/science-blogger/roundup-a-new-scientific-integrity-framework-and-overstretched-epa-staff/.

274 National Science and Technology Council. 2023. Progress on implementation of the recommendations of the equitable data working group. Report by the Subcommittee on Equitable Data, March. https://www.whitehouse.gov/wp-content/uploads/2023/03/Progress-on-Equitable-Data-Mar2023.pdf.

275 Reilly, S. “EPA advisers urge overhaul of EJ accounting in air rules,” Greenwire. (December 19, 2022). https://subscriber.politicopro.com/article/eenews/2022/12/19/epa-advisers-urge-overhaul-of-ej-accounting-in-air-rules-00074554.

Because public comment periods are less accessible to affected communities due to a number of factors including those captured below, business commenters tend to shape the final policy to a greater extent than nonbusiness commenters. 276 A Phase 3 public comment period that is less accessible to the frontline and fenceline communities limits EPA’s ability to protect communities across the country from toxic diesel emissions produced by the freight system. It is critical that agencies, such as EPA, investigate strategies for proactively engaging communities, and evaluating and responding to public comments to ensure that stakeholder concerns are heard and understood in an equitable, efficient way. 277 The following are recommendations for beginning to improve the accessibility of the EPA’s public engagement process and the effectiveness of public comment periods for shaping impactful and just regulation. [EPA-HQ-OAR-2022-0985-1608-A1, p. 121]

276 Yackee, J.W., and S.W. Yackee. A bias toward business? Assessing interest group influence on the U.S. bureaucracy. Journal of Politics. V. 68. No.1. (2006). p. 128–139. www.journals-uchicago-edu.ezproxy2.library.colostate.edu/doi/pdfplus/10.1111%2Fj.1468-2508.2006.00375.x.

277 Small, D. Public participation in rulemaking in the age of mass comments. Washington, DC: Administrative Conference of the United States. Blog. (July 19, 2018). www.acus.gov/newsroom/administrativefix-blog/public-participation-rulemaking-age-mass-comments.

Collect Environmental Justice feedback and research earlier to inform proposals. Once a proposal is released and the public comment period begins, the range of changes to a rule the public can influence is significantly limited. 278 EPA took steps to increase engagement with environmental justice communities the month before the Phase 3 rule was released. However, by that point, there was little time for the EPA to incorporate feedback and proposed solutions to resolve major air quality concerns related to the heavy reliance on hydrogen combustion in the rule before the proposal was submitted to the Office of Management and Budget Directives (OMB). Increased EJ engagement earlier in the proposal writing process would better inform the final rule. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 121 - 122]

278 Potter, R.A. Slow-rolling, fast-tracking, and the pace of bureaucratic decisions in rulemaking. Journal of Politics. V. 79. No. 3. (2017). p. 841–55. www.journals-uchicago-edu.ezproxy2.library.com

Lengthen public comment periods beyond 50 days. The fifty-day public comment period has significantly limited the amount of outreach and community engagement possible for informing the public about the Phase 3 proposal and turning out comments and testimonies. The shorter public comment period favors better-resourced actors that can afford lobbyists that influence the rule at the expense of environmental justice. Public comment periods that are the maximum allowable by law are more equitable. Combined with longer comment periods, virtual hearings, and in-person public hearings in impacted communities, public hearings that take place outside of working hours, the ability to submit written and oral comments in non-English languages, virtual public hearings with active transcription services for people hard of hearing or with disabilities help to improve access to public comment periods. [EPA-HQ-OAR-2022-0985-1608-A1, p. 122]

Improve accessibility of relevant information shared in Spanish. In addition to increasing the length of public comment periods to improve access to information by environmental justice communities, improvements to language access is also crucial. EPA distributed materials and communication about Phase 3 in Spanish. However, in some cases, there was no indication that the information was also available in Spanish and required that a non-English speaker scrolls beyond the English sections of the communication before seeing information in Spanish. For documents that contain information in English and Spanish, including a sentence at the beginning of the document conveying that information in Spanish is available below would ensure the accessibility of information to Spanish-speakers - For example, “Para información en español, haga clic aquí”/ “Información en español abajo”. [EPA-HQ-OAR-2022-0985-1608-A1, p. 122]

Improve hearing registration and block scheduling process. EPA only provided the public with 13 business days (April 12-May 1) to register for the Phase 3 hearing, which limited the ability of environmental justice communities to register and provide testimony at the hearing. The fifty-day public comment period possibly exacerbated this challenge. Additionally, testifiers were notified of their assigned hearing block only 24 hours prior to the hearing. This does not give the working public enough time to notify their employers to take time away from their jobs. [EPA-HQ-OAR-2022-0985-1608-A1, p. 122]

Improve Spanish language access during hearings.

- More lead time before a hearing will make it more feasible to circulate hearing details and information in Spanish to allow for more participation from Spanish speaking communities.

- When you account for Spanish speakers having to slow down for translation, they receive less than the actual allotted time. It also creates challenges for interpreters to be able to translate accurately when testifiers are forced to speak too quickly. The time limits for testimonies create situations where an interpreter may not have enough time to fully translate a testimony to Spanish because it takes additional time to convey what was said in English. EPA should provide more time for those needing translation (e.g., meaning testimony time would be set, for example, at 3 minutes, but the scheduling for testimony would be that each person has 4 minutes to account for a slower pace for translation).
- Interpreters may need a more complete glossary to reference ahead of the hearing to improve the accuracy of translations.
- Testifiers speaking in Spanish may need more guidance to know which channel to use when providing testimony.
- More words are often needed to communicate the same point in Spanish than it takes in English. Equal time limits for giving testimony in English and Spanish are also less fair for Spanish speakers since it takes more time to convey a point in Spanish. For this reason, Spanish speakers do not have an equitable amount of time to give testimony relative to their English-speaking counterparts. [EPA-HQ-OAR-2022-0985-1608-A1, pp. 122 - 123]

The voices not adequately heard in the public participation process call for the strongest possible standards. [EPA-HQ-OAR-2022-0985-1608-A1, p. 123]

Organization: National Automobile Dealers Association (NADA)

Yet despite the obvious need for a thoughtful and deliberative process, EPA has engaged in a compressed Phase 3 GHG rulemaking schedule, breaking from established practices of previous Clean Air Act rulemakings.6 This has deprived industry stakeholders of the chance to provide crucial information to the agency—including data that would have been pertinent to the agency's decision-making. This break in practice is particularly difficult considering the nascency of the technology and the many challenges and unknowns of the ZEV HDV marketplace. [EPA-HQ-OAR-2022-0985-1592-A1, p. 3.]

6 See e.g., Advance Notice of Proposed Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine Standards, EPA, (Feb. 16, 2023).

For example, EPA failed to issue an Advanced Notice of Proposed Rulemaking (ANPRM) and declined requests for a reasonable comment period extension shutting off the ability of key stakeholders to gather relevant data to provide robust and thoughtful review and comment.7 ATD and ATA had sought a reasonable time period to collect and provide EPA with data to inform its ability to make reasonable forecasts of the market adoption of ZEV HDV technologies, including with respect to such factors as charging and refueling infrastructure, power generation and transmission needs, technology related costs such as raw materials, technology advancements and manufacturing capabilities and operational support requirements. Both associations had undertaken to solicit real world data on these very important topics. Yet EPA imprudently denied the extension request, stating wrongly that the existing truncated comment period "provided sufficient avenues for stakeholders to provide their data, views, and arguments." [EPA-HQ-OAR-2022-0985-1592-A1, p. 3.]

7 On May 26, 2023, ATD and the American Trucking Association (ATA) requested a 45-day comment period extension; Appendix B: ATA and ATD Extension Request. [See Docket Number EPA-HQ-OAR-2022-0985-1592-A1, pages 18-20, for Appendix B.]

Organization: Transfer Flow, Inc.

I. REQUEST FOR AN EXTENSION OF THE COMMENT PERIOD

Transfer Flow respectfully requests the EPA consider granting a ninety (90) day extension for submitting comments and allow submission of comments through September 14, 2023. Given the complexity of the proposed rule, which the EPA refers to as the “most stringent vehicle standards ever,” it would be beneficial for the public and stakeholders to have additional time to assess the impact of the proposed rule in order to allow ample opportunity to develop meaningful comments. [EPA-HQ-OAR-2022-0985-1534-A1, p. 2]

Organization: Valero Energy Corporation

This lack of rigor and discipline in the methodology relied upon to support this rule stands in stark contrast with EPA’s typical approach to major rulemakings under the Clean Air Act and defies the general assessment factors for evaluating the quality of scientific and technical information that the Science Policy Council (SPC) has issued.103 In particular, this rulemaking does not have the hallmarks of the “weight-of-evidence” approach which “considers all relevant information in an integrative assessment that takes into account the kinds of evidence available, the quality and quantity of the evidence, the strengths and limitations associated with each type of evidence.”104 Nor does this proposal comport with the Action Development Process outlined by EPA, which states that rules should be “based on sound scientific, economic, legal, and policy analyses” and “reflect appropriate solicitation and consideration of views outside EPA.” 105 Instead, EPA unreasonably bases sweeping conclusions and makes “engineering judgments” about the economic impacts of transitioning the HDV fleet largely on the strength of anecdotal news articles and other random information sources of questionable reliability. [EPA-HQ-OAR-2022-0985-1566-A2, p. 22]

103 EPA, Science Policy Council, A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information (2003), available at https://www.epa.gov/sites/default/files/2015-01/documents/assess2.pdf.

104 Id. at p. 2.

105 EPA, Action Development Process: Guidance for EPA Staff on Developing Quality Actions (2011), p. 11, available at https://nepis.epa.gov/.

Additionally, rulemaking under the CAA almost always starts with EPA gathering information, often seeking information from regulated parties and others with information relevant to the rules under consideration through a formal regulatory process that provides for clarity and consistency in the responses. EPA did issue an information request (ICR) to vehicle manufacturers in connection with the heavy-duty Phase 3 non-methane organic gases and NOx standards106 - but the scope was limited to updating information submitted under previously issued ICRs. It is unclear in this Phase 3 GHG emissions rulemaking whether EPA sought information from vehicle manufacturers, battery manufacturers, fleet operators, small businesses, trucking operators, retailers, mineral suppliers, and others in order to obtain credible, verifiable, and standardized information in order to support a thoughtful and critical analysis of its projections regarding vehicle availability, purchase costs, battery availability, battery performance, charging infrastructure availability and performance, and other aspects of this proposal. To the extent EPA has not gathered information using its authorities under the Clean Air Act or through working with other federal agencies and the private sector, EPA has failed to gather appropriate information upon which to base an action with vast economic consequences. [EPA-HQ-OAR-2022-0985-1566-A2, pp. 22 - 23]

106 EPA-HQ-OAR-2019-0489-008.

By selectively citing statements that appear to support the Administration's policy objectives while glossing over accompanying caveats, EPA appears to be indulging in confirmation bias. Instead, the agency should exercise its data collection authorities to obtain and evaluate specific data and credible information regarding manufacturers' investments and capabilities, the status and likely rate of infrastructure buildout, the capacity of electrical grids to support the additional demand presented for charging vehicles, the availability of facilities to manage battery waste, the effect of the proposed rule on demand for renewable fuels mandated under the Renewable Fuel Standard, and other important topics. EPA ought not disregard or diminish the significance of material assumptions and contingencies outside the control of regulators and manufacturers alike that are relevant to its analysis. In this proposal, however, EPA unreasonably relies on optimistic projections that have no basis in actual fact while overlooking the large body of credible evidence that strongly indicates that EPA's proposed standards are infeasible. Consequently, EPA's proposal for the HD Phase 3 GHG Rule is unsupported, arbitrary, and exceeds EPA's statutory authority. [EPA-HQ-OAR-2022-0985-1566-A2, p. 23]

EPA Summary and Response:

Summary:

Of the many entities that commented on the proposed rule, eight mentioned the length of the comment period in their written comments and urged EPA to extend the comment period. All but one of these commenters represent industry stakeholders. Moving Forward Network (MFN) represents communities disproportionately affected by heavy-duty vehicle emissions. Three of these industry entities, American Bus Association (ABA), American Fuel and Petrochemical Manufacturers (AFPM), and American Trucking Associations (ATA), sent additional letters to EPA Administrator Regan specifically requesting an extension of the comment period. Two of them, China WTO/TBT Notification & Enquiry Center and Transfer Flow, Inc., expressed dissatisfaction with the length of the comment period in their written comments. Dana suggested that EPA should consider conducting a second comment period or technical amendment after gathering additional data to better inform HD TRUCS analysis. Although National Automobile Dealers Association (NADA) sent a letter to EPA Administrator Regan requesting an extension of the comment period for EPA's Proposed Multi-Pollutant Emissions Standards for Model Year 2027 and Later Light-Duty and Medium-Duty Vehicles, they did not submit a similar letter for this heavy-duty rule. Instead, they made their request in their submitted public comments for this heavy-duty rule as reproduced previously in this section.

ABA, AFPM, ATA, and Transfer Flow requested a longer comment period due to assertions regarding the length and complexity of responding to the proposal and the need to review and obtain technical assistance as part of the review, and/or a truncated deliberative process. China WTO/TBT, MFN, and NADA were also concerned about transparency and stated that there was limited outreach to the public. AFPM claimed that EPA defined the affected entities very narrowly as if the Agency was counting on closing the comment period before some entities became aware of the rule, in violation of the Due Process clause of the U.S. Constitution.

AFPM also said that more time was needed because their review would require a significant amount of time to fact-check EPA's work, stating that this was because the Agency was not careful in citing and characterizing its underlying sources. AFPM also cited the burden of having to provide comment on four concurrent rulemakings relevant to electric vehicles: two by EPA, one by DOE, and one by IRS.

MFN was concerned that the short comment period would deprive disproportionately affected communities of the ability to provide analysis and guidance; because of this, they stated such communities have less of an impact on the development of the final policy. More broadly, MFN stated that the public engagement process must engage all stakeholders affected by a proposed rule, not just businesses, as expressed in the White House "Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-based Policymaking," the Scientific Integrity Framework, the OSTP, and the Science Advisory Board recommendations for strengthening the evaluation of environmental justice impacts. MFN provided several recommendations to improve the public engagement process with such communities.

Some of the above commenters stated that EPA did not meet the requirements of the Administrative Procedure Act that agencies allow enough time for meaningful comment, and Executive Order 12866 that states that, in most cases, agencies should provide a comment period "of not less than 60 days." One commenter stated that EPA violated the WTO transparency obligation of giving no less than 60 days for a comment period. Another asserted that EPA should have issued an ANPRM to provide a preliminary version of the program and obtain meaningful public comment on alternative approaches.

Valero takes issue with the Agency's research methodology, stating that it reflects confirmation bias. Specifically, the commenter stated that instead of assembling information and developing a rule based on those facts, the Agency appears to have gathered information to confirm a pre-determined approach. Also, the commenter stated that the Agency's information collection request was limited to updating information received under previous ICRs.

Finally, MCS Referral & Resources disagreed that the proposal is not a "significant energy action" because the program will reduce petroleum consumption and they assert it will thus have a significant adverse impact on the companies that supply the energy. The commenter implied the Agency's response to E.O. 13211 is inadequate.

Response:

Although several of these commenters stated that the comment period was inadequate, they joined hundreds of others in submitting detailed comments on the rule before the end of the comment period. As we explained in our responses to the formal requests for extension of the comment period, which can be found on the website for the proposal and in the docket for this rule,[1048] we continue to believe that the comment period length was appropriate and provided a meaningful opportunity for all stakeholders, including industry, communities, and individuals, to

[1048] See https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy as well as documents EPA-HQ-OAR-2022-0985-2689 through -2695.

comment on the proposed rulemaking. In addition, we posted a copy of the pre-Federal Register publication of the notice of proposed rulemaking on the EPA website on April 12, when we issued the press release for the proposed rule. This pre-publication availability increased the total amount of time for commenting on the rule to 66 days. Finally, we conducted two days of public hearings (May 2 and May 3, 2022) for stakeholders to provide oral presentation of data, views, and arguments. These actions provided sufficient avenues for stakeholders to provide their data, views, and arguments. Note, as explained in RTC section 29, although the comment period for this rule closed on June 16, 2023, EPA was able to also consider late comments on this final action.

There were two comments about the Agency's general approach to developing the proposed rule: the need for an ANPRM and how the Agency obtained data supporting the proposed program. With regard to the former, we note that CAA section 307(d) requires EPA to publish a notice of proposed rulemaking; the agency is not obligated to publish advance notices. We also remind commenters that EPA engaged stakeholders and initiated the comment process relating to GHG standards for HD vehicles in a March 2022 notice of proposed rulemaking (87 FR 17414, March 28, 2022). We considered information collected as part of that proposal and information from outreach as part of the Phase 3 rulemaking, to inform the proposed standards in this Phase 3 rule. . With regard to the latter, there is no substance to the allegation that the Agency sought only information to support a pre-determined policy choice. The Agency has spent years developing and analyzing technical data and emission results to develop the proposed, and final, program. That information is discussed at length in the preamble and RIA prepared for this rule and in other sections of this RTC document, and is documented in the Supporting Materials included in the public docket for this rule.

The Agency is making important strides to address the equity concerns raised by MFN to facilitate participation by "frontline and fenceline" communities and others. As noted by MFN, the Agency reached out to environmental justice communities and other stakeholders before the proposal was released, and we continued to meet and communicate with these communities and other stakeholders as we developed the final rule. To maximize the opportunity for these communities and other stakeholders to comment on the rule, the hearing process took into account many of the MFN recommendations: hearings were virtual, allowing more people to attend; there were late hour testimony options; the hearings were held in both English and Spanish; and there was closed captioning. In addition, we provided announcement materials on our websites in both Spanish and English. The Agency remains committed to enhancing the opportunity for participation of these communities.

We disagree with MCS that reduction of petroleum consumption makes this a "significant energy action." A significant energy action is defined by the E.O. as a significant regulatory action under E.O. 12866 (which this rule is) and "likely to have a significant adverse effect on the supply, distribution or use of energy or is designated by the Administrator of OMB/OIRA as a significant energy action". We do not project that this rulemaking will have a significant adverse effect on the supply, distribution, or use of energy. Much of the energy impacted will be electricity rather than liquid fuel. We project sufficient electricity supply to provide the energy needed (see Preamble II.D.2.iii.d). We project that half of the reduced liquid fuel consumption would result in reduced domestic refining. We also analyzed a possible future where only 20 percent of the reduced demand would result in reduced domestic refining (see RIA 4.9). The text in X.H has been modified to clarify the scale of projected energy impacts.

28 Out of Scope Comments

<u>Comments by Organizations</u>

Organization: Bradbury, Steven G.

EPA's consideration of direct cost factors is inadequate and incomplete.

EPA estimates that the light- and medium-duty rule will impose an additional technology cost on automakers of between $180 billion and $280 billion,25 which EPA asserts will translate into an average increase of $1,200 in the purchase price of a typical vehicle, an increase EPA considers modest.26 The derivation of these cost estimates is murky and fundamentally not credible. [EPA-HQ-OAR-2022-0985-2427-A2, p. 11]

25 88 FR at 29200.

26 Id. at 29201.

EPA's estimates assume that in the "no-action world" (the future world as it would exist without the proposed rules), battery-electric vehicle sales would ramp up rapidly from today's levels and would plateau at around 40 percent of total U.S. light-duty vehicle sales by model year 2030, remaining at 39 percent through model year 2032.27 [EPA-HQ-OAR-2022-0985-2427-A2, p. 11]

27 See id. at 29296-97, Figure 20.

This assumption depends on full implementation of the Agency's own prior carbon dioxide emissions rule from 2021 (covering model years 2023 through 2026),28 which is currently facing legal challenge in the U.S. Court of Appeals for the D.C. Circuit. It also appears to depend on implementation of CARB's previously finalized ZEV mandates and carbon dioxide emissions restrictions (those that preceded CARB's Advanced Clean Car II proposals).29 Once again, these CARB rules are only in effect because EPA approved them in a special waiver for California, another EPA action under challenge in the D.C. Circuit. [EPA-HQ-OAR-2022-0985-2427-A2, p. 11]

28 See id. at 29296.

29 See id. at 29296-97.

The combined effects of all three sets of regulatory edicts—the current proposals, EPA's 2021 rule, and the CARB rules—are closely interrelated and flow from the same policy choices of the Biden administration. An accurate accounting of cost would recognize that these three regulatory actions are part of a single integrated policy implemented through EPA. They are intended to build upon each other, and in fact they do. EPA is presenting a deceptively compartmented picture of the regulatory costs of its actions by treating the effects of its own 2021 rule and the CARB rules that it authorized through its waiver decision as if they were exogenous background facts. They are not. [EPA-HQ-OAR-2022-0985-2427-A2, p. 12]

The 39-40 percent no-action baseline also assumes that American car buyers will suddenly drop their resistance to EVs. In effect, EPA is banking on a near-term future in which market demand for the new fleet of EVs will be just as high as it currently is for the most popular brands of ICE and hybrid vehicles, like the Ford F-150 pickup, the Chevy Silverado pickup, or the Toyota Camry. That assumption is highly suspect: the average price of an EV today is $61,000 (24 percent higher than the average ICE vehicle),30 and EVs come with limitations and question marks that concern many buyers.31 EPA is untroubled; it casually predicts that the price of EVs will fall and buyer demand will rise greatly in the years ahead, assumptions that are critical to EPA's ability to minimize the true cost effects of its proposals. [EPA-HQ-OAR-2022-0985-2427-A2, p. 12]

30 See https://www.kbb.com/car-news/average-new-car-price-tops-49500/.

31 For example, reports suggest that some electric pickups may have a greatly reduced effective range when towing heavy loads—a limitation likely to be of concern to prospective pickup buyers. See https://www.motortrend.com/reviews/ford-f150-lightning-electric-truck-towing-test/.

In the real world of the marketplace, the automakers cannot manage the huge capital costs of EPA's assumed production switchover to battery-electric technology unless consumer demand for EVs is strong. Without sufficient market demand, at levels far more robust than currently seen, the effective costs of these rules will be much higher than EPA recognizes and will not be sustainable for the automakers. It is not always true that "if you build it, they will come"—just ask Facebook about the Metaverse. [EPA-HQ-OAR-2022-0985-2427-A2, p. 12]

EPA is confident that generous federal subsidies for EV purchases will help consumers overcome their reluctance, but that confidence is questionable at best. EPA's calculations assume that the current subsidies promised in the Inflation Reduction Act will apply to all EV purchases in the U.S., which they do not and never will, and that these subsidies will remain available going forward, which will not be the case if a future Congress changes course and repeals these costly subsidies. [EPA-HQ-OAR-2022-0985-2427-A2, p. 12]

Finally, the $1,200-per-vehicle cost figure touted by EPA is simply borrowed and carried over from the EPA's 2021 rulemaking without additional substantive analysis.32 It is not reasonable to assume that the per-vehicle cost of the current proposal for model years 2027 through 2032 would be anywhere close to the same as the estimated cost figure for the 2021 rule covering model years 2023 through 2026 (even if the figure was accurate for the 2021 rule). The current proposal is far more expansive and involves much more draconian reductions in emissions limits. [EPA-HQ-OAR-2022-0985-2427-A2, p. 13]

32 See 86 FR 74434, 74497, https://www.federalregister.gov/documents/2021/12/30/2021-27854/revised-2023-and-later-model-year-light-duty-vehicle-greenhouse-gas-emissions-standards.

The true per-vehicle technology costs of the proposed rules must be far higher than the figure thrown out by EPA. Even accepting the thoroughly implausible "no action" baseline that EPA has posited for future EV sales, EPA is projecting that the regulatory force of the current proposal, considered in isolation, will by itself cause the overall percentage of EV sales nationally to go from 39 percent to 67 percent—a huge increase, nearly a doubling in EV production and sales. Notably, based on EPA's own assumptions, this regulation- forced increase would have to come after all the early adopters have already purchased their EVs. Such an industry-wide transformation in production volumes and sales of EVs to non-early-adopters would involve a massive capital investment and marketing surge, and all the costs associated with that transformation would be attributable to the EPA's administrative rule, if the rule were indeed expected to be the forcing action. [EPA-HQ-OAR-2022-0985-2427-A2, p. 13]

In addition, the comparative lifecycle costs of owning and operating an EV versus an ICE vehicle are not nearly so different as EPA's NPRMs assert. EPA claims huge cost savings for EV owners over ICE owners from the avoided costs of fuel and maintenance and repairs over the life of the vehicle,33 but EPA's analysis fails to include the full costs of owning an EV: [EPA-HQ-OAR-2022-0985-2427-A2, p. 13]

33 See 88 FR at 29200.

For one thing, EPA ignores the cost of battery replacements for EV owners.34 EV batteries degrade over time with each charge and discharge, and this degradation will be accelerated if the EV gets heavy use, if it is driven through cold winters, or if the owner uses rapid recharging.35 Battery degradation reduces significantly the power and range of the EV and will eventually lead to an unacceptable risk of thermal runaway and fire.36 At a certain point in the life of the EV, depending on the nature of its use, the type of recharging, and the environment where the vehicle is driven, the owner will need to replace the battery (if replacement is even feasible)—just to maintain or restore the utility of the vehicle or for safety reasons. Further, independent of use, if the battery is scratched or suffers other forms of damage in a relatively minor traffic accident, the battery may need to be replaced prematurely (or the vehicle may be considered a total loss).37 [EPA-HQ-OAR-2022-0985-2427-A2, p. 13-14]

34 Section 3.1 of the EPA's draft regulatory impact analysis (DRIA) for the proposed light- and medium-duty rule, for example, does not include any estimate for the cost of battery replacement.

35 See Jacqueline S. Edge, et al., "Lithium ion battery degradation: what you need to know," Royal Society of Chemistry, March 22, 2021, https://pubs.rsc.org/en/content/articlehtml/2021/cp/d1cp00359c (identifying 5 principal and 13 secondary mechanisms causing degradation of lithium-ion batteries in EVs, and explaining that degradation will be exacerbated by, among other things, usage profile, outside temperature, and the use of fast charging); Niall Kirkaldy, et al., "Lithium-Ion Battery Degradation: Measuring Rapid Loss of Active Silicon in Silicon-Graphite Composite Electrodes," American Chemical Society Applied Energy Materials, November 3, 2022, https://pubs.acs.org/doi/10.1021/acsaem.2c02047 (similar).

36 Significant loss in battery capacity and range over the life of the EV is expected and allowed for even within the parameters of the UN's GTR No. 22 standard for EV battery durability cited by the EPA.

37 See https://www.reuters.com/business/autos-transportation/scratched-ev-battery-your-insurer-mayhave-junk-whole-car-2023-03-20/ (full citation in footnote 17 above).

Battery replacement, when available, will undoubtedly be very expensive. For an EV battery pack with a capacity of 100 kWh (the capacity level assumed by the EPA in its models), the replacement battery alone (not including labor, any fee for disposing of the old battery, and any other associated expenses) would cost at least $15,300. That figure is based on the Energy Department's 2022 estimated cost of manufacturing the battery—$153 per kWh of capacity. [EPA-HQ-OAR-2022-0985-2427-A2, p. 14]

Uncertainty about the remaining life and capacity of the vehicle's battery, combined with the high cost of any potential replacement, will likely mean that a used EV will have much lower resale or trade-in value relative to a comparable used ICE vehicle. This loss in value will be a significant cost disadvantage of EV ownership. [EPA-HQ-OAR-2022-0985-2427-A2, p. 14]

EPA also undercounts the cost of electricity charging over the life of the EV. EPA relies on a pricing model that claims to show that electricity prices will somehow not rise significantly in a world where EVs comprise more than half of new cars sold in the U.S., but that claim is wholly unrealistic. Even absent high EV penetration, the Bureau of Labor Statistics reports that electricity prices are steadily rising in the U.S.38 Increased EV charging demand will only cause those prices to rise even faster. Driving a single EV 15,000 miles per year and charging it at home could raise the annual electricity bill for the average family by 50 percent or more.39 If the nation converts to EV ownership at the rates EPA is aiming for, such a large increase in overall electricity demand will inevitably cause electricity rates to rise significantly. [EPA-HQ-OAR-2022-0985-2427-A2, p. 14-15]

38 See generally https://data.bls.gov/pdq/SurveyOutputServlet (allowing user to generate graph showing the rise from 2003 to the present in the average price of electricity in the U.S.).

39 The Energy Information Agency reports that the average American household uses about 886 kilowatt hours of electricity per month, https://www.eia.gov/tools/faqs/faq.php, and the EPA says the average EV consumes 36 kilowatt hours of electricity per every 100 miles driven, https://www.epa.gov/greenvehicles/comparison-your-car-vs-electric-vehicle. If the family's EV is driven 15,000 miles per year, or 1,250 miles per month, it would consume 450 kilowatt hours of electricity every month.

The EPA's glib premise that car buyers in the U.S. will respond with strong demand for the supposed flood of future EVs (notwithstanding the practical concerns, cost considerations, and other uncertainties that surround EVs in the minds of American consumers), is typical of the consistently rosy—almost relentlessly rosy—assumptions about cost factors and consequential risks that underlie all parts of EPA's supporting analysis. [EPA-HQ-OAR-2022-0985-2427-A2, p. 15]

Organization: Colin Kuroishi

I ask that the EPA impose tighter restrictions on the GHG emissions of medium and heavy duty highway vehicles. The USA will not reach any climate goals so long as car manufactures are allowed to use the atmosphere, which we all depend to live and breath, as a public, unregulated sewer. Every ton of GHG emitted will need to be address at some point in the future. It should not be on the backs of the younger generations we all collectively cause. We all have a small part to play, however Trucks and SUVs place an outsized and un-nessesary impact on climate change. Car manufacture pollute and warm up the planet because they can without restrictions. According to IEA.org " On average, SUVs consume around 20% more oil than an average medium-size non-SUV car. ... Altogether, the 330 million SUVs on the road today emit nearly 1 billion tonnes of CO2." The switch to SUV's and truck is making the solutions to climate change more expensive for future generations. So long as we depend on motor vehicles for our society to function all cars utilized should be as light and efficient as possible. There is no need for a majority of consumers to carry around an extra 20% of steel and plastic just to get to work. Please make the restrictions as tight as possible to slow the rate GHG are released to the atmosphere. [EPA-HQ-OAR-2022-0985-1785]

Additionally, I ask that warranty requirements for batteries and other components of zero-emission vehicles. Also apply to eBikes, eScooters, and eMotorcycles. These are not toys that children use to play. These are legitimate forms of personal transportation that all ages use to travel to Work, School, Church, shop, and all other reasons for travel. These warranty requirements could also decrease the unregulated sale of less-than-safe ebike batteries and compotents that result in destructive fires in cities. Consumer protections are vital to keep consumers safe from dangerous vehicles. These warranties could incentive more utilization of low-to-no carbon forms of transportation. According to the E-Bike 1000 MPG project, "E-bikes get anywhere from 1000 to over 4000 MPG equivalent". More consumer protection on eBikes are a great step to lowering the GHG emission in the transportation sector. [EPA-HQ-OAR-2022-0985-1785]

Organization: Daimler Truck North America LLC (DTNA)

Include MDVs and HDVs in the RFS eRINs Program. EPA has proposed to amend the Renewable Fuel Standard (RFS) regulations to allow light-duty vehicle manufacturers to generate marketable Renewable Identification Numbers (eRINs) corresponding to the electricity consumption of the light-duty electric vehicles they sell. As outlined in the comments submitted by DTNA on EPA's proposal, inclusion of medium- and heavy-duty EVs in the eRINs program will be critical to expanding renewable electricity production, development of charging infrastructure, and lowering TCO of medium- and heavy-duty EVs.14 We thus reiterate our previous comments that the Agency should consider including provisions in the RFS regulations to allow medium- and heavy-duty vehicle manufacturers to generate eRINs. [EPA-HQ-OAR-2022-0985-1555-A1, p. 12]

> 14 See DTNA Comments on Notice of Proposed Rulemaking: Renewable Fuel Standard ('RFS') Program: Standards for 2023-2025 and Other Changes, 87 Fed. Reg. 80,582 (Dec. 30, 2022); Docket Nos. EPA-HQ-OAR-2021-0427, FRL-8514-01-OAR (Feb. 10, 2023), https://downloads.regulations.gov/EPA-HQ-OAR-2021-0427-0544/attachment_1.pdf.

Organization: KALA Consulting, LLC

Comments for EPA Docket ID No. EPA–HQ–OAR– 2022–0829 Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles (these comments may also apply to Docket ID No. EPA-HQ-OAR-2022-0985) [EPA-HQ-OAR-2022-0985-2675-A2]

> [Note: As indicated in the title to these comments, reproduced above, these comments apply primarily to EPA's *Multi-Pollutant Emission Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles*, although some comments may apply to heavy-duty engines and vehicles. The Agency has determined that, apart from the text included in Section 17.1 of this RTC document, the comments from KALA Consulting, LLC, do not apply to heavy-duty engines and vehicles. Rather than reproduce verbatim the portions of this 60-page comment that do not apply to the heavy-duty sector, the Agency refers interested readers to the analysis included in the RTC document prepared for the light- and medium-duty rule, which can be found in docket EPA-HQ-OAR-2022-0829.]

Organization: Lubrizol Corporation (Lubrizol)

3) Lubrizol supports providing increased education and information about the benefits of using the appropriate high-performing lubricant throughout useful life.

Lubrizol supports providing increased education and information about the benefits of using the appropriate high-performing lubricants and oils throughout their useful life. Lubrizol has worked closely with SmartWay staff and others in the Office of Transportation and Air Quality to ensure that vehicle owners or operators can easily access the most up-to-date information regarding the benefits of using the appropriate engine oils and lubricants throughout useful life. [EPA-HQ-OAR-2022-0985-1651-A2, p. 6]

We believe that the SmartWay program can provide a necessary complement to the information that should be distributed in owner's manuals, engine labels, and QR Codes by providing additional information about the cost savings, emissions reductions, maintenance benefits, and other benefits of using the appropriate engine oils and lubricants throughout useful life. Education should be directed to service and maintenance facilities and technicians, as well as owners and operators of the vehicles. [EPA-HQ-OAR-2022-0985-1651-A2, p. 6]

In designing its education and outreach programs (whether done via SmartWay or through other EPA outreach efforts), Lubrizol encourages EPA to consider strategies to ensure that communications reach service and maintenance facilities and technicians, as well as owners and operators of the vehicles. [EPA-HQ-OAR-2022-0985-1651-A2, p. 6]

Organization: Lynden Incorporated

Further Restrictions on Nitrous Oxide Emissions Should be Strategic and Local

The impact of proposed Nitrous Oxide (NOX) and Particulate Matter (PM) restrictions is worth highlighting specifically. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

Emission technology introduced with the 2010 engine standards reduced NOX and PM by more than 90%. Modern trucks do not emit the smelly black exhaust that people think of with the older diesel trucks. The proposed restrictions for further NOX emissions are in addition to the 90% reductions already achieved in 2010. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

In order to comply with the proposed additional NOx emission reduction standards, trucks will require an additional generator to heat up the exhaust gas - because modern engines are so efficient that the exhaust is cold - a solution that is heavy, expensive, and rife with potential maintenance and reliability issues. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

It is important to understand that any technology that reduces NOX also reduces fuel economy and available payload, so runs counter to CO2 emission reduction and climate goals. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

These NOX restrictions may be justified in certain highly congested urban areas and industrial ports where air quality is poor, but not nationwide where they act as a de facto ban on the internal combustion engine and would dramatically increase the cost of food and other necessities for rural Americans and small businesses for infinitesimal environmental benefit. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

Any future NOX reduction technology should be optional and additional emissions requirements should be accomplished at the local level so that trucks with this highly complex, heavy, and expensive technology can be placed in strategic highly congested areas where air quality concerns justify the economic investment and outweigh climate concerns. [EPA-HQ-OAR-2022-0985-1470-A1, p. 4]

Recommendations:

- Further restrictions on Nitrous Oxide and Particulate Matter emissions should be strategic and local and should be secondary to exhausting opportunities to replace pre-2010 engines. [EPA-HQ-OAR-2022-0985-1470-A1, p. 5]

Organization: Natural Gas Vehicles for America (NGVAmerica)

(3) EPA should provide enhanced SmartWay designations for trucks powered by low-NOx engines and fueled by carbon-neutral or even carbon-negative renewable natural gas; [EPA-HQ-OAR-2022-0985-1522-A1, p. 12]

(4) Federal agencies should fund pilot programs and infrastructure development that demonstrate the ways in which natural gas can be used to fuel a variety of different transportation sectors by supporting the purchase of vehicles and equipment at multimodal facilities such as ports and rail facilities; [EPA-HQ-OAR-2022-0985-1522-A1, p. 12]

(5) Federal agencies should ensure that federal funding provided under the CMAQ Program and the DERA Program and other programs enacted as part of the Bipartisan Infrastructure Law and Inflation Reduction Act are competitively awarded for projects that provide the most cost-effective emission reductions and offer increased funding levels for engines and vehicles that are certified to more demanding standards in advance of EPA's adoption of such standards; [EPA-HQ-OAR-2022-0985-1522-A1, p. 12]

Organization: Nicole McKenzie and John Felton

As a member of NPCA, I am committed to improving the health of our national parks. I strongly urge the EPA to set stronger National Ambient Air Quality Standards for fine particulate matter pollution, or soot. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

EPA must fulfill its duty as required under the Clean Air Act to address the public welfare effects of soot pollution by ensuring that the secondary standards are at the very least set at the same levels as the primary standards to protect our ecosystems, nature, and clear views in urban, rural and wilderness areas including our national parks. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

Soot pollution is harmful to crops and ecosystems when deposited on land and in water, it can cause serious damage to soil and water chemistry. When deposited on plants, it can affect their ability to metabolize and photosynthesize correctly. Like mercury, soot particles can be absorbed by the smallest organisms and bioaccumulate up the food chain. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

Fine particulate matter from industrial pollution and forest fires is a major cause of visibility-impairing haze. I ask that the primary and secondary standards be set no higher than 8 micrograms per cubic meter (g/m3) for the annual standard and no higher than 25 g/m3 for the 24-hour standard. Anything weaker than the above levels, which are recommended by leading medical groups, will only lead to avoidable serious health consequences for people, particularly among those who disproportionately bear the burden of the environmental injustice of this pollution. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

The EPAs work to implement and enforce the Clean Air Act has yielded enormous public health benefits and saved countless lives over the years, but we are behind the curve in setting strong, independent secondary standards. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

We urge EPA to finalize secondary standards at this time that incrementally advance ecosystem protections by keeping the annual and 24hr standards in sync with the primary until a proper scientific review for a distinct secondary standard can be conducted. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

EPA should not leave weaker secondary standards in place if the improved primary standards are finalized. [EPA-HQ-OAR-2022-0985-1896; EPA-HQ-OAR-2022-1981]

Organization: Sean San Josa

I'm writing today regarding the outdated and insufficient standards for soot pollution that have not been updated since 2012. My generation and those that follow will face the most severe impacts of soot and climate change. So it's crucial to my future that we take action to set the strongest science-based soot standards to protect our air, advance environmental justice, and protect public health. [EPA-HQ-OAR-2022-0995-2462]

Peer-reviewed studies have repeatedly found the current soot standards are inadequate to protect people's health. EPA must strengthen soot standards that will protect public health with an adequate margin of safety and that ensure the level selected protects vulnerable populations. [EPA-HQ-OAR-2022-0995-2462]

The EPA has the power to save nearly 20,000 lives each year. In communities of color, communities that are often overburdened by pollution, a stronger soot rule is expected to at least partially close some of the well-known racial disparities in health outcomes. Finally, by tightening soot protections, other dangerous pollution from these sources will also be reduced. The EPA must take action and meet the president's commitments to cut dangerous pollution and protect our health and environment. [EPA-HQ-OAR-2022-0995-2462]

Please stand with young people across the country in protecting our communities! [EPA-HQ-OAR-2022-0995-2462]

Organization: South Dakota Department of Agriculture and Natural Resources (DANR)

Electric Vehicle (EV) Mandate

The proposed emissions standards are based on the projection that 70 percent of all new light-duty passenger vehicles will need to be EV s for manufacturers to meet the standards. Setting the standards based on a projected level of EV production essentially mandates the manufacturing of EVs to comply. As discussed below, EVs do not make sense in all situations and environments and EPA should not be setting emissions standards that mandate their production. [EPA-HQ-OAR-2022-0985-1639-A2, p. 2]

Organization: Texas Public Policy Foundation (TPPF)

The LMD Tailpipe Rule, specifically, is 'projected to accelerate the transition to electric vehicles.' Id. The EPA states that these regulatory changes are part of a push to 'support the development and market for clean vehicle technologies and associated infrastructure' and to ‘expand[] the manufacture, sale, and use of zero emission vehicles.’ Id. [EPA-HQ-OAR-2022-0985-1488-A1, p. 2]

The LMD Tailpipe Rule Will Unnecessarily Harm Consumers Similarly, the LMD Tailpipe Rule is regulatory overkill that will harm average Americans and limit innovation. To start, stricter emissions regulations will increase manufacturing costs for automakers. This will lead to higher sticker prices for vehicles, pricing low- to middle-class Americans out of the automotive market, leaving them stranded with little recourse or dependent on public transit, eventually depressing the job market. The government should not place the burden for green energy on the least fortunate Americans, adding yet another obstacle to their economic climb. [EPA-HQ-OAR-2022-0985-1488-A1, p. 5]

Automakers will rush to convert their fleets to feature either all or mostly electric vehicle models, disadvantaging new car buyers in areas without existing electric charging infrastructure. In the same vein, as mentioned above, the strain placed on the electric grid caused by millions of Americans charging their vehicles will cause electric prices to rise markedly and lead to ‘brown-outs.’ See, e.g. Nadia Lopez, Race to zero: Can California’s power grid handle a 15-fold increase in electric cars?, CALMATTERS (Feb. 6, 2023), https://calmatters.org/environment/2023/01/california-electric-cars-grid/ (‘State officials claim that the 12.5 million electric vehicles expected on California’s roads in 2035 will not strain the grid. But their confidence that the state can avoid brownouts relies on a best-case — some say unrealistic — scenario: massive and rapid construction of offshore wind and solar farms, and drivers charging their cars in off-peak hours.’). [EPA-HQ-OAR-2022-0985-1488-A1, p. 6]

Additionally, electric cars have limited range and require long recharging sessions, and the infrastructure to support the sudden transition to electric vehicles that the LMD Tailpipe Rule would cause simply does not exist. Rural and low-income communities, the people most affected by this regulation, likely will be the last to receive said recharging infrastructure. [EPA-HQ-OAR-2022-0985-1488-A1, p. 6]

The LMD Tailpipe Rule and the market change it would engender will also make the federal government complicit in the often exploitative practices associated with rare-earth metal mining. The production and acquisition of rare-earth metals used in electric vehicle batteries is a dirty business. The extraction and processing of rare-earth metals can have serious environmental impacts, including soil and water contamination, deforestation, and habitat destruction, negatively affecting ecosystems and biodiversity. In certain areas, rare-earth metal mining has also been linked to labor rights violations, poor working conditions, low wages, child labor, and inadequate safety measures. The batteries that will power the green future the EPA seeks to create through the LMD Tailpipe Rule bear the stain of these violations of human dignity. [EPA-HQ-OAR-2022-0985-1488-A1, p. 6]

As if that weren’t enough, electric vehicles are especially susceptible to damage from flooding and hurricanes. When the grid goes down, those who own electric vehicles will be left at the mercy of the elements, trapped and unable to flee disaster due to the inability to reliably recharge their cars and trucks. And should they survive but their cars take on water, it is likely that the vehicles will catch on fire without warning due to corrosion from saltwater. See Jen Frost, Florida’s electric vehicles are catching fire after Hurricane Ian, INSURANCE BUSINESS (Nov. 4, 2022), https://www.insurancebusinessmag.com/us/news/auto-motor/floridaselectricvehicles-are-catching-fire-after-hurricane-ian-426452.aspx. [EPA-HQ-OAR-2022-0985-1488-A1, p. 6]

In sum, implementing the emission limitations mandated by the LMD Tailpipe Rule will require a massive, nationwide overhaul of our electrical grid and refueling network. By regulating in this manner, the EPA will make driving and daily living more expensive and difficult. [EPA-HQ-OAR-2022-0985-1488-A1, p. 7]

Organization: U.S. Tire Manufacturers Association (USTMA)

2. USTMA encourages the Biden Administration to ensure vehicles in the federal fleet and on federally funded projects are using retreaded tires to the extent practicable. In a recent letter to President Biden, USTMA recommended that the President promote the use of retreaded tires federal vehicle fleets as a means of supporting sustainability.2 USTMA encourages EPA to support these efforts through this rulemaking, by recognizing the role retreaded tires play in sustainable transportation. Such a policy is directly aligned with the Sustainable Acquisition and Procurement policy outlined in Executive Order 14057, directing federal agencies to "reduce emissions, promote environmental stewardship, support resilient supply chains, drive innovation, and incentivize markets for sustainable products and services by prioritizing products that can be reused, refurbished, or recycled; maximizing environmental benefits and cost savings." [EPA-HQ-OAR-2022-0985-1635-A1, pp. 3 - 4]

2 USTMA letter to President Joseph R. Biden RE: Furthering sustainability in transportation and federal procurement, December 1, 2022. [See Docket Number EPA-HQ-OAR-2022-0985-1635-A1, pages 5-6, for letter.]

Retreaded tires enhance sustainability and grow American jobs. Tire retreading is a prime example of economically beneficial product recycling. Each retreaded tire creates local jobs and reduces energy consumption, CO2 emissions, raw material usage, and tire disposal challenges. However, over the last 25 years, retreading of commercial tires has steadily decreased due to cheap foreign alternatives, which are 65% less likely to be retreaded because of their design and construction. [EPA-HQ-OAR-2022-0985-1635-A1, p. 4]

As the largest purchaser in the world, the federal government has an opportunity to lead by example by requiring the purchase of American-made retreaded tires for the federal fleet and any fleet under federal contract, where possible. USTMA notes there is precedent for such policies, including:

- Provisions in the Federal Vehicle Repair Cost Savings Act of 2015 (Public Law No: 114-65) that mandated the use of remanufactured replacement parts on federal fleet vehicles; and
- The 1991 executive action issued by President George H. W. Bush that required the use of retreaded tires on federal fleet vehicles where practicable. [EPA-HQ-OAR-2022-0985-1635-A1, p. 4]

<u>EPA Summary and Response:</u>

<u>Summary:</u>

EPA received comments on a variety of topics that were not included in the proposed rule. Colin Kuroishi recommend that EPA adopt warranty requirements for batteries and other components of zero-emission vehicles, including eBikes, eScooters and e-Motorcycles; Daimler made recommendations regarding eRINs in the RFS program; Lubrizol Corporation encouraged EPA to consider strategies to ensure communications about benefits of using appropriate engine oils and lubricants throughout useful life reach service and maintenance facilities and technicians, as well as owners and operators of vehicles; Lynden Incorporated commented on the overall effectiveness of the 2010 heavy-duty NOx standards and asked for EPA to consider truck NOx and PM standards that would be applied locally and not nationally or regionally to allow for better fuel consumption outside of urban areas where the air pollution reductions are not as critical to air quality; Nicole McKenzie, John Felton, and Sean San Josa commented on the PM NAAQS; NGVAmerica recommended new EPA SmartWay designations for renewable natural gas, pilot programs to demonstrate uses for natural gas, and criteria for awarding federal funding under CMAQ, DERA, and programs enacted as part of the Bipartisan Infrastructure Law and Inflation Reduction Act;; Steven Bradbury expressed concern with the cost analysis associated with EPA's parallel rulemaking for light- and medium-duty vehicles; South Dakota DANR suggested EVs are not appropriate for all light-duty vehicle applications; TPPF expressed concern about the light- and medium-duty rulemaking; and USTMA recommended that the Administration request the purchase of American-made retreaded tires for the federal fleet and any fleet under federal contract, where possible.

Response:

We did not propose or request comment on any aspect of the Renewable Fuels Standard (RFS) program; therefore, this comment is beyond the scope of the rulemaking.

In this rulemaking we did not propose or request comment on the following topics raised by commenters and are not taking final action in this rule related to: standards for sectors other than heavy-duty highway engines and vehicles (e.g., eBikes, eScooters and e-Motorcycles); new or revised NOx standards, including the impacts of additional generators to heat exhaust gas to comply with NOx standards or the impact on CO_2 emissions, or whether new or revised NOx standards should be limited to specific locations rather than nationwide applicability; NAAQS standards for particulate matter and soot; or any provisions to require the use of retreated tires, either for vehicles in the federal fleet or more generally. . In this rulemaking we also did not propose or request comment on and are not taking final action related to criteria for awarding funding for CMAQ and DERA programs or regarding how EPA will administer various BIL or IRA incentive programs. New SmartWay designations and broad federal pilot programs relating to natural gas or other fuels are out of scope of this rulemaking.

EPA appreciates feedback from Lubrizol that education can improve maintenance and help to achieve real-world emissions benefits. We also appreciate their recognition of the valuable role of EPA's voluntary SmartWay program. EPA is not taking any specific action to increase education relating to lubricants at this time but intends to continue to look for future opportunities to educate the transportation industry through its regulatory and voluntary programs.

EPA agrees with USTMA on the value of retreaded tires for use in heavy-duty vehicles. As we noted the Phase 2 final Regulatory Impact Analysis (see chapters 2.4.3.1 and 2.4.3.4), we recognize that retreadability is an important consideration when evaluating tire durability and we expect owners and fleets will continue to retread tires for environmental and/or financial reasons.

USTMA also commented that retread tires should be used in Federal fleets. Requirements for federal fleets are outside the scope of this rulemaking.

EPA's consideration of Clean Air Act waiver authorizations for various mobile source sectors (locomotives, off-road equipment, and marine vessels) are the subject of separate action(s) and are not part of this final rule; thus, they are out of scope.

Light- and medium-duty vehicles, including our analysis of the costs and feasibility of EV adoption, are the subject of a separate rulemaking action and are not part of this final rule; thus, they are out of scope.

29 Additional Comments

The Agency has been, is, and will continue to be committed to considering timely comments received on proposed rules. Although the comment period for this rule closed on June 16, 2023, EPA was able to also consider late comments on this final action. Comments received that provide specific information and feedback about particular data or assumptions used in EPA's analysis supporting the proposal or other aspects of the program and that were received after the end of the comment period through July 18, 2023, are included in the various sections of this RTC document. Additional comments received after that date that provide detailed information are included in this section. Comments received after the close of the comment period that express general support for or opposition to the proposal and/or contain opinions or statements about issues but without detailed data, information, or comment relating to specific provisions of the proposal or EPA's supporting analysis are not included in this RTC document.

List of Additional Comments

Index	Document Number	Commenter Name
1	EPA-HQ-OAR-2022-0985-2673	BackBone Campaign et al.
2	EPA-HQ-OAR-2022-0985-2672	Center for Biological Diversity et al.
3	EPA-HQ-OAR-2022-0985-2697	Corporate Electric Vehicle Alliance (CEVA)
4	EPA-HQ-OAR-2022-0985-2681	Cummins, Inc.
	EPA-HQ-OAR-2022-0985-2699	Cummins, Inc.
5	EPA-HQ-OAR-2022-0985-2671	Environmental Defense Fund (EDF)
6	EPA-HQ-OAR-2022-0985-2686	Environmental Defense Fund (EDF)
7	EPA-HQ-OAR-2022-0985-2698	Environmental Defense Fund (EDF)
	EPA-HQ-OAR-2022-0985-2700	Environmental Defense Fund (EDF)
8	EPA-HQ-OAR-2022-0985-2687 and EPA-HQ-OAR-2022-0985-2688	OLIPOP
9	EPA-HQ-OAR-2022-0985-2678	The Moving Forward Network (MFN) et al.
10	EPA-HQ-OAR-2022-0985-2680	The Moving Forward Network (MFN) et al.

Index	Document Number	Commenter Name
11	EPA-HQ-OAR-2022-0985-2696	Walmart, Inc.

Comments by Organizations

Organization: BackBone Campaign et al.

We write on behalf of community and environmental justice organizations that experience the brunt of the environmental and health impacts from railyard pollution, and allied environmental organizations. Our organizations submitted a comment letter with the Moving Forward Network in strong support of the U.S. Environmental Protection Agency's (EPA) proposal to align the agency's locomotive rules with the plain text and Congressional intent behind the Clean Air Act

§ 209(e). Railyard pollution remains one of the most harmful sources of pollution in our communities, so our organizations greatly appreciate the EPA's latest interest in aligning the additional legal protections reinforcing states' rights to regulate the rail and locomotive sector. Now we are asking EPA to act expeditiously to finalize the locomotive preemption proposal by the end of October 2023.

Presently, the EPA is proposing to clarify that states and local authorities are authorized to address locomotive pollution under the Clean Air Act, consistent with how the agency views preemption for other vehicle sources. The request to finalize the decision by October is based on the urgency of the public health and environmental impacts caused by the largely unregulated freight rail and locomotive sector.

Rail pollution is a national issue with significant and deadly environmental justice impacts. The freight system remains one of the largest sources of pollution in the country, and locomotives, in particular, are responsible for a large amount of pollution in communities across the country.1 Rail pollution impacts our health, safety, and well-being.2 Bright lights, noises, and vibrations that feel like earthquakes are torturous consequences of passing trains. The effects of asthma, cardiovascular disease, and other dangerous diesel-related illnesses diminish health and quality of life in frontline and fenceline communities and contribute to shorter lifespans.3 Rail pollution has serious negative effects on our air quality and the climate. In fact, more than 13 million of us in the United States live and work near railyards, rail lines, and ports.4 We are forced to breathe in diesel pollution day after day. Cancer clusters in neighborhoods near railyards show the undeniable link between diesel emissions from locomotives and other railyard equipment and adverse health harms5—yet our well-being rests on outdated locomotive emission standards that no longer reflect the current state of technology. EPA's decades-old locomotive emission standards are not bringing the emissions reductions and health benefits that the agency anticipated and communities need.

1 For example, in California, locomotive emissions represent a considerable 12 percent of statewide NOx emissions, and 8 percent of statewide PM2.5 emissions. Cal. Air Res. Board, Draft In-Use Locomotive Regulation Workshop, (March 30, 2021), at 11, https://ww2.arb.ca.gov/sites/default/files/2021-03/Draft%20In-Use%20Locomotive%20Regulation%20Workshop% 20Slides%203-30-2021_0.pdf.

2 Giulia Grande et al., Association Between Cardiovascular Disease and Long-term Exposure to Air Pollution with Risk of Dementia, JAMA Neurol. 77(7), at 801-09, (July 1, 2020), https://pubmed.ncbi.nlm.nih.gov/32227140/.

3 American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023)

4 Office of Transportation and Air Quality (OTAQ), U.S. Environmental Protection Agency (EPA), Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, EPA420, pp. 2-57 (March 2008). Available at: http://www.regulations.gov/#!documentDetail;D=EPAHQ-OAR-2003-0190-0938.

5 Andrea Hricko et al., Global Trade, Local Impacts: Lessons From California on Health Impacts and Environmental Justice Concerns for Residents Living Near Freight Rail Yards, Int.J. Environ. Res. Public Health, 11(2), at 1914-41 (Feb. 2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3945577/.

The agency's current approach has long stalled local and state action to protect communities from the perils of deadly locomotive pollution, so it is critical that the agency finalizes the locomotive preemption regulations separately and by the end of October.

Given that the locomotive issues present discrete and purely legal considerations involved in the Phase 3 truck proposal, the EPA should finalize this portion of the rule as expeditiously as possible in a separate Federal Register notice. The locomotive preemption proposal made up just five pages of the 236-page Notice of Proposed Rulemaking for the Phase 3 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles, making this a distinct issue well-positioned to be finalized in October of this year.

We have lived under the veil and excessive pollution caused by this erroneous and misaligned legal interpretation by EPA. Lives could have been saved if EPA had provided the appropriate guidance. Railyard pollution continues to create an urgent public health crisis in our communities. By finalizing the locomotive preemption rule by the end of October, EPA will be fixing an issue that has had cascading consequences which have chilled efforts to constrain pollution from a reckless and heavily polluting industry.

In addition, we point the agency to MFN's letter dated June 16, 2023, which highlights the need to address locomotive pollution in order to protect the health and safety of community members, including by requiring air monitors at all railyards across the country. [EPA-HQ-OAR-2022-0985-2673]

Organization: Center for Biological Diversity et al.

Center for Biological Diversity, Clean Air Task Force, Environmental Law & Policy Center, National Parks Conservation Association, Public Citizen, and Sierra Club respectfully submit these comments in response to the Environmental Protection Agency's (EPA) Proposed Rule titled Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926 (Apr. 27, 2023). As additional support for a strong final rule, we are providing EPA with important materials that were published after the close of the comment period:

1. Attachment 1: Electric Power Research Institute, *EVs2Scale2030 Program Overview*, https://publicdownload.epri.com/PublicAttachmentDownload.svc/AttachmentId% 3D84807

a. EVs2Scale is a data-driven, multi-stakeholder initiative to help prepare the electric grid for expanded deployment of EV charging infrastructure, including for heavy-duty vehicles. Participants include fleet operators, truck manufacturers, electric utilities, charging infrastructure providers, government institutions, and national laboratories. Among other projects, the initiative will provide a secure data exchange platform to help utilities efficiently plan grid investments, and will identify location-specific EV loads, grid impacts, lead times, workforce needs, and costs across the 50 states.
b. Further information on EVs2Scale2030 is available at https://msites.epri.com/evs2scale2030.

2. Attachment 2: Calstart, *Phasing in U.S. Charging Infrastructure* (Aug. 22, 2023), https://calstart.org/wp-content/uploads/2023/08/Phasing-in-U.S.-infrastructure-bri ef-082223.pdf
   a. This report presents a model and roadmap for a geographically-targeted, phased approach to heavy-duty charging infrastructure buildout, showing that the charging needs of those vehicles (in volumes even higher than associated with the Phase 3 proposal) can be met feasibly and cost-effectively.

We urge the Agency to consider these materials and include them in the record for this rulemaking. [EPA-HQ-OAR-2022-0985-2672]

Organization: Corporate Electric Vehicle Alliance

I write on behalf of the Corporate Electric Vehicle Alliance (the Alliance), led by Ceres—a coalition of 32 major companies and fleet operators that represent over $1.1 trillion in annual revenue and collectively own, lease, or operate more than 2.5 million fleet or networked vehicles in the U.S.—to emphasize members' continued support for the Environmental Protection Agency's (EPA's) adoption of stringent greenhouse gas (GHG) emissions "Phase 3" standards for heavy-duty vehicles (HDVs).

In June 2023, the Alliance submitted comments to EPA in response to its notice of proposed rulemaking on the Phase 3 HDV standards. In these comments, we expressed support for standards that are at least as strong as those proposed, but ideally are stronger to ensure at least 50% zero-emission vehicle (ZEV) sales across all market segments by 2032. California's Advanced Clean Trucks (ACT) rule, manufacturer commitments, and the Inflation Reduction Act (IRA) funding are all consistent with such a goal.

At this critical time ahead of the standards being finalized, the Alliance is further weighing in to emphasize our support for strong ACT-alignment, and the technical and economic feasibility of widespread commercial fleet electrification that would result from strong standards. Commercial fleets need policy and regulatory support to access the full volume and variety of ZEV models and charging infrastructure solutions to meet their decarbonization goals.

Outlined below is the Alliance’s case for why:

1) there is corporate support for ACT-aligned Phase 3 standards,

2) heavy-duty ZEV technology is feasible for widespread adoption in HDV fleets, and

3) the U.S. electrical grid, utilities, and fleets can (with support from policymakers and private sector investment) manage the infrastructure installations and upgrades required of widespread heavy-duty ZEV adoption.

1) Corporate Support for ACT-Aligned Phase 3 Standards

Market-enabling policies like EPA’s proposed Phase 3 GHG emissions standards for HDVs will rapidly unlock the long-term cost savings, climate, clean air, and economic benefits of widespread ZEV adoption, while spurring the much needed at-scale build out of charging infrastructure to meet increased electric vehicle (EV) demand. The more closely aligned that EPA’s HDV standards are with the ZEV sales targets of California’s ACT rule, the greater the benefits of the standards, effectively lowering costs and creating a more stable, coordinated, and self-sustaining market for ZEVs nationwide.

2) ZEV Technology is Feasible for HDV Fleets

Many major companies, including multiple Alliance members, have committed to electrifying between 50% and 100% of their medium- and heavy-duty fleet operations by 2030, indicating that commercial fleets see ZEVs as operationally and financially viable options, including in heavy-duty use cases.

The results of real-world zero-emission truck deployment studies have proven their feasibility for major commercial fleets. Financially, according to the International Council on Clean Transportation (ICCT), even heavy-duty long-haul ZEV applications will have a total-cost-of-ownership (TCO) advantage over internal combustion engine (ICE) vehicles by 2030. And operationally, not only are original equipment manufacturers (OEMs) and suppliers bringing innovative technologies to market that make ZEVs an option across more and more use cases and class sizes, but vehicle operators themselves are speaking out on the preferred driveability of ZEV trucks over their ICE counterparts.

Currently available ZEV trucks are overcoming one of the most often mentioned barriers to heavy-duty electrification: range. According to the National Renewable Energy Laboratory (NREL), only about 10% of heavy-duty trucks have operating routes of 500 miles or more, whereas around 70% operate primarily within 100 miles, well within the range of currently available heavy-duty EVs.

The predictable routes of most heavy-duty fleet use cases add to their electrification readiness. As the Union of Concerned Scientists (UCS) notes, “heavy-duty vehicles often travel to predictable destinations with consistent mileage, making them good candidates for electrification.” Such predictability also makes it easier to schedule time to charge, and can lead to overnight charging taking up less overall time than fueling up a diesel truck.

3) The Grid, Utilities, and Fleets Can Handle HDV Charging Infrastructure Growth (with Support from Policymakers and Private Sector Investment)

Contrary to fears about EV deployment overwhelming the electricity grid, studies have found that it is highly likely the U.S. grid will be able to accommodate the relatively modest growth in national electricity generation (around 1% by 2030 from a 2021 baseline) that is projected from zero-emission medium- and heavy-duty vehicle (MHDV) demand in 2030. Historically, the U.S. grid has managed to accommodate much more severe strains on its capacity than the strain the EV transition will impose.

We acknowledge that challenges—such as long lead times—may arise as fleets work with their local utilities to install charging infrastructure to serve heavy-duty EVs, especially when they require site and broader grid upgrades. However, while complex, many of these hurdles can be mitigated and even solved by collaboration, strategic communication, and advanced planning—and fleets are not alone in these efforts. For instance, the Electric Power Research Institute (EPRI) is working with partners, including the Edison Electric Institute, major fleets, and OEMs, to develop a platform (i.e., EVs2Scale Initiative) for critical EV stakeholders to submit vehicle electrification sales and deployment data to allow for better advance planning for future grid upgrades.

Policy and regulatory support are critical to ensuring that such stakeholder collaboration efforts are successful in meeting the charging needs of heavy-duty ZEV fleets. Charging infrastructure funding programs, such as those included in the Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA), must work to prioritize the deployment of chargers for MHDVs in addition to light- duty vehicles. Direct financial support mechanisms are, however, just one side of the coin.

Federal regulations, including strong Phase 3 truck emissions standards aligned with the ACT rule, will help give additional momentum to funding incentives like those in the IIJA and IRA by providing market certainty and ensuring a cohesive U.S. ZEV market nationwide. Other federal non-funding programs— such as the IIJA's EV Freight Corridor program, which has the potential to accommodate 85% of the nation's long-haul charging needs by 2030—are also key components of a successful national strategy for commercial MHDV electrification.

Conclusion

We applaud EPA for its commitment to adopting strong GHG emissions standards for HDVs and urge you to recognize the technical and economic feasibility of aligning these standards with the ACT rule, and U.S. climate and public health goals. [EPA-HQ-OAR-2022-0985-2697]

Organization: Cummins, Inc.

EPA's heavy-duty engine and vehicle Final Rule, published on January 24, 2023, indicated that, "…EPA intends to also consider alternative field fix inducement approaches that manufacturers choose to develop and propose to CARB and EPA, for engines certified by both EPA and CARB, such as approaches that provide a more balanced inducement strategy than that used in current certifications while still being effective." (see 88 FR 4380). Cummins is seeking clarifications on those "alternative field fix inducement approaches."

Cummins supports the EPA 2027 SCR inducement algorithm in 40 CFR 1036.111 and the associated in-cab display requirement in in 40 CFR 1036.110. However, Cummins requests that EPA considers clarifying in final rule regulations or Preamble that for only model year 2026, manufacturers opting to generate ABT credits for NOx emissions according to 40 CFR 1036.150(a)(4) may comply via an "alternative field fix inducement strategy" that is accepted by both EPA and CARB. The Society of Automotive Engineers (SAE) standardizing committees and other industry groups have only begun the processes to develop, standardize and publish the electronic communications protocols necessary to fully meet the 2027 inducement and cab display requirements that were only published on January 24, 2023. We expect those processes to take upwards of a year from now to complete. Engine manufacturers, vehicle manufacturers and dash display manufacturers would need those finalized and published by now, in order to develop, validate and certify engines and vehicles for model year 2026. Without clarification the inducement and dash display requirements would preclude manufacturers from opting into 40 CFR 1036.150(a)(4).

Cummins also requests that EPA considers clarifying in final rule regulations or Preamble the DEF Level fault condition requirements. EPA's heavy-duty engine and vehicle Proposed Rule, published on March 28, 2022, indicated that, "Consistent with the existing guidance, the proposed requirements would codify that SCR-equipped engines must meet critical emission-related scheduled maintenance requirements and limit the physically adjustable range under the adjustable parameter requirements by triggering inducements." (see 87 FR 17541). That guidance referenced DEF depletion inducements in terms of "Percent DEF Tank Level". However, EPA finalized, "DEF supply falling to a level corresponding to three hours of engine operation, based on available information on DEF consumption rates." Therefore, Cummins requests that EPA provides flexibility to meet the requirement by allowing manufacturers to correlate the current requirement to a DEF Tank Level % format consistent with prior guidance, which would mean that at 2.5% DEF Tank Level or Empty Tank, the new SCR inducement derate schedule would start. Alternatively, EPA could consider amending 40 CFR 1036.111(b)(1) to provide an option to either use the 3 hours of DEF supply remaining condition or the 2.5% of DEF tank level remaining condition, as follows, or similar, "…DEF supply falling to a level corresponding to three hours of engine operation, based on available information on DEF consumption rates. In lieu of the 3 hours of engine operation, alternatively trigger inducement at a minimum 2.5% DEF tank level". Such flexibility is necessary because vehicle manufacturer selections of sensor resolution, tank volume and tank geometry are key factors that can impact the estimation of DEF tank usage over time. [EPA-HQ-OAR-2022-0985-2699]

[PowerPoint Slides attached]

Organization: Environmental Defense Fund (EDF)

Environmental Defense Fund (EDF) respectfully submits the attached report, “U.S. Electric Vehicle Manufacturing Investments and Jobs: Characterizing the Impacts of the Inflation Reduction Act after 12 Months,” as supplemental comments on EPA’s Proposed Rule, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29184 (May 5, 2023), and on EPA’s Proposed Rule, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles, 88 Fed. Reg. 25926 (April 27, 2023). The attached analysis, released by EDF and WSP in August 2023, focuses on the impacts of the Inflation Reduction Act in dramatically accelerating U.S. investments in EV manufacturing and job growth.

The analysis finds:

- Investments in the EV manufacturing ecosystem over the last eight years total more than
- $165 billion with 56% of that investment occurring since the passage of the IRA.
- These investments support 179,000 direct jobs and are expected to create more than 800,000 additional jobs in the broader economy.
- By 2026, U.S. manufacturing facilities will be able to make 4.7 million new EVs annually (36% of new vehicles sold last year) and by 2027, enough batteries to supply 12.1 million new passenger vehicles (95% of new vehicles sold last year).

[Two PowerPoint attachments:

- U.S. Electric Vehicle Manufacturing Investments and Jobs Characterizing the Impacts of the Inflation Reduction Act after 1 Year August 2023
- EDF Meeting on EPA's Proposed Multipollutant Standards for New Light-, Medium-, and Heavy-Duty Vehicles, August 23, 2023]

[EPA-HQ-OAR-2022-0985-2671]

Organization: Environmental Defense Fund (EDF)

The report attached and linked below is listed as Attachment N in comments filed by Environmental Defense Fund on EPA's Proposed Rule, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926 (April 27, 2023), but was inadvertently not filed with our comment. [EPA-HQ-OAR-2022-0985-2686]

Attachment N: ERM, Rachel MacIntosh, Harrison Branner, Kayla Escobar, and Sophie Tolomiczenko,. Electric Vehicle Market Update: Manufacturer & Commercial Fleet Electrification Commitments Supporting Electric Mobility in the United States, Appendix C (April 2023). https://www.edf.org/sites/default/files/2023-05/Electric%20Vehicle%20Market%20Update%20April%202023.pdf

Organization: Environmental Defense Fund (EDF)

Please add the attached document to the Greenhouse Gas Emissions Standards for Heavy-Duty Engines and Vehicles- Phase 3 (EPA-HQ-OAR-2022-0985) and Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles (EPA-HQ-OAR-2022-0829) dockets. [EPA-HQ-OAR-2022-0985-2698]

[Attached study:]

U.S. Electric Vehicle Battery Manufacturing on Track to Meet Demand

The announced U.S. electric vehicle (EV) battery production capacity is more than on track to meet the projected demand for EV batteries that may occur under the Environmental Protection Agency's (EPA) proposed emission standards for light- medium- and heavy-duty vehicles with $92 billion of investment in batteries announced in the U.S.[i] Over 1,000 gigawatt hours (GWh) per year of U.S. battery production capacity has already been announced to come online by 2028 – enough to meet all of EPA's projected demand in 2030 and 85% of the projected demand in 2032.

[i] EPA's standards are technology neutral: vehicle manufacturers can use any combination of technologies they choose to reduce emissions from their vehicles. Likely the most cost-effective pathway is using ZEVs, as EPA modeled in its proposed rules.

Projected Demand for EV Batteries from EPA Proposed Standards

EDF used the EPA's projections for EV adoption and associated battery demand through 2030.[ii] Roughly 90% of the potential EV battery demand is from light-duty (passenger) vehicles. Potential demand for batteries in medium-duty vehicles (large pickup trucks and vans) and heavy-duty vehicles (delivery trucks, step vans, semi-trucks, buses, etc.) is much smaller.

[ii] Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29184 (May 5, 2023); Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926 (April 27, 2023).

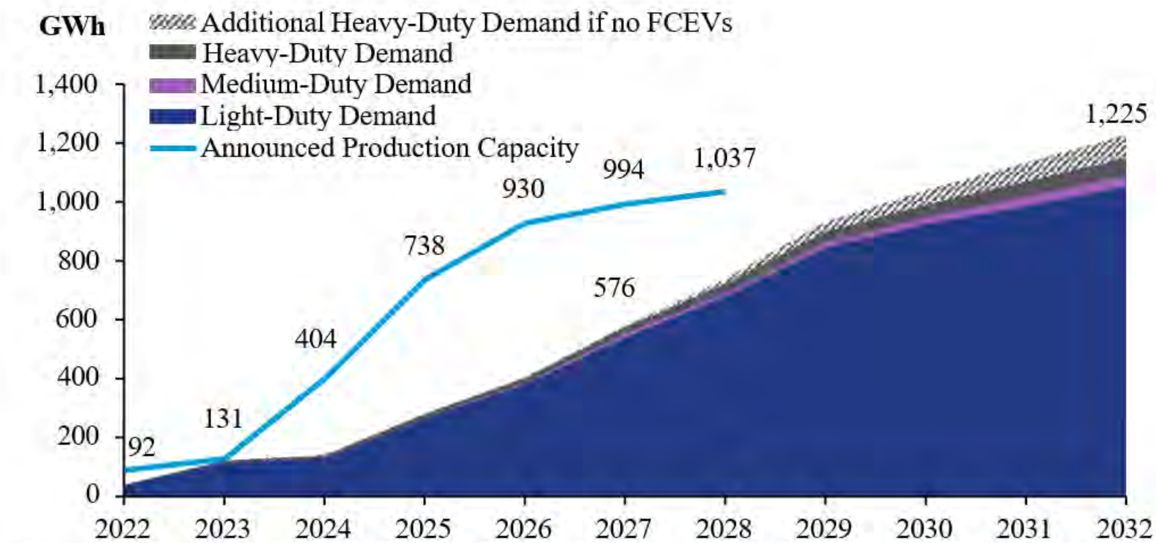

Figure 1: Projected U.S. EV Battery Demand and Announced Battery Production Capacity (2022-2032)

Figure 1 shows EPA projected battery demand by segment:

- Light-duty: 539 GWh per year in 2027 growing to 1,053 GWh per year by 2032.
- Medium-duty: 13 GWh per year in 2027 and only 38 GWh per year in 2032.
- Heavy-duty: 23 GWh per year in 2027 growing to between 59 GWh to 134 GWh per year in 2032, depending on whether heavy-duty EV adoption is met with a combination of fuel cell electric vehicles (FCEVs) and battery electric vehicles (BEVs) or solely BEVs (which would require more batteries). The additional batteries for an all-BEV compliance with EPA's heavy-duty proposal are labeled as "Additional Heavy-Duty Demand if no FCEVs".

Combined, U.S. EV battery demand is projected to be 576 GWh per year in 2027 and 1,151 GWh – 1,225 GWh per year in 2032. Even if heavy-duty EV battery demand increased twofold, overall battery demand would only increase to 1,359 GWh in 2032.

Announced Battery Manufacturing Capacity in the U.S.

As shown by the blue line in Figure 1, based solely on announced EV battery manufacturing plants, the U.S. will have an estimated capacity of 1,037 GWh per year by 2028, consistent with projections made by other sources.iii This includes 45 battery manufacturing facilities with an average production capacity of 23 GWh per year. Table 1 shows states with the most announced battery production capacity. To estimate the nation's battery manufacturing capacity, EDF used publicly announced battery manufacturing plant information, including total monetary investment, battery capacity, and production start date.

[iii] A DOE estimate from January 2023 found 1,000 GWh of announced battery capacity expected to come online by 2030. https://www.energy.gov/eere/vehicles/articles/fotw-1271-january-2-2023-electric-vehicle-battery-manufacturing-capacity Tech Crunch in August 2023 estimated 1,200 GWh per year of battery capacity by 2030. https://techcrunch.com/2023/08/16/tracking-the-ev-battery-factory-construction-boom-across-north-america/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAACQ3fpohOwikg9 1T2WLv1r2F04jRtHJDtRVn8x0POx4Nz9XSKaYfKo6VDeVTY9Qgtb2X1MT1iiNwW2Zsoi8Owel0pZeKtL- M6tKgad7jbJsInS3C6TGxfX9gTHeWX7ZbKQtH5gHEk79lt0NqGsUzWt73wa0_Vb7Xw2ulgzY15X22 In July 2023, Digi Times Asia estimated the announced battery capacity for 2030 was 900 GWh per year. https://www.digitimes.com/news/a20230726VL202/us-battery-electric-vehicle-meet-the-analyst.html

Table 1: States with Highest Announced Battery Manufacturing

State	Number of Facilities	Battery Production (GWh)
Michigan	6	140
Georgia	5	136
Tennessee	3	128
Kentucky	4	119
Indiana	3	97
Ohio	2	75
South Carolina	5	67
Arizona	4	56
California	1	54
Illinois	1	40
Other	11	125
Total	45	1,037

The announced capacity for battery production outpaces EPA's projected demand through 2028, the last year for which any of the concrete current announcements project production will begin. Shifting consumer demand together with tax credits and incentives in the Inflation Reduction Act provide a strong case for battery manufacturers to build EV batteries in the U.S.

Even if construction delays shift production, there would still be enough battery supply. The average time between announcement and expected start of production for the battery facilities is 2.7 years, indicating that many of the facilities that would come online in 2027 and beyond have not yet been announced.

Plants Provide Capacity for Passenger EVs and Commercial EVs

As shown in Figure 1, EPA projects that roughly 90% of projected battery demand will power light-duty BEVs. While the relative demand for heavy-duty batteries is small, it will likely grow as demand for heavy- duty EVs grows. A recent announcement by Cummins, Daimler and PACCAR to build a joint battery plant in the U.S. indicates that heavy-duty manufacturers are already moving to supply this market.[iv]

[iv] *Accelera by Cummins, Daimler Truck, and PACCAR form a joint venture to advance battery cell production in the United States*, Cummins Newsroom, (September 6, 2023), https://www.cummins.com/news/releases/2023/09/06/accelera-cummins- daimler-truck-and-paccar-form-joint-venture-advance.

There can also be significant sharing of vehicle batteries and components across light- and heavy-duty EVs, including cell modules.[v] For example, Tesla uses the same batteries for its electric semi-truck and Model Y passenger car.[vi] And many of the same battery chemistries are being used and explored for both vehicle segments, including Nickel Manganese Cobalt Oxide (NMC) and Lithium-Iron Phosphate (LFP).[vii] [viii]

v Vishnu Nair et al., Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush for EDF, (February 2, 2022), https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf.

vi Mark Kane, New Photo Reveals Resla Semi's Massive Battery System, (January 25, 2023), https://insideevs.com/news/633133/photo-tesla-semi-battery-system/.

vii Nair et al., Medium and Heavy-Duty Electrification Costs for MY 2027- 2030.

viii A Million-Mile Battery From China Could Power Your Electric Car, Bloomberg News, (June 7, 2020), https://www.bloomberg.com/news/articles/2020-06-07/a-million-mile-battery-from-china-could-power-your-electric-car

Methodology

EPA's OMEGA2 model tracks fleetwide battery usage by model year. EDF used EPA's OMEGA2 model outputs for the light- and medium-duty runs for the proposed rule, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, to quantify the projected battery need. We summed the battery pack size for each vehicle by EPA's projected sales for a given year for all years between 2022 and 2032.

For the proposed heavy-duty rule, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, EPA used the HD TRUCS model to project EV adoption, including number of vehicles and size of battery packs. EPA modeled two years, 2027 and 2032. EPA also included two types of EVs – battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs). EDF multiplied the projected BEV adoption in 2027 and 2032 (in percentage terms) for each of the 101 vehicle categories in HD TRUCS by the annual sales and estimated battery pack size. HD TRUCS includes 2019 sales. To project HDV sales in later years, EDF assumed a 0.8% compound annual growth rate consistent with AEO2023.ix Heavy-duty battery demand in 2022 was assumed to be 10% of the demand in 2027. The battery demand was linearly interpolated for the years between 2022, 2027 and 2032.

[ix] U.S. Energy Information Administration's Annual Energy Outlook 2023, Table 49. Freight Transportation Energy Use, (March 2023), https://www.eia.gov/outlooks/aeo/supplement/excel/suptab_49.xlsx.

To account for a more conservative scenario in which the projected heavy-duty EV adoption might be met with all BEVs instead of a mix of BEVs and FCEVs as EPA projects, we calculated the battery demand if adoption projections are met entirely with BEVs. The largest group of vehicles projected to be FCEVs are sleeper cab tractors. EPA projects sleeper cab tractors would have very large battery packs, if BEVs were the chosen compliance path versus FCEVs, with the largest being more than 2 MWh per vehicle. EDF believes that EPA overestimates the battery pack size needed for many heavy- duty vehicles as explained in more detail in our comments,x but for purposes of this analysis, we used the EPA projected battery pack sizes. Assuming all heavy-duty EVs are BEVs results in the same 2027 battery demand because EPA does not project any FCEVs to be deployed then. Heavy-duty battery demand increases in 2030 to 90 GWh per year as a result of more BEVs, doubling EPA's projected demand for heavy-duty vehicles with BEVs and FCEVs of 45 GWh. This additional battery demand is labeled as "Additional Heavy-Duty Demand if no FCEVs" in Figure 1.

[x] Comments of the Environmental Defense Fund, EPA-HQ-OAR-2022-0985-1644, https://www.regulations.gov/comment/EPA- HQ-OAR-2022-0985-1644.

To determine the announced U.S. battery manufacturing capacity, EDF updated a previous analysis performed by WSP in August 2023 for EDF.xi EDF confirmed all plants produced batteries and not battery components to ensure no double counting. In cases where plans had changed for battery plants and the timelines for production were uncertain, the battery facilities were removed from the list. Some of the facilities like the North Carolina Toyota plant have announced investments ($13.9B) that would likely support much more battery production than they have announced (30GWh). Due to the conservative measures we took, this is likely an underestimate of the battery production capacity from already announced plants.

[xi] U.S. Electric Vehicle Manufacturing Investments and Jobs: Characterizing the Impacts of the Inflation Reduction Act after 1 Year, WSP for EDF, (August 2023), https://www.edf.org/sites/default/files/2023-08/EDF%20WSP%20EV%20report%208-16- 23%20FINAL%20FINAL.pdf.

[EPA-HQ-OAR-2022-0985-2698]

Organization: Environmental Defense Fund (EDF)

Executive Summary

Since the close of the comment period, EDF has evaluated alternative technology pathways for manufacturers to meet the Proposed Standards, different from those presented by EPA.1 Our analysis concludes that EPA's proposed standards for most vehicle categories can be met without any zero emission vehicles (ZEVs) and all can be met with ZEV levels well below those that will otherwise result from heavy-duty (HD) ZEV sales in states that have already adopted California's Advanced Clean Truck (ACT) program.

1 EDF submitted a series of similar alternative pathways analyses and comments to the docket for EPA's proposed Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29184 (May 5, 2023). See Docket ID Nos. EPA-HQ-OAR-2022-0985-0451 and EPA-HQ-OAR-2022-0985-5118.

EPA has always set performance-based, heavy-duty vehicle greenhouse gas (GHG) standards that manufacturers can meet with a range of emissions-improving technologies. The Proposed Standards are no exception. EDF has performed a detailed analysis, set forth below, assessing additional viable pathways to achieve compliance through fuller reliance on internal combustion engine vehicle (ICEV) emission controls, strong hybrids, and plug-in hybrid electric vehicles (PHEVs) with low levels of ZEV sales.

Our analysis concludes that EPA's Proposed Standards for most classes of vehicles can be met without any ZEV sales at all, and all classes of vehicles can meet the standards with ZEV levels well below those that will otherwise result from heavy-duty (HD) ZEV sales in ACT states in model year (MY) 2032, the first year of Phase 3's highest stringency. While the analysis was only for MY2032, the same conclusions are expected to apply to earlier years with lower stringencies. The technologies relied on in this analysis have already been demonstrated and/or are commercially available. Thus, our analysis demonstrates the flexibility afforded to manufacturers to reduce emissions using a mix of technologies with no or substantially lesser reliance on ZEV sales as compared to what was shown in EPA's Proposal. Figures ES-1 and ES-2 below show the multiple scenarios modeled in this analysis demonstrating a small sampling of the compliance pathways manufacturers can use to meet the Proposed Standards.

[Omitted: Figure ES-1: Possible Compliance Pathways for EPA's Proposed 2032 Vocational Vehicle Standards]

[Omitted: Figure ES-2: Possible Compliance Pathways for EPA's Proposed 2032 Tractor Standards]

Analysis

This analysis investigates manufacturers' ability to comply with EPA's Proposed Standards with fewer ZEVs than EPA projections, focusing on other viable technology options such as further ICEV emissions control, strong hybrids, and PHEVs. Our analysis evaluates model year (MY) 2032, the first model year covered by the greatest stringency in EPA's proposal. Since the earlier years in the program have lower stringency, the same conclusion likely holds that other pathways will less reliance on ZEVs than EPA projected are feasible for manufacturers.

Our analysis separately examines viable alternative pathways for vocational vehicles and tractors, as they are expected to employ different technologies. For vocational vehicles subject to the Proposed Standards, we assess additional viable pathways through more reliance on ICEV emission reduction, strong hybrids, and PHEVs. For Class 7 and 8 tractors, we assess pathways that rely only on more ICEV control.

1. Baseline ZEVs

This analysis conservatively assumes only ACT-driven ZEV sales would occur in the absence of further EPA standards. As previously described by EDF and others,2 there has been significant growth in HD ZEV adoption across the U.S. and around the world. This growth is expected to continue because of strong market trends (described below) and actions by states. California's Advanced Clean Trucks (ACT) rule, which requires increasing sales of ZEVs across heavy-duty vehicle segments, has been adopted by ten additional states with several more expected to adopt the standards in the near future.3 Depending on the data source, these states account for an estimated 22% to 26%4 of HD sales within the U.S. In this analysis, EDF accounted for the possible range in ZEV sales estimated to occur due to the ACT rule.

2 Rachel MacIntosh et al., Electric Vehicle Market Update: April 2023, ERM for EDF, https://www.edf.org/sites/default/files/2023-05/Electric%20Vehicle%20Market%20Update%20April%202023.pdf; Marissa Nixon, Electric truck deployment by U.S. companies grew five times in 2023, EDF Blog, December 13, 2023, https://blogs.edf.org/energyexchange/2023/12/13/electric-truck-deployments-by-u-s-companies-grew-five-times-in- 2023/; Jacob Richard et al., Zeroing in on Zero-Emission Trucks: The State of the U.S. Market, CALSTART, January 2024, https://calstart.org/zio-zets-jan-2024-update/. Trends in electric heavy-duty vehicles, IEA Global EV Outlook 2023, https://www.iea.org/reports/global-ev-outlook-2023/trends-in-electric-heavy-duty-vehicles;

3 The states that have adopted ACT include California, Colorado, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Rhode Island, Vermont, and Washington. Connecticut, Maine, and North Carolina all have rulemakings underway or have indicated an intention to adopt the regulation. https://www.sierraclub.org/transportation/clean-vehicle-programs-state-tracker

4 The impact ACT states will have on national ZEV sales is dependent on the share of HDV sales those states represent. Depending on the data source, there is a range of values that represent ACT state-share. California Air Resources Board's Section 177 States Regulation Dashboard uses the state shares of registered heavy-duty vehicles from the Federal Highway Administration table MV-1 from 2020 and find current ACT states make up 26.4% of national vehicle registrations. Sierra Club's Clean Vehicle Programs State Tracker uses new registrations by state in 2021 from Atlas Public Policy and HIS Markit and find current ACT states make up 22.0% of national new registrations. Using EPA's MOVES3 HD state population values, ACT states represent 25.6% of national vocational vehicles and 24.5% of tractors.

https://www.sierraclub.org/transportation/clean-vehicle-programs-state-tracker; https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/states-have-adopted-californias-vehicle-regulations; https://www.sierraclub.org/transportation/clean-vehicle-programs-state-tracker; https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/states-have-adopted-californias-vehicle-regulations; https://www.epa.gov/moves/moves-versions-limited-current-use's

ACT requires the sale of 60% ZEVs in 2032 for vocational vehicles Class 4 to 8. Nationwide, this would result in vocational ZEV sales between 13% and 16%. Our analysis assumes the ZEV adoption is evenly spread across Class 4 to 8 vocational vehicles.

For heavy-duty tractors, ACT requires 40% ZEV sales in 2032, combining all Class 7 and 8 tractors into one category. EPA, on the other hand, sets different standards for Class 7 day, Class 8 day, and Class 8 sleeper cab tractors.5 Given the differences in duty cycles and uses between day and sleeper cabs, it is possible ACT-related ZEV tractor sales will not be spread evenly across those categories. We considered two scenarios in our analysis – one where ZEV tractor sales to meet ACT are spread evenly across all tractor categories and one where ZEV tractor sales are concentrated within day cab tractors.

5 While there are 7 different Class 8 tractor standards and 3 different Class 7 tractor standards set, the rule allows all Class 8, vocational and tractor, to be averaged together in one averaging set and all Class 6 and 7

vehicles, vocational and tractor, to be averaged together in one averaging set. See Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles, Notice of Proposed Rulemaking, 88 Fed. Reg. 25957 (April 27, 2023).

Spread evenly, ACT-driven ZEV tractor sales would range between 9% and 10% of all national tractor sales in 2032. In the scenario where all ACT-driven ZEV tractor sales are concentrated within day cabs, national ZEV day cab tractor sales would range between 22% and 26% and all other types of ZEV tractor sales would be near-zero. In our analysis below, we assume these ZEV sales will occur in the absence of EPA's Phase 3 standards so that any ZEV sales resulting from the Phase 3 standards would be incremental to these baselines.

Even accounting for the ACT rule, our analysis reflects a conservative assessment of ZEV deployment in the coming years. The historic investments in the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL) have rapidly accelerated an American electric vehicle manufacturing renaissance, dramatically advancing purchase price parity for heavy-duty ZEVs, and accelerating already declining costs for vehicles at the same time. Leveraging these trends, some manufacturers and fleets have already made commitments exceeding the levels of ZEV deployment EPA projects in the proposal. EDF comments submitted to the docket on June 16, 2023, summarized extensive evidence by a large and growing body of analyses of the declining upfront costs of electrification and the significant cost savings over time.6 Our comments also summarized the substantial investments in the IRA and BIL that have accelerated the manufacture and deployment of ZEVs. Since the submission of our earlier comments, WSP and EDF updated our investment and job analysis in August 2023, finding that over $165 billion in private EV supply ecosystem investments and nearly 180,000 new jobs have been announced in the last eight years, with more than half of the announced investments happening since the passage of the IRA.7 Of the announced investments, $14.5 billion is specific to HD EV manufacturing. And in January 2024, Cummins, Daimler and PACCAR, three top U.S. HD manufacturers, announced joint plans to build a $2 billion HD battery plant.8

6 https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0985-1644

7 WSP and EDF, U.S. Electric Vehicle Manufacturing Investments and Jobs Characterizing the Impacts of the Inflation Reduction Act after 1 Year, August 2023. https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0985- 2671

8 https://investor.cummins.com/news/detail/634/accelera-by-cummins-daimler-truck-and-paccar-select

Manufacturer commitments also signal a continued growth in ZEV investment and deployment. For example, Daimler Trucks has a goal of selling only CO2-neutral vehicles in Europe, Japan, and North America by 2039.9 Both Traton SE, the parent company of Navistar, and Volvo Trucks set a global target that 50% of all truck sales will be electric by 2030, with Volvo setting a higher target in North America and Europe to reach 70% electric trucks sales by 2030.10 In a recent shareholder meeting, Daimler, the largest HDV manufacturer in the U.S., told investors they projected their ZEV sales would account for 40% of their vehicle sales by 2030 in North America.11 These market trends indicate that ZEV deployment in 2032 will likely be higher than what will result from the ACT state regulations alone and underscore the extremely conservative nature of our analysis here.

9 David Cullen, Daimler to Offer Carbon Neutral Trucks by 2039, Truckinginfo (Oct. 25, 2019), https://www.truckinginfo.com/343243/daimler-aims-to-offer-only-co2-neutral-trucks-by-2039-in-key-markets.

10 De Lombaerde, Geert, Traton boosting its trucking electrification investments, Fleet Owner (16 Mar 2022). https://www.fleetowner.com/emissions-efficiency/article/21236316/traton-adding-to-electrification-investments. Volvo Trucks, Record order from Maersk for Volvo electric trucks, Volvo Trucks. 29 March 2022. https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/mar/volvo-trucks-receives-record-order-for- electric-trucks-from-maersk.html.

11 Daimler Truck Capital Market Day 2023 Presentation, July 11, 2023, https://www.daimlertruck.com/fileadmin/user_upload/documents/investors/capital-market-days/daimler-truck-ir- capitalmarketday-2023-07-11.pdf.

2. ICEV improvements

In its proposal, EPA assumed manufacturers would reduce ICEV emissions only to the levels required under Phase 2 and that all emission reduction that Phase 3 would require beyond that would result from ZEV adoption. However, as laid out by several reports from the International Council on Clean Transportation (ICCT) and Argonne National Laboratory (ANL), and demonstrated by real world examples, including SuperTruck, manufacturers can reduce heavy-duty ICEV emissions much further than required to meet Phase 2, indicating that manufacturers could pursue further ICEV improvement as part of an alternative compliance strategy to meet Phase 3 standards.

To understand the potential of ICEV technologies in controlling HDV tailpipe emissions, EDF reviewed analyses by ICCT including Buysee et al 202112 and Ragon et al 2023.13 Buysse et al 2021 looks at two vehicle types, medium heavy-duty (MHD) multi-purpose (MP) vocational vehicles and Class 8 sleeper cab high roof tractors for MY2035. The study includes the following emissions control technologies:

- MHD MP Vocational Vehicles
    - Improved engine efficiency (49% peak BTE)
    - Advanced axle efficiency (97%)
    - Rolling resistance tires (Level 7v)
    - Lightweighting (LHD-850 lb, MHD-1,100 lb, HHD-1,580 lb)
    - Improved aerodynamics (improvements of LHD-0.2 m2, MHD and HHD-0.5 m2)
    - Reduced accessory load (2.1% efficiency improvement)
    - Mild hybridization with stop-start
- Class 8 Sleeper Cab High Roof Tractors
    - Improved engine efficiency (55% peak BTE)
    - Advanced axle efficiency (97%)
    - Rolling resistance tires (Level 5)
    - Lightweighting (day-1,940 lb and sleeper-1,990 lb reductions)
    - Improved aerodynamics (Bin VI CdA 4.1-5.2 m2)
    - Reduced accessory load (1.5% efficiency improvement)

- o Predictive cruise control (3% efficiency improvement)
- o Dual-clutch transmission (2.0 final drive ration, 10% engine downsizing)
- o Mild hybridization

12 Claire Buysse, Ben Sharpe, Oscar Delgado, ”Efficiency Technology Potential for Heavy-duty Diesel Vehicles in the United States through 2035,” ICCT (Nov. 18, 2021). https://theicct.org/publication/efficiency-technology-potential-for- heavy-duty-diesel-vehicles-in-the-united-states-through-2035/

13 Pierre-Louis Ragon et al., Potential benefits of the U.S. Phase 3 greenhouse gas emissions regulation for heavy- duty vehicles, Table C1, International Council on Clean Transportation, April 14, 2023, https://theicct.org/publication/hdv-phase3-ghg-standards-benefits-apr23/.

Ragon et al 2023 modeled all of the EPA regulatory categories for vocational vehicles, urban, MP, and regional for light heavy-duty (LHD), MHD, and heavy heavy-duty (HHD), as well as all of the tractor categories, low, mid, and high roof for Class 7, Class 8 day cab, and Class 8 sleeper cab tractors with all of the technologies identified in Buysse et al as having payback periods of fewer than 2 years and modeled this for MY2036. For tractors, this meant removing dual-clutch transmission and mild hybridization. For vocational vehicles, the analysis removed mild hybridization but left stop-start. While mild hybridization with stop-start had a 1.8-year payback period in Buysse et al 2021, Ragon et al 2023 found there was not currently enough commercial interest in mild hybrid technology in HD vocational vehicles to justify using it in their study. For both studies, we assumed manufacturers would produce vehicles with these levels of emissions control technology a few years earlier than ICCT modeled (i.e., MY2032 instead of MY2035). Many of them are commercially available now or have been demonstrated in real world tests supporting the idea that manufacturers could reach these emission reduction levels within the timeframe.

Since Buysse et al 2021 only modeled two vehicle categories, we applied the relative improvements from these additional technologies to the results from Ragon et al 2023 to estimate the remaining vehicle categories with this additional technology added. In the remainder of the analysis the Buysse et al 2021-like technology package is referred to as Mild Hybrid (MHEV) for vocational vehicles and MHEV + Dual-Clutch Transmission (DCT) for tractors.

We also wanted to isolate the portion of ICEV improvements possible without any electrification (in this case, removing mild hybrid and stop-start). In Buysse et al 2021, for MHD MP vocational vehicles, the analysis specifies the emissions with all of the technologies described above including mild hybridization and stop-start (155 g/ton-mi) and without mild hybridization or stop- start (169 g/ton-mi). Additionally, Ragon et al 2023 modeled vocational vehicles with stop-start, but without mild hybridization. The emissions level they modeled for MHD MP vocational vehicles is 163 g/ton-mi. The emissions impact of removing start-stop is an increase of 6 g/ton- mi, a 3.9% increase in emissions. We applied this 3.9% increase in emissions to all the Ragon et al 2023 results for all of the EPA vocational vehicle categories in order to represent the capability of ICEV improvements without start-stop or any hybridization. In the case of tractors, the values in Ragon et al 2023 do not include mild hybridization or stop-start so no adjustments were needed. The Ragon et al 2023 modeling also did not include dual-clutch transmission since it had a payback period of longer than two years. In the remainder of this analysis, this level of emissions control is referred to as Advanced ICEV (Adv ICEV) and includes only technologies with payback periods of less than 2 years. The emissions and percent change from Phase 2 MY2027 standards for Adv ICEV and MHEV/MHEV + DCT are below in Table 1. EPA sets separate urban, multi-purpose, and regional standards for vocational vehicles and separate low, mid, and high roof standards for tractors. The values included in Table 1 and for the remainder of the analysis are sales-weighted averages.14

14 Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2: Regulatory Impact Analysis, EPA-420-R-16-900, Tables 2-286 and 5-16, August 2016, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NS.PDF?Dockey=P100P7NS.PDF.

[Omitted: TABLE 1: Heavy-duty Vehicle Emissions for ICEV Technologies and Percent Change from Phase 2 MY2027 Standards]

a. Examples of highly fuel efficient ICEVs in the real world

The recent results of the SuperTruck II program bolster the projections in the ICCT analyses and are further evidence that manufacturers could reasonably choose to pursue greater use of ICEV efficiency controls in HD vehicles. SuperTruck, a public-private partnership with the U.S. Department of Energy, promotes research and development to improve the freight efficiency of heavy-duty Class 8 long-haul tractor-trailer trucks. The program aims to accelerate the development of cost-effective advanced emissions control technologies not currently widely available in the market. SuperTruck I began in 2009 and funded four truck makers to develop a heavy-duty truck with 50% better efficiency than anything in production at the time.15

15 https://www.energy.gov/eere/vehicles/articles/report-adoption-new-fuel-efficient-technologies-supertruck

SuperTruck II kicked off in 2017 and tasked OEMs with achieving a 100% freight efficiency improvement over their submitted 2009 baseline. Some OEMs have exceeded DOE’s goal, illustrating that significant improvements in ICEV efficiencies still remain.

Volvo Trucks’ SuperTruck II program announced in October 2023 that it had achieved a 134% efficiency improvement over 2009 levels. Volvo focused heavily on advanced aerodynamics, achieving 50% lower drag than 2009.16 In addition to the aerodynamics advancements, engineers implemented several weight reduction strategies to achieve a significantly reduced curb weight. Volvo Trucks worked with the project partner trailer manufacturer and tire manufacturer on aerodynamics and weight reduction. The company plans to integrate the technology improvements into upcoming models, noting, “[o]ur engineers have already begun implementing some of the learnings from SuperTruck II into our future truck models. The future of trucks is just around the corner.”

16 https://www.volvotrucks.us/news-and-stories/press-releases/2023/october/volvo-trucks-supertruck-exceeds-freight- efficiency-goals-with-focus-on-aerodynamics-and-advanced-engineering/

The Cummins SuperTruck II team focused research and development on heavy-duty diesel engine technology, achieving 55% brake thermal efficiency (BTE) from an engine equipped with waste heat recovery in 2021.17 Cummins’ engine is part of Peterbilt’s SuperTruck II vehicle, which announced in January 2024 that it also exceeded the program goals with a 132% improvement over the 2009 baseline.18 Peterbilt focused on advanced and highly efficient powertrain systems and vehicle technologies including a mild hybrid powertrain, Cummins’ waste heat recovery system and a lightweight chassis for improved fuel economy.

17 https://www.cummins.com/news/2021/08/10/supertruck-ii-team-reaches-never-achieved-55-brake-thermal- efficiency

18 https://www.peterbilt.com/news-and-events/press-releases/peterbilt-demonstrates-advanced-technology-and- innovation-at-ces-with-supertruck-ii

Daimler Truck North America (DTNA) developed a SuperTruck II vehicle in 2023 with enhanced tractor aerodynamics, low-rolling resistance tires, powertrain improvements and energy management with advanced technologies.19 In February 2023, when Freightliner, a DTNA subsidiary, debuted their SuperTruck II vehicles they said, "[t]aken all together, the combined innovations developed for the Freightliner SuperTruck II have provided us the opportunity to explore the technologies needed to meet stringent and forthcoming Greenhouse Gas reduction requirements in the coming years."20 DTNA has also been awarded a grant for SuperTruck III to "develop a hydrogen fuel cell electric tractor that exceeds heavy-duty long-haul sleeper performance, efficiency, and range requirements without compromising payload."21 The design is set to be revealed by 2027.

19 https://corpcomm.blob.core.windows.net/media/supertruck-ii_press-release.pdf

20 https://www.ccjdigital.com/trucks/article/15306208/freightliner-debuts-second-supertruck

21 Id.

3. Strong Hybrid and Plug-In Hybrid Improvements

The ICCT studies only considered mild hybrid vehicles that have limited electrification. They did not consider strong hybrids (SHEVs) or plug-in hybrids (PHEVs). Our analysis includes SHEV and PHEV technologies for vocational vehicles because they can provide additional pathways for manufacturers to meet the proposed Phase 3 standards, and they are mainstream technologies in the light-duty truck market, making their extension to the heavy-duty fleet feasible.22 One study that considers the improvements possible from SHEVs and PHEVs for HDVs is from Argonne National Laboratory (ANL).23 The study includes a Class 4 Box Truck (C4 Box), Class 6 Box Truck (C6 Box), and Class 8 Vocational Truck (C8 Voc) with a range of powertrains. The study looks at vehicles in MY2020 and MY2025. For MY2025, ANL considered a higher technology progression ("high") and a lower technology progression ("low").

22 EPA, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, Draft Regulatory Impact Analysis," (April 2023) EPA-420-D-23-003; Chapter 3. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10175J2.pdf

23 Andrew Burnham et al., Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains, Argonne National Laboratory, April 2021, https://publications.anl.gov/anlpubs/2021/05/167399.pdf.

EDF converted the fuel economy (mpg) values in the ANL study to fuel consumption (gal/100 miles) values to allow us to better identify emissions reductions. The improvements from strong hybrids for the three vehicles in question range from 12% to 23% reduction in fuel consumption over the ICEV as shown in Table 2.

[Omitted: TABLE 2: Fuel Consumption for ANL Report Powertrains]

The value given by ANL for PHEV fuel economy includes the efficiency of the electricity powered portion of the duty-cycle. To get at the emission reductions from PHEVs, we calculated a utility factor (UF). Since a PHEV is a SHEV + BEV with the fraction of operation as a BEV being the UF, we used the fuel consumption (FC) values for PHEVs, SHEVs, and BEVs to calculate the UF, using the relationships below.

Formula to equate the FC of PHEVs, SHEVs, and BEVs:

$$FCPHEV = FCBEV * UF + FCSHEV * (1 - UF)$$

Solving for UF:

$$UF = \frac{FCPHEV - FCBEV}{FCSHEV - FCBEV}$$

Using this formula, we calculated the UF for the HD vehicles within the ANL study. As shown in Table 2, the calculated UF ranged from 27% to 40% with the improvement of PHEV emissions over the ICEV ranging from 41% to 48%.

For the remainder of the analysis, we use the higher of the two values for SHEV improvement and PHEV UF. Since these are improvements in 2025 and we are looking at 2032, using the high value is a reasonable choice.

We applied the values for C4 Box to all LHD vocational vehicles, the C6 Box to all MHD vocational vehicles, and the C8 Voc to all HHD vocational vehicles. To understand how reasonable an assumption it is to apply the improvements for the ANL vehicles to the Urban, MP, and Regional vehicles, we looked at the daily mileage assumed by EPA and in the ANL study.

In the HD TRUCS model, EPA includes a daily, 10-year average daily, and battery sizing mileage values for each of the 101 vehicle categories it models. We aggregated the 101 vehicle categories into the nine vocational vehicle EPA standards and calculated the sales weighted average for each of the different daily mileages. Figure 1 shows these values.

[Omitted: FIGURE 1: HD TRUCS Average VMT by Category]

For LHD and MHD, the daily and sizing VMT increases between Urban and MP and between MP and Regional but the 10-yr average that were used to determine operating and maintenance costs is similar across Urban, MP, and Regional. For HHD, the Urban, MP, and Regional vehicles are similar for all three VMTs.

The PHEV electric ranges for the vehicles modeled in ANL varied with C4 Box and C6 Box having 75 miles of electric range and the C8 Voc having 100 miles. ANL uses VIUS 2002 data to determine the annual VMT for vehicles over the lifetime of the vehicle. This data is not exactly comparable to the values included in EPA's HD TRUCS. Using the annual milage for each year of the vehicle's life, then calculated the lifetime daily mileage - assuming 250 days of driving per year and the highest average daily mileage using the year with the most annual miles. These are reflected in Table 3 below.

[Omitted: TABLE 3: VMT from EPA HD TRUCS and ANL Report]

Comparing the daily milage used in the ANL report to EPA's HD TRUCS, the ANL daily milage is higher in most cases, supporting the application of the utility factor and PHEV improvements of the Argonne results to all the Urban, MP, and Regional vehicles.

In addition to the improvements from hybridization, emission reduction technologies like aerodynamics and axel efficiency improvements can also be applied to these vehicles. Because SHEVs only use gasoline and PHEVs use gasoline and electricity, slightly different methodologies were used to combine the emission control technologies.

The improvements from SHEV were applied to the Adv ICEV vocational vehicle emissions levels as to not double count the benefits from mild and strong hybrids.

For PHEVs, the UF was used to calculate the emissions benefits of making vehicles PHEVs. As discussed above, a PHEV is a BEV combined with a SHEV with the utility factor describing the ratio of electricity to gasoline use. The UF calculated above (shown in Table 1) was applied to MHEV emission levels. The study may underestimate the possible benefits because it only included mild hybridization and not strong hybridization which is how a PHEV operates in charge sustaining mode.

In both cases, SHEVs and PHEVs, a 0.9 dis-synergy factor was applied to account for "decreases in technology effectiveness as a result of multiple technologies being applied to an engine" or vehicle. This is consistent with what EPA used in Phase 2 MY2024 and MY2027 modeling.24 The emissions and percent change from Phase 2 MY2027 standards for SHEV and PHEV are below in Table 4 for a sales-weighted average of urban, multi-purpose, and regional.

24 Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2: Regulatory Impact Analysis, Page 2-81, August 2016 https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NS.PDF?Dockey=P100P7NS.PDF.

[Omitted: TABLE 4: Heavy-duty Vocational Vehicle Emissions for SHEVs and PHEVs and Percent Change from Phase 2 MY2027 Standards]

a. Examples of HD SHEV and PHEV

Strong hybrid and plug-in hybrid technologies have become mainstream in the light-duty truck market and are now also being operationalized in some vehicles within the medium- and heavy- duty sector. For example, Xcelcior makes a hybrid electric transit bus that achieves 10-29% fuel economy improvement over a conventional bus, depending on the route.25 Nova Bus also sells a hybrid transit bus that can reduce fuel consumption by up to 30% while also reducing harmful criteria pollutant emissions by up to 40%.26 Odyne Hybrid Systems offers an advanced plug-in hybrid system for medium- and heavy-duty work trucks. The system provides improved driving efficiency as well as stationary electric power for auxiliary systems.27 Scania makes a heavy- duty hybrid electric tractor or rigid truck with up to 10 mi range and a plug-in hybrid truck with up to 37 mi all electric range available in Europe.28 These examples indicate that strong hybrid and plug-in hybrid technologies can be part of a feasible pathway to compliance with the Phase 3 standards.

25 https://www.newflyer.com/bus/xcelsior-hybrid/

26 https://novabus.com/blog/bus/lfs_hev/

27 https://www.odyne.com/wp-content/uploads/2019/02/020215allisonodynebrochure6singlepagessm.pdf

28 https://www.scania.com/group/en/home/products-and-services/trucks/plug-in-hybrid-truck.html

4. Results

The above sections outline how we calculated the vehicle emissions for four technology packages for vocational vehicles, Adv ICEV, MHEV, SHEV, and PHEV, and two for tractors, Adv ICEV and MHEV + DCT. To evaluate the impact these different levels and packages of emission control technology would have on Phase 3 compliance strategies, we looked at each technology in isolation and in combination. We determined the percent of ZEV adoption needed in 2032 assuming the remaining fleet adopted each of the technologies. Additionally, we modeled a few of the many possible compliance pathways manufacturers could use.

Vocational Vehicles

Figure 2 shows the precent ZEV adoption needed to meet MY2032 Proposal using each technology for a sales weighted combination of urban, multi-purpose, and regional. The horizontal light blue bar in Figure 2 represents the range of ZEV sales required in current ACT states - the minimum level of ZEVs that would be sold in the U.S. in 2032 in the absence of any additional regulations, between 13% and 16%. As described above, this is an exceedingly conservative estimate of ZEV sales in 2032 absent additional EPA action due to expected favorable economics of ZEVs, manufacturer commitments, and corporate climate target.

[Omitted: FIGURE 2: Vocational Vehicles: Percent ZEV Adoption to Meet 2032 Proposed Standards using Different Control Technology Packages]

All of the additional technologies included in Figure 2 would reduce the level of ZEV adoption needed to meet the Proposed Standards as compared to what EPA projected (the dark blue bars in Figure 2). For LHD vocational vehicles, which have the highest level of emission reductions in the Phase 3 Proposed Standards, the level of ZEVs needed if the remaining fleet only meets Phase 2 MY2027 standards is 57%. The ZEV share falls to 41% with Adv ICEV, 36% with MHEV, 26% with SHEV, and less than 1% with PHEV.

For MHD vocational vehicles, EPA projected 34% ZEV adoption in the Phase 3 Proposal, with the remaining fleet meeting the Phase 2 MY2027 standards.29 If the remaining fleet is Adv ICEV, only 8% ZEVs are needed to comply with Phase 3 and less than 1% ZEV with MHEV. When the remaining fleet is SHEV and PHEV, no ZEVs are needed. The MHD SHEVs and PHEVs have lower emissions than the MY2032 Phase 3 Proposed Standards. A fleet of 89% SHEVs and 11% Phase 2 MY2027 vehicles would comply, as would a fleet of 56% PHEVs and 44% Phase 2 MY2027 vehicles.

29 In some of the tables in the preamble for EPA's Proposed Standards, they list only the multi-purpose vehicle emission reduction (e.g., Table ES-3). The values here are using a sales-weighted average of urban, multi-purpose, and regional vehicles.

Finally, for HHD vocational vehicles, EPA projected 38% ZEV adoption by MY2032 with the remaining fleet being Phase 2 MY2027 ICEVs. If the remaining fleet was instead Adv ICEVs, the ZEV percentage would drop to 27%. If the remaining fleet was MHEVs, the ZEV percentage would drop to 20%, SHEVs to 17%, and no ZEVs are needed if the rest of the fleet is made up of PHEVs. A combination of 75% PHEVs and 25% Phase 2 MY2027 ICEVs would comply with EPA's Proposed MY2032 Standards for HHD vocational vehicles.

Possible Compliance Pathways – Vocational Vehicles

While many compliance pathways exist for manufacturers, we looked at five possible scenarios for vocational vehicles using a sales-weighted average of urban, multi-purpose, and vocational. Figure 3 below shows the percentage of each technology type for each of the potential compliance pathways modeled here. The first two scenarios assume less than 1% ZEV deployment for LHD vocational vehicles and no ZEV deployment for MHD and HHD vehicles, showing that the Phase 3 standards could be met with almost no ZEV deployment. Scenarios 3 and 4 have 15% ZEVs to be consistent with ACT state-driven ZEV sales, which is still unrealistically low even without EPA's proposed regulations. Finally, Scenario 5 includes a baseline of 35% ZEVs, consistent with ACT Research's projections for 2032.30 These scenarios show that all of EPA's proposed Phase 3 standards can be met with ZEV levels below those that will result from HD ZEV sales in ACT states and many of the proposed standards can be met without any ZEVs at all.

30 Half of all Commercial Vehicles will be Zero Emissions by 2040, ACT Research, September 12, 2023, https://www.actresearch.net/resources/blog/charging-forward-blog.

[Omitted: FIGURE 3: Possible Compliance Pathways For EPA's Proposed 2032 Vocational Vehicle Standards]

Class 7/8 tractors

As discussed above, it is not currently clear what types of ZEV tractors manufacturers will sell in ACT states. We analyzed two possibilities. First, if we assume that manufacturers sell primarily ZEV day cab tractors instead of sleeper cabs to comply with ACT, the share of national ZEV day cab tractors sales will be 22% to 26%. This is represented by the horizontal purple bar in Figure

4. Second, if we instead assume manufacturers spread their ZEV tractor production across all tractor types, national ZEV tractor sales for all tractor categories will be 9% to 11% from ACT required sales alone. This is represented by the horizontal blue bar in Figure 4. EPA sets separate standards for low, mid, and high roof tractors for Class 7 day, Class 8 day, and Class 8 sleeper cabs. The analysis below was [text missing from original comment]

Because the level of emissions improvement proposed in Phase 3 is lower for tractors than for vocational vehicles, the relative impact of ICEV improvements beyond those required by Phase 2 on vehicle emissions is greater. In the Proposal, EPA projected that 34% of Class 7 and Class 8 day cab tractors would be ZEVs in 2032, assuming the rest of the fleet produced emissions consistent with Phase 2 MY2027 levels. If the remaining fleet were Adv ICEVs, the share of ZEVs would be around 13% in 2032. This level of ZEVs is lower than what would occur if manufacturers met ACT tractor requirements with day cab ZEV tractors and no sleeper cab ZEVs. If manufacturers applied more emission control technology to Class 7 and Class 8 day cab tractors, consistent with MHEV + DCT, the share of ZEVs required to meet the proposed Phase 3 standards would be reduced to almost zero.

For Class 8 Sleeper cabs, EPA projects 25% ZEV sales in 2032 with the remaining ICEVs meeting only Phase 2 MY2027 standards. However, if manufacturers produced Adv ICEVs, they would only need 3% ZEVs and if they produced MHEV + DCTs, they could fully comply with Phase 3 emissions reductions without any ZEV sales. A fleet of 77% MHEV + DCTs and 23%

Phase 2 MY2027 ICEVs would meet the proposed MY2032 sleeper cab standard. Similarly for heavy haul sleeper cabs, EPA proposed a 15% emissions reduction, which can easily be met with ICEV improvements alone.

[Omitted: FIGURE 4: Tractors: Percent ZEV Adoption to Meet 2032 Proposed Standards Using Different Control Technology Packages]

An additional flexibility available to manufacturers is the averaging set. All vehicles within each set are averaged together, allowing manufacturers to improve some of the vehicle emissions more than is required by Phase 3 and offset a failure to meet reduction requirements for other vehicles. The averaging occurs across all vehicles within an averaging set, regardless of whether they are vocational or tractors. There are three averaging sets for HD vehicles, incomplete chassis LHDVs, MHDVs, and HHDVs, respectively.31 In particular, this combines most of the tractors (excluding the share of Class 7 tractors) together with the HHD vocational vehicles to be one averaging set. This analysis did not explicitly take into account the averaging set flexibility but it is another important mechanism manufacturers have available to them to meet the standards.

31 In previous HD GHG rulemakings (i.e., Phase 1 and Phase 2), there was a forth averaging set, complete HD pickups and vans, but these vehicles are included in the proposed light- and medium-duty multi-pollutant emission standard rule.

Possible Compliance Pathways - Tractors

Similarly for tractors, several compliance pathways were modeled. We modeled 3 scenarios. The first includes almost no ZEVs, the second scenario includes 10% ZEVs for all tractor categories consistent with ACT state ZEV tractor sales being evenly distributed, and the third scenario includes 24% ZEVs for day cabs and no ZEVs for sleeper and heavy haul tractors, consistent with ZEV sales in ACT states being focused on day cabs.

[Omitted: FIGURE 5: Possible Compliance Pathways for EPA's Proposed 2032 Tractor Standards]

Figure 5 shows that additional ICEV improvements result in little to zero need for ZEVs across all of the modeled scenarios. Even under scenarios where some ZEV sales are estimated to be needed to meet the proposed Phase 3 standards, the level of ZEVs is considerably lower than what is expected to occur within ACT states even without further EPA regulation.

Conclusion

As shown above, there are many compliance pathways manufacturers can use to meet the EPA proposed standards that are less reliant on ZEVs than the scenario EPA modeled in their Proposal. Our analysis concludes that most of EPA’s Proposed Standards can be met without any ZEVs and all can be met with ZEV levels well below those that will result from HD ZEV sales in ACT states.

We welcome any questions about our analysis. [EPA-HQ-OAR-2022-0985-2700]

Organization: OLIPOP

As a significant business and employer, I write to express OLIPOP's support for ambitious Phase 3 heavy-duty vehicle standards. We believe the Environmental Protection Agency's proposal aligns well with our goals and commitments to decarbonize our supply chains and combat climate change. While OLIPOP is already advancing toward electrification, we acknowledge the collective benefit of robust federal standards that would facilitate vehicle electrification across the economy.

Strong standards promise billions in savings from health and climate costs and are essential to stimulate the availability, production volume, and variety of zero-emission cars and trucks that meet the requirements of commercial fleets, while also reducing harmful pollutants to the maximum extent possible.

Failure to enact new heavy-duty vehicle standards penalizes early adopters already investing in clean vehicles and undermines the rationale for accelerated fleet investments in clean vehicles and infrastructure. We cannot afford a slowdown in the race to build out the infrastructure needed to electrify the transportation sector, and delaying the finalization of the heavy-duty emissions standards would do just that.

It is for these reasons we joined dozens of our peers earlier this year in advocating for ambitious standards that meet the current environmental challenges. [EPA-HQ-OAR-2022-0985-2687]

On behalf of OLIPOP, I am writing to respectfully submit these comments concerning the publication by the Environmental Protection Agency (EPA) of its Phase 3 heavy-duty vehicle standards. At OLIPOP, we are committed to a green and sustainable business model. This encompasses not just our healthy soda products, but extends to our broader corporate responsibility, including our outsourced vehicle fleet and supply chain operations. We wish to express our strong support for the EPA's efforts to finalize at least the strongest proposed standards for heavy-duty vehicles. We believe this proposal aligns well with OLIPOP's commitments to electrify our shared vehicle fleet and decarbonize our overall supply chains.

OLIPOP operates extensively within the United States, employing a dedicated workforce across multiple states. Our outsourced vehicle fleet travels hundreds of thousands of miles across the country, transporting our products to various markets. We have outlined a set of ambitious goals to reduce our carbon footprint significantly over the coming years. However, we recognize that our individual efforts, while substantial, pale in comparison to the collective impact of robust federal standards that would drive vehicle electrification across companies operating in the heavy-duty vehicle transportation sector.

We have been proud supporters of the Advanced Clean Trucks (ACT) rule in California, along with the seven other states who have adopted similar standards. These policies ensure the availability of clean heavy-duty vehicles in regions where OLIPOP operates. We also appreciate the U.S.'s decision to enter the Global Memorandum of Understanding on Zero- Emission Medium-and Heavy-Duty Vehicles, which endorses 100% new zero-emission medium- and heavy-duty vehicle sales by 2040. To stay aligned with this goal, robust U.S. standards for Model Year 2027 and beyond are crucial for ensuring the increased availability and sales of zero emission vehicles (ZEV) in the U.S.

Strong Heavy-Duty Vehicle (HDV) emissions standards are vital not only for the availability of clean trucks in the U.S., but also for mitigating the economic risks associated with volatile fuel prices and reducing transportation costs. Moreover, they promise billions of dollars in savings from health and climate-related costs. Both manufacturers and fleet operators largely rely on federal policy that drives technological advancements to bridge the gap between supply and demand for zero-emission commercial vehicles. These standards are necessary to stimulate the availability, production volume, and variety of zero-emission heavy-duty vehicles that meet the requirements of commercial fleets, while also reducing harmful pollutants to the maximum extent possible.

The absence of new heavy-duty vehicle standards puts pioneers in clean vehicles at a competitive disadvantage compared to fleets that continue relying on transportation modes powered by internal combustion engines, which already have the advantage of a national network of refueling and service stations. This scenario could result in a wave of stranded assets borne by early adopters, undermining the rationale for further investment in clean vehicles and infrastructure.

Our national transportation system is intricately interconnected. While regional efforts have and will continue to propel electrification forward, a national network of charging infrastructure is essential to support and maximize the investments already made and those anticipated by the owners and operators of corporate fleets in clean vehicles and charging infrastructure.

With the backing of the Infrastructure Investment and Jobs Act, the CHIPS and Science Act, and the Inflation Reduction Act passed in the 117th Congress, the United States has the potential to lead in the clean transportation economy of the future. However, without a supportive regulatory framework, we fear the US may lag behind on the global stage. We strongly urge you to support these regulations for the sake of our climate, the health of American communities, and the wellbeing of the American economy.

Thus, on behalf of OLIPOP, I urge the EPA to adopt Phase 3 heavy-duty vehicle standards that will support ZEV adoption rates at least as strong as those proposed, and ideally consistent with those required by California's Advanced Clean Trucks rule. [EPA-HQ-OAR-2022-0987-2688]

Organization: The Moving Forward Network (MFN) et al.

We write on behalf of community and environmental justice organizations that experience the brunt of the environmental and health impacts from railyard pollution, and allied environmental organizations. Our organizations submitted a comment letter with the Moving Forward Network in strong support of the U.S. Environmental Protection Agency's (EPA) proposal to align the agency's locomotive rules with the plain text and Congressional intent behind the Clean Air Act

§ 209(e). Railyard pollution remains one of the most harmful sources of pollution in our communities, so our organizations greatly appreciate the EPA's latest interest in aligning the additional legal protections reinforcing states' rights to regulate the rail and locomotive sector. Now we are asking EPA to act expeditiously to finalize the locomotive preemption proposal by the end of October 2023.

Presently, the EPA is proposing to clarify that states and local authorities are authorized to address locomotive pollution under the Clean Air Act, consistent with how the agency views preemption for other vehicle sources. The request to finalize the decision by October is based on the urgency of the public health and environmental impacts caused by the largely unregulated freight rail and locomotive sector.

Rail pollution is a national issue with significant and deadly environmental justice impacts. The freight system remains one of the largest sources of pollution in the country, and locomotives, in particular, are responsible for a large amount of pollution in communities across the country.1 Rail pollution impacts our health, safety, and well-being.2 Bright lights, noises, and vibrations that feel like earthquakes are torturous consequences of passing trains. The effects of asthma, cardiovascular disease, and other dangerous diesel-related illnesses diminish health and quality1 of life in frontline and fenceline communities and contribute to shorter lifespans.3 Rail pollution has serious negative effects on our air quality and the climate. In fact, more than 13 million of us in the United States live and work near railyards, rail lines, and ports.4 We are forced to breathe in diesel pollution day after day. Cancer clusters in neighborhoods near railyards show the undeniable link between diesel emissions from locomotives and other railyard equipment and adverse health harms5—yet our well-being rests on outdated locomotive emission standards that no longer reflect the current state of technology. EPA's decades-old locomotive emission standards are not bringing the emissions reductions and health benefits that the agency anticipated and communities need.

1 For example, in California, locomotive emissions represent a considerable 12 percent of statewide NOx emissions, and 8 percent of statewide PM2.5 emissions. Cal. Air Res. Board, Draft In-Use Locomotive Regulation Workshop, (March 30, 2021), at 11, https://ww2.arb.ca.gov/sites/default/files/2021-03/Draft%20In-Use%20Locomotive%20Regulation%20Workshop% 20Slides%203-30-2021_0.pdf.

2 Giulia Grande et al., Association Between Cardiovascular Disease and Long-term Exposure to Air Pollution with Risk of Dementia, JAMA Neurol. 77(7), at 801-09, (July 1, 2020), https://pubmed.ncbi.nlm.nih.gov/32227140/.

3 American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023)

4 Office of Transportation and Air Quality (OTAQ), U.S. Environmental Protection Agency (EPA), Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, EPA420, pp. 2-57 (March 2008). Available at: http://www.regulations.gov/#!documentDetail;D=EPAHQ-OAR-2003-0190-0938.

5 Andrea Hricko et al., Global Trade, Local Impacts: Lessons From California on Health Impacts and Environmental Justice Concerns for Residents Living Near Freight Rail Yards, Int.J. Environ. Res. Public Health, 11(2), at 1914-41 (Feb. 2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3945577/

The agency's current approach has long stalled local and state action to protect communities from the perils of deadly locomotive pollution, so it is critical that the agency finalizes the locomotive preemption regulations separately and by the end of October.

Given that the locomotive issues present discrete and purely legal considerations involved in the Phase 3 truck proposal, the EPA should finalize this portion of the rule as expeditiously as possible in a separate Federal Register notice. The locomotive preemption proposal made up just five pages of the 236-page Notice of Proposed Rulemaking for the Phase 3 Greenhouse Gas

Emissions Standards for Heavy-Duty Vehicles, making this a distinct issue well-positioned to be finalized in October of this year.

We have lived under the veil and excessive pollution caused by this erroneous and misaligned legal interpretation by EPA. Lives could have been saved if EPA had provided the appropriate guidance. Railyard pollution continues to create an urgent public health crisis in our communities. By finalizing the locomotive preemption rule by the end of October, EPA will be fixing an issue that has had cascading consequences which have chilled efforts to constrain pollution from a reckless and heavily polluting industry.

In addition, we point the agency to MFN's letter dated June 16, 2023, which highlights the need to address locomotive pollution in order to protect the health and safety of community members, including by requiring air monitors at all railyards across the country. [EPA-HQ-OAR-0985-2678]

Organization: The Moving Forward Network (MFN)

On July 5, 2023, the California Air Resources Board signed an agreement with the Truck and Engine Manufacturers Association ("EMA") and nine of its largest manufacturers members ("OEMs") "providing certainty and stability for the [heavy-duty on-highway] industry and its customers" and "promoting the transition of the . . . industry to zero-emissions" ("CARB-EMA Agreement" or "Agreement").1 This letter requests that EPA incorporate the Agreement into the docket for EPA's proposed Greenhouse Gas Emissions Standards for Heavy-Duty Trucks–Phase 3, 88 Fed. Reg. 25926 (April 23, 2027), Docket ID No. EPA-HQ-OAR-2022-0985. The Agreement is relevant to EPA's proposed rule for the following key reasons:

1 See Attachment A (available at: https://ww2.arb.ca.gov/sites/default/files/2023-07/Final%20Agreement%20between%20CARB%20and%20EMA%202023_06_27.pdf).

1. It is feasible to electrify all trucks. In the Agreement, the OEMs commit to meeting the zero-emission sales targets in California's 2021 Advanced Clean Truck Rule, as well as the 100% zero-emission truck sales target for 2036 that California adopted as part of its Advanced Clean Fleets Rule. This means OEMs believe every type of medium- and heavy-duty truck they sell can be zero-emissions by 2036 – short-haul, long-haul, concrete mixers, RVs, coach buses, . . . everything. And zero-emissions does not include the use of hydrogen or any other type of combustion engines that might claim to be zero- carbon or carbon neutral but still emit other pollutants. Now that OEMs have legally bound themselves to electrify all trucks in California by 2036, EPA should reconsider its assessment of the Industry Commitments Alternative Proposal and acknowledge that manufacturers see no technological barriers to making every type of truck a zero- emissions truck. See NRDC v. EPA, 665 F.2d 318, 335 (D.C. Cir. 1981) ("[T]he industry's own predictions, while not determinative, support the view that success in this kind of research can realistically be expected within the proposed time frame.").

2. Infrastructure will not be a barrier. The commitment to electrify every type of new medium- and heavy-duty vehicle by 2036 is also a vote of confidence from the manufacturers that the infrastructure to support these trucks can be built out in time to make purchasers ready to go all electric. The parties to the agreement commit to "actively promote the infrastructure development needed to support the successful implementation of CARB's ACT regulation." As Moving Forward Network's (MFN) June 16, 2023 comments discussed, there are no

technological barriers to deploying infrastructure (indeed, electrification of these trucks promises to drive down rates and enhance resiliency of the grid). The challenges are planning and investment, and the solution to those challenges is the adoption of strong standards that clearly signal the need to transition to zero-emission vehicles. That clear signal will allow utilities to plan accordingly and will align public and private investments as California and the OEMs are now demonstrating.2

2 A recent example of how zero-emission vehicle mandates are driving the necessary infrastructure planning is the Electric Power Research Institute's August 7, 2023, launch of the 3-year EVs2Scale2030 initiative to ready the electric grid in support of the accelerated development of EV charging infrastructure. The initiative plans to create:

- A 50-state visualization and 2030 roadmap identifying the aggregated and anonymized electric vehicle loads, grid impacts, utility lead times, workforce requirements, and costs;
- An online platform that defines the cross-industry processes needed to support the pace of activity and investment required to meet large-scale electrification by 2030; and
- A secure data exchange platform for fleet operators and charging providers that allows energy companies to better plan and prioritize investments in grid upgrades.

Truck OEMS Daimler Truck North America, PACCAR and Volvo Group North America are collaborating in the effort along with major fleet operators including Amazon. See https://msites.epri.com/evs2scale2030

3. At a minimum, EPA must significantly increase its baseline assumptions around zero-emission vehicle sales. EPA explained in its proposal that it had failed to account for zero-emission vehicle adoption rates resulting from compliance with California's Advanced Clean Truck rule because the waiver for the California rule had only recently been granted. 81 Fed. Reg. at 25989. EPA suggests it will update its analysis to consider ACT in the final rule. The CARB-EMA Agreement means that EPA's updated analysis must also include California's 2036 100% zero-emission sales requirement. EMA and the OEMs have committed to complying with that requirement whether or not a waiver is granted. EPA's rationale for not considering compliance until EPA grants all necessary waivers is no longer reasonable, and the baseline should consider the more rapid increase in ZE truck sales that will be necessary to get to 100% ZE sales by 2036. As outlined in MFN's June 16, 2023 comments, achieving 100% ZE sales in 2035 (MFN's recommended alternative) will likely mean 2032 ZE sales will be close to 80%. EPA's baseline analysis should reflect much higher ZE sales in California even than required by ACT.

MFN knows that it is both necessary and feasible to electrify all new trucks by 2035. The CARB-EMA Agreement is further evidence that others agree and that EPA's overly conservative Phase 3 proposal reflects neither the urgency nor the opportunity of the moment. [EPA-HQ-OAR-2022-0985-2680; there is an attachment to this comment]

Organization: Walmart Inc.

Walmart's Commitment to Zero Emission Transportation

Over our 17-year history of embedding sustainability in how we do business, Walmart has harnessed the efficient operation of our best-in-class fleet to reduce our emissions footprint. Through innovating various operational practices, we previously reported that Walmart improved fuel efficiency by 11%, avoided 87,000 MTCO2e and saved $140 million in costs.1 In

2020, we announced a goal to achieve zero emissions across our operations by 2040. This means shifting our nearly 10,000 vehicle, on-road transportation fleet composed of yard trucks, day cabs, cargo vans and long-haul tractors, to zero-emissions technology. To meet the unique demands of a national logistics and distribution system, we are testing and piloting different technologies ranging from batteries to fuels, and hydrogen to renewable natural gas (RNG). For example, in January 2023, we placed our first all-electric Class 8 truck—the Freightliner eCascadia—into service in the U.S., and Walmart also has been steadily increasing the number of electric yard trucks in operation during 2023.2

1 https://corporate.walmart.com/content/dam/corporate/documents/purpose/environmental-social-and-governance- report-archive/walmart-2019-esg-report.pdf

2 https://corporate.walmart.com/purpose/esgreport/environmental/climate-change

In 2022, Walmart U.S. began deploying 1,100 Ford E-Transit electric vans and aims to complete this deployment in 2023. These vehicles are part of our growing last-mile delivery fleet.3

3 https://corporate.walmart.com/purpose/esgreport/environmental/climate-change

Specific Comments to the NPRM

EPA should take a full and robust market view in revising Phase 2 GHG standards and setting Phase 3 standards based on market conditions, cost-effectiveness, diverse stakeholder input and infrastructure needs.

In the proposed rule, EPA seeks to increase the stringency of the current Phase 2 GHG standard for MY2027 and set new standards through MY2032.

- We encourage EPA to take a full and robust view of the market demand and policy developments incentivizing growing demand for these vehicle types in MY2027 and after, and to set an appropriate regulatory signal that reflects realistic technology and infrastructure conditions, motivating action by manufacturers to meet the compliance and demand-side needs, while further driving down purchase costs.

- We recommend extending GHG credit multipliers past the CY2027 time frame to encourage further maturation of EV vehicle technology. We also recommend a ramp down of credits instead of a hard cut off to prevent a “pre-buy” spike in demand at the end of CY2027.

We believe EPA’s regulatory actions provide a valuable signal to the market that can accelerate the innovation and supply of zero and near-zero emissions vehicles to meet the demand from companies like Walmart.4 We have previously expressed high-level support for EPA’s Phase 2 GHG standards, and we support strong Phase 3 standards through MY2032 that function as a critical national standard.

4 “Here’s How Policy Can Design a Reliable and Resilient Zero Emissions Future for Transportation Fleets,” Luke McCollum, VP Supply Chain Sustainability, Walmart and Roberta Barbieri, VP Global Sustainability, PepsiCo, December 14, 2021.

- It is essential to design a Phase 3 standard that aligns climate outcomes with market and operational realities. A standard should unlock viable, emissions-reducing technology at a pace that is cost-effective and based on an independent analysis of market supply and demand conditions and projections, necessary grid and fueling infrastructure needs, and the operational realities of medium- and heavy-duty vehicle (MHDV) fleets.

Consideration of a Phase 3 Standard should align and build policy consistency nationally.

Additionally, we urge EPA to consider how a Phase 3 standard can align and build consistency across the various states that have initiated zero emissions sales standards. One national standard is ideal for national operators to help mitigate the complexity of competing policy requirements while leveraging economies of scale.

Walmart encourages EPA to collaborate with relevant state regulators and stakeholders in an effort to finalize a Phase 3 rule that sets one national standard.

Phase 3 standards should account for complementary policy actions taken across government agencies.

Robust inter-agency collaboration is critical to ensuring that incentives are aligned across the government and deliver a smooth transition to lower- and zero-emissions technologies for heavy duty vehicles.

For example, there is a concern that the additional weight of lower- and zero-emissions technologies in MHDVs will trigger weight limits that can affect payload efficiency and route optimization, which is an important short- and medium-term tool for reducing GHG emissions. Congress partially addressed this concern in 2019, when it added a 2,000-pound allowance for some technologies on federal interstate highways.5 Walmart encourages consideration of weight limitation differences and load hauling differences between near-zero and zero-emission vehicles and diesel engines.

5 https://ops.fhwa.dot.gov/freight/pol_plng_finance/policy/fastact/tswprovisions2019/index.htm#:~:text=116%2D6) %20(%22Act,segments%20of%20the%20William%20H

- It will be valuable for EPA to consult and coordinate with other key federal agencies that are adopting complementary policies to accelerate adoption of lower- and zero- emissions heavy duty vehicles and the deployment of necessary infrastructure. For example, the EPA could encourage the Internal Revenue Service to swiftly finalize guidance for the 30C tax credit for investment in near-zero and zero-emission vehicle refueling infrastructure. The guidance should maximize inclusivity for the use of this credit, and specifically, it should define “urban area” as a census tract in which no more than 10 percent of census blocks are classified as rural by the Census Bureau. This could facilitate private sector investment in zero-emission fueling infrastructure, which is a prerequisite to achieving the Phase 3 rule’s projected ZEV adoption rates.

Phase 3 Standards should signal the need for ZEV Infrastructure Investment.

We encourage EPA to send a clear signal to utility companies and utility regulators on the urgent necessity of infrastructure – including generation, transmission, and new service for charging equipment. Walmart is aware that many MHDV fleets face unduly long lead times and expensive grid upgrade costs when installing new electric service for charging equipment at MHDV depots, distribution centers, and other fueling centers.

- In comments to EPA, the Edison Electric Institute highlighted that a signal would allow utility companies to "adequately plan for the future of their generation, transmission, and distribution infrastructure." Facilitating the deployment of this infrastructure could require reforming utility policies, prioritization, cost allocation, and rates, and EPA's timely signal would be an important impetus for action. National Renewable Energy Laboratory researchers have found that charging MHDVs at depots is a flexible load capable of providing "significant potential benefits for the grid over multiple timescales and applications."6 Walmart welcomes a signal from EPA that could facilitate deployment of grid infrastructure that increases the reliability of electricity delivered to our stores and clubs.

  6 https://pubs.rsc.org/en/content/articlelanding/2022/ee/d1ee02206g ; https://www.nrel.gov/docs/fy22osti/81656.pdf

- As EPA considers changes to the draft regulation to correct for the potential for a lack of infrastructure availability, as suggested by some of the largest MHDV manufacturers, we encourage EPA to maintain the clear signal to utilities and utility regulators and to maintain the motivation for manufacturers to meet demand-side needs.

EPA should continue to update its ZEV Component Supply Chain evaluation.

Walmart appreciates that EPA assessed the readiness of the supply chain to provide the required components and battery manufacturing capacity in the draft Phase 3 Rule.

We also appreciate that EPA explicitly sought stakeholder comment and data on its initial assessment and conclusions. We encourage EPA to carefully consider the feedback it receives as it finalizes the Phase 3 regulation's stringency. As EV technology supply chains are changing rapidly, an updated assessment would be useful going forward.

Consider the use of Clean Fuels in MHD Vehicles.

Walmart is testing and learning in order to find the right recipe to reduce greenhouse gas emissions and create a less impactful transportation fleet, all while still delivering the freshest food and goods to our customers.7

7 https://corporate.walmart.com/news/2022/06/08/zero-sum-how-walmart-transportation-is-working-to-reduce- emissions-now-and-in-the-future

As part of this approach, Walmart is testing the use of alternative fuel-types with low or no carbon emissions, as well as vehicle technologies. Many of the technologies we are testing are still in an early stage.

In light of these efforts, we encourage EPA to consider the availability and use of alternative fuel-types when finalizing the Phase 3 standards, to the degree the Agency has authority to do so under the Clean Air Act. Through industry collaboration, support from policymakers, and actively testing alternative fuel-types in our transportation fleet, we hope to make a difference not only for Walmart's operations but for the industry as a whole. [EPA-HQ-OAR-2022-0985-2696]

EPA Summary and Response

Comment Summary:

Commenters from the BackBone Campaign et al and the Moving Forward Network commented on the public health and environmental need for action of EPA's proposal to revise its regulations addressing preemption of state regulation of new locomotives and new engines used in locomotives, which was included HD GHG Phase 3 NPRM. They asked EPA to "expeditiously to finalize the locomotive preemption proposal by the end of October 2023."

Response:

These comments are outside the scope of this final rule, as EPA finalized those revisions in a separate action on November 8, 2023 – for more information, please see the Final Rulemaking for Locomotives and Locomotive Engines; Preemption of State and Local Regulations. 88 FR 77004 (November 8, 2023).

Comment Summary:

Several commenters submitted additional documents on data and studies that became available after the close of the comment period. Commenters from Center for Biological Diversity et al submitted materials on heavy-duty charging infrastructure buildout and on the electric grid for expanded deployment of EV charging infrastructure. EDF submitted an analysis on the impacts of the Inflation Reduction Act "on U.S. investments in EV manufacturing and job growth," an attachment that was mistakenly omitted from one of their comments "Electric Vehicle Market Update: Manufacturer & Commercial Fleet Electrification Commitments Supporting Electric Mobility," and additional material on battery manufacturing and demand. The Moving Forward Network submitted an agreement with the California Air Resources Board and the Truck and Engine Manufacturers Association ("EMA") and nine of its largest manufacturers members in support of "ZEV adoption rates at least as strong as those proposed, and ideally consistent with those required by California's Advanced Clean Trucks rule" as well as support for the feasibility of electrification of trucks and availability of infrastructure, and a call for EPA in increase ZEVs in its analytical baseline. Walmart encouraged EPA to "take a full and robust market view in revising Phase 2 GHG standards and setting Phase 3 standards based on market conditions, cost-effectiveness, diverse stakeholder input and infrastructure needs" and called for EPA to assess "the readiness of the supply chain to provide the required components and battery manufacturing capacity."

Response:

In the development of the final standards, EPA has considered numerous wide-ranging perspectives, data and analyses submitted in support of stakeholder positions, as well as new studies and data that became available after the proposal. As a consequence, EPA believes that the technical analyses supporting the final rule are improved and more robust. For example, in our technology analysis tool (HD TRUCS, see Preamble Section II and RIA Chapter 2) we have adjusted our battery and other component cost assumptions, revised vehicle efficiency values, refined the battery sizing determination, added en-route charging, increased depot charging costs and diesel prices, added federal excise tax and state tax, increased charging equipment installation costs, included more charger sharing, and increased hydrogen fuel costs. After consideration of comment (and as EPA signaled at proposal), we also have adjusted our analytical baseline (i.e. reference case) by increasing the amount of ZEV adoption in our "no-action" scenario (i.e., without this rule) to reflect ZEV adoption required by California's ACT program, as well as further ZEV adoption in other states. See preamble Section V and RIA

Chapter 4. We also improved our analysis of infrastructure readiness and cost by including projected needed upgrades to the electricity distribution system under our modeled potential compliance pathway in our analysis. As described in Section II of this preamble, our improved analysis of charging infrastructure supports that such infrastructure will be available corresponding to the future growth of ZEV technology of the magnitude EPA is projecting in this final rule's modeled potential compliance pathway's technology packages. EPA further notes that we recognize that charging and refueling infrastructure for BEVs and FCEVs is important for success in the increasing development and adoption of those vehicle technologies (further discussed in Section II and RIA Chapters 1 and 2). There are significant efforts already underway to develop and expand heavy-duty vehicle electric charging and hydrogen refueling infrastructure. The U.S. government is making large investments through the BIL and the IRA, as discussed in more detail in RIA Chapter 1.3 (e.g., this includes a tax credit for charging or hydrogen refueling infrastructure as well as billions of additional dollars for programs that could help fund charging infrastructure if purchased alongside an electric vehicle).1049,1050 Private investments will also play a critical role in meeting future infrastructure needs, as discussed in more detail in RIA Chapter 1.6. These and many more updates described throughout Section II of the preamble and Chapters 1 through 5 of the RIA strengthen the analyses supporting the final standards. Specifically, regarding comments on the consideration of electric charging infrastructure and buildout and grid reliability, see our responses in preamble Section II, and Sections 6 and 7 of this document. Regarding comments on the consideration of IRA, battery manufacturing and demand, the feasibility of ZEVs, and consideration of the supply chain and current market in our analysis, see our responses in preamble Section II and Sections 2, 3 and 4 of this document. Regarding comments on the consideration of ZEVs in our analytical baseline (i.e. reference case), see our responses in preamble Section V, and Sections 2.4, 3 and 13 of this document.

Comment Summary:

EDF submitted comments that contained evaluation of "alternative technology pathways for manufacturers to meet the Proposed Standards" which "concludes that EPA's proposed standards for most vehicle categories can be met without any zero emission vehicles (ZEVs) and all can be met with ZEV levels well below those that will otherwise result from heavy-duty (HD) ZEV sales in states that have already adopted California's Advanced Clean Truck (ACT) program."

Response:

In this rulemaking, EPA has accounted for a wide range of emissions control technologies, including advanced ICE engine and vehicle technologies (e.g., engine, transmission, drivetrain, aerodynamics, tire rolling resistance improvements, the use of low carbon fuels like CNG and LNG, and H2-ICE), hybrid technologies (e.g., HEV and PHEV), and ZEV technologies (e.g., BEV and FCEV). These include technologies applied to motor vehicles with ICE (including hybrid powertrains) and without ICE, and a range of electrification across the technologies. The final standards do not mandate the use of a specific technology, and EPA anticipates that a compliant fleet under the standards would include a diverse range of HD motor vehicle technologies (e.g., transmission technologies, aerodynamic improvements, engine technologies,

[1049] Inflation Reduction Act, Pub. L. No. 117-169 (2022).
[1050] Bipartisan Infrastructure Law, Pub. L. No. 117-58, 135 Stat. 429 (2021).

hybrid technologies, battery electric powertrains, hydrogen fuel cell powertrains, etc.). The technologies that have played (and that the Phase 2 rule projected would play) a fundamental role in meeting the Phase 2 GHG standards will continue to play an important role going forward, as they remain among the technologies key to reducing the GHG emissions of HD vehicles powered by internal combustion engines. In our assessment that supports the appropriateness and feasibility of these final standards, we developed projected technology packages for a modeled potential compliance pathway that could be used to meet each of the final standards.1051 We have also assessed a few additional example potential compliance pathways with technology packages that are purposely different to support the feasibility of the final standards. Consistent with EDF's analysis, one example potential compliance pathway's projected technology relative to the reference case does not include ZEV technology but does include a suite of GHG-reducing technologies for vehicles with ICE ranging from: ICE improvements in engine, transmission, drivetrain, aerodynamics, and tire rolling resistance; the use of lower carbon fuels (Compressed Natural Gas (CNG) / Liquified Natural Gas (LNG)); hybrid powertrains (Hybrid Electric Vehicles (HEV) and Plug-in Hybrid Electric Vehicles (PHEV)); and hydrogen-fueled ICE (H2-ICE). These technologies either exist today or are actively being developed by manufacturers to be commercially available for MY 2027 and later, and continue to evolve to improve their CO2 emissions reductions. Details on several additional example potential technology compliance pathways we considered can be found in Preamble Section II.F.4 and RIA Chapter 2.11. Because our standards are performance-based and there are compliance flexibilities built into the ABT program, there are many variations in the exact mix of technologies manufacturers can use to meet the standards, and this mix can include technologies that EPA has not envisioned.

Comment Summary:

Commenters from the Corporate Electric Vehicle Alliance and OLIPOP expressed support for standards at least as strong as proposed and/or on par with CARB's ACT program.

Response:

Regarding comments on the consideration of standard stringency see our responses in Section 2.4 of this document.

Comment Summary:

Comments from Walmart included: a recommendation to extend GHG credit multipliers past the CY2027 time frame and a ramp down of credits, recommendations on coordination with other federal agencies, encouragement for EPA to "send a clear signal to utility companies and utility regulators on the urgent necessity of infrastructure," and encouragement for EPA to consider the availability and use of alternative fuel-types.

[1051] As further explained in Sections I and II (including II.G), EPA is required by law to assess feasibility and compliance costs of standards issued pursuant to CAA section 202(a), and thus practically must demonstrate a potential means of complying with the standards in order to do so (e.g., a potential compliance pathway's projected technology packages that manufacturers' may, but are not required, to utilize). Long-standing case law regarding EPA's CAA section 202(a) authority supports the necessity of this approach. See *NRDC v. EPA*, 655 F. 2d 321, 332 (D.C. Cir. 1981) (indicating that EPA is to state the engineering basis underlying a section 202 standard (i.e., the technology package which could be utilized to meet a standard), indicate potential impediments to that technology package's feasibility, and plausibly explain how those impediments could be resolved within the lead time afforded).

Response:

As further explained in Preamble Section III, after consideration of comment, we are retaining the existing Phase 2 advanced technology vehicle credit multipliers for PHEV, BEV, and FCEV technologies through MY 2027 (the Phase 2 sunset date), and we are limiting the period over which manufacturers can use the multiplier portion of credits earned from advanced technologies. Regarding comments on the consideration of advanced technology vehicle credits, see our responses in preamble Section III, and Section 10 of this document.

Similar comments are shared in RTC sections 6 and 7 relating specifically to charging infrastructure and grid reliability, respectively. We note in Section 2.4 of this document that these federal standards are a signal not just to the vehicle manufacturing sector, but to the utility and other sectors as well. See these sections for further details.

We emphasize that this final rule does not require use of any particular technology or technology mix, and the final standards are performance-based standards. As discussed in the preamble Section II.F and RIA Chapter 2.11, and above in this section of this document, one example potential compliance pathway's projected technologies relative to the reference case does not include ZEV technology but does include a suite of GHG-reducing technologies for vehicles with ICE ranging from: ICE improvements in engine, transmission, drivetrain, aerodynamics, and tire rolling resistance; the use of lower carbon fuels (Compressed Natural Gas (CNG) / Liquified Natural Gas (LNG)); hybrid powertrains (Hybrid Electric Vehicles (HEV) and Plug-in Hybrid Electric Vehicles (PHEV)); and hydrogen-fueled ICE (H2-ICE). Please see RTC Section 9 for a discussion about the use of other alternative fuels. See RTC Section 2 for additional response to comments on the final standards and the final standards' stringency.

Comment Summary:

Comments from Cummins included: a request for EPA to clarify acceptable field-fix approaches for SCR-related inducements on in-use vehicles, a request for clarification of whether the in-cab dash display requirements in 40 CFR 1036.110(c)(1) must be met when certifying MY 2026 engines under the credit provisions in in 40 CFR 1036.150(a)(3), and a request for clarification on acceptable alternative DEF-level inducement triggers.

Response:

In the HD2027 FRM, we indicated we would consider modifications (field-fixes) for in-use inducements. We recognize that due to hardware and software limitations, OEMs may not be able to meet HD2027 inducement requirements on existing vehicles or earlier than is required in HD2027 (i.e., through MY 2026). OEMs have indicated that due to these limitations, they can only include a single step-down in speed; further, that existing torque-derates likely need to remain (25% torque derate at the time of the fault and 40% four hours after that). Torque derates provide a strong inducement to maintain SCR systems and allow for a multiple-step inducement similar to the HD2027 inducement requirements. For prior to MY 2027 vehicles, EPA may consider strategies that keep a torque derate in place as the primary means of compelling owners to address the fault condition, and rely on speed limitations as a backstop measure by adjusting the final inducement speed to 45 mph after 35 hours. In the absence of torque derates, EPA's view for such vehicles is that lower final speeds and/or a shorter time for final inducement may be appropriate.

The ABT program requirements in 40 CFR 1036.150(a)(3) state that manufacturers can “…[g]enerate full credits by certifying any model year 2024 through 2026 engine family to meet all the requirements that apply under this part." EPA did not reopen this provision in this rulemaking such that these comments are untimely and outside the scope of this final rule. Without reopening the ABT program, we respond to the comments raised to note that the requirements in 40 CFR 1036.150(a)(3) state that all requirements that apply under part 1036 for model year 2027 need to be met in take advantage of the flexibilities in 40 CFR 1036.150(a)(3), and that inducement requirements in 40 CFR 1036.111 and OBD requirements in 40 CFR 1036.110 are requirements that apply under part 1036 where part 1036 applies.

Cummins is requesting clarification on whether the requirement in 1036.111(b)(1) can reasonably be interpreted to include a DEF-level trigger of 2.5% tank level remaining in lieu of a three-hour supply of DEF remaining. Please see section III.C.2.xv of the preamble for discussion of how we are correcting the omission of this alternative DEF level triggering condition.

Appendix A: Other Comments Received, Not Reproduced Verbatim in RTC Text

This appendix contains a list of comments that are general in nature and do not require detailed EPA response beyond provided elsewhere in this document, and/or contain opinions or statements about issues that are raised without reasonable specificity. There are 1,011 individual comments that fall into this category. The commenters are listed in Table A-3, below.

<u>EPA Summary and Response:</u>

<u>Summary:</u>

We characterize the nature of each of these comments by classifying their statements along eight dimensions (one comment may contain statements on more than one dimension). The topics are as follows:

- General support
- Want more stringent
- Oppose
- Environmental, health concerns
- Environmental Justice concerns
- Business, cost concerns
- Infrastructure, supply chain concerns
- Incentive availability

As shown in Table A-1, of the 1,011 unique non-detailed comments, only 25 comments did not include a statement on one of these 8 topics. Most of the rest, 63.4%, included statements on 3 topics.

Table A-1: Number of Topics Raised in Other Comments Received, Not Reproduced Verbatim in RTC Text

No. Issues Raised	Number of Commenters	
0	25	2.5%
1	101	9.9%
2	234	23.2%
3	640	63.4%
4	11	1.1%
Total	1,011	100.0%

As shown in Table A-2, the most commonly raised topics were statements raising concerns about the climate change and the environment (34.6%) and Environmental Justice (28.0%), or to request EPA to adopt standards more stringent than proposed (26.9%).

Table A-2: Themes Raised in Other Comments Received, Not Reproduced Verbatim in RTC Text

Theme	Number of Comments Raising Theme	
General support	44	1.7%
Want more stringent	681	26.9%
Oppose	33	1.3%
Environmental, Health	875	34.6%
Environmental Justice	711	28.1%
Business, Costs	92	3.6%
Infrastructure, Supply Chain	69	2.7%
Incentive Availability	28	1.1%
Total	2,533	100.0%

Response:

As noted above, these comments are general in nature and do not require detailed EPA response beyond provided elsewhere in this document, and/or contain opinions or statements that are raised without reasonable specificity. EPA's responses included throughout this RTC document address each of the general topics raised in these comments.

Table A-3: List of Comments Not Reproduced Verbatim in RTC

Index	Commenter Name	Dociket Document No.
1	A Benson	EPA-HQ-OAR-2022-0985-1870
2	Aaron Moulin	EPA-HQ-OAR-2022-0985-2459
3	Abby Novinska-Lois, MPH	EPA-HQ-OAR-2022-0985-1944
4	Abby Paris	EPA-HQ-OAR-2022-0985-1991
5	Abigail Siddall	EPA-HQ-OAR-2022-0985-2612
6	Adrian Dominican Sisters, Portfolio, et al.	EPA-HQ-OAR-2022-0985-1519
7	ADS-TEC Energy et al.	EPA-HQ-OAR-2022-0985-1653
8	Aggie Per	EPA-HQ-OAR-2022-0985-1974
9	Ahmed Umair	EPA-HQ-OAR-2022-0985-1700
10	Al Beltram	EPA-HQ-OAR-2022-0985-2388
11	Al Hansen	EPA-HQ-OAR-2022-0985-2236
12	Alan Solomon	EPA-HQ-OAR-2022-0985-2557
13	Alana Sheeren	EPA-HQ-OAR-2022-0985-2228
14	Alex Kalfayan	EPA-HQ-OAR-2022-0985-1942
15	Alex Weisshaus	EPA-HQ-OAR-2022-0985-2037
16	Alfred Jonas	EPA-HQ-OAR-2022-0985-1990
17	Alice Goss	EPA-HQ-OAR-2022-0985-2652
18	Alida Coughlin	EPA-HQ-OAR-2022-0985-1781
19	Allan Young	EPA-HQ-OAR-2022-0985-1907
20	Alliance of Nurses for Healthy Environments et al.	EPA-HQ-OAR-2022-0985-1569
21	Allison Garvin	EPA-HQ-OAR-2022-0985-1798
22	Alvin Davis	EPA-HQ-OAR-2022-0985-2416
23	Alyssa D. Bell	EPA-HQ-OAR-2022-0985-2055
24	Ama Ansah	EPA-HQ-OAR-2022-0985-2339
25	Amalya Sherman	EPA-HQ-OAR-2022-0985-1871
26	Amber Arbogast	EPA-HQ-OAR-2022-0985-2016
27	Amber Kaplan	EPA-HQ-OAR-2022-0985-2137
28	Amber Kaplan	EPA-HQ-OAR-2022-0985-2349
29	American College of Obstetricians and Gynecologists (ACOG)	EPA-HQ-OAR-2022-0985-1531
30	Amy Houchen	EPA-HQ-OAR-2022-0985-2183
31	Amy Sherwood	EPA-HQ-OAR-2022-0985-1883
32	Ana Juarbe	EPA-HQ-OAR-2022-0985-2262
33	Andrea Faste	EPA-HQ-OAR-2022-0985-2581
34	Andrea Wachter	EPA-HQ-OAR-2022-0985-2054
35	Andrew Ashburn	EPA-HQ-OAR-2022-0985-2529
36	Andrew Aton	EPA-HQ-OAR-2022-0985-1758
37	Andrew Feil	EPA-HQ-OAR-2022-0985-2072
38	Andrew Hartley	EPA-HQ-OAR-2022-0985-1958

39	Andy Ahmed	EPA-HQ-OAR-2022-0985-2112
40	Angel Recchia	EPA-HQ-OAR-2022-0985-1923
41	Angela Liptack	EPA-HQ-OAR-2022-0985-2108
42	Anita Sanchez	EPA-HQ-OAR-2022-0985-2118
43	Ann Bergstrom	EPA-HQ-OAR-2022-0985-2131
44	Ann Bergstrom	EPA-HQ-OAR-2022-0985-2132
45	Ann Krooth	EPA-HQ-OAR-2022-0985-2348
46	Ann Outka	EPA-HQ-OAR-2022-0985-2163
47	Ann Schubert	EPA-HQ-OAR-2022-0985-1784
48	Ann Zerkel	EPA-HQ-OAR-2022-0985-2641
49	Anne Kiley	EPA-HQ-OAR-2022-0985-2231
50	Anne Rouse	EPA-HQ-OAR-2022-0985-2012
51	Annie Capestany	EPA-HQ-OAR-2022-0985-2586
52	Annie Tomlin	EPA-HQ-OAR-2022-0985-2109
53	Anonymous public comment	EPA-HQ-OAR-2022-0985-1419
54	Anonymous public comment	EPA-HQ-OAR-2022-0985-1420
55	Anonymous public comment	EPA-HQ-OAR-2022-0985-1434
56	Anonymous public comment	EPA-HQ-OAR-2022-0985-1712
57	Anonymous public comment	EPA-HQ-OAR-2022-0985-1763
58	Anonymous public comment	EPA-HQ-OAR-2022-0985-1774
59	Anonymous public comment	EPA-HQ-OAR-2022-0985-1777
60	Anonymous public comment	EPA-HQ-OAR-2022-0985-1801
61	Anonymous public comment	EPA-HQ-OAR-2022-0985-1814
62	Anonymous public comment	EPA-HQ-OAR-2022-0985-1815
63	Anonymous public comment	EPA-HQ-OAR-2022-0985-1820
64	Anonymous public comment	EPA-HQ-OAR-2022-0985-1821
65	Anonymous public comment	EPA-HQ-OAR-2022-0985-1833
66	Anonymous public comment	EPA-HQ-OAR-2022-0985-1843
67	Anonymous public comment	EPA-HQ-OAR-2022-0985-1869
68	Anonymous public comment	EPA-HQ-OAR-2022-0985-1873
69	Anonymous public comment	EPA-HQ-OAR-2022-0985-1876
70	Anonymous public comment	EPA-HQ-OAR-2022-0985-1898
71	Anonymous public comment	EPA-HQ-OAR-2022-0985-1921
72	Anonymous public comment	EPA-HQ-OAR-2022-0985-1940
73	Anonymous public comment	EPA-HQ-OAR-2022-0985-1962
74	Anonymous public comment	EPA-HQ-OAR-2022-0985-1979
75	Anonymous public comment	EPA-HQ-OAR-2022-0985-1987
76	Ariel Hoover	EPA-HQ-OAR-2022-0985-2111
77	Arizona Department of Environmental Quality (ADEQ)	EPA-HQ-OAR-2022-0985-1496
78	Arrival	EPA-HQ-OAR-2022-0985-1441

79	Art Hanson	EPA-HQ-OAR-2022-0985-2366
80	Arthur Connick	EPA-HQ-OAR-2022-0985-1755
81	Ashley Bull	EPA-HQ-OAR-2022-0985-2180
82	Azaria Chamberlain Ricquitta Johnson	EPA-HQ-OAR-2022-0985-1806
83	Barbara Bailey	EPA-HQ-OAR-2022-0985-2075
84	Barbara Clutter	EPA-HQ-OAR-2022-0985-2146
85	Barbara Dennis	EPA-HQ-OAR-2022-0985-2628
86	Barbara Ducharme	EPA-HQ-OAR-2022-0985-2093
87	Barbara Dust	EPA-HQ-OAR-2022-0985-2386
88	Barbara Hedges-Goettl	EPA-HQ-OAR-2022-0985-1897
89	Barbara Jernée	EPA-HQ-OAR-2022-0985-1778
90	Barbara McGaffey	EPA-HQ-OAR-2022-0985-2635
91	Barbara Moore	EPA-HQ-OAR-2022-0985-2451
92	Barbara Schelstrate	EPA-HQ-OAR-2022-0985-2351
93	Barbara Smith	EPA-HQ-OAR-2022-0985-2593
94	Barbara Thiele	EPA-HQ-OAR-2022-0985-2101
95	Ben Holme	EPA-HQ-OAR-2022-0985-1693
96	Benjamin Gorman	EPA-HQ-OAR-2022-0985-2272
97	Beppie Shapiro	EPA-HQ-OAR-2022-0985-1838
98	Beth Magura	EPA-HQ-OAR-2022-0985-2278
99	Bethany Learn	EPA-HQ-OAR-2022-0985-1939
100	Bethany Pertzsch, MSN, RN	EPA-HQ-OAR-2022-0985-2006
101	Beverly Doggrell	EPA-HQ-OAR-2022-0985-2057
102	Bill Bowman	EPA-HQ-OAR-2022-0985-2498
103	Bill Carey	EPA-HQ-OAR-2022-0985-2411
104	Bill King	EPA-HQ-OAR-2022-0985-2656
105	Bill Treloar	EPA-HQ-OAR-2022-0985-2310
106	Bobbie Flowers	EPA-HQ-OAR-2022-0985-1927
107	Bonnie Simms	EPA-HQ-OAR-2022-0985-2325
108	Bonnielo Wilkins	EPA-HQ-OAR-2022-0985-2660
109	Brad Dannhaus	EPA-HQ-OAR-2022-0985-1766
110	bradley paris	EPA-HQ-OAR-2022-0985-1813
111	Bradley Schuster	EPA-HQ-OAR-2022-0985-2204
112	Brandon Burcham	EPA-HQ-OAR-2022-0985-1451
113	Brandon Lin	EPA-HQ-OAR-2022-0985-1872
114	Brandy Ingargiola	EPA-HQ-OAR-2022-0985-2520
115	Brett Robert	EPA-HQ-OAR-2022-0985-2390
116	Brian Korek	EPA-HQ-OAR-2022-0985-1984
117	Brian Lee	EPA-HQ-OAR-2022-0985-1786
118	Bridget Barker	EPA-HQ-OAR-2022-0985-2176
119	Bruce Becque	EPA-HQ-OAR-2022-0985-2441

120	Bruce Hlodnicki	EPA-HQ-OAR-2022-0985-2186
121	Bruce Madden	EPA-HQ-OAR-2022-0985-2610
122	Buck Schall	EPA-HQ-OAR-2022-0985-1718
123	Buck Schall	EPA-HQ-OAR-2022-0985-2638
124	Buzz Davis	EPA-HQ-OAR-2022-0985-1824
125	C P Saul	EPA-HQ-OAR-2022-0985-1993
126	C. Ferreira [First name unknown]	EPA-HQ-OAR-2022-0985-1909
127	Caesar Garduno	EPA-HQ-OAR-2022-0985-2423
128	Caitlin Hillyard	EPA-HQ-OAR-2022-0985-1739
129	Caleb Merendino	EPA-HQ-OAR-2022-0985-1708
130	Caleb Peters	EPA-HQ-OAR-2022-0985-1768
131	Cameron Kiersch, DNP	EPA-HQ-OAR-2022-0985-1943
132	Carl Ross	EPA-HQ-OAR-2022-0985-1834
133	Carlye Hooten	EPA-HQ-OAR-2022-0985-2097
134	Carol Bahmueller	EPA-HQ-OAR-2022-0985-1926
135	Carol Gray	EPA-HQ-OAR-2022-0985-2367
136	Carol Ring	EPA-HQ-OAR-2022-0985-2207
137	Carol Valentine	EPA-HQ-OAR-2022-0985-2140
138	Carol Voeller	EPA-HQ-OAR-2022-0985-2222
139	Carole Menninger	EPA-HQ-OAR-2022-0985-2172
140	Carole Tebay	EPA-HQ-OAR-2022-0985-1977
141	Caroline Hamlet	EPA-HQ-OAR-2022-0985-2558
142	Carolyn Bishop	EPA-HQ-OAR-2022-0985-2409
143	Carolyn Lange	EPA-HQ-OAR-2022-0985-2540
144	Carolyn Woodbury	EPA-HQ-OAR-2022-0985-1886
145	Carrie Domnitch	EPA-HQ-OAR-2022-0985-1752
146	Carrie Tilton-Jones	EPA-HQ-OAR-2022-0985-2600
147	Carroll Baltimore	EPA-HQ-OAR-2022-0985-1503
148	Catherine Cameron	EPA-HQ-OAR-2022-0985-1978
149	Catherine Nichols	EPA-HQ-OAR-2022-0985-2266
150	Catherine Rich	EPA-HQ-OAR-2022-0985-2039
151	Cathy McGuire	EPA-HQ-OAR-2022-0985-1862
152	Cathy Thornburn	EPA-HQ-OAR-2022-0985-2250
153	Cecilia Mangini	EPA-HQ-OAR-2022-0985-2094
154	Chander Sanbhi	EPA-HQ-OAR-2022-0985-1747
155	Charles Kristie	EPA-HQ-OAR-2022-0985-2664
156	Charles Stenken	EPA-HQ-OAR-2022-0985-2637
157	Charlie Cooper	EPA-HQ-OAR-2022-0985-2312
158	Charlie Loelius	EPA-HQ-OAR-2022-0985-1782
159	Charlotte Fremaux	EPA-HQ-OAR-2022-0985-2398
160	Charlotte Smith	EPA-HQ-OAR-2022-0985-2424

161	Chase Erickson	EPA-HQ-OAR-2022-0985-1679
162	Cheron Holman	EPA-HQ-OAR-2022-0985-2296
163	Cheryl Niccoli	EPA-HQ-OAR-2022-0985-2488
164	Chloe Humbert	EPA-HQ-OAR-2022-0985-2233
165	Chris Eaton	EPA-HQ-OAR-2022-0985-2654
166	Chris Ferguson	EPA-HQ-OAR-2022-0985-2368
167	Christine Barsy-Eckman	EPA-HQ-OAR-2022-0985-1879
168	Christine Frazier-Hollins	EPA-HQ-OAR-2022-0985-1703
169	Christine Grem	EPA-HQ-OAR-2022-0985-2419
170	Christine Guldi	EPA-HQ-OAR-2022-0985-1924
171	Christine Ihde	EPA-HQ-OAR-2022-0985-2564
172	Christopher Fromme	EPA-HQ-OAR-2022-0985-1936
173	Christopher Hale	EPA-HQ-OAR-2022-0985-2019
174	Christopher Jablonski	EPA-HQ-OAR-2022-0985-1702
175	Christopher Lish	EPA-HQ-OAR-2022-0985-1557
176	Claire Chang	EPA-HQ-OAR-2022-0985-2302
177	Claire Gervais	EPA-HQ-OAR-2022-0985-2177
178	Claire Moore	EPA-HQ-OAR-2022-0985-2022
179	Clara Jacobson	EPA-HQ-OAR-2022-0985-2655
180	Colleen Scotch	EPA-HQ-OAR-2022-0985-2287
181	Congregation of St. Joseph, Wheeling, WV	EPA-HQ-OAR-2022-0985-1611
182	Connie M. Jones	EPA-HQ-OAR-2022-0985-2042
183	Cori Hirai	EPA-HQ-OAR-2022-0985-1805
184	Corinne Dodge	EPA-HQ-OAR-2022-0985-1840
185	Cory Pinckard	EPA-HQ-OAR-2022-0985-1816
186	Cory Pinckard	EPA-HQ-OAR-2022-0985-2598
187	Cream City Medical Society, Healthy Climate Wisconsin, et al.	EPA-HQ-OAR-2022-0985-1589
188	Creation Justice Ministries (CJM)	EPA-HQ-OAR-2022-0985-1490
189	Cressida Wasserman	EPA-HQ-OAR-2022-0985-2616
190	Crystal Brunelli	EPA-HQ-OAR-2022-0985-2545
191	Curtis Avis	EPA-HQ-OAR-2022-0985-1761
192	Cynthia Coleman	EPA-HQ-OAR-2022-0985-1677
193	Cynthia Heinze	EPA-HQ-OAR-2022-0985-2073
194	Cynthia Stewart	EPA-HQ-OAR-2022-0985-2401
195	D Gerdeman (no first name provided)	EPA-HQ-OAR-2022-0985-2133
196	D. Burn	EPA-HQ-OAR-2022-0985-2235
197	Daniel He	EPA-HQ-OAR-2022-0985-1799
198	Darlene Rancourt	EPA-HQ-OAR-2022-0985-2503
199	Dave Hromanik	EPA-HQ-OAR-2022-0985-1479
200	David Bezanson	EPA-HQ-OAR-2022-0985-2569

201	David Brandt	EPA-HQ-OAR-2022-0985-2526
202	David Falls	EPA-HQ-OAR-2022-0985-2150
203	David Heller	EPA-HQ-OAR-2022-0985-1851
204	David Leach	EPA-HQ-OAR-2022-0985-1750
205	David Marlow	EPA-HQ-OAR-2022-0985-2270
206	David Mitchell	EPA-HQ-OAR-2022-0985-2198
207	David Moore	EPA-HQ-OAR-2022-0985-1881
208	David Sowerwine	EPA-HQ-OAR-2022-0985-2151
209	David Suzuki	EPA-HQ-OAR-2022-0985-2017
210	David Williams	EPA-HQ-OAR-2022-0985-1839
211	David Wooley	EPA-HQ-OAR-2022-0985-2116
212	Dawn Malone	EPA-HQ-OAR-2022-0985-1743
213	Dawn R. Casper	EPA-HQ-OAR-2022-0985-2360
214	Deanna Johnson	EPA-HQ-OAR-2022-0985-2139
215	Debbie McDaniel-Lindsey	EPA-HQ-OAR-2022-0985-1946
216	Debby Cohen	EPA-HQ-OAR-2022-0985-1999
217	Deborah Bieleck	EPA-HQ-OAR-2022-0985-2446
218	Deborah Bowman	EPA-HQ-OAR-2022-0985-2345
219	Deborah Narrigan	EPA-HQ-OAR-2022-0985-1832
220	Deborah Stewart	EPA-HQ-OAR-2022-0985-2343
221	Deborah Temple	EPA-HQ-OAR-2022-0985-2238
222	Deirdre Scripture-Adams	EPA-HQ-OAR-2022-0985-2106
223	Den Mark Wichar	EPA-HQ-OAR-2022-0985-1904
224	Den Mark Wichar	EPA-HQ-OAR-2022-0985-2620
225	Denise Fogel	EPA-HQ-OAR-2022-0985-2406
226	Denise Moody	EPA-HQ-OAR-2022-0985-2449
227	Denise Woods	EPA-HQ-OAR-2022-0985-1436
228	Dennis Harris	EPA-HQ-OAR-2022-0985-1694
229	DeRicki Johnson	EPA-HQ-OAR-2022-0985-2307
230	Diana Krystofiak	EPA-HQ-OAR-2022-0985-2226
231	Diane Clyne	EPA-HQ-OAR-2022-0985-1731
232	Diane Ensign	EPA-HQ-OAR-2022-0985-2363
233	Diane Golden	EPA-HQ-OAR-2022-0985-2048
234	Diane Keefe	EPA-HQ-OAR-2022-0985-2030
235	Diane Swann	EPA-HQ-OAR-2022-0985-2220
236	Diane Wallace	EPA-HQ-OAR-2022-0985-1787
237	Diane Wallace	EPA-HQ-OAR-2022-0985-1788
238	Diane Wallace	EPA-HQ-OAR-2022-0985-2323
239	Diane Wallace	EPA-HQ-OAR-2022-0985-2421
240	Diego Molina-Castrillon	EPA-HQ-OAR-2022-0985-2318
241	Don Lipmanson	EPA-HQ-OAR-2022-0985-2173

242	Donald Weigt	EPA-HQ-OAR-2022-0985-2659
243	Donna Albert	EPA-HQ-OAR-2022-0985-2100
244	Donna Fine	EPA-HQ-OAR-2022-0985-2332
245	Donna Williams	EPA-HQ-OAR-2022-0985-1884
246	Dorcas Kunkel	EPA-HQ-OAR-2022-0985-2027
247	Dorcas Smith	EPA-HQ-OAR-2022-0985-2135
248	Doreen Mahoney	EPA-HQ-OAR-2022-0985-2253
249	Dori Dietz Blitz	EPA-HQ-OAR-2022-0985-2210
250	Dorothy Rocklin	EPA-HQ-OAR-2022-0985-2316
251	Doug Stoyanoff	EPA-HQ-OAR-2022-0985-1467
252	Douglas Hylan	EPA-HQ-OAR-2022-0985-2658
253	Douglas Russell	EPA-HQ-OAR-2022-0985-2592
254	Dr. Greg Kusinski	EPA-HQ-OAR-2022-0985-1683
255	Du Ng	EPA-HQ-OAR-2022-0985-2623
256	Dusty Cordell	EPA-HQ-OAR-2022-0985-2434
257	Dylan Slayton	EPA-HQ-OAR-2022-0985-2474
258	Ed Baker	EPA-HQ-OAR-2022-0985-2556
259	Ed Carter	EPA-HQ-OAR-2022-0985-2023
260	Ed Manning	EPA-HQ-OAR-2022-0985-1880
261	Edith Alston	EPA-HQ-OAR-2022-0985-2525
262	Edward and Beatrice Simpson	EPA-HQ-OAR-2022-0985-2258
263	Edward Main	EPA-HQ-OAR-2022-0985-1949
264	Edwin Hollowell	EPA-HQ-OAR-2022-0985-2311
265	Edwina Allen	EPA-HQ-OAR-2022-0985-2470
266	Effie Caldarola	EPA-HQ-OAR-2022-0985-1895
267	Eileen Cavanaugh	EPA-HQ-OAR-2022-0985-1828
268	Elaine Brightwater	EPA-HQ-OAR-2022-0985-1723
269	Eleanor Dvorak	EPA-HQ-OAR-2022-0985-2352
270	Elias Arismendez	EPA-HQ-OAR-2022-0985-1751
271	Elise MacDonald	EPA-HQ-OAR-2022-0985-2650
272	Elizabeth B Ezerman	EPA-HQ-OAR-2022-0985-2580
273	Elizabeth Boardman	EPA-HQ-OAR-2022-0985-2209
274	Elizabeth C. Jackson	EPA-HQ-OAR-2022-0985-1469
275	Elizabeth Cerceo	EPA-HQ-OAR-2022-0985-1439
276	Elizabeth Lynch	EPA-HQ-OAR-2022-0985-2284
277	Elizabeth Mittermiller	EPA-HQ-OAR-2022-0985-2385
278	Elizabeth Pottorff	EPA-HQ-OAR-2022-0985-2018
279	Elizabeth Winthrop	EPA-HQ-OAR-2022-0985-2428
280	Ellen Ryan	EPA-HQ-OAR-2022-0985-2103
281	Elliot Robinson	EPA-HQ-OAR-2022-0985-2241
282	Emily Lydon	EPA-HQ-OAR-2022-0985-2047

283	Emily Miksic	EPA-HQ-OAR-2022-0985-2301
284	Emma Shook	EPA-HQ-OAR-2022-0985-2512
285	Eric Stoddard	EPA-HQ-OAR-2022-0985-1714
286	Erin Moore	EPA-HQ-OAR-2022-0985-2049
287	Erin Morita	EPA-HQ-OAR-2022-0985-2033
288	Erland Wittig	EPA-HQ-OAR-2022-0985-1748
289	Ernie Williams	EPA-HQ-OAR-2022-0985-2458
290	Ervin Kelman	EPA-HQ-OAR-2022-0985-2567
291	Esther Diamondstone	EPA-HQ-OAR-2022-0985-2523
292	Eugene Gorrin	EPA-HQ-OAR-2022-0985-1850
293	Eugene V. Torisky, Jr.	EPA-HQ-OAR-2022-0985-2174
294	Evangelical Environmental Network (EEN)	EPA-HQ-OAR-2022-0985-1508
295	Felix Mbuga	EPA-HQ-OAR-2022-0985-2122
296	Fernando Autrique	EPA-HQ-OAR-2022-0985-2453
297	Fran Korten	EPA-HQ-OAR-2022-0985-1730
298	Frank Franco	EPA-HQ-OAR-2022-0985-2292
299	Fred Davis	EPA-HQ-OAR-2022-0985-2597
300	Fred Dobb	EPA-HQ-OAR-2022-0985-1964
301	Frederick Davis	EPA-HQ-OAR-2022-0985-2405
302	G Siegler	EPA-HQ-OAR-2022-0985-2294
303	Gabrielle Lawrence	EPA-HQ-OAR-2022-0985-1458
304	Gabrielle Lawrence	EPA-HQ-OAR-2022-0985-1582
305	Gail Bartlett	EPA-HQ-OAR-2022-0985-2089
306	Gail Barton	EPA-HQ-OAR-2022-0985-2527
307	Gail Eastwood	EPA-HQ-OAR-2022-0985-2479
308	Gail Fitzpatrick	EPA-HQ-OAR-2022-0985-2239
309	Gail W. Reynolds	EPA-HQ-OAR-2022-0985-2050
310	Gary Bennett	EPA-HQ-OAR-2022-0985-2024
311	Gary Lee	EPA-HQ-OAR-2022-0985-2596
312	Gary M. Stewart	EPA-HQ-OAR-2022-0985-2169
313	Gary Rainville	EPA-HQ-OAR-2022-0985-2496
314	Gary Trakas	EPA-HQ-OAR-2022-0985-1855
315	Gene Mackay	EPA-HQ-OAR-2022-0985-2528
316	Gene Pistacchio	EPA-HQ-OAR-2022-0985-2552
317	Gene Robertson	EPA-HQ-OAR-2022-0985-2130
318	Genette Foster	EPA-HQ-OAR-2022-0985-2410
319	Genevieve Gavin	EPA-HQ-OAR-2022-0985-2264
320	George Blackburn	EPA-HQ-OAR-2022-0985-2280
321	George Brieger	EPA-HQ-OAR-2022-0985-1841
322	George Brieger	EPA-HQ-OAR-2022-0985-2533
323	George Burazer	EPA-HQ-OAR-2022-0985-2555

324	George Mihalovich	EPA-HQ-OAR-2022-0985-2491
325	Georgia Cotrell	EPA-HQ-OAR-2022-0985-2585
326	Georgia Morgan	EPA-HQ-OAR-2022-0985-1791
327	GL. Bender	EPA-HQ-OAR-2022-0985-1800
328	Glenn Ayres	EPA-HQ-OAR-2022-0985-2212
329	Gloria McClintock	EPA-HQ-OAR-2022-0985-2508
330	Gloria Shen	EPA-HQ-OAR-2022-0985-2420
331	Go Clemson	EPA-HQ-OAR-2022-0985-2271
332	Gordon Bourland	EPA-HQ-OAR-2022-0985-2395
333	Gordon Weller	EPA-HQ-OAR-2022-0985-2384
334	Greg Feigh	EPA-HQ-OAR-2022-0985-2634
335	Greg Hardy	EPA-HQ-OAR-2022-0985-1716
336	Gregg Linn	EPA-HQ-OAR-2022-0985-1685
337	Gretchen Peters	EPA-HQ-OAR-2022-0985-2035
338	Gretchen Schultz-Ellison	EPA-HQ-OAR-2022-0985-2305
339	Gunta Alexander	EPA-HQ-OAR-2022-0985-2196
340	Halle Morrison	EPA-HQ-OAR-2022-0985-2330
341	Hancock Mary	EPA-HQ-OAR-2022-0985-2215
342	Hannah Decker	EPA-HQ-OAR-2022-0985-2230
343	Hannah Todd	EPA-HQ-OAR-2022-0985-2662
344	Harold Uber Kellogg	EPA-HQ-OAR-2022-0985-2632
345	Heather Gray	EPA-HQ-OAR-2022-0985-2211
346	Heather Macleod	EPA-HQ-OAR-2022-0985-2021
347	Heather Stanton	EPA-HQ-OAR-2022-0985-2184
348	Heather Stevens	EPA-HQ-OAR-2022-0985-2570
349	Helena Melone	EPA-HQ-OAR-2022-0985-2608
350	Henry Atkins	EPA-HQ-OAR-2022-0985-2510
351	Henry Burwell	EPA-HQ-OAR-2022-0985-1887
352	Henry Washburn	EPA-HQ-OAR-2022-0985-2537
353	Herman Whiterabbit	EPA-HQ-OAR-2022-0985-1736
354	Herman Whiterabbit	EPA-HQ-OAR-2022-0985-2554
355	Herman Wittenbrink	EPA-HQ-OAR-2022-0985-1963
356	Hillary Hersh	EPA-HQ-OAR-2022-0985-2086
357	Hillary Hunt	EPA-HQ-OAR-2022-0985-1950
358	Hilli Passas	EPA-HQ-OAR-2022-0985-2454
359	Howard B. Hassman	EPA-HQ-OAR-2022-0985-2408
360	I. Alexakos	EPA-HQ-OAR-2022-0985-2536
361	Ian Benson	EPA-HQ-OAR-2022-0985-1779
362	Ilka Vega	EPA-HQ-OAR-2022-0985-2110
363	Inge Knudson	EPA-HQ-OAR-2022-0985-1842
364	Isabel Rathbone	EPA-HQ-OAR-2022-0985-2248

365	J R Frey	EPA-HQ-OAR-2022-0985-1933
366	Jacalyn Dean	EPA-HQ-OAR-2022-0985-2313
367	Jackie Moreau	EPA-HQ-OAR-2022-0985-2201
368	Jackie Rolfs	EPA-HQ-OAR-2022-0985-2361
369	Jacqueline Welsh	EPA-HQ-OAR-2022-0985-2171
370	Jadwiga Spiewak	EPA-HQ-OAR-2022-0985-2063
371	Jae Sabol	EPA-HQ-OAR-2022-0985-2095
372	James and Ann Lamb	EPA-HQ-OAR-2022-0985-2175
373	James Carlson	EPA-HQ-OAR-2022-0985-2476
374	James Caufield	EPA-HQ-OAR-2022-0985-1894
375	James Crosby, P.E.	EPA-HQ-OAR-2022-0985-1699
376	James Cunningham	EPA-HQ-OAR-2022-0985-2594
377	James Cutcliff	EPA-HQ-OAR-2022-0985-2340
378	James Day	EPA-HQ-OAR-2022-0985-1819
379	James DiLuzio	EPA-HQ-OAR-2022-0985-2506
380	James Freeman	EPA-HQ-OAR-2022-0985-2633
381	James Grier	EPA-HQ-OAR-2022-0985-1421
382	James Merrill	EPA-HQ-OAR-2022-0985-1885
383	James Muschalek	EPA-HQ-OAR-2022-0985-2059
384	James Parker	EPA-HQ-OAR-2022-0985-2550
385	James Smoker	EPA-HQ-OAR-2022-0985-1729
386	James Sweeney	EPA-HQ-OAR-2022-0985-2603
387	James West	EPA-HQ-OAR-2022-0985-1868
388	Jan Lapides	EPA-HQ-OAR-2022-0985-1948
389	Jan Peterson	EPA-HQ-OAR-2022-0985-2372
390	Jan Sieving	EPA-HQ-OAR-2022-0985-1956
391	Jan Wright	EPA-HQ-OAR-2022-0985-1892
392	Jane Simpson	EPA-HQ-OAR-2022-0985-2549
393	Janet Draper	EPA-HQ-OAR-2022-0985-2562
394	Janet King	EPA-HQ-OAR-2022-0985-2136
395	Janet Mardfin	EPA-HQ-OAR-2022-0985-2358
396	Janice Gintzler	EPA-HQ-OAR-2022-0985-2551
397	Janice Kubiac	EPA-HQ-OAR-2022-0985-2337
398	Jaquelyn Soto	EPA-HQ-OAR-2022-0985-1875
399	Jason Smith	EPA-HQ-OAR-2022-0985-1444
400	Jean Trygstad	EPA-HQ-OAR-2022-0985-2426
401	Jean Wynn	EPA-HQ-OAR-2022-0985-1888
402	Jeanne Zang	EPA-HQ-OAR-2022-0985-1961
403	Jeff Gahris	EPA-HQ-OAR-2022-0985-1996
404	Jeff Kronick	EPA-HQ-OAR-2022-0985-1844
405	Jefferson County Vision	EPA-HQ-OAR-2022-0985-1489

406	Jeffrey Daniels	EPA-HQ-OAR-2022-0985-2495
407	Jen Rund	EPA-HQ-OAR-2022-0985-2321
408	Jen Thilman	EPA-HQ-OAR-2022-0985-1754
409	Jennifer Barton	EPA-HQ-OAR-2022-0985-2365
410	Jennifer McMurtray	EPA-HQ-OAR-2022-0985-2644
411	Jennifer Nitz	EPA-HQ-OAR-2022-0985-2661
412	Jennifer Rentfleish	EPA-HQ-OAR-2022-0985-2331
413	Jerry Weiss	EPA-HQ-OAR-2022-0985-2507
414	Jesse More	EPA-HQ-OAR-2022-0985-2649
415	Jesse Reyes	EPA-HQ-OAR-2022-0985-2629
416	Jessica Lawrence	EPA-HQ-OAR-2022-0985-1698
417	Jessica Weaver Boose	EPA-HQ-OAR-2022-0985-2214
418	Jewish Earth Alliance	EPA-HQ-OAR-2022-0985-1501
419	Jill Seiden	EPA-HQ-OAR-2022-0985-2246
420	Jill Stephenson	EPA-HQ-OAR-2022-0985-2645
421	Jim Merkle	EPA-HQ-OAR-2022-0985-2444
422	Jim Steitz	EPA-HQ-OAR-2022-0985-2219
423	Jo Haberman	EPA-HQ-OAR-2022-0985-1930
424	Jo Niemann	EPA-HQ-OAR-2022-0985-2192
425	Jo Reichler	EPA-HQ-OAR-2022-0985-2499
426	Joan Crist	EPA-HQ-OAR-2022-0985-1975
427	Joan Lesikin	EPA-HQ-OAR-2022-0985-2213
428	Joan Milewski	EPA-HQ-OAR-2022-0985-2315
429	Joan N. Poole	EPA-HQ-OAR-2022-0985-2548
430	Joan Poole	EPA-HQ-OAR-2022-0985-2256
431	Joan Raphael	EPA-HQ-OAR-2022-0985-2599
432	Joan Walker	EPA-HQ-OAR-2022-0985-2619
433	Joanna Bishop	EPA-HQ-OAR-2022-0985-1985
434	Joe Blount	EPA-HQ-OAR-2022-0985-1760
435	Joel Kirschenstein	EPA-HQ-OAR-2022-0985-2003
436	Johanna Kovitz	EPA-HQ-OAR-2022-0985-1830
437	John Benoit	EPA-HQ-OAR-2022-0985-1986
438	John Commerford	EPA-HQ-OAR-2022-0985-2257
439	John Conway	EPA-HQ-OAR-2022-0985-2216
440	John Czachurski	EPA-HQ-OAR-2022-0985-2243
441	John Fredrickson	EPA-HQ-OAR-2022-0985-2079
442	John Hailey	EPA-HQ-OAR-2022-0985-2053
443	John Harrington	EPA-HQ-OAR-2022-0985-2299
444	John Hinnant	EPA-HQ-OAR-2022-0985-2404
445	John Kavalunas	EPA-HQ-OAR-2022-0985-1891
446	John Lent	EPA-HQ-OAR-2022-0985-1846

447	John Little	EPA-HQ-OAR-2022-0985-1687
448	John Lucas	EPA-HQ-OAR-2022-0985-2221
449	John Meyer	EPA-HQ-OAR-2022-0985-2297
450	John Noble	EPA-HQ-OAR-2022-0985-1969
451	John P Chambers	EPA-HQ-OAR-2022-0985-2281
452	John Raby	EPA-HQ-OAR-2022-0985-2245
453	John Thompson	EPA-HQ-OAR-2022-0985-2466
454	John Vanellis	EPA-HQ-OAR-2022-0985-2350
455	John Wallace	EPA-HQ-OAR-2022-0985-2522
456	Johnnie McBride	EPA-HQ-OAR-2022-0985-2418
457	Joleen Siebert	EPA-HQ-OAR-2022-0985-2105
458	Jon Sheehan	EPA-HQ-OAR-2022-0985-2375
459	Jonathan Luquette	EPA-HQ-OAR-2022-0985-1764
460	Jonathan Zimet	EPA-HQ-OAR-2022-0985-2143
461	Jordan Briskin	EPA-HQ-OAR-2022-0985-2595
462	Joseph Armstrong	EPA-HQ-OAR-2022-0985-2148
463	Joseph Connelly	EPA-HQ-OAR-2022-0985-2539
464	Joseph DeSimone	EPA-HQ-OAR-2022-0985-1967
465	Joseph L. Scheiter	EPA-HQ-OAR-2022-0985-2328
466	Joseph Palmer	EPA-HQ-OAR-2022-0985-1783
467	Joseph Scheiter	EPA-HQ-OAR-2022-0985-2336
468	Joseph Stenger	EPA-HQ-OAR-2022-0985-2052
469	Josh Wright	EPA-HQ-OAR-2022-0985-1759
470	Joshua Baxter	EPA-HQ-OAR-2022-0985-1771
471	Joshua Sherman	EPA-HQ-OAR-2022-0985-1762
472	jourdan beaumont	EPA-HQ-OAR-2022-0985-1681
473	Joyce Mercado	EPA-HQ-OAR-2022-0985-2126
474	Joyce Siegel	EPA-HQ-OAR-2022-0985-1916
475	Judith Eda	EPA-HQ-OAR-2022-0985-2589
476	Judith Mellow	EPA-HQ-OAR-2022-0985-2249
477	Judith Nicolaidis	EPA-HQ-OAR-2022-0985-2511
478	Judith Preciado	EPA-HQ-OAR-2022-0985-2430
479	Judith Swink	EPA-HQ-OAR-2022-0985-2578
480	Judith Thayer	EPA-HQ-OAR-2022-0985-2412
481	Judy Grant	EPA-HQ-OAR-2022-0985-1744
482	Judy Lukasiewicz	EPA-HQ-OAR-2022-0985-1906
483	Judy Schultz	EPA-HQ-OAR-2022-0985-2618
484	Juli Kring	EPA-HQ-OAR-2022-0985-1853
485	Juli Kring	EPA-HQ-OAR-2022-0985-1945
486	Juli Kring	EPA-HQ-OAR-2022-0985-2417
487	Julia ODonnell	EPA-HQ-OAR-2022-0985-2165

488	Julia Radwany	EPA-HQ-OAR-2022-0985-1432
489	Julie Adelson	EPA-HQ-OAR-2022-0985-2519
490	Julie Bernstein	EPA-HQ-OAR-2022-0985-2631
491	Julie Breskin	EPA-HQ-OAR-2022-0985-2288
492	Julie Carll	EPA-HQ-OAR-2022-0985-1983
493	Julie Dunn	EPA-HQ-OAR-2022-0985-2627
494	Julie Dybdahl	EPA-HQ-OAR-2022-0985-2149
495	Julie Dybdahl	EPA-HQ-OAR-2022-0985-2347
496	Julie Glover	EPA-HQ-OAR-2022-0985-2191
497	K Danowski (No first name provided)	EPA-HQ-OAR-2022-0985-2274
498	K. Danowski	EPA-HQ-OAR-2022-0985-2334
499	K. Danowski	EPA-HQ-OAR-2022-0985-2422
500	Karen Burtness Prak	EPA-HQ-OAR-2022-0985-2152
501	Karen Hig	EPA-HQ-OAR-2022-0985-2651
502	Karen Schimmer	EPA-HQ-OAR-2022-0985-2195
503	Karen Toyohara	EPA-HQ-OAR-2022-0985-2402
504	Karen Van Atta	EPA-HQ-OAR-2022-0985-2229
505	Karolyn Beebe	EPA-HQ-OAR-2022-0985-1831
506	Kate Grodd	EPA-HQ-OAR-2022-0985-2082
507	Katharine OConnell	EPA-HQ-OAR-2022-0985-2493
508	Katherine Fredricks	EPA-HQ-OAR-2022-0985-2517
509	Katherine Neubauer	EPA-HQ-OAR-2022-0985-1818
510	Katherine Scott	EPA-HQ-OAR-2022-0985-2036
511	Katherine Ziegler	EPA-HQ-OAR-2022-0985-2624
512	Kathie Westman	EPA-HQ-OAR-2022-0985-2338
513	Kathleen Dahl	EPA-HQ-OAR-2022-0985-1697
514	Kathleen Hulley	EPA-HQ-OAR-2022-0985-2263
515	Kathleen McGeeney	EPA-HQ-OAR-2022-0985-1829
516	Kathleen Murtey	EPA-HQ-OAR-2022-0985-1976
517	Kathryn Dorn	EPA-HQ-OAR-2022-0985-1941
518	Kathryn Gallicchio	EPA-HQ-OAR-2022-0985-2154
519	Kathryn Goettel	EPA-HQ-OAR-2022-0985-2113
520	Kathryn L. Giebenhain	EPA-HQ-OAR-2022-0985-2394
521	Kathy Angel	EPA-HQ-OAR-2022-0985-2168
522	Kathy D Chuparkoff	EPA-HQ-OAR-2022-0985-1911
523	Kathy Daniels	EPA-HQ-OAR-2022-0985-1740
524	Kathy Selvage	EPA-HQ-OAR-2022-0985-2085
525	Kathy Taylor	EPA-HQ-OAR-2022-0985-2065
526	Katrina Soundy	EPA-HQ-OAR-2022-0985-1692
527	Kay Ellison	EPA-HQ-OAR-2022-0985-2407
528	Kay Gorman	EPA-HQ-OAR-2022-0985-1877

529	Kelly Hoose	EPA-HQ-OAR-2022-0985-2064
530	Kelly Peterson	EPA-HQ-OAR-2022-0985-2468
531	Kelsey Keyes	EPA-HQ-OAR-2022-0985-2134
532	Ken Dolsky	EPA-HQ-OAR-2022-0985-1852
533	Ken Hippler	EPA-HQ-OAR-2022-0985-1918
534	Kennedy Abdool	EPA-HQ-OAR-2022-0985-1865
535	Kent Opal	EPA-HQ-OAR-2022-0985-1910
536	Kent Opal	EPA-HQ-OAR-2022-0985-2609
537	Kenyon Karl	EPA-HQ-OAR-2022-0985-2237
538	Kevin Scutt	EPA-HQ-OAR-2022-0985-1864
539	Kim Stone	EPA-HQ-OAR-2022-0985-1917
540	Kim Young	EPA-HQ-OAR-2022-0985-2167
541	Kimberly Cushman	EPA-HQ-OAR-2022-0985-2543
542	Kimberly Gila	EPA-HQ-OAR-2022-0985-1925
543	Kimberly Hornung-Marcy	EPA-HQ-OAR-2022-0985-1899
544	Kit Lord	EPA-HQ-OAR-2022-0985-2200
545	Krista Lohr	EPA-HQ-OAR-2022-0985-1827
546	Kristalyn Munger	EPA-HQ-OAR-2022-0985-1770
547	Kristin Cooper	EPA-HQ-OAR-2022-0985-2541
548	Kristin Park	EPA-HQ-OAR-2022-0985-2077
549	Kristina Lane	EPA-HQ-OAR-2022-0985-2587
550	Kyle McAdam	EPA-HQ-OAR-2022-0985-1711
551	Kyle McAdam	EPA-HQ-OAR-2022-0985-2383
552	L. M. Ashley	EPA-HQ-OAR-2022-0985-2244
553	Lance Ericksen	EPA-HQ-OAR-2022-0985-1696
554	Lance Hoots	EPA-HQ-OAR-2022-0985-2206
555	Lance Rubin	EPA-HQ-OAR-2022-0985-2178
556	Larry Langstaff	EPA-HQ-OAR-2022-0985-2187
557	Larry McFall	EPA-HQ-OAR-2022-0985-1837
558	Larry Olivarez	EPA-HQ-OAR-2022-0985-1953
559	Larry Olivarez II	EPA-HQ-OAR-2022-0985-1433
560	Larry Smith	EPA-HQ-OAR-2022-0985-2188
561	Laudato Si’ Advocates Program	EPA-HQ-OAR-2022-0985-1955
562	Laura Brody	EPA-HQ-OAR-2022-0985-2621
563	Laura DeStigter	EPA-HQ-OAR-2022-0985-2463
564	Laura fries	EPA-HQ-OAR-2022-0985-1857
565	Laura Haule	EPA-HQ-OAR-2022-0985-2225
566	Laura Magzis	EPA-HQ-OAR-2022-0985-2320
567	Laura Raffield	EPA-HQ-OAR-2022-0985-1675
568	Laurel Hardin	EPA-HQ-OAR-2022-0985-1861
569	Lauren Cunningham	EPA-HQ-OAR-2022-0985-2329

570	Lauren Friedman	EPA-HQ-OAR-2022-0985-2290
571	Lauren Rusk	EPA-HQ-OAR-2022-0985-2471
572	Laurie Boosahda	EPA-HQ-OAR-2022-0985-2032
573	Laurie Durocher	EPA-HQ-OAR-2022-0985-2014
574	Laurie Hidy	EPA-HQ-OAR-2022-0985-2591
575	Laurie Mann	EPA-HQ-OAR-2022-0985-1937
576	Lawrence Brown	EPA-HQ-OAR-2022-0985-2392
577	Lee C. Mitchell	EPA-HQ-OAR-2022-0985-2045
578	Lee Reinert	EPA-HQ-OAR-2022-0985-2197
579	Lee Willard	EPA-HQ-OAR-2022-0985-2273
580	Lena Nilsson	EPA-HQ-OAR-2022-0985-2357
581	Lenore Shisler	EPA-HQ-OAR-2022-0985-2625
582	Leslie Fiddler	EPA-HQ-OAR-2022-0985-2240
583	Leslie Raynor	EPA-HQ-OAR-2022-0985-2590
584	Leslie Spurling	EPA-HQ-OAR-2022-0985-2575
585	Lester Rosenzweig	EPA-HQ-OAR-2022-0985-2121
586	Li Dvorak	EPA-HQ-OAR-2022-0985-2028
587	Linda Cornejo	EPA-HQ-OAR-2022-0985-2123
588	Linda DeLap	EPA-HQ-OAR-2022-0985-1720
589	Linda Diers	EPA-HQ-OAR-2022-0985-1715
590	Linda Drey-Nightingale	EPA-HQ-OAR-2022-0985-1749
591	Linda Engle	EPA-HQ-OAR-2022-0985-2087
592	Linda Henson	EPA-HQ-OAR-2022-0985-1849
593	Linda Henson	EPA-HQ-OAR-2022-0985-2457
594	Linda Kramm	EPA-HQ-OAR-2022-0985-2071
595	Linda Little	EPA-HQ-OAR-2022-0985-2381
596	Linda Osikowicz	EPA-HQ-OAR-2022-0985-1992
597	Linda Rawles	EPA-HQ-OAR-2022-0985-2403
598	Linda Singerman	EPA-HQ-OAR-2022-0985-2088
599	Linda Weimer	EPA-HQ-OAR-2022-0985-2147
600	Linda Yow	EPA-HQ-OAR-2022-0985-2464
601	Lindy Moceus	EPA-HQ-OAR-2022-0985-2011
602	Lisa Jordan	EPA-HQ-OAR-2022-0985-2279
603	Lisa Joy	EPA-HQ-OAR-2022-0985-2317
604	Lisa Kunkel	EPA-HQ-OAR-2022-0985-2482
605	Lisa Modola	EPA-HQ-OAR-2022-0985-2370
606	Lisa Stevens	EPA-HQ-OAR-2022-0985-2443
607	Lisa Tedder	EPA-HQ-OAR-2022-0985-2391
608	Lisa Tiberio	EPA-HQ-OAR-2022-0985-1935
609	Lisa Wilhelm	EPA-HQ-OAR-2022-0985-2181
610	Lisa Wood	EPA-HQ-OAR-2022-0985-2583

611	Liz Amsden	EPA-HQ-OAR-2022-0985-2414
612	Lloyd Williams	EPA-HQ-OAR-2022-0985-2574
613	Lola Pudinski	EPA-HQ-OAR-2022-0985-2098
614	Lori Bryant	EPA-HQ-OAR-2022-0985-2639
615	Lori Stephens	EPA-HQ-OAR-2022-0985-2480
616	Louis Merlin	EPA-HQ-OAR-2022-0985-1878
617	LuAnn Glatzmaier	EPA-HQ-OAR-2022-0985-1735
618	Luke Valentine	EPA-HQ-OAR-2022-0985-2448
619	Lydia Stettler	EPA-HQ-OAR-2022-0985-2500
620	Lyle Courtsal	EPA-HQ-OAR-2022-0985-2382
621	Lynn Merrill	EPA-HQ-OAR-2022-0985-2481
622	Lynn Shannon	EPA-HQ-OAR-2022-0985-2068
623	Lynne Atherton-Dat	EPA-HQ-OAR-2022-0985-2606
624	Lynne Walters	EPA-HQ-OAR-2022-0985-2657
625	M Jennifer Chandler	EPA-HQ-OAR-2022-0985-2004
626	M. Atkinson	EPA-HQ-OAR-2022-0985-2043
627	M. Doretta Cornell	EPA-HQ-OAR-2022-0985-2199
628	Mandy Senechal	EPA-HQ-OAR-2022-0985-1914
629	Marc LeMaire	EPA-HQ-OAR-2022-0985-2553
630	Marc Okrand	EPA-HQ-OAR-2022-0985-2565
631	Marcia Edelen	EPA-HQ-OAR-2022-0985-2437
632	Marcia Haggins	EPA-HQ-OAR-2022-0985-2487
633	Margaret Christoffer	EPA-HQ-OAR-2022-0985-2489
634	Margaret Lyons	EPA-HQ-OAR-2022-0985-1734
635	Margaret Nelson	EPA-HQ-OAR-2022-0985-2431
636	Margaret Phanes	EPA-HQ-OAR-2022-0985-2333
637	Margaret Sabol	EPA-HQ-OAR-2022-0985-2275
638	Maria Pontones	EPA-HQ-OAR-2022-0985-2327
639	Marianne Grisez	EPA-HQ-OAR-2022-0985-1889
640	Marie A. Curtis	EPA-HQ-OAR-2022-0985-2643
641	MarieJo Binet	EPA-HQ-OAR-2022-0985-2161
642	Marilyn Gooch	EPA-HQ-OAR-2022-0985-1812
643	Marina Atlas	EPA-HQ-OAR-2022-0985-2322
644	Marjorie Greenfield	EPA-HQ-OAR-2022-0985-2194
645	Mark Barkan	EPA-HQ-OAR-2022-0985-2514
646	Mark Escajeda	EPA-HQ-OAR-2022-0985-2518
647	Mark Gall	EPA-HQ-OAR-2022-0985-2205
648	Mark Hamilton	EPA-HQ-OAR-2022-0985-2160
649	Mark Herranen	EPA-HQ-OAR-2022-0985-1947
650	Mark Houdashelt	EPA-HQ-OAR-2022-0985-2460
651	Mark Pezzati	EPA-HQ-OAR-2022-0985-2010

652	Marsha Bennett	EPA-HQ-OAR-2022-0985-1684
653	Marsha Epstein	EPA-HQ-OAR-2022-0985-2029
654	Martha Booz	EPA-HQ-OAR-2022-0985-1994
655	Martha Whitman	EPA-HQ-OAR-2022-0985-2314
656	Martin Darley	EPA-HQ-OAR-2022-0985-1689
657	Martin Haverly	EPA-HQ-OAR-2022-0985-1753
658	Martin Wolf	EPA-HQ-OAR-2022-0985-2203
659	Marvin Higgins	EPA-HQ-OAR-2022-0985-2559
660	Mary Alice Drain	EPA-HQ-OAR-2022-0985-2056
661	Mary Ann and Frank Graffagnino	EPA-HQ-OAR-2022-0985-1817
662	Mary Ann Smith	EPA-HQ-OAR-2022-0985-2289
663	Mary Ann Vascotto	EPA-HQ-OAR-2022-0985-2295
664	Mary Brickley	EPA-HQ-OAR-2022-0985-2304
665	Mary Cushing	EPA-HQ-OAR-2022-0985-1767
666	Mary D. Moderacki	EPA-HQ-OAR-2022-0985-2374
667	Mary E. Ross	EPA-HQ-OAR-2022-0985-2051
668	Mary Hansen	EPA-HQ-OAR-2022-0985-2080
669	Mary Higgins	EPA-HQ-OAR-2022-0985-2397
670	Mary Martin	EPA-HQ-OAR-2022-0985-1733
671	Mary Nordman	EPA-HQ-OAR-2022-0985-2020
672	Mary Stewart	EPA-HQ-OAR-2022-0985-2261
673	Mary Till	EPA-HQ-OAR-2022-0985-1959
674	Mary Waggener	EPA-HQ-OAR-2022-0985-2104
675	MaryAnn and Frank Graffagnino	EPA-HQ-OAR-2022-0985-2376
676	Maryland Department of the Environment (MDE)	EPA-HQ-OAR-2022-0985-1511
677	Marylou Rodriguez	EPA-HQ-OAR-2022-0985-1968
678	Matt Eidem	EPA-HQ-OAR-2022-0985-1988
679	Matt Marques	EPA-HQ-OAR-2022-0985-1706
680	Matthew Alschuler	EPA-HQ-OAR-2022-0985-2546
681	Matthew Gayton	EPA-HQ-OAR-2022-0985-2251
682	Matthew LeFluer	EPA-HQ-OAR-2022-0985-2344
683	Matthew Reid	EPA-HQ-OAR-2022-0985-1848
684	Matthew Rodriguez	EPA-HQ-OAR-2022-0985-1802
685	Matthew Rodriguez	EPA-HQ-OAR-2022-0985-1803
686	Maureen Kennedy	EPA-HQ-OAR-2022-0985-2521
687	Maureen Kilroy	EPA-HQ-OAR-2022-0985-2538
688	Maureen Sheahan	EPA-HQ-OAR-2022-0985-2582
689	Max Garro	EPA-HQ-OAR-2022-0985-1796
690	Max Garro	EPA-HQ-OAR-2022-0985-1804
691	Maya Pasini-Schnau	EPA-HQ-OAR-2022-0985-1808
692	Meghan Olafson	EPA-HQ-OAR-2022-0985-2630

693	Melissa Carlson	EPA-HQ-OAR-2022-0985-1726
694	Melissa Floyd	EPA-HQ-OAR-2022-0985-2067
695	Melissa Heithaus	EPA-HQ-OAR-2022-0985-2415
696	Melissa Kelley	EPA-HQ-OAR-2022-0985-1966
697	Melissa Olesen	EPA-HQ-OAR-2022-0985-1797
698	Melissa Wirsig	EPA-HQ-OAR-2022-0985-2008
699	Metropolitan Washington Air Quality Committee (MWAQC)	EPA-HQ-OAR-2022-0985-1484
700	Micah Smith	EPA-HQ-OAR-2022-0985-2400
701	Michael Cronin	EPA-HQ-OAR-2022-0985-2081
702	Michael Dodds	EPA-HQ-OAR-2022-0985-1957
703	Michael Emery	EPA-HQ-OAR-2022-0985-2389
704	Michael Gannon	EPA-HQ-OAR-2022-0985-2083
705	Michael Graham	EPA-HQ-OAR-2022-0985-2617
706	Michael Haub	EPA-HQ-OAR-2022-0985-1688
707	Michael Laird	EPA-HQ-OAR-2022-0985-1989
708	Michael Matthews	EPA-HQ-OAR-2022-0985-2413
709	Michael McClain	EPA-HQ-OAR-2022-0985-1920
710	Michael Nelson	EPA-HQ-OAR-2022-0985-2369
711	Michael Rueli	EPA-HQ-OAR-2022-0985-2515
712	Michael Schramm	EPA-HQ-OAR-2022-0985-2255
713	Michael Wichkoski	EPA-HQ-OAR-2022-0985-1866
714	Michele Drossman	EPA-HQ-OAR-2022-0985-2647
715	Michele Swenson	EPA-HQ-OAR-2022-0985-1860
716	Michelle Bilodeau-Lanne	EPA-HQ-OAR-2022-0985-2303
717	Midori Seppa	EPA-HQ-OAR-2022-0985-2091
718	Mike Azzarello	EPA-HQ-OAR-2022-0985-1775
719	Mike Knight	EPA-HQ-OAR-2022-0985-2005
720	Mike McCool	EPA-HQ-OAR-2022-0985-1717
721	Miri Hindes	EPA-HQ-OAR-2022-0985-2117
722	Miriam Berg	EPA-HQ-OAR-2022-0985-2268
723	Miriam Kennedy	EPA-HQ-OAR-2022-0985-2445
724	Mollie Hansen	EPA-HQ-OAR-2022-0985-2044
725	Mona Young	EPA-HQ-OAR-2022-0985-2571
726	Monica Cannaley	EPA-HQ-OAR-2022-0985-2119
727	Monica Steensma	EPA-HQ-OAR-2022-0985-2359
728	Monica Steensma	EPA-HQ-OAR-2022-0985-2452
729	Morgan Songi	EPA-HQ-OAR-2022-0985-2615
730	Munro Meyersburg	EPA-HQ-OAR-2022-0985-1901
731	Nadine Godwin	EPA-HQ-OAR-2022-0985-1811
732	Nadine Young	EPA-HQ-OAR-2022-0985-2128

733	Nancy Ariewitz	EPA-HQ-OAR-2022-0985-2179
734	Nancy Carleton	EPA-HQ-OAR-2022-0985-2636
735	Nancy Gault	EPA-HQ-OAR-2022-0985-2438
736	Nancy Holland	EPA-HQ-OAR-2022-0985-2114
737	Nancy Kho	EPA-HQ-OAR-2022-0985-2026
738	Nancy Power	EPA-HQ-OAR-2022-0985-1890
739	Natalie Pien	EPA-HQ-OAR-2022-0985-1676
740	Nathaniel Evans	EPA-HQ-OAR-2022-0985-1822
741	National Center for Health Research (NCHR)	EPA-HQ-OAR-2022-0985-1518
742	National Religious Partnership for the Environment	EPA-HQ-OAR-2022-0985-1997
743	National Religious Partnership for the Environment et al.	EPA-HQ-OAR-2022-0985-1524
744	National Ski Areas Association (NSAA)	EPA-HQ-OAR-2022-0985-1412
745	Neal Hadley	EPA-HQ-OAR-2022-0985-2208
746	Neal Havener	EPA-HQ-OAR-2022-0985-2501
747	New York State Common Retirement Fund (CRF)	EPA-HQ-OAR-2022-0985-1650
748	Nicholas Gonzales	EPA-HQ-OAR-2022-0985-1982
749	Nicholas Ross	EPA-HQ-OAR-2022-0985-2107
750	NicholS Herrmann	EPA-HQ-OAR-2022-0985-1790
751	Nick Keseloff	EPA-HQ-OAR-2022-0985-1965
752	Nora Pfeiffer	EPA-HQ-OAR-2022-0985-2293
753	Noreen Weeden	EPA-HQ-OAR-2022-0985-2560
754	Norm Conrad	EPA-HQ-OAR-2022-0985-2547
755	Norma Kline	EPA-HQ-OAR-2022-0985-1826
756	North Carolina Conservation Network	EPA-HQ-OAR-2022-0985-1500
757	Novella Keith	EPA-HQ-OAR-2022-0985-2532
758	P. J. Scalzo	EPA-HQ-OAR-2022-0985-1765
759	Paige Knight	EPA-HQ-OAR-2022-0985-2247
760	Pamela A. Lowry	EPA-HQ-OAR-2022-0985-2601
761	Pamela Caldwell	EPA-HQ-OAR-2022-0985-2298
762	Pamela Weaver	EPA-HQ-OAR-2022-0985-2145
763	Park Choy	EPA-HQ-OAR-2022-0985-1769
764	Pat Hyde	EPA-HQ-OAR-2022-0985-2125
765	Pat Pardun	EPA-HQ-OAR-2022-0985-2433
766	Pat Scherer	EPA-HQ-OAR-2022-0985-1919
767	Patricia Blevins	EPA-HQ-OAR-2022-0985-2646
768	Patricia Bode	EPA-HQ-OAR-2022-0985-2046
769	Patricia Bode	EPA-HQ-OAR-2022-0985-2509
770	Patricia Friedman	EPA-HQ-OAR-2022-0985-2061
771	Patricia Guthrie	EPA-HQ-OAR-2022-0985-2425
772	Patricia Long	EPA-HQ-OAR-2022-0985-2396

773	Patricia Matteson	EPA-HQ-OAR-2022-0985-2465
774	Patrick Olivier	EPA-HQ-OAR-2022-0985-1422
775	Patrick Smyth	EPA-HQ-OAR-2022-0985-1746
776	Patt Jones	EPA-HQ-OAR-2022-0985-2478
777	Paul Carlson	EPA-HQ-OAR-2022-0985-1882
778	Paul Mantsch	EPA-HQ-OAR-2022-0985-2663
779	Paul Meyers	EPA-HQ-OAR-2022-0985-2223
780	Paul Schryba	EPA-HQ-OAR-2022-0985-1847
781	Paula Whitney	EPA-HQ-OAR-2022-0985-1741
782	Peggy Adams	EPA-HQ-OAR-2022-0985-1772
783	Peggy Malone	EPA-HQ-OAR-2022-0985-2642
784	Penny Conklin	EPA-HQ-OAR-2022-0985-2477
785	Penny DiPuma	EPA-HQ-OAR-2022-0985-2300
786	Perry Kendall	EPA-HQ-OAR-2022-0985-2379
787	Perry Y (no last name provided)	EPA-HQ-OAR-2022-0985-2144
788	Peter Beves	EPA-HQ-OAR-2022-0985-1738
789	Peter Fontneau	EPA-HQ-OAR-2022-0985-2475
790	Peter Havlik	EPA-HQ-OAR-2022-0985-1710
791	Peter Heymann	EPA-HQ-OAR-2022-0985-2613
792	Peter Mortensen	EPA-HQ-OAR-2022-0985-2502
793	Peter Nardone	EPA-HQ-OAR-2022-0985-1973
794	Peter Wilkinson	EPA-HQ-OAR-2022-0985-1737
795	Phillip Carew	EPA-HQ-OAR-2022-0985-2224
796	Pilar Barranco	EPA-HQ-OAR-2022-0985-2380
797	Pippa Pearthree	EPA-HQ-OAR-2022-0985-2653
798	Preston Elrod	EPA-HQ-OAR-2022-0985-2447
799	R Reyna	EPA-HQ-OAR-2022-0985-2494
800	Rachel Beck	EPA-HQ-OAR-2022-0985-1727
801	Rachel Resnikoff	EPA-HQ-OAR-2022-0985-2561
802	Rachel Schulman	EPA-HQ-OAR-2022-0985-1859
803	Raj Chowdhary	EPA-HQ-OAR-2022-0985-2432
804	Ralph Palmer	EPA-HQ-OAR-2022-0985-2469
805	Ray Garcia	EPA-HQ-OAR-2022-0985-1704
806	Rebecca Peck	EPA-HQ-OAR-2022-0985-2364
807	Rebecca Powell	EPA-HQ-OAR-2022-0985-2062
808	Rebecca Thomas	EPA-HQ-OAR-2022-0985-2099
809	Rebecca Trujillo	EPA-HQ-OAR-2022-0985-1757
810	Rhonda Chase	EPA-HQ-OAR-2022-0985-2513
811	Richard Bradus	EPA-HQ-OAR-2022-0985-1912
812	Richard Bradus	EPA-HQ-OAR-2022-0985-2182
813	Richard Dallett	EPA-HQ-OAR-2022-0985-2084

814	Richard Fischer	EPA-HQ-OAR-2022-0985-2277
815	Richard Leigh	EPA-HQ-OAR-2022-0985-2269
816	Richard Ramirez	EPA-HQ-OAR-2022-0985-2306
817	Richard Sigler	EPA-HQ-OAR-2022-0985-2387
818	Richard Spotts	EPA-HQ-OAR-2022-0985-1854
819	Richard Spotts	EPA-HQ-OAR-2022-0985-2001
820	Rita Carter	EPA-HQ-OAR-2022-0985-1928
821	Riva Blumenfield	EPA-HQ-OAR-2022-0985-2326
822	RJ Harrington Jr.	EPA-HQ-OAR-2022-0985-2025
823	RJ Souza	EPA-HQ-OAR-2022-0985-1810
824	Rob Piccola	EPA-HQ-OAR-2022-0985-1793
825	Robert Drysdale	EPA-HQ-OAR-2022-0985-1725
826	Robert Hirsch	EPA-HQ-OAR-2022-0985-2614
827	Robert Ruzensky, Jr.	EPA-HQ-OAR-2022-0985-1707
828	Robert Szuter	EPA-HQ-OAR-2022-0985-1915
829	Robert Tucker	EPA-HQ-OAR-2022-0985-2185
830	Robert Wasilewski	EPA-HQ-OAR-2022-0985-2530
831	Robert Wegener	EPA-HQ-OAR-2022-0985-2189
832	Robert Weingart	EPA-HQ-OAR-2022-0985-1856
833	Roberta Jean Rogers	EPA-HQ-OAR-2022-0985-2162
834	Roberta Merlitti	EPA-HQ-OAR-2022-0985-1713
835	Roberta Meserve	EPA-HQ-OAR-2022-0985-2324
836	Roberta Paige	EPA-HQ-OAR-2022-0985-1922
837	Roberts James	EPA-HQ-OAR-2022-0985-2568
838	Robin Perry	EPA-HQ-OAR-2022-0985-1756
839	Robynne Limoges	EPA-HQ-OAR-2022-0985-2531
840	Rochelle Killingbeck	EPA-HQ-OAR-2022-0985-2588
841	Roe McBurnett	EPA-HQ-OAR-2022-0985-2283
842	Roger Hankey	EPA-HQ-OAR-2022-0985-2485
843	Roger Luckman	EPA-HQ-OAR-2022-0985-2341
844	Roger Martin	EPA-HQ-OAR-2022-0985-2040
845	Roger Reinicker	EPA-HQ-OAR-2022-0985-1960
846	Roger Wright	EPA-HQ-OAR-2022-0985-1728
847	Roget Zeits	EPA-HQ-OAR-2022-0985-1789
848	Romalda Allsup	EPA-HQ-OAR-2022-0985-2371
849	Rosemary Agneessens	EPA-HQ-OAR-2022-0985-2611
850	Rosemary Schmalz	EPA-HQ-OAR-2022-0985-1719
851	Ruby Bell	EPA-HQ-OAR-2022-0985-2640
852	Ruchi Stair	EPA-HQ-OAR-2022-0985-2127
853	Russ Gorsline	EPA-HQ-OAR-2022-0985-2286
854	Russ Rothman	EPA-HQ-OAR-2022-0985-2285

855	Russell Donnelly	EPA-HQ-OAR-2022-0985-2034
856	Russell Meyer	EPA-HQ-OAR-2022-0985-1512
857	Russell Vernon-Jones	EPA-HQ-OAR-2022-0985-1721
858	Ruth Charloff	EPA-HQ-OAR-2022-0985-2456
859	Ruth Crook	EPA-HQ-OAR-2022-0985-2060
860	Ruth Fishkin	EPA-HQ-OAR-2022-0985-2516
861	Ruth Jannello	EPA-HQ-OAR-2022-0985-2242
862	Ryan Dybdahl	EPA-HQ-OAR-2022-0985-2142
863	S. Linden	EPA-HQ-OAR-2022-0985-2461
864	Sally Friedman	EPA-HQ-OAR-2022-0985-2031
865	Sam Inabinet	EPA-HQ-OAR-2022-0985-2607
866	Sandra Brady	EPA-HQ-OAR-2022-0985-2504
867	Sandra George	EPA-HQ-OAR-2022-0985-1934
868	Sandra Hartzell	EPA-HQ-OAR-2022-0985-2041
869	Sandra Walker	EPA-HQ-OAR-2022-0985-2455
870	Sandra Wilmore	EPA-HQ-OAR-2022-0985-2009
871	Sandy Brown	EPA-HQ-OAR-2022-0985-2074
872	Sanna DeKovessey	EPA-HQ-OAR-2022-0985-1809
873	Sara B. Harstad	EPA-HQ-OAR-2022-0985-2353
874	Sarah Bartholomew	EPA-HQ-OAR-2022-0985-2013
875	Sarah McKee	EPA-HQ-OAR-2022-0985-2450
876	Sarah Shah	EPA-HQ-OAR-2022-0985-2190
877	Schweitzer	EPA-HQ-OAR-2022-0985-1413
878	Scott Azar	EPA-HQ-OAR-2022-0985-1701
879	Scott Baker	EPA-HQ-OAR-2022-0985-1709
880	Scott Hedrick	EPA-HQ-OAR-2022-0985-1794
881	Scott Johnson	EPA-HQ-OAR-2022-0985-2577
882	Sean Gough	EPA-HQ-OAR-2022-0985-1913
883	Seun Oyeniran	EPA-HQ-OAR-2022-0985-1695
884	Seymour Mansfield	EPA-HQ-OAR-2022-0985-1648
885	Sharon Fairbanks	EPA-HQ-OAR-2022-0985-1998
886	Sharon Morris	EPA-HQ-OAR-2022-0985-2579
887	Shauna Junco	EPA-HQ-OAR-2022-0985-2129
888	Sheila Williams	EPA-HQ-OAR-2022-0985-2309
889	Shepherd Environmental Organization	EPA-HQ-OAR-2022-0985-1475
890	Shirley Hou	EPA-HQ-OAR-2022-0985-1678
891	Sierra Club et al.	EPA-HQ-OAR-2022-0985-1636
892	Sierra Club Minnesota North Star Chapter	EPA-HQ-OAR-2022-0985-2002
893	Silent Tortoise	EPA-HQ-OAR-2022-0985-2354
894	Silvia Bunge	EPA-HQ-OAR-2022-0985-2102
895	Stacy Rauch	EPA-HQ-OAR-2022-0985-1903

896	Stacy Winnick	EPA-HQ-OAR-2022-0985-2308
897	Stamatina Podes	EPA-HQ-OAR-2022-0985-2535
898	Stan and Kiyomi Hutchings	EPA-HQ-OAR-2022-0985-2486
899	Stephanie Malady	EPA-HQ-OAR-2022-0985-2356
900	Stephanie Molnar	EPA-HQ-OAR-2022-0985-2138
901	Stephanie Wellemeyer	EPA-HQ-OAR-2022-0985-2534
902	Stephen Bredin	EPA-HQ-OAR-2022-0985-2319
903	Stephen Hawkins	EPA-HQ-OAR-2022-0985-2440
904	Stephen Houdek	EPA-HQ-OAR-2022-0985-1448
905	Stephen Lane	EPA-HQ-OAR-2022-0985-2000
906	Stephen Northcraft	EPA-HQ-OAR-2022-0985-1431
907	Steve Cichowski	EPA-HQ-OAR-2022-0985-2484
908	Steve Cochran	EPA-HQ-OAR-2022-0985-1450
909	Steven Van Auken	EPA-HQ-OAR-2022-0985-1453
910	Steven Woodbury	EPA-HQ-OAR-2022-0985-2232
911	Stirling Alexander	EPA-HQ-OAR-2022-0985-1682
912	Sue Parker	EPA-HQ-OAR-2022-0985-2069
913	Sue Stoudemire	EPA-HQ-OAR-2022-0985-2563
914	Sun Butuyan	EPA-HQ-OAR-2022-0985-2015
915	Sunil Thomas	EPA-HQ-OAR-2022-0985-1690
916	Susan Abrams	EPA-HQ-OAR-2022-0985-2605
917	Susan Coombs	EPA-HQ-OAR-2022-0985-2276
918	Susan Dieterlen	EPA-HQ-OAR-2022-0985-2164
919	Susan Donaldson	EPA-HQ-OAR-2022-0985-2573
920	Susan Lynch	EPA-HQ-OAR-2022-0985-2439
921	Susan Millar	EPA-HQ-OAR-2022-0985-2492
922	Susan Oerkvitz	EPA-HQ-OAR-2022-0985-2254
923	Susan Price	EPA-HQ-OAR-2022-0985-2436
924	Susan Purcell	EPA-HQ-OAR-2022-0985-2096
925	Suzanne Painter	EPA-HQ-OAR-2022-0985-1874
926	Suzie Kidder	EPA-HQ-OAR-2022-0985-2202
927	Sylvie Karlsda	EPA-HQ-OAR-2022-0985-2377
928	Taina Litwak	EPA-HQ-OAR-2022-0985-2234
929	Tammy A. Jantzen	EPA-HQ-OAR-2022-0985-2282
930	Tania Bukach	EPA-HQ-OAR-2022-0985-2120
931	Tanya Barlow	EPA-HQ-OAR-2022-0985-1980
932	Tarya Simo	EPA-HQ-OAR-2022-0985-2078
933	Taylor Garrett	EPA-HQ-OAR-2022-0985-1863
934	Taylor Schlacke	EPA-HQ-OAR-2022-0985-1452
935	Teresa Bessett	EPA-HQ-OAR-2022-0985-2393
936	Teresa Tillman	EPA-HQ-OAR-2022-0985-2265

937	Terri Tylo	EPA-HQ-OAR-2022-0985-2604
938	Terry Brownfield	EPA-HQ-OAR-2022-0985-2584
939	Terry Townsend	EPA-HQ-OAR-2022-0985-2092
940	Tes Welborn	EPA-HQ-OAR-2022-0985-2576
941	Theodore Soulakis	EPA-HQ-OAR-2022-0985-1835
942	Theresa Kardos	EPA-HQ-OAR-2022-0985-2335
943	Therese MacKenzie	EPA-HQ-OAR-2022-0985-2497
944	Thomas Hazelleaf	EPA-HQ-OAR-2022-0985-2602
945	Thomas Keenan	EPA-HQ-OAR-2022-0985-2070
946	Thomas Kessler	EPA-HQ-OAR-2022-0985-2483
947	Thomas Klopf	EPA-HQ-OAR-2022-0985-1705
948	Thomas Mader	EPA-HQ-OAR-2022-0985-2505
949	Thomas Seaman	EPA-HQ-OAR-2022-0985-1825
950	Tim Bardell	EPA-HQ-OAR-2022-0985-2622
951	Tim Holmes	EPA-HQ-OAR-2022-0985-1724
952	Tim Sunlake	EPA-HQ-OAR-2022-0985-2355
953	Timothy Barker	EPA-HQ-OAR-2022-0985-2442
954	Timothy Bybee	EPA-HQ-OAR-2022-0985-2267
955	Timothy Close	EPA-HQ-OAR-2022-0985-2058
956	Tina Grosowsky	EPA-HQ-OAR-2022-0985-2342
957	Todd Saunders	EPA-HQ-OAR-2022-0985-1792
958	Todd Snyder	EPA-HQ-OAR-2022-0985-1858
959	Tom Byrnes	EPA-HQ-OAR-2022-0985-2435
960	Tom Ragouzis	EPA-HQ-OAR-2022-0985-2566
961	Tom Steinmetz	EPA-HQ-OAR-2022-0985-2346
962	Tom Sunlake	EPA-HQ-OAR-2022-0985-2373
963	Tori Coto	EPA-HQ-OAR-2022-0985-2090
964	Tracey Bonner	EPA-HQ-OAR-2022-0985-1780
965	Tracy Heart	EPA-HQ-OAR-2022-0985-1908
966	Tracy Heart	EPA-HQ-OAR-2022-0985-2542
967	Tracy Patch	EPA-HQ-OAR-2022-0985-2124
968	Tria Shaffer	EPA-HQ-OAR-2022-0985-1931
969	Trudie Atkinson	EPA-HQ-OAR-2022-0985-1732
970	U.S. Conference of Catholic Bishops (USCCB)	EPA-HQ-OAR-2022-0985-1952
971	U.S. Representative Harriet M. Hageman	EPA-HQ-OAR-2022-0985-2667
972	United States Climate Alliance	EPA-HQ-OAR-2022-0985-1504
973	United Women in Faith	EPA-HQ-OAR-2022-0985-1929
974	Ursula Cohrs	EPA-HQ-OAR-2022-0985-1972
975	Vanessa Jones	EPA-HQ-OAR-2022-0985-2166
976	Vasu Murti	EPA-HQ-OAR-2022-0985-1776
977	Vasu Murti	EPA-HQ-OAR-2022-0985-1902

978	Vasu Murti	EPA-HQ-OAR-2022-0985-2472
979	Vicki Bynum	EPA-HQ-OAR-2022-0985-2490
980	Vicki Madden	EPA-HQ-OAR-2022-0985-1795
981	Victor Kordish	EPA-HQ-OAR-2022-0985-2227
982	Violeta Fuduric	EPA-HQ-OAR-2022-0985-1742
983	Virginia Fox	EPA-HQ-OAR-2022-0985-2170
984	Virginia Harris	EPA-HQ-OAR-2022-0985-2076
985	Virginia Lawson	EPA-HQ-OAR-2022-0985-2217
986	Virginia Lawson	EPA-HQ-OAR-2022-0985-2218
987	Virginia Lee	EPA-HQ-OAR-2022-0985-2378
988	Ward McCartney	EPA-HQ-OAR-2022-0985-2524
989	Washington State Department of Ecology	EPA-HQ-OAR-2022-0985-1476
990	Wayne Carson	EPA-HQ-OAR-2022-0985-1845
991	Wayne Mickletz	EPA-HQ-OAR-2022-0985-1938
992	Wayne Olson	EPA-HQ-OAR-2022-0985-2648
993	Wayne Teel	EPA-HQ-OAR-2022-0985-1893
994	Wayne Umbertis	EPA-HQ-OAR-2022-0985-2066
995	Wendy Alberg	EPA-HQ-OAR-2022-0985-2141
996	Wendy Beck Von Peccoz	EPA-HQ-OAR-2022-0985-2362
997	Wendy Lott	EPA-HQ-OAR-2022-0985-2572
998	Wendy Way	EPA-HQ-OAR-2022-0985-2115
999	West Virginia Electric Auto Association (WVEAA)	EPA-HQ-OAR-2022-0985-1474
1000	William Cline	EPA-HQ-OAR-2022-0985-2626
1001	William Houston	EPA-HQ-OAR-2022-0985-2038
1002	William Huggins	EPA-HQ-OAR-2022-0985-2544
1003	William James	EPA-HQ-OAR-2022-0985-1680
1004	William Kriege	EPA-HQ-OAR-2022-0985-1722
1005	William Sasso	EPA-HQ-OAR-2022-0985-2399
1006	William Schreier	EPA-HQ-OAR-2022-0985-2291
1007	Willie Moses Boone	EPA-HQ-OAR-2022-0985-1745
1008	Wisconsin Department of Natural Resources (WDNR)	EPA-HQ-OAR-2022-0985-1483
1009	Wisconsin Medical Society	EPA-HQ-OAR-2022-0985-1513
1010	Yvonne Smith	EPA-HQ-OAR-2022-0985-1905
1011	Zoe Poteet	EPA-HQ-OAR-2022-0985-2467

Appendix B: List of Mass Comment Campaigns

EPA received 29 mass mail campaigns commenting on the proposal, representing 170,563 signatures. These mass comment campaigns are in the form of either a cover letter with many signatures; individual letters that are identical, or nearly identical; or a cover note with a spreadsheet containing many individual comments. The mass mail campaigns are listed in Table B-1, organized by the sponsoring organization (if known), along with the number of signatures. Also reproduced verbatim below is the docketed example of each mass mail campaign or one excerpt from the associated spreadsheet or attachments.

<u>EPA Summary and Response:</u>

<u>Summary:</u>

Many of these mass mail campaigns are supportive of EPA's proposed program or request EPA to issue more stringent standards to address climate change and other environmental issues, as well as Environmental Justice concerns. Some, however, raise concerns about potential adverse impacts of the rule.

<u>Response:</u>

The mass mail campaign comments, reproduced verbatim below, are general in nature and do not require detailed EPA response beyond provided elsewhere in this document, and/or contain opinions or statements that are raised without reasonable specificity. EPA's responses included throughout this RTC document address each of the general topics raised in these comments. Interested readers should refer to Sections 2 of this RTC document for stringency of the standards, Sections 6 through 8 for infrastructure and electric grid concerns, section 12 for costs, Section 13 through 16 for emission impacts, climate, health, and environmental impacts, and Section 18 for Environmental Justice concerns.

Table B-1: List of Mass Comment Campaigns

Index	Document ID	Sponsoring Organization	Number of Signatures
1	EPA-HQ-OAR-2022-0985-1546	Alliance of Nurses for Healthy Environments. (web)	85
2	EPA-HQ-OAR-2022-0985-1539	American Lung Association (ALA). (web)	1,290
3	EPA-HQ-OAR-2022-0985-1544	Climate Action Campaign. (web)	5,891
4	EPA-HQ-OAR-2022-0985-1540 (duplicate at -2155)	Defend Our Future. (web)	756
5	EPA-HQ-OAR-2022-0985-1480	E2 Business Leaders. (web)	124
6	EPA-HQ-OAR-2022-0985-1951	EDF Action. (paper)	144

7	EPA-HQ-OAR-2022-0985-1538	Evangelical Environmental Network (EEN). (web)	21,675
8	EPA-HQ-OAR-2022-0985-1494	Evergreen Collaborative. (web)	7,280
9	EPA-HQ-OAR-2022-0985-1495	Interfaith Power & Light. (web)	220
10	EPA-HQ-OAR-2022-0985-1536	Interfaith Power & Light. (web)	148
11	EPA-HQ-OAR-2022-0985-1537	National Religious Partnership for the Environment. (web)	11,425
12	EPA-HQ-OAR-2022-0985-1542	Natural Resources Defense Council (NRDC). (web)	16,369
13	EPA-HQ-OAR-2022-0985-1548	Organization unknown. (web)	25
14	EPA-HQ-OAR-2022-0985-1666	Organization unknown. (web)	1,642
15	EPA-HQ-OAR-2022-0985-1667	Organization unknown. (web)	44,603
16	EPA-HQ-OAR-2022-0985-1668	Organization unknown. (web)	4,755
17	EPA-HQ-OAR-2022-0985-1669	Organization unknown. (web)	168
18	EPA-HQ-OAR-2022-0985-1670	Organization unknown. (web)	1,150
19	EPA-HQ-OAR-2022-0985-1671	Organization unknown. (web)	2,346
20	EPA-HQ-OAR-2022-0985-1672	Organization unknown. (web)	240
21	EPA-HQ-OAR-2022-0985-1673	Organization unknown. (web)	2,782
22	EPA-HQ-OAR-2022-0985-1674	Organization unknown. (web)	20
23	EPA-HQ-OAR-2022-0985-2156	Organization unknown. (web)	15,032
24	EPA-HQ-OAR-2022-0985-2157	Organization unknown. (web)	20
25	EPA-HQ-OAR-2022-0985-2158	Organization unknown. (web)	938
26	EPA-HQ-OAR-2022-0985-2159	Organization unknown. (web)	1,345
27	EPA-HQ-OAR-2022-0985-1547	Sierra Club. (web)	21,693
28	EPA-HQ-OAR-2022-0985-1545	The Climate Reality Project. (web)	7,367
29	EPA-HQ-OAR-2022-0985-1543	Union of Concerned Scientists. (web)	1,030

Comments by Organization:

Mass Comment Campaign sponsored by Alliance of Nurses for Healthy Environments. (web) (85 signatures)

The transportation sector is the largest source of greenhouse gasses in the United States, making up nearly 30% of our country's emissions. Emissions from passenger vehicles and trucks pollute the air we breathe causing adverse health impacts and contributing to the increasingly urgent issue of climate change. Nurses applaud EPA for finalizing robust clean car standards through model year 2026 and for taking the important next steps to finalize stricter clean car and truck standards through model year 2027.

It is critical that EPA finalize the strongest possible clean car and truck standards to drive a rapid transition to zero emissions vehicles. Numerous studies show that poor health outcomes and higher incidences of chronic conditions, like asthma, lung disease, and cancer, are linked to tailpipe pollution from passenger vehicles. In 2020, the national passenger vehicle fleet represented approximately 94 percent of the nation's on-road vehicles and generated over one million tons of ozone- and particle-forming NOx emissions, and over 33,400 tons of fine particles annually. Further, freight truck pollution harms especially those who live near highways, ports, freight hubs and other high traffic areas. We know that clean car standards are the most effective policy to reduce dangerous air pollution and protect public health nationwide.

Climate change poses serious threats to the health and lives of all Americans, especially children, older adults, low-wealth communities, communities of color and people living with chronic diseases. When poor air quality due to vehicle emissions coincides with climate-related risks, such as extreme heat or ground-level ozone, adverse health effects are further amplified.

By finalizing the strongest possible clean car standards for cars and trucks, EPA will help the communities, who often are more exposed to air pollution and the hardest hit by effects of climate change and will align with the Biden Administration's environmental justice goals.

The Biden Administration has an opportunity to protect public health and fight the climate crisis with strong long-term clean cars standards. As we transition nationwide to zero-emission vehicles, we urge EPA to move swiftly to enact the strongest possible long-term standards for light-, medium-, and heavy-duty trucks to clean our air, keep Americans healthy, and combat the climate crisis. [EPA-HQ-OAR-2022-0985-1546]

Mass Comment Campaign sponsored by American Lung Association (ALA). (web) (1,290 signatures)

We urge the U.S. Environmental Protection Agency to finalize strong emissions standards for heavy-duty, light-duty and medium-duty vehicles this year. These emissions standards are critical for addressing climate change, improving public health and promoting environmental justice.

We appreciate your proposal to strengthen greenhouse gas emissions limits for new heavy-duty vehicles. We urge you to ensure that they are finalized this year, as new diesel trucks have long lifespans on our roads. We also urge you to make the final rule even stronger than the proposal. The final standards should be at least as stringent as the state-level Advanced Clean Trucks program currently in place in many states.

We also appreciate your proposal to strengthen limits on greenhouse gases and other air pollutants for new light-duty and medium-duty vehicles in Model Years 2027-2032. We call on you to ensure these standards for all pollutants are finalized this year as well. We appreciate that in the proposal, you included alternative levels, and urge you to build off Alternative 1 – the most stringent option – in the final rule. This alternative will yield the most health benefits from pollution reductions.

Emissions from vehicles powered by gasoline and diesel pose immediate harm to health. In the heavy-duty vehicle sector, pollution from diesel-powered trucks and buses drive health harms including asthma attacks, heart attacks and strokes, and premature death. Seventy-two million people are estimated to live near truck freight routes, and they are more likely to be people of color and with lower incomes.

Pollution from light- and medium-duty vehicles powered by gasoline and diesel, like passenger cars, SUVs, pickup trucks and package delivery vans, also harms public health and is driving climate change. Particulate matter can cause immediate health harm, including respiratory and cardiovascular disease and even premature death.

Transportation is the single biggest source of greenhouse gas emissions in the U.S. and transitioning to zero-emission cars is a critical part of addressing climate change. Climate change is a health emergency, leading to more frequent and intense extreme weather events like flooding, excessive heat, drought, and wildfires; longer and more intense allergy seasons; increased risks from water-borne and vector-borne diseases like Lyme Disease; and worsening air quality.

Stronger limits on emissions from cars, vans, buses and trucks will help drive a nationwide transition to zero-emission vehicles, which is crucial for not only addressing climate change, but also for improving public health and equity. [EPA-HQ-OAR-2022-0985-1539]

Mass Comment Campaign sponsored by Climate Action Campaign. (web) (5,891 signatures)

We applaud you and the Biden Administration for taking a strong step forward to address heavy duty vehicle pollution driving climate change. However, EPA needs to move quickly and finalize the strongest possible cleaner truck standards to address the climate crisis by the end of the year.

Greenhouse gas emissions contribute to climate change, which threatens the health and well-being of all Americans, affecting everything from the air we breathe to the places we live. Extreme weather events caused by climate change create more air and water pollution, destabilize food sources, and put our homes and lives at risk.

The US's adoption of strong, effective standards to reduce tailpipe emissions from trucks, buses, and other heavy-duty vehicles is exactly what we need to clean up one of the dirtiest sources of pollution in the state. This will protect the health of our planet and the health of our people.

These proposed standards for heavy-duty vehicles need to be at least the strongest of the alternatives proposed by the EPA already, if not stronger. The final rule must require tighter limits on diesel vehicle pollution generally so that we're making diesel trucks increasingly cleaner as manufacturers transition to zero pollution vehicles.

Thank you! [EPA-HQ-OAR-2022-0985-1544]

Mass Comment Campaign sponsored by Defend Our Future. (web) (756 signatures)

Enclosed you will find the names of 756 individuals who commented on your proposed regulations to establish emissions standards for heavy-duty vehicles such as delivery trucks, garbage trucks, day/sleeper cabs, and school/transit buses. These standards aim to reduce greenhouse gas emissions starting in model year 2027. The rule sets vehicle emission standards for new heavy-duty trucks and buses.

The signers below agree that:

I'm writing today to ask you to take an important step to protect communities who live near roads, highways, ports, distribution centers and freight depots making them particularly vulnerable to tailpipe pollution from heavy-duty vehicles.

I am writing to ask you to do more to prioritize environmental justice and adopt the strongest possible pollution standards for heavy-duty vehicles!

As you may know, the transportation sector is responsible for more greenhouse gas (GHG) emissions than any other sector in the U.S. in 2020, accounting for 27% of total emissions. Heavy-duty vehicles make up a slim majority (10%) of all traffic on our roads, yet they produce more than half the pollution.

This public health crisis contributes to deadly particulate and ozone pollution that affects frontline and vulnerable communities that live near highways, ports, and other high-traffic areas.

By enacting strong clean car standards for the model year 2027 and beyond, the EPA can further its commitment to environmental justice. Issuing stronger and longer-term clean car standards will help address vital transportation-related impacts. Frontline communities often experience disproportionate harm from dirty vehicle pollution, leading to increased asthma and other respiratory illnesses. These communities are also often closest to highways and bear the greatest burden from vehicle pollution.

It’s time for the Environmental Protection Agency to set the strongest passenger vehicle emissions standards possible to protect our air and public health. You can make a difference by leaving a public comment supporting EPA’s history-making vehicle standards.

Thank you for taking climate action with us! [EPA-HQ-OAR-2022-0985-1540; duplicate, same signatures, EPA-HQ-OAR-2022-0985-2155]

Mass Comment Campaign sponsored by E2 Business Leaders. (web) (124 signatures)

As business leaders and supporters of E2, we are writing to urge you to ensure that both the medium/light duty and heavy-duty vehicle emission standards are as strong as possible.

Specifically, we believe that it is vital the Environmental Protection Agency (EPA):

1. Quickly finalize a standard for Light and Medium-duty vehicles that achieves at least a 75% reduction in greenhouse gas emissions by model year 2030.

2. Finalize Heavy Duty Vehicle/clean truck standards by the end of 2023 that puts the

nation on a path to all new heavy-duty vehicle sales being zero emissions by 2035.

E2 is a national, nonpartisan group of more than 11,000 business leaders, investors, and professionals from every sector of the economy. Our members have founded or funded more than 2,500 companies, created more than 600,000 jobs and manage more than $100 billion in venture and private equity capital.

We recognize and appreciate that this administration has driven incredible and unprecedented federal clean energy investments across a broad range of sectors including vehicles. E2 has been proud to actively support key components of your agenda including the passage of the Inflation Reduction Act, the Infrastructure Investment and Jobs Act and the Chips and Science Act.

As businesspeople from a broad cross-section of the economy, we value these investments and are seeing, firsthand, the positive benefits. However, we also recognize that without strong light/medium and heavy-duty vehicle emission standards, the U.S. risks ceding global economic leadership to other nations and regions such as Asia, Europe or India. These global competitors have plans in place advancing their transition to zero-emission vehicles in the coming decades.

As of September 2022, automakers and battery manufacturers worldwide will spend more than $626 billion through 2030 to develop new electric cars, passenger trucks, freight trucks and buses. That is a $110 billion increase from projections in April of 2022.

To be globally competitive, the US must accelerate the rate that our auto sector is transitioning to clean vehicles. Strong EPA standards will provide the clear market certainty needed to support commitments that are already being made by many in the industry and will provide regulatory support to ensure those commitments are met.

Furthermore, many of our businesses are trying to lower emissions in our supply chains and lower costs for our consumers. Most businesses are dependent on third party delivery truck operators. Stronger vehicle emissions standards will drive the availability of lower emission, lower cost, options in a way that businesses with small market-share cannot.

Strengthening tailpipe emissions and advancing a transition to zero-emission vehicles is a win for America and all those looking to protect public health, spur job creation, economic growth, as well as family and business cost savings.

Please redouble your efforts to ensure that the very strongest light-, medium-, and heavy-duty vehicle emission standards are finalized this year. Doing so will allow us to tackle the climate crisis and address air pollution. It will also allow us to fully leverage the recent federal clean energy investments and historic investments from Congress, accelerate the vehicle sector's shift to a zero-emission future, increase U.S. global competitiveness, save consumers money, and create good American jobs.

Thank you and please let us know how we can help to get this done. [EPA-HQ-OAR-2022-0985-1480]

Mass Comment Campaign sponsored by EDF Action. (paper) (144 signatures)

RE: Docket ID No. EPA-HQ-OAR-2022-0985

I am writing to express my support for the strongest possible science-based standards to limit medium and heavy-duty vehicle emissions. The transportation sector is the leading source of climate pollution in the US. The climate crisis is harming our families and our communities today, and vehicle emissions are a major contributor.

ERA's primary proposal reflects a conservative assessment of ZEV deployment in the coming years. The agency can and should further strengthen final standards in a manner that would help to deliver nationwide levels of ZEVs consistent with the Advanced Clean Trucks rule. It is especially important that ERA strengthen standards for key segments, including tractor trailers and school buses.

I implore the EPA to seek standards that achieve the greatest emissions reductions feasible, as early as possible, to put us on the path to zero emissions from new vehicles in 2035. [EPA-HQ-OAR-2022-0985-1951]

Mass Comment Campaign sponsored by Evangelical Environmental Network (EEN). (web) (21,675 signatures)

As pro-life evangelicals, we want every child to reach their God-given potential and be born healthy and unhindered by the ravages of pollution. However, traffic pollution from heavy duty trucks like tractor trailers robs children of their health and lives. Medical research finds that diesel fumes, soot (PM2.5), and other toxins emitted by heavy duty trucks cause lung cancer, heart disease, asthma in children and adults, and preterm birth. The American Lung Association estimates that cutting heavy duty truck pollution can prevent 66,800 premature deaths and 1.75 million asthma attacks.

As pro-life Christians, we're calling on the EPA to set stronger standards for heavy duty truck pollution. We urge the EPA to prioritize the health of children by setting the strongest possible heavy duty truck standards. The standards EPA sets must put us on a trajectory to achieve 100 percent zero-emission truck sales by 2035. Our children deserve nothing less. [EPA-HQ-OAR-2022-0985-1538]

Mass Comment Campaign sponsored by Evergreen Collaborative. (web) (7,280 signatures)

Thank you for proposing new climate pollution standards on medium- and heavy-duty trucks (Clean Truck Standards). As someone concerned about preserving a safe climate for our families and communities, I urge EPA to strengthen these standards to better reflect the available technologies that will lead to the greatest emissions reductions.

It is important that this standard is technology neutral to allow manufacturers to have flexibility, but ultimately zero-emissions vehicles present the most promising path to achieving critical emissions reductions. Accordingly, EPA should identify a path to zero-emissions medium- and heavy-duty vehicles, which this proposal does not do. Under this proposal, long-haul tractors would only need to achieve 10 percent electrification by 2030. Meanwhile, over a dozen states have already committed to achieving a 30 percent transition of heavy-duty vehicles by 2030. In addition, six states are committed to California‚Äôs more ambitious and more protective standards.

Manufacturers have consistently expressed that having one standard to work towards is better than having standards with varying levels of vehicle transition ambition. Because California‚Äôs Advanced Clean Trucks rule takes effect next year, and the states that have adopted the rule make up 20 percent of the national medium- and heavy-duty market, it follows that EPA should strengthen the proposed clean truck rule to better align with the Advanced Clean Trucks Rule. For the benefit of manufacturers, fleet owners and the health of communities living near high truck traffic areas, EPA must carve out a path that aligns with the level of ambition expressed by the manufacturer's commitments.

In addition to strengthening the medium- and heavy-duty vehicle standards, EPA should move forward with allowing states to regulate the emissions of locomotives within their borders. I hope to see EPA take further steps to regulate freight emissions, and give states control over the regulation of these sources of pollution.

We urgently need standards that fight climate pollution while reducing dangerous air pollution and protecting public health.

Please move quickly to finalize the strongest possible Clean Truck Standards. [EPA -HQ-OAR-2022-0985-1494]

Mass Comment Campaign sponsored by Interfaith Power & Light. (web) (220 signatures)

As faith leaders from diverse religious and spiritual traditions, we speak with one voice in support of bold and just climate solutions. Climate change is a moral issue that is most harmful to those least responsible for creating the problem. People of faith and conscience recognize the need for bold, new transportation solutions, and clean trucks and buses are an integral step towards addressing the climate crisis. Today we write to ask you to move swiftly to enact robust heavy-duty vehicle greenhouse gas emissions standards. As a nation, we have a moral imperative to enact the most stringent heavy-duty vehicle standards in order to address our historically unsafe carbon emissions and to protect our public health and Shared Home.

Transportation is currently the single largest source of climate pollution in the United States. And while trucks and buses account for a very small portion of vehicles on the road, they create a disproportionate amount of harmful greenhouse gas pollution. Setting robust longer-term standards will put American trucks and buses on a clear path towards 100% zero-emission vehicle sales by 2035 and help us reach our nation’s climate goals.

It is critical to remember that the climate crisis is a challenge of racial, economic, and generational justice, and these rules target air pollution that disproportionately harms marginalized communities of color and low-wealth communities that reside in counties closest to major freeways and trucking corridors. Implementing the strongest heavy-duty vehicle standards is a matter of environmental justice, and these standards would deliver massive emission reductions and life-saving relief to frontline communities.

In addition, electrifying medium- and heavy-duty trucks will be key to improving air quality and saving lives across the nation. More than 119 million American residents currently live in areas with unhealthy levels of air pollution. In particular, diesel exhaust contains more than 40 known cancer-causing organic substances. It is of the utmost importance that standards require tighter limits on diesel vehicles in order to continually make diesel trucks cleaner as manufacturers transition to zero-emission vehicles.

Now is the time to maximize the impact of our national clean truck standards—the most effective policy that the federal government has to reduce dangerous air pollution, lower greenhouse gas emissions, and save fleets money at the pump. As policymakers, you have acritical and sacred role in helping to achieve these goals. As faith leaders, we urge you to establish strong heavy-duty vehicle greenhouse gas standards that put our nation on a trajectory to a zero-emissions transportation future, and we ask you to redouble efforts to announce the draft rule before the end of 2023. For more than a decade, people of faith and conscience have advocated for strong safeguards on greenhouse gas pollution from transportation. Since then, the climate crisis has only accelerated, taking an enormous toll on human life, our communities, and our world. We have a moral responsibility to act right now as a nation to do all we can to address climate change for our communities, future generations, and our Sacred Earth. [EPA-HQ-OAR-2022-0985-1495]

Mass Comment Campaign sponsored by Interfaith Power & Light. (web) (148 signatures)

As a person of faith and conscience, I recognize that we have a moral obligation to cut carbon emissions that harm our Shared Home. People of faith and conscience are ready for bold, new transportation solutions, and cleaner trucks are an integral step towards addressing climate change for our communities, future generations, and our Sacred Earth.

I am asking EPA to move quickly and finalize the strongest possible heavy-duty vehicle standards. Federal and manufacturer investments and state Advanced Clean Trucks adoption all support more stringent standards than what has been initially proposed. Therefore, these standards need to be at least the strongest of the alternatives proposed by EPA.

While trucks and buses account for a very small portion of vehicles on the road, they create a disproportionate amount of climate pollution. Heavy-duty vehicles are the fastest-growing source of climate emissions and truck miles traveled are projected to grow rapidly in the coming years. Not implementing the strongest possible heavy-duty vehicle standards would create major negative implications for our country’s climate goals.

We also must keep in mind that these rules target air pollution that disproportionately harms marginalized communities of color and low-wealth communities that reside closest to major freeways and trucking corridors. Implementing the strongest HDV standards is a matter of environmental justice, and these standards would deliver massive emission reductions and life-saving relief to frontline communities. In addition, electrifying medium- and heavy-duty trucks will be key to improving air quality and saving lives across the nation. More than 119 million American residents currently live in areas with unhealthy levels of air pollution. It is the duty of the EPA to protect the health of all American residents from the detrimental impacts of air pollution.

Again, I urge the EPA to move quickly and finalize the strongest possible heavy-duty vehicle standards in order to reap the benefits of heavy-duty vehicle electrification and accelerate the transition to zero-emission vehicles.

Thank you for this opportunity to comment. [EPA-HQ-OAR-2022-0985-1536]

Mass Comment Campaign sponsored by National Religious Partnership for the Environment. (web) (11,425 signatures)

As Black church leaders we care about stewarding God's creation, protecting human health and working towards a more just and equity world. We know first-hand the impacts that pollution has on the health and wellbeing of our communities.

Transportation is the largest contributor to climate change in the U.S. And, communities of color, which too often are dissected by highways and transportation depots, carry a higher pollution burden from vehicle pollution. We face 24 percent higher exposures to air pollution from vehicles than whites. It is clear that Black communities are paying the price for transportation choices.

Trucks and buses, which only account for 4 percent of vehicles on the road, produce nearly 25 percent of the transportation sectors greenhouse gases. The trucking industry is a leading source of deadly pollution and has an outsized impact climate impact. Air pollution, coupled with the consequences of climate change, is crippling communities of color.

Reducing diesel emissions would not only address climate change but significantly reduce pollution in our communities. The Environmental Protection Agency has an opportunity to stand against the injustice of pollution and climate change by enacting the strongest possible heavy duty truck standards. The standards EPA sets should achieve 100 percent zero-emission truck sales by 2035, which would be at a pace that would deliver much needed health benefits to communities of color. [EPA-HQ-OAR-2022-0985-1537]

Mass Comment Campaign sponsored by Natural Resources Defense Council (NRDC). (web) (16,369 signatures)

Thank you for recently proposing new vehicle standards. I ask you to finalize the strongest possible standards to reduce pollution and help ensure the transition toward zero-emission vehicles.

Transportation accounts for the largest share of climate pollution in the U.S. and is also a major source of other harmful pollutants that significantly impact public health, causing deadly diseases such as asthma, heart problems, and cancer.

Cleaner vehicles are a winner all around. They help clean up the air, deliver savings on fuel, support domestic job creation, and protect the climate.

Please finalize strong vehicle standards that would do the following:

- A strong EPA standard for cars, SUVs, pickup trucks, and cargo vans should be finalized by the end of the year and must lead to significant reductions in carbon emissions by being at least as strong as the most stringent alternative in the agency's proposal.

- A strong EPA standard for big, dirty diesel trucks and buses must be finalized by the end of the year, must put us on a trajectory to zero emissions by 2035, and must be significantly stronger than the most stringent alternative in the agency's proposal.

- A strong DOT fuel economy standard for cars, SUVs, pickup trucks, and cargo vans would reduce gasoline consumption and help combat the climate crisis.

- A strong DOT fuel efficiency standard for big trucks and buses would reduce diesel fuel use and help protect communities.

Thank you. [EPA-HQ-OAR-2022-0985-1542]

Mass Comment Campaign sponsoring organization unknown. (web) (25 signatures)

I'm writing to urge the EPA to enact the strongest possible pollution safeguards on greenhouse gas emissions from heavy-duty vehicles to protect public health. The agency's current proposal is a good start, but federal and manufacturer investments and state policies like the Advanced Clean Trucks rule all support the EPA enacting more stringent pollution limits than the current proposal.

Implementing the strongest possible limits on greenhouse gas emissions from heavy-duty vehicles will help limit climate change and dramatically improve public health. The American Lung Association estimates that if fleets move towards zero-emission trucks by 2050, we could have $735 billion in public health benefits due to cleaner air, 66,800 fewer premature deaths, 1.75 million fewer asthma attacks, and 8.5 million fewer lost workdays.

Cutting air pollution is an issue of environmental justice and health equity. Asian-American, Black, and Latinx communities are being disproportionately burdened with air pollution from vehicles. Respectively, they face 34%, 24%, and 23%, higher exposures when compared with their white counterparts. In addition, 45 percent of residents in counties with high truck traffic are people of color, compared to 38.4% of the total U.S. population. The strongest possible pollution safeguards on heavy-duty vehicles would deliver massive emission reductions and life-saving relief to frontline communities.

While trucks and buses account for only 4 percent of vehicles on the road, they are responsible for more than 25 percent of total transportation sector greenhouse gas emissions. Emissions from trucks are the fastest growing source of greenhouse gas emissions, and the number of truck miles traveled on the nation's roads is forecast to increase significantly in the coming decades.

Greenhouse gas emissions accelerate climate change, which poses a serious threat to Americans' health and well-being, affecting everything from the air we breathe to the places we live. Extreme weather events worsened by climate change create more air and water pollution, destabilize food sources, and put our homes and lives at risk.

I ask that the EPA move quickly to finalize these safeguards by the end of the year. There is no time to lose. The EPA has the opportunity–and responsibility–to deploy the strongest possible safeguards to clean up deadly truck pollution, limit catastrophic climate change, and improve public health. Thank you for the opportunity to provide input. [EPA-HQ-OAR-2022-0985-1548]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (1,642 signatures)

As a 40+ year oilfield employee, I'm writing to express my concern about the new proposed EPA emissions rules on light and medium-duty vehicles and heavy-duty trucks. The EPA's recent proposals to effectively require up to 60% heavy-duty and 70% light and medium-duty vehicles sales by 2032 to be "zero emission" is very concerning to me. Among other defects, the proposals fail to consider lifecycle emissions and overlooks the potential for internal combustion vehicles and liquid fuels, such as biofuels, to continue improving and reducing carbon intensity.

Specifically, I have the following concerns with the proposals:

- Limits consumer choice and increases cost: The proposals may limit choices and increase costs for consumers, including those in economically disadvantaged groups.

- Potentially affects U.S. energy security and use of biofuels: These proposals do not address the potential for biofuel to be used to create energy security benefits.

- Provides potentially a too optimistic forecast for EV Sales: Projected EV sales rates may be optimistic and may overstate the benefits of the proposals.

- The lack of infrastructure for EVs: Increased sales of EVs may rely on optimistic forecasts of increased electricity generation and charging infrastructure.

- The lack of critical materials: There is concern about the supply and availability of critical minerals and supply chains for battery manufacturing.

- Provides no incentivizes for existing vehicles to reduce GHG emissions: This is a missed opportunity to accelerate GHG reduction in the early years of the program.

- Fails to consider electric Vehicles are not zero emissions: The proposals are focused on tailpipe GHG emissions rather than life cycle emissions.

Note that the US is the only country approaching greenhouse emission reductions agreed to in Kyoto Protocols. This reduction is primarily from replacing coal with natural gas for electric power generation. Europe ended up going back to coal for power generation recently due to reduced availability of natural gas from Russia. Encouragement of (or at least no discouragement of) natural gas production will keep us on this path of greenhouse gas reduction.

The EPA is not acknowledging how these proposals would trade our hard-earned U.S. energy security for mineral dependence on China. It is not in our strategic interest to ban cars that run on fuels extracted, refined, and grown in the United States, especially considering all the work that is being done here to lower the carbon intensity of those fuels. To do so would leave us more dependent on and beholden to China and I don't think the EPA is the entity that should be making such critical economic and geopolitical decisions.

The EPA's proposals take the misguided position that only emissions from the vehicle tailpipes are worth counting. In doing so, the proposals do not consider internal combustion engine vehicles as a factor in lowering carbon right now using existing technologies. Consumers should have the greatest number of choices to meet their needs and budget. The final standards need to take a tech and fuel neutral approach.

Therefore, I ask that you do not support the new proposed EPA emissions rules on light and medium-duty vehicles and heavy-duty trucks. [EPA-HQ-OAR-2022-0985-1666]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (44,603 signatures)

I am a supporter of the League of Conservation Voters, and I am writing to ask that the EPA set the strongest rules possible to cut dangerous pollution from trucks and passenger vehicles. I urge you to ensure that light-, medium-, and heavy-duty vehicle standards accelerate greater zero-emission vehicle adoption, pushing beyond what is expected from federal clean energy investments.

Emissions from cars and trucks both contribute to climate change and impact my health and the health of communities across the country. Low-wealth communities and communities of color are often hit hardest, as are any neighborhoods near highways, freight hubs and anywhere with lots of traffic. These communities deserve a chance to live in a society where access to clean air is a fundamental right.

We encourage you to finalize the strongest standards possible that will open the door to a brighter future for all. Please adopt strong vehicle emissions standards that bring us to 100% clean vehicles sold by 2035.Or else help us all to buy an electric vehicle, because those things are expensive! [EPA-HQ-OAR-2022-0985-1667]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (4,755 signatures)

Thank you for taking this step to address heavy-duty vehicle pollution that threatens public health and drives climate change. I urge EPA to- create the strongest possible limits on heavy-duty vehicle pollution- protect communities and- address the climate crisis.

Our neighborhoods are full of heavy duty vehicles that spew dangerous emissions and are major contributors to “diesel death zones,” areas where asthma rates and cancer risks are elevated due to vehicle pollution. Tailpipe pollution causes tens of thousands of premature deaths nationwide each year, especially in communities of color. Disproportionate exposure of Black and Brown communities to diesel pollution is a clear example of environmental racism. Strong standards would deliver massive emission reductions and life-saving relief to frontline communities and the public in general.

Air pollution from heavy-duty vehicles is a major threat to our climate. Greenhouse gas emissions contribute to climate change, which endangers the health and well-being of all Americans, affecting everything from the air we breathe to the places we live. Extreme weather events caused by climate change create more air and water pollution, destabilize food sources, and put our homes and lives at risk.

The US’s adoption of strong, effective standards to reduce tailpipe emissions from trucks, buses, and other heavy-duty vehicles is exactly what we need to clean up one of the dirtiest sources of pollution in the country. This will protect the health of our planet and communities.

These proposed standards for heavy-duty vehicles need to be at least the strongest of the alternatives proposed by the EPA, if not stronger. The final rule must require tighter limits on diesel vehicle pollution generally so that we’re making diesel trucks increasingly cleaner as manufacturers transition to zero-emission vehicles.

May you do ONLY that which is truly best for the environment and the vast majority of people living in America as well as its territories and possessions, and causes those people as little harm as humanly possible.

Thank you for reading my comments and prayer. [EPA-HQ-OAR-2022-0985-1668]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (168 signatures)

The Supreme Court and other partisan republicans are successfully doing their best to undo any efforts the US has made to preserve the planet, its animals and human health. I just read yesterday about the earth having reached or surpassed the tipping point of global warming, with temperatures the earth hasn't seen in 100,000 years.

I am writing to request that U.S. Environmental Protection Agency's (USEPA) enact the strongest standards possible for the proposed Phase 3 Greenhouse Gas Rule for heavy duty trucks (Docket NumberEPA-HQ-OAR-2022-0985). This rule should go further than currently proposed in setting new emission limits as well as promoting a faster transition to zero emission heavy duty vehicles.

Please support the following additional improvements:

* The most stringent option in the proposal only sets a 50% by 2032 sales goal for zero emission vehicle(ZEV). The USEPA should require 100% zero emission sales by 2035 in the final rule. Based on proven ZEV heavy duty truck technologies that already exist, commercially viable and rapidly emerging on the market, both industry and states including New Jersey are setting higher projection numbers of ZEVs on the road. The USEPA should lead, not follow behind.

* The USEPA should adopt a rule that does not just set a broad-based ZEV truck conversion goal, but guarantee mandatory emission reductions, prioritize funding and convert zero emission heavy duty vehicles faster and with greater intensity in communities already overburdened by multitudes of pollution and corresponding harms. Priority setting should be done in coordination with environmental justice communities and frontline workers.

* Establish a scrapping program to prevent the re-sale, migration and increased density of dirty diesel heavy duty vehicles in already overburdened, largely BIPOC and low-income communities where goods movement is concentrated.

* Prioritize zero emission freight conversions for Class 7 and 8 heavy duty trucks, particularly short-haul drayage. These are some of the oldest and most polluting trucks in our state. Their activity and impact are concentrated in port adjacent and fence-line communities, as well as along routes to warehouses and distribution centers.

* Conduct environmental justice and public health analysis to ensure systems are in place to protect our most vulnerable and neighborhoods chronically exposed to heavy duty diesel emissions.

* Develop a multi-pollutant standard that regulates not just greenhouse gases, but also nitrogen oxides(NOx) and particulate matter (PM), etc. This approach would help prevent false solutions like natural gas from being considered a "zero emission" option which it is not.

Thank you for your consideration. [EPA-HQ-OAR-2022-0985-1669]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (1,150 signatures)

As a parent, I am writing to urge you to move quickly to finalize the strongest possible standards for climate pollution from heavy-duty trucks and buses.

The transportation sector is the largest source of climate pollution in the US, and cleaning up this pollution is one of the most important things we can do to fight climate change and protect our childrens future.

Not only does tailpipe pollution contribute to the climate crisis, but it can also harm the health of our families and communities. Exposure to diesel pollution from heavy-duty trucks can cause premature death, heart attacks, respiratory and cardiovascular illnesses, aggravated asthma, and decreased lung function. Clean truck standards are a critical tool to fight climate change, and they help reduce dangerous air pollution. They help protect public health nationwide.

Our families want to see a rapid transition to zero-emitting heavy-duty vehicles, and we urgently need cleaner air for our children and our communities. Please move quickly to finalize the strongest possible greenhouse gas emission standards for heavy-duty trucks, consistent with the Advanced Clean Trucks Rule.

As an add to this include pick up (car) street trucks that are modified to be loud and blow black smoke. and fines for any companies that do that. [EPA-HQ-OAR-2022-0985-1670]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (2,346 signatures)

As a person of faith and conscience, I recognize that we have a moral as well as existential obligation to cut carbon emissions that harm the Earth (our only home) and all Beings. We must do this not just for our own health and survival, but for that of our children, grandchildren, and all species on this planet. People of faith and conscience are ready for bold, new transportation solutions, and cleaner trucks are an integral step towards addressing climate change for our communities, future generations, and our Sacred Earth.

I am asking EPA to move quickly and finalize the strongest possible heavy-duty vehicle standards. Federal and manufacturer investments and state Advanced Clean Trucks adoption all support more stringent standards than what has been initially proposed. Therefore, these standards need to be at least the strongest of the alternatives proposed by EPA.

While trucks and buses account for a very small portion of vehicles on the road, they create a disproportionate amount of climate pollution. Heavy-duty vehicles are the fastest-growing source of climate emissions and truck miles traveled are projected to grow rapidly in the coming years. Not implementing the strongest possible heavy-duty vehicle standards would create major negative implications for our country’s climate goals.

We also must keep in mind that these rules target air pollution that disproportionately harms marginalized communities of color and low-wealth communities that reside closest to major freeways and trucking corridors. Implementing the strongest HDV standards is a matter of environmental justice, and these standards would deliver massive emission reductions and life-saving relief to frontline communities.

In addition, electrifying medium- and heavy-duty trucks will be key to improving air quality and saving lives across the nation. More than 119 million American residents currently live in areas with unhealthy levels of air pollution. It is the duty of the EPA to protect the health of all American residents from the detrimental impacts of air pollution.

Again, I urge the EPA to move quickly and finalize the strongest possible heavy-duty vehicle standards in order to reap the benefits of heavy-duty vehicle electrification and accelerate the transition to zero-emission vehicles.

Thank you for this opportunity to comment. [EPA-HQ-OAR-2022-0985-1671]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (240 signatures)

We applaud you and the Biden Administration for taking a strong step forward to address heavy-duty vehicle pollution driving climate change. However, EPA needs to move quickly and finalize the strongest possible cleaner truck standards to address the climate crisis by the end of the year.

Greenhouse gas emissions contribute to climate change, which threatens the health and well-being of all Americans, affecting everything from the air we breathe to the places we live. Extreme weather events caused by climate change create more air and water pollution, destabilize food sources, and put our homes and lives at risk.

The US’s adoption of strong, effective standards to reduce tailpipe emissions from trucks, buses, and other heavy-duty vehicles is exactly what we need to clean up one of the dirtiest sources of pollution in the state. This will protect the health of our planet and the health of our people.

These proposed standards for heavy-duty vehicles need to be at least the strongest of the alternatives proposed by the EPA already, if not stronger. The final rule must require tighter limits on diesel vehicle pollution to make diesel trucks increasingly cleaner as manufacturers transition to zero-pollution vehicles. [EPA-HQ-OAR-2022-0985-1672]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (2,782 signatures)

As someone who loves and cares about our national parks, I know that the clock is ticking for us to curb climate pollution. We need bold climate action now.

With the transportation sector now the largest source of climate-altering greenhouse gas pollution in the U.S., the U.S. Environmental Protection Agency (EPA) must put us on a clear path to make all on-road vehicles zero emissions as soon as possible.

Vehicle pollution harms the health and well-being of individuals, affects ecosystems and visibility in our treasured national parks, and exacerbates the global climate crisis. EPAs proposals to reduce greenhouse gas emissions from light, medium, and heavy-duty vehicles will provide our communities with cleaner air and can prevent the worst effects of climate change.

For this reason, I urge EPA to move forward quickly with ambitious new rules for on-road vehicles. Specific to EPAs clean cars proposal, I ask that you implement the stronger Alternative 1. For EPAs clean trucks proposal, more must be done sooner, and EPA should follow the lead of states that have already committed to 100 percent zero-emission truck sales by no later than 2045.

Following significant investments in the Inflation Reduction Act to support transportation electrification, now is the time for aggressive action to tackle vehicle emissions and deliver cleaner air and a livable climate for our communities and national parks. [EPA-HQ-OAR-2022-0985-1673]

Mass Comment Campaign sponsoring organization unknown. Sample attached (web) (20 signatures)

I am a concerned citizen in the community concerned with both public health and climate change. I care about environmental justice and human rights and this is an important issue. I have noticed air quality alerts more often due to wildfires and this is yet another part of picture concerning climate change.

I'm writing to urge the EPA to enact the strongest possible pollution safeguards on greenhouse gas emissions from heavy-duty vehicles to protect public health. The agency's current proposal is a good start, but federal and manufacturer investments and state policies like the Advanced Clean Trucks rule all support the EPA enacting more stringent pollution limits than the current proposal.

Implementing the strongest possible limits on greenhouse gas emissions from heavy-duty vehicles will help limit climate change and dramatically improve public health. The American Lung Association estimates that if fleets move towards zero-emission trucks by 2050, we could have $735 billion in public health benefits due to cleaner air, 66,800 fewer premature deaths, 1.75 million fewer asthma attacks, and8.5 million fewer lost workdays.

Cutting air pollution is an issue of environmental justice and health equity. Asian-American, Black, and Latinx communities are being disproportionately burdened with air pollution from vehicles. Respectively, they face 34%, 24%, and 23%, higher exposures when compared with their white counterparts. In addition, 45 percent of residents in counties with high truck traffic are people of color, compared to38.4% of the total U.S. population. The strongest possible pollution safeguards on heavy-duty vehicles would deliver massive emission reductions and life-saving relief to frontline communities.

While trucks and buses account for only 4 percent of vehicles on the road, they are responsible for more than 25 percent of total transportation sector greenhouse gas emissions. Emissions from trucks are the fastest growing source of greenhouse gas emissions, and the number of truck miles traveled on the nation's roads is forecast to increase significantly in the coming decades.

Greenhouse gas emissions accelerate climate change, which poses a serious threat to Americans' health and well-being, affecting everything from the air we breathe to the places we live. Extreme weather events worsened by climate change create more air and water pollution, destabilize food sources, and put our homes and lives at risk.

I ask that the EPA move quickly to finalize these safeguards by the end of the year. There is no time to lose. The EPA has the opportunity–and responsibility–to deploy the strongest possible safeguards to cleanup deadly truck pollution, limit catastrophic climate change, and improve public health.

Thank you for the opportunity to provide input. [EPA-HQ-OAR-2022-0985-1674]

Mass Comment Campaign sponsoring organization unknown. Sample attached (email) (15,032 signatures)

I am pleased that the EPA is taking important steps to address global warming pollution from trucks. This effort is long overdue. But the heavy-duty vehicle standard needs to do much more to put us on a path to eliminate all tailpipe emissions from new vehicles by 2035.

I am concerned that Black, Asian America, and Latin American communities and other marginalized communities living in high traffic areas have suffered the health impacts of diesel trucks for far too long. Now is the time to set us on a path to eliminate toxic tailpipe emissions from trucks.

Unfortunately, the current proposal leaves the door open to hydrogen combustion technology that will continue to contaminate the air we breathe for decades to come. Let's make sure that doesn't happen. The EPA has the power to accelerate the deployment of zero-emission vehicles. Please finalize the strongest possible rule to deliver clean air. The clock is ticking, and zero-emission trucks will save lives.

I strongly urge the EPA to adopt requirements that would address the disproportionate health impacts for marginalized communities living near freight corridors and accelerate the rollout of zero-emission trucks. Thank you for your consideration. [EPA-HQ-OAR-2022-0985-2156]

Mass Comment Campaign sponsoring organization unknown. Sample attached (email) (20 signatures)

I strongly urge you to strengthen the proposed Phase 3 rule for medium- and heavy-duty vehicles. Failing to reduce harmful exhaust from big trucks and much as possible will harm millions of lives, including people living with chronic lung diseases like asthma and COPD, and especially people living in largely minority and low-income communities close to industry, major roads and freight yards.

The current EPA proposal is simply not strong enough to protect vulnerable people. EPA requirements should at least mirror requirements that have already been adopted by states that are driving zero-emission technology forward. Eight states, with over 93 million people, have already adopted the more protective California Advanced Clean Truck (ACT) emission standard; nine more are working towards adopting it. Compared to the ACT, EPA's Phase 3 Rule would require 50% fewer single-body zero-emission trucks to be sold in 2032 and up to 62% fewer zero-emission semi-tractor trucks to be sold. The ACT also increases the percentage of zero emission vehicles sales past 2032 up until 2035, while EPA's rule stops ramping up in 2032.

Freight dominated communities seeing huge numbers of trucks will be breathing more dangerous air for many years to come unless EPA aligns its rule with California's clean truck requirements. If 93 million people will be breathing cleaner air and living healthier longer lives by implementing the California truck emission rule that EPA has already deemed technologically and economically practical, then the rest of the country should also see those same benefits. EPA should also do better than California by setting a target of 100% sales of zero-emissions medium and heavy-duty vehicles by 2035.

EPA must ensure zero-emission medium and heavy-duty vehicles appear in communities as quickly as possible. It must lead the county down the road to where all Americans breathe cleaner air no matter where they live. [EPA-HQ-OAR-2022-0985-2157]

Mass Comment Campaign sponsoring organization unknown. Sample attached (email) (938 signatures)

Climate Crises are here and now! Exhibit A: Canadian climate fires this year. Exhibit B: Colorado and Western US climate fires in 2020-2022.

I am a parent, grandparent and concerned citizen who always strives to keep my commitments, and I am writing to remind you of the U.S. commitment under the 2015 Paris Agreement to reduce its CO2 emissions by 50% by 2030, and President Biden's commitments to transition to a zero emission economy by 2050 and to safeguard a sustainable planet for our children. To achieve these commitments, the EPA must strengthen the proposed standards for climate pollution from heavy-duty vehicles.

The largest U.S. source of climate warming emissions is our transportation sector, and that's the sector where we have the best opportunity to rapidly cut emissions because EV technology is now available, even for certain categories of heavy-duty vehicles (HDVs).

As proposed the HDV standard is an important step, but it is not sufficiently stringent to keep pace with the GHG reductions needed. It must be strengthened to require that, in categories where EV technology is now commercially available, 100% of all new vehicles must be zero emissions by 2030.

As the largest source of pollution in the US, tailpipe pollution contributes to the climate crisis and causes direct harm to the health of our families and communities. Diesel pollution from heavy-duty trucks can cause premature death, heart attacks, respiratory and cardiovascular illnesses, and asthma, stronger rules will help protect public health. Our families and communities want to see a rapid transition to zero-emitting heavy-duty vehicles.

The consequences of this rule will be irreversible and are our last chance to keep within the 1.5 C limit on warming. Clean air and a livable planet, for generations to come, are what is most important. [EPA-HQ-OAR-2022-0985-2158]

Mass Comment Campaign sponsoring organization unknown. Sample attached (email) (1,345 signatures)

I'm writing today to ask you to take an important step to protect communities who live near roads, highways, ports, distribution centers and freight depots making them particularly vulnerable to tailpipe pollution from heavy duty vehicles.

I am writing to ask you to do more to prioritize environmental justice and adopt the strongest possible pollution standards for heavy duty vehicles!

As you may know, the transportation sector is responsible for more greenhouse gas (GHG) emissions than any other sector in the U.S. in 2020, accounting for 27% of total emissions. Heavy-duty vehicles make up a slim majority (10%) of all traffic on our roads, yet they produce more than half the pollution. This public health crisis contributes to deadly particulate and ozone pollution that affects frontline and vulnerable communities that live near highways, ports, and other high-traffic areas.

By enacting strong clean car standards for the model year 2027 and beyond, the EPA can further its commitment to environmental justice. Issuing stronger and longer-term clean car standards will help address vital transportation-related impacts. Frontline communities often experience disproportionate harm from dirty vehicle pollution, leading to increased asthma and other respiratory illnesses. These communities are also often closest to highways and bear the greatest burden from vehicle pollution.

It's time for the Environmental Protection Agency to set the strongest passenger vehicle emissions standards possible to protect our air and public health. You can make a difference by leaving a public comment supporting EPA's history-making vehicle standards. Thank you for taking climate action with us! [EPA-HQ-OAR-2022-0985-2159]

Mass Comment Campaign sponsored by Sierra Club. (web) (21,693 signatures)

To deliver on the Biden Administration's environmental justice, public health, and climate goals, the EPA must finalize a strong vehicle pollution standard this year that sets us on a rapid path to electrifying the most polluting vehicles on the roads: our trucks and buses.

We appreciate President Biden making clean transportation a day-one priority and EPA moving quickly to propose long-overdue regulations to clean up pollution from dirty heavy-duty vehicles.

Our communities and our planet require bolder standards that will slash greenhouse gas emissions. That can only happen if the greenhouse gas standards match the urgency of the climate and public health crisis.

Manufacturers are moving quickly toward more and more zero pollution vehicles. We need the EPA standard to build on that momentum and reinforce the market signal. It should put us on a path so that 100 percent of all new heavy-duty vehicles sold in 2035 are zero-emission.

Thank you for taking action on this important issue. [EPA-HQ-OAR-2022-0985-1547]

Mass Comment Campaign sponsored by The Climate Reality Project. (web) (7,367 signatures)

Transportation makes up the largest share United States greenhouse gas (GHG) emissions— 28%— due to the fossil fuels we burn for cars, trucks, and other modes of transport.i This must change if we are to achieve our climate and justice goals. In combination with recent historic provisions in the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA), the proposed standards for light-, medium-, and heavy-duty vehicles could accelerate emission reductions, while significantly growing the electric vehicle (EV) sector.ii We are encouraged by the EPA's proposal and urge you to enact the strongest possible limits on vehicle pollution.

i https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions ii https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-cars-and

Communities of color are more likely to reside near highways, and subsequently experience the brunt of associated negative health impacts, including impaired lung function, cardiovascular diseases, and premature death.iii The new standards could address these issues by potentially reducing emissions for harmful pollutants, such as downstream fine particulate matter (PM), by about 39% of the sectors' total PM2.5 emissions.iv Not only would this lessen the burden of pollution on vulnerable communities, but these standards could yield up to $29 billion in associated public health benefits through 2055.v

iii https://www.epa.gov/mobile-source-pollution/environmental-justice-and-transportation; https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-cars-and

iv https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf pg. 25935

v https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf pg. 25936

EVs made up an estimated 5.6% of cars and trucks sold in 2022.vi To achieve President Biden's goal of cutting climate pollution in half by the end of the decade, the number of EVs on the road must significantly increase; the strongest proposed standards could grow the adoption rate of zero-emission vehicle (ZEV) technology by up to 50% by 2032 for certain trucks.vii Since low-income households and communities of color are most likely to directly benefit from reduced emissions from the heavy-duty sector, we cannot afford to delay this transition with less stringent standards.viii

vi https://insideevs.com/news/657660/us-electric-car-sales-january2023/#:~:text=Reference%3A%202022%20EV%20Sales&text=In%202022%2C%20more%20than%20750%2C000,Experian%20(via%20Automotive%20News).;

vii https://www.govinfo.gov/content/pkg/FR-2023-04-27/pdf/2023-07955.pdf pg. 25933

viii https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-cars-and

IPCC recently warned that rapid and deep GHG emissions reduction must be executed to keep warming below the critical 1.5 degrees Celsius threshold.ix In 2021, President Biden signed an Executive Order setting a target for half of all vehicles sold to be zero emission vehicles by 2030.x We applaud EPA's efforts to exceed this directive and implement ambitious regulation that will help us to meet our climate targets.

ix https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_SPM.pdf pg. 21

x https://www.whitehouse.gov/briefing-room/presidential-actions/2021/08/05/executive-order-on-strengthening-american-leadership-in-clean-cars-and-trucks/

Under the BIL and IRA, Congress showcased its commitment to transitioning toward a clean energy economy. If we are serious about unlocking the full potential of these laws, we must end our dependence on dirty fossil fuels. We urge you to enact historic climate regulation by implementing the strongest possible proposed vehicle pollution standards. Our just energy transition and the health of our communities depends on it. [EPA-HQ-OAR-2022-0985-1545]

Mass Comment Campaign sponsored by Union of Concerned Scientists. (web) (1,030 signatures)

We, the over 1000 undersigned scientists, researchers, health professionals, economists, engineers, and planners respectfully submit this comment in support of standards for heavy-duty vehicles and passenger vehicles that put us on a trajectory to eliminate tailpipe pollution.

The Environmental Protection Agency (EPA) has made explicit commitments to climate, clean air, and environmental justice under this administration. The transportation sector is the largest contributor to global warming emissions in the United States. And while heavy-duty trucks make up only 10 percent of vehicles on the road, they produce 28 percent of global warming emissions from on-road transportation, as well as 45 percent of nitrogen oxide emissions and 57 percent of particulate matter emissions, which disproportionately harm environmental justice communities living near ports and freight corridors. Thus, we believe that the light- and medium-duty vehicle multipollutant rule and the global warming emissions proposal for heavy-duty trucks should live up to these important stated commitments and to set us on an accelerated path to a zero-emission transportation future.

The light- and medium-duty vehicle rule is on the right track to reduce climate-harming, smog-forming, and particulate pollution, but the heavy-duty rule trails passenger vehicles, leaving environmental justice communities in harm's way.1 The science and technology, as well as the urgent need to protect public health and address the climate crisis, are clear on this front: zero-emission vehicles are available today and must be the number one priority.2

1 https://www.movingforwardnetwork.com/zero-emissions/

2 https://www.ucsusa.org/resources/electrify-trucks

New state standards adopted by several states across the country will ensure more than 50 percent of new heavy-duty vehicle sales are electric vehicles by 2030. Also, new tax incentives for commercial trucks are predicted to push electrification even further.3 As the EPA acts to accelerate the deployment of zero-emission passenger vehicles, it must also eliminate toxic tailpipe emissions from heavy-duty trucks and ensure that 100 percent of all new vehicles sales are electric by 2035 to maximize clean air to breathe. This has also long been an ask of environmental justice communities across the country.

The urgency of these issues demands a strong response. For far too long, vehicle pollution has been devastating for the health of communities across the country and the climate.4 The solutions are here – and we urge the EPA to stand up to this moment, pass the strongest possible version of the light- and medium-duty standards, and eliminate tailpipe pollution from heavy-duty trucks and cars.

Thank you for taking public comment on this important topic. [EPA-HQ-OAR-2022-0985-1543]

Appendix C: List of Testifiers at Public Hearings

This appendix contains a list of individuals who testified at a virtual public hearing on the proposal, which was held on May 2 and 3, 2023. The hearing transcript can be found in the docket for this rule (EPA-HQ-OAR-2022-0985-2666). Over the two days of the hearings, 213 testifiers provided statements voicing their support for or concerns about the proposal, 119 on May 2 and 94 on May 3. The testifiers are listed in Table C-3, below.

EPA Summary and Response:

Summary:

We characterize the nature of each of these comments by classifying their statements along eight dimensions (one comment may contain statements on more than one dimension). The topics are as follows:

- General support
- Want more stringent
- Oppose
- Environmental, health concerns
- Environmental Justice concerns
- Business, cost concerns
- Infrastructure, supply chain concerns
- Incentive availability

As shown in Table C-1, each of the testifiers testified on at least one of these 8 topics. Most of the testifiers, 47.4%, made statements on 3 topics.

Table C-1: Number of Topics Raised in Hearing Testimony

No. Issues Raised	Number of Commenters	
1	9	4.2%
2	68	31.9%
3	101	47.4%
4	26	12.2%
5	8	3.8%
6	1	0.5%
Total	213	100.0%

As shown in Table C-2, the most commonly raised topics were statements raising concerns about the climate change and the environment (27.8%) and Environmental Justice (17.4%), or to request EPA to adopt standards more stringent than proposed (21.1%).

Table C-2: Themes Raised in Hearing Testimony

Themes of Non-Detailed Comments	Number of Comments Raising Theme	
General support	45	7.7%
Want more stringent	123	21.1%
Oppose	21	3.6%
Environmental, Health	162	27.8%
Environmental Justice	101	17.4%
Business, Costs	53	9.1%
Infrastructure, Supply Chain	47	8.1%
Incentive Availability	30	5.2%
Total	582	100.0%

Response:

Hearing statements that are specific in nature and are not included in written comments submitted by the testifier or the testifier's organization are included verbatim in sections of this document above and responded to by EPA.

Some of the testimony statements are general in nature and do not require detailed EPA response beyond those provided in the sections above in this document, and/or they contain opinions or statements about issues without reasonable specificity. EPA's responses included throughout this RTC document address each of the general topics raised in these general comments.

Table C-3: List of Testifiers at Public Hearing, May 2 and 3, 2023

Day	Docket Number	Page	Testifier Name	Affiliation
1	EPA-HQ-OAR-2022-0985-2666	125-127	Alex Boesenberg	MEMA
1	EPA-HQ-OAR-2022-0985-2666	199-201	Ali Simpson	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	107-110	Almeta Cooper	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	343-344	Alondra Morales Sanchez	Moms Clean Air Force, Poder Latinx
1	EPA-HQ-OAR-2022-0985-2666	196-198	Ana Rios	Moms Clean Air Force New Mexico, EcoMadres
1	EPA-HQ-OAR-2022-0985-2666	72-75	Anastasia Gordon	WE ACT for Environmental Justice
1	EPA-HQ-OAR-2022-0985-2666	224-226	Andrea Marpillero-Colomina	GreenLatinos
1	EPA-HQ-OAR-2022-0985-2666	287-289	Andrew Boyle	Boyle Transportation
1	EPA-HQ-OAR-2022-0985-2666	337-339	Andrew Hauptman	Moms Clean Air Force Michigan
1	EPA-HQ-OAR-2022-0985-2666	247-249	Anna Mudd	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	297-299	Antonia Herzog	Health Care Without Harm
1	EPA-HQ-OAR-2022-0985-2666	374-376	Atenas Mena	Clean Air Now
1	EPA-HQ-OAR-2022-0985-2666	238-240	Athena Motawef	Earthjustice
1	EPA-HQ-OAR-2022-0985-2666	120-122	Azjargal Tsogtsaikhan	Breathe Mongolia Clean Air Coalition
1	EPA-HQ-OAR-2022-0985-2666	367-370	Bill Bradley	Interfaith Power and Light (IPL)
1	EPA-HQ-OAR-2022-0985-2666	204-2-6	Brandon Buchanan	American Bus Association
1	EPA-HQ-OAR-2022-0985-2666	353-355	Brian Russo	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	114-117	Britt Carmon	Natural Resources Defense Council (NRDC)
1	EPA-HQ-OAR-2022-0985-2666	46-48	Brooke Petrie	Moms Clean Air Force Pennsylvania
1	EPA-HQ-OAR-2022-0985-2666	144-147	Bryan Burton	American Lung Association
1	EPA-HQ-OAR-2022-0985-2666	130-132	Cara Cook	Alliance of Nurses for Healthy Environments (ANHE)
1	EPA-HQ-OAR-2022-0985-2666	344-347	Carissa Sipp	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	138-141	Carolina Chacon Mendoza	Alliance for Electric School Buses
1	EPA-HQ-OAR-2022-0985-2666	347-349	Carolina Pena	Moms Clean Air Force, EcoMadres
1	EPA-HQ-OAR-2022-0985-2666	285-286	Cassandra Carmichael	National Religious Partnership for the Environment
1	EPA-HQ-OAR-2022-0985-2666	282-285	Cecilia Garibay	Moving Forward Network (MFN)
1	EPA-HQ-OAR-2022-0985-2666	266-268	Cedric Whelchel	UE Local 1177
1	EPA-HQ-OAR-2022-0985-2666	227-229	Chelsea Lyons	Moms Clean Air Force North Carolina
1	EPA-HQ-OAR-2022-0985-2666	330-332	Christine Feely	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	184-186	Coleton Whitaker	EVHybridNoire

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1	EPA-HQ-OAR-2022-0985-2666	279-282	Connor Mighell	Center for the American Future, Texas Public Policy Foundation
1	EPA-HQ-OAR-2022-0985-2666	83-86	Danny Schnautz	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	380-384	Doug O'Malley	Environment New Jersey
1	EPA-HQ-OAR-2022-0985-2666	315-318	Dr. David Cooke	Union of Concerned Scientists
1	EPA-HQ-OAR-2022-0985-2666	150-153	Dr. David Hill	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	214-216	Dr. Ida Sami	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	350-353	Dr. Joel Charles	Healthy Climate Wisconsin
1	EPA-HQ-OAR-2022-0985-2666	160-162	Dr. Marguerite Pennoyer	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	71-72	Dr. William Beckett	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	157-160	East Peterson-Trujillo	Public Citizen
1	EPA-HQ-OAR-2022-0985-2666	326-327	Elaine Weir	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	117-120	Elizabeth Bechard	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	92-94	Elizabeth Brandt	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	193-195	Elizabeth Chun Hye Lee	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	333-336	Elizabeth Hauptman	Moms Clean Air Force Michigan
1	EPA-HQ-OAR-2022-0985-2666	58-61	Emily Picket	Moms Clean Air Force Florida
1	EPA-HQ-OAR-2022-0985-2666	356-359	Erandi Trevino	Moms Clean Air Force, EcoMadres
1	EPA-HQ-OAR-2022-0985-2666	52-54	Eric White	National Association of Clean Air Agencies (NACAA)
1	EPA-HQ-OAR-2022-0985-2666	294-296	Gary Ewart	American Thoracic Society
1	EPA-HQ-OAR-2022-0985-2666	328-330	Gloria E. Barrera	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	141-143	Hazel Chandler	Moms Clean Air Force Arizona
1	EPA-HQ-OAR-2022-0985-2666	189-192	Henry Glynn	Catholic Climate Covenant
1	EPA-HQ-OAR-2022-0985-2666	162-165	Ileagh MacIvers	Interfaith Power and Light (IPL)
1	EPA-HQ-OAR-2022-0985-2666	165-167	Jacob Jones	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	217-220	Jacqueline Gelb	American Trucking Association (ATA)
1	EPA-HQ-OAR-2022-0985-2666	261-263	Jayla Atkinson	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	42-45	Jed Mandel	Truck and Engine Manufacturers Association (EMA)
1	EPA-HQ-OAR-2022-0985-2666	147-150	Jenna Riemenschneider	Asthma and Allergy Foundation of America (AAFA)
1	EPA-HQ-OAR-2022-0985-2666	258-261	Jim Mullen	Clean Freight Coalition (CFC)
1	EPA-HQ-OAR-2022-0985-2666	230-233	Jonathan Moody	Holiday Tours

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1	EPA-HQ-OAR-2022-0985-2666	201-203	Julie Kimmel	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	310-312	Karen Campbell	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	36-39	Kate Shenk	Clean Fuels Alliance America
1	EPA-HQ-OAR-2022-0985-2666	55-58	Katherine Garcia	Sierra Club
1	EPA-HQ-OAR-2022-0985-2666	133-136	Katherine Stainken	Electrification Coalition
1	EPA-HQ-OAR-2022-0985-2666	359-362	Kathy Taylor	Washington State Department of Ecology
1	EPA-HQ-OAR-2022-0985-2666	244-247	Kelly Bobek	Volvo Group North America
1	EPA-HQ-OAR-2022-0985-2666	111-113	Kevin Brown	MECA Clean Mobility
1	EPA-HQ-OAR-2022-0985-2666	241-243	Kevin Maggay	Navistar
1	EPA-HQ-OAR-2022-0985-2666	263-265	Larry Hopkins	UE Local 1177
1	EPA-HQ-OAR-2022-0985-2666	29-33	Laura Kate Bender	American Lung Association
1	EPA-HQ-OAR-2022-0985-2666	322-325	Laurel Moorhead	Transfer Flow, Incorporated
1	EPA-HQ-OAR-2022-0985-2666	104-107	Laurie Anderson	Moms Clean Air Force Colorado
1	EPA-HQ-OAR-2022-0985-2666	168-169	Leigh Kauffman	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	86-89	Lewie Pugh	Owner-Operator Independent Drivers Association (OOIDA)
1	EPA-HQ-OAR-2022-0985-2666	274-276	Lindsay Garcia	Evangelical Environmental Network (EEN), Young Evangelicals for Climate Action (YACA)
1	EPA-HQ-OAR-2022-0985-2666	181-183	Lindsey Mendelson	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	212-214	Liz Hurtado	Moms Clean Air Force, EcoMadres
1	EPA-HQ-OAR-2022-0985-2666	98-101	Luciana Valentine	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	365-367	Margarita Parra	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	67-69	Maribeth Diggle	Moms Clean Air Force Washington D.C.
1	EPA-HQ-OAR-2022-0985-2666	220-223	Mark Rose	National Parks Conservation Association (NPCA)
1	EPA-HQ-OAR-2022-0985-2666	270-273	Max Kiefer	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	89-91	Melody Reis	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	40-42	Michael Livingston	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	320-322	Michael McClain	National Baptist Convention Incorporated, USA
1	EPA-HQ-OAR-2022-0985-2666	234-237	Michelle Uberuaga	Moms Clean Air Force
1	EPA-HQ-OAR-2022-0985-2666	48-51	Mike Geller	MECA Clean Mobility
1	EPA-HQ-OAR-2022-0985-2666	362-365	Molly Greenberg	Moving Forward Network (MFN)
1	EPA-HQ-OAR-2022-0985-2666	81-83	Monte Wiederhold	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	336-337	Oscar Hauptman	Private Citizen

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1	EPA-HQ-OAR-2022-0985-2666	123-125	Patrick Kelly	American Fuel and Petrochemical Manufacturers (AFPM)
1	EPA-HQ-OAR-2022-0985-2666	24-27	Paul Billings	American Lung Association
1	EPA-HQ-OAR-2022-0985-2666	312-315	Raymond Minjares	International Council on Clean Transportation (ICCT)
1	EPA-HQ-OAR-2022-0985-2666	302-303	Reverend Richard Kilmer	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	187-189	Rob Wheeler	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	170-173	Robert Yuhnke	Elders Climate Action
1	EPA-HQ-OAR-2022-0985-2666	307-309	Ruth Hund	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	176-179	Sam Wilson	Union of Concerned Scientists
1	EPA-HQ-OAR-2022-0985-2666	75-77	Sarah Bucic	Alliance of Nurses for Healthy Environments (ANHE)
1	EPA-HQ-OAR-2022-0985-2666	256-258	Scott Slawson	UE Local 506 (Erie, Pennsylvania)
1	EPA-HQ-OAR-2022-0985-2666	101-104	Shaina Oliver	Moms Clean Air Force, EcoMadres Colorado
1	EPA-HQ-OAR-2022-0985-2666	207-210	Shruti Vaidyanathan	American Council for an Energy Efficient Economy (ACEEE)
1	EPA-HQ-OAR-2022-0985-2666	127-129	Shyamalan Raja	American Lung Association
1	EPA-HQ-OAR-2022-0985-2666	377-380	Stanislav Jaracz	Electric Vehicle Association
1	EPA-HQ-OAR-2022-0985-2666	299-301	Stephanie Sears	Lynden Incorporated
1	EPA-HQ-OAR-2022-0985-2666	253-255	Steve Cliff	California Air Resources Board (CARB)
1	EPA-HQ-OAR-2022-0985-2666	304-306	Susan Entin	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	371-373	Taki Darakos	Pitt Ohio Express
1	EPA-HQ-OAR-2022-0985-2666	289-293	Thomas Walker	Clean Air Task Force (CATF)
1	EPA-HQ-OAR-2022-0985-2666	27-29	Tiffany Nichols	American Lung Association
1	EPA-HQ-OAR-2022-0985-2666	268-270	Tim Gould	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	64-67	Tracy Sabetta	Moms Clean Air Force Ohio
1	EPA-HQ-OAR-2022-0985-2666	61-64	Tricia Delloacono	CALSTART
1	EPA-HQ-OAR-2022-0985-2666	154-157	Urvashi Nagrani	Private Citizen
1	EPA-HQ-OAR-2022-0985-2666	33-36	Will Barrett	American Lung Association
1	EPA-HQ-OAR-2022-0985-2666	173-176	William Morris	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	38-41	Adam Rossi	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	101-103	Alana Langdon	Nikola Corporation
2	EPA-HQ-OAR-2022-0985-2666	85-87	Amy Goldsmith	Clean Water Action
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2	EPA-HQ-OAR-2022-0985-2666	250-252	Beatrice Zovich	Sierra Club Pennsylvania Chapter
2	EPA-HQ-OAR-2022-0985-2666	26-29	Brian Urbaszewski	Respiratory Health Association
2	EPA-HQ-OAR-2022-0985-2666	132-135	Celera Hewes	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	41-43	Cheri Conca	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	155-157	Christina Krost	Faith in Place
2	EPA-HQ-OAR-2022-0985-2666	246-249	Clarence Tong	Arrival
2	EPA-HQ-OAR-2022-0985-2666	104-106	Dan McCarthy	Massachusetts Chapter of the Sierra Club
2	EPA-HQ-OAR-2022-0985-2666	286-289	Danielle Berkowitz-Sklar	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	225-228	Darien Davis	League of Conservation Voters
2	EPA-HQ-OAR-2022-0985-2666	29-32	Dave Simons	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	186-189	David Myers	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	234-236	Dr. Anne-Marie Dooley	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	76-78	Dr. Breck Lebegue	Washington Physicians for Social Responsibility
2	EPA-HQ-OAR-2022-0985-2666	263-264	Dr. Lori Byron	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	270-273	Dr. Shelly Francis	EVHybridNoire
2	EPA-HQ-OAR-2022-0985-2666	55-57	Dyna Anderson	New Jersey Environmental Justice Alliance
2	EPA-HQ-OAR-2022-0985-2666	145-148	Elaine O'Grady	Northeast States for Coordinated Air Use Management (NESCAUM)
2	EPA-HQ-OAR-2022-0985-2666	160-162	Elizabeth Jackson	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	294-296	Emily Chaclas	Sierra Club Illinois Chapter
2	EPA-HQ-OAR-2022-0985-2666	212-215	Eric Wriston	Environmental Defense Fund
2	EPA-HQ-OAR-2022-0985-2666	312-313	Ernest Rogers	Creed Engines
2	EPA-HQ-OAR-2022-0985-2666	82-85	Eugenie Lewis	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	200	Franklin Mack	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	309-311	Gloria Chavez	N/A
2	EPA-HQ-OAR-2022-0985-2666	192-194	Greg Sutton	Transland
2	EPA-HQ-OAR-2022-0985-2666	112-115	Hayden Samples	Environmental Defense Action Fund
2	EPA-HQ-OAR-2022-0985-2666	176-179	Janet McGarry	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	318-319	Jason Dragseth	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	299-302	Jennifer Cantely	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	258-260	Jerome Paulson	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	125-129	Jessica Mangastab	Alliance of Nurses for Healthy Environments (ANHE)
2	EPA-HQ-OAR-2022-0985-2666	179-183	Jodie Teuton	American Truck Dealers (ATD), Division of NADA
2	EPA-HQ-OAR-2022-0985-2666	304-308	Joe Jaska	DB Schenker, Inc

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2	EPA-HQ-OAR-2022-0985-2666	201-203	Jonathan Levenshus	Sierra Club Federal Energy Campaigns
2	EPA-HQ-OAR-2022-0985-2666	240-244	Joseph Gillis	Northwest Navigator Luxury Coaches
2	EPA-HQ-OAR-2022-0985-2666	276-278	Karin Stein	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	315-318	Katherine Dorn	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	58-60	Katherine Pruitt	American Lung Association
2	EPA-HQ-OAR-2022-0985-2666	32-35	Kay Campbell	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	231-233	Kristina Pistone	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	302-304	Laura Magsis	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	203-205	Leslie Vasquez	South Bronx Unite
2	EPA-HQ-OAR-2022-0985-2666	68-72	Levi Kamolnick	Ceres
2	EPA-HQ-OAR-2022-0985-2666	195-197	Liliana Sierra	Laudato Si' Advocates Program
2	EPA-HQ-OAR-2022-0985-2666	123-125	Liz Scott	American Lung Association
2	EPA-HQ-OAR-2022-0985-2666	228-230	Lux Ho	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	197-200	Mariela Ruacho	American Lung Association
2	EPA-HQ-OAR-2022-0985-2666	283-286	Mary Arnold	Civics United for Railroad Environmental Solutions
2	EPA-HQ-OAR-2022-0985-2666	99-101	Matthew LaFleur	Sierra Club of Vermont
2	EPA-HQ-OAR-2022-0985-2666	218-221	Mercedes McKinley	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	94-96	Michael Replogle	Institute for Transportation and Development Policy
2	EPA-HQ-OAR-2022-0985-2666	290-293	Mona Safarty	George Mason University Center for Climate Change Communication
2	EPA-HQ-OAR-2022-0985-2666	206-208	Omega Wilson	West End Revitalization Association
2	EPA-HQ-OAR-2022-0985-2666	36-37	Patricia Bond	Sierra Club of Pennsylvania
2	EPA-HQ-OAR-2022-0985-2666	151-154	Patrick Quinn	AESI
2	EPA-HQ-OAR-2022-0985-2666	255-258	Patty Power	American Concrete Pumping Association
2	EPA-HQ-OAR-2022-0985-2666	139-141	Paul Cort	Earthjustice Right Zero Campaign
2	EPA-HQ-OAR-2022-0985-2666	265-268	Phil Streif	Vandalia Bus Lines
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2	EPA-HQ-OAR-2022-0985-2666	168-171	Rachel Meyer	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	44-47	Rachel Patterson	Evergreen Action
2	EPA-HQ-OAR-2022-0985-2666	141-145	Reem Rayef	BlueGreen Alliance
2	EPA-HQ-OAR-2022-0985-2666	107-109	Reverend Dr. Jessica Moerman	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	215-218	Reverend Susan Hendershot	Interfaith Power and Light
2	EPA-HQ-OAR-2022-0985-2666	189-192	Rich Kassel	Clear Flame Engine Technologies
2	EPA-HQ-OAR-2022-0985-2666	313-315	Richard Sigler	Private Citizen

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2	EPA-HQ-OAR-2022-0985-2666	148-151	Robb Shite	Private Citizen
2	EPA-HQ-OAR-2022-0985-2666	96-98	Robert Saucedo	Carreras Tours
2	EPA-HQ-OAR-2022-0985-2666	73-76	Ryan Makarem	Clean Air Now
2	EPA-HQ-OAR-2022-0985-2666	109-111	Sarah Carter	Laudato Si' Advocates Program
2	EPA-HQ-OAR-2022-0985-2666	244-246	Shannon Baker-Branstetter	Center for American Progress
2	EPA-HQ-OAR-2022-0985-2666	47-50	Shawn Waters	Daimler Trucks North America
2	EPA-HQ-OAR-2022-0985-2666	296-299	Sherry Hime	Midwest Bus and Motor Coach Association
2	EPA-HQ-OAR-2022-0985-2666	261-263	Shilpa Shenvi	Sierra Club, Maryland Chapter
2	EPA-HQ-OAR-2022-0985-2666	279-282	Shruti Bhatnager	Sierra Club
2	EPA-HQ-OAR-2022-0985-2666	164-167	Stephanie Reese	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	91-94	Steve Henderson	Ford Motor Company
2	EPA-HQ-OAR-2022-0985-2666	172-175	Susan Mudd	Environmental Law and Policy Center
2	EPA-HQ-OAR-2022-0985-2666	78-81	Tereza Cevidanes	NATSO/SIGMA
2	EPA-HQ-OAR-2022-0985-2666	51-53	Thomas Boylan	Zero Emission Transportation Association (ZETA)
2	EPA-HQ-OAR-2022-0985-2666	23-26	Tia Sutton	American Petroleum Institute
2	EPA-HQ-OAR-2022-0985-2666	136-138	Tina Catron	EDF Action, advocacy partner of the Environmental Defense Fund
2	EPA-HQ-OAR-2022-0985-2666	64-66	Trenton Stange	Compass Coach
2	EPA-HQ-OAR-2022-0985-2666	120-122	Vanessa Lynch	Moms Clean Air Force
2	EPA-HQ-OAR-2022-0985-2666	237-239	Will Vuncannon	Laudato Si' Advocates Program
2	EPA-HQ-OAR-2022-0985-2666	183-185	Yasmine Agelidis	Earthjustice Right Zero Campaign
2	EPA-HQ-OAR-2022-0985-2666	209-211	Yassi Kravezade	Sierra Club My Generation Campaign
2	EPA-HQ-OAR-2022-0985-2666	61-64	Zatcher Brittany Keyes	Healthy Climate Wisconsin

Appendix D: List of Abbreviations, Acronyms, and Symbols

Acronym	**Definition**
°C	Degrees Celsius
µg	Microgram
µm	Micrometers
20xx$	U.S. Dollars in calendar year 20xx
A/C	Air Conditioning
ABTC	American Battery Technology Company
AC	Alternating Current
ACT	California Advanced Clean Truck
AEO	Annual Energy Outlook
AFDC	Alternative Fuels Data Center
AHS	American Housing Survey
ANL	Argonne National Laboratory
APU	Auxiliary Power Unit
ARCHES	Alliance for Regional Clean Hydrogen Energy Systems
ARPA	Advanced Research Projects Agency
ATR	Autothermal Reforming
ATRI	American Transportation Research Institute
ATSDR	Agency for Toxic Substances and Disease Registry
AV	Annualized value
Avg	Average
BEA	Bureau of Economic Analysis
BenMAP	Benefits Mapping and Analysis Program
BenMAP-CE	Benefits Mapping and Analysis Program-Community Edition
BEV	Battery Electric Vehicle
bhp	Brake Horsepower
bhp-hr	Brake Horsepower Hour
BIL	Bipartisan Infrastructure Law
BLS	Bureau of Labor Statistics
BNEF	Bloomberg New Energy Finance
BOP	Balance of Plant
BP	British Petroleum
BPT	Benefit Per Ton
BTU	British Thermal Unit
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CARB	California Air Resources Board
CASAC	Clean Air Scientific Advisory Committee
CCS	Combined Charging System
CDC	Center for Disease Control
CEC	California Energy Commission
CFI	Charging and Fueling Infrastructure
CFR	Code of Federal Regulations
CH_4	Methane
CHPS	Clean Hydrogen Production Standard
CI	Compression-Ignition
CMI	Critical Minerals Institute
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2eq	CO_2 Equivalent
COI	Cost-of-illness
CONUS	Contiguous US

Acronym	Definition
COP	Coefficient of Performance
COPD	Chronic Obstructive Pulmonary Disease
CRC	Coordinating Research Council
CSB	Clean School Bus
CY	Calendar Year
DC	Direct Current
DCFC	Direct Current Fast Charger
DEF	Diesel Exhaust Fluid
DER	Distributed Energy Resources
DFH	Direct Fired Heaters
DHHS	Department of Health and Human Services
DICE	Dynamic Integrated Climate and Economy
DMC	Direct Manufacturing Costs
DOC	Diesel Oxidation Catalyst
DOE	Department of Energy
DOT	Department of Transportation
DPA	Defense Production Act
DPF	Diesel Particulate Filter
DRIA	Draft Regulatory Impact Analysis
DSCIM	Data-driven Spatial Climate Impact Model
DTNA	Daimler Truck North America
EC	Elemental Carbon
EDF	Environmental Defense Fund
EEAC	Environmental Economics Advisory Committee
EER	Energy Efficiency Ratio
EGR	Exhaust Gas Recirculation
EGU	Electricity Generation Unit
EIA	Energy Information Administration
EJ	Environmental Justice
EMF	Energy Modeling Forum
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ERM	Employment Requirements Matrix
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FAF	Freight Analysis Framework
FaIR	Finite Amplitude Impulse Response
FCEV	Fuel Cell Electric Vehicle
FCT	Fuel Cell Truck
FEL	Family Emission Limit
FERC	Federal Energy Regulatory Commission
FET	Federal Excise Tax
FHWA	Federal Highway Administration
FMVSS	Federal Motor Vehicle Safety Standards
FOH	Fuel Operated Heaters
FR	Federal Register
FrEDI	Framework for Evaluating Damages and Impacts
FRM	Final Rulemaking
FTA	Federal Transit Administration
FTP	Federal Test Procedure
FUND	Framework for Uncertainty, Negotiation, and Distribution
FY	Fiscal Year

Acronym	Definition
g	Gram
g/s	Gram-per-second
g/ton-mile	Grams emitted to move one ton (2000 pounds) of freight over one mile
gal	Gallon
gal/1000 ton-mile	Gallons of fuel used to move one ton of payload (2,000 pounds) over 1000 miles
GAO	Government Accountability Office
GDP	Gross Domestic Product
GE	General Electric
GEM	Greenhouse Gas Emissions Model
GHG	Greenhouse Gas
GIVE	Greenhouse Gas Impact Value Estimator
GM	General Motors
GREET	Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation
GTP	Global Temperature Potential
GTR	Global Technical Regulation
GVWR	Gross Weight Vehicle Rating
GW	Gigawatt
GWP	Global Warming Potential
HAD	Health Assessment Document
HCM	Hosting Capacity Maps
HH	Heavy-haul
HD	Heavy-duty
HDV	Heavy-duty Vehicle
HEI	Health Effects Institute
HEV	Hybrid Electric Vehicle
HFC	Hydrofluorocarbon
HHD	Heavy Heavy-duty
HHDV	Heavy Heavy-duty vehicle
hrs	Hours
HVAC	Heating, Ventilation, Air Conditioning
HVIP	Hybrid Voucher Incentives Project
hz	Hertz
IAM	Integrated Assessment Model
IARC	International Agency for Research on Cancer
ICCT	International Council for Clean Transportation
ICE	Internal Combustion Engine
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IIHS	Insurance Institute for Highway Safety
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Planning Model
IRA	Inflation Reduction Act
IRIS	Integrated Risk Information System
ISA	Integrated Science Assessment
ISO	International Standards Organization
IWG	Interagency Working Group
JOET	Joint Office of Energy and Transportation
K	Potassium
kg	Kilogram
km	Kilometer
km/h	Kilometers per Hour
lb	Pound

Acronym	Definition
LBNL	Lawrence Berkeley National Laboratory
LD	Light-duty
LDT	Light-duty truck
LDV	Light-duty vehicle
LHDV	Light heavy-duty vehicle
LFP	Lithium Iron-Phosphate
LHD	Light Heavy-duty
Li	Lithium
LLC	Limited Liability Company
LMDV	Light- and Medium-Duty Vehicle (rule), which is a reference to the Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles
LNG	Liquefied natural gas
m^2	Square Meters
m^3	Cubic Meters
m^3	Cubic Meters
MARAD	Maritime Administration
MCS	Megawatt Charging System
MD	Medium-duty
MEA	Membrane Electrode Assemblies
MFR	Manufacturer
Mg	Magnesium
MH	Medium Heavy
MHD	Medium Heavy-duty
MHDV	Medium Heavy-duty vehicle
MINER	Mining Innovations for Negative Emissions Resource Recovery
MMBD	Million barrels of oil per day
MMT	Million metric tons
Mn	Manganese
MOU	Memorandum of Understanding
MOVES	Motor Vehicle Emission Simulator
MP	Multi-Purpose
MRL	Minimal Risk Level
MSP	Minerals Security Partnership
MW	Megawatt
MY	Model Year
NAAQS	National Ambient Air Quality Standards
NACS	North American Charging Standard
NAICS	North American Industry Classification System
NASA	National Aeronautics and Space Administration
NCA	Nickel-Cobalt-Aluminum
NCA4	4th National Climate Assessment
NEC	National Electric Code
NEI	National Emissions Inventory
NEMS	National Energy Modeling System
NERC	North American Electric Reliability Corporation
NESCAUM	Northeast States for Coordinated Air Use Management
NEVI	National Electric Vehicle Infrastructure
NHFN	National Highway Freight Network
NHIS	National Health Interview Survey
NHTSA	National Highway Traffic Safety Administration
NMC	Nickel-Manganese-Cobalt
NO	Nitric Oxide

Acronym	Definition
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NPRM	Notice of Proposed Rulemaking
NRC	National Research Council
NREL	National Renewable Energy Laboratory
NTP	National Toxicology Program
NYC	New York City
NZEV	Near Zero-emission Vehicle
O_3	Ozone
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturers
OMB	Office of Management Budget
OMEGA	Optimization Model for reducing Emissions of Greenhouse Gases from Automobiles
OPEC	Organization of Petroleum Exporting Countries
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PAGE	Policy Analysis of the Greenhouse Gas Effect
PBPK	Physiologically based pharmacokinetic
PEM	Polymer Electrolyte Membrane
PEV	Plug-in Electric Vehicle
PFC	Perfluorocarbon
PFG	Performance Food Group
PHEV	Plug-in Hybrid Electric Vehicles
PM	Particulate Matter
PM_{10}	Coarse Particulate Matter (diameter of 10 µm or less)
$PM_{2.5}$	Fine Particulate Matter (diameter of 2.5 µm or less)
PNNL	Pacific Northwest National Laboratory
PNW	Pacific Northwest
PPE	Personal Protection Equipment
PTC	Production Tax Credit
PTO	Power Takeoff
PV	Present Values
RFA	Regulatory Flexibility Act
RFF-SPs	Resources for the Future socioeconomic projections
RFS	Renewable Fuel Standard
RIA	Regulatory Impact Analysis
RPE	Retail Price Equivalent
RTC	Response to Comment (Document)
SAB	Science Advisory Board
SABERS	Solid-state Architecture Batteries for Enhanced Rechargeability and Safety
SAE	Society of Automotive Engineers
SAFE	Securing America's Future Energy
SBA	Small Business Administration
SBREFA	Small Business Regulatory Enforcement Fairness Act
SC-GHG	Social Cost of Greenhouse Gases
SCR	Selective Catalytic Reduction
SES	Socioeconomic status
SET	Supplemental Emission Test
SF_6	Sulfur Hexafluoride
SI	Spark-Ignition
SMR	Steam Methane Reforming
SO_2	Sulfur Dioxide

Acronym	**Definition**
SOH	State-of-health
SO_X	Oxides of Sulfur
SOX	Sulfur Oxides
SPR	Strategic Petroleum Reserve
T3CO	NREL's Transportation Technology Total Cost of Ownership
TCO	Total Cost of Ownership
TEIS	Multi-State Transportation Electrification Impact Study
TEMPO	NREL's Transportation Energy & Mobility Pathway Options Model
TIGER	Topologically Integrated Geographic Encoding and Referencing system
TOU	Time of use
TPRD	Thermally activated pressure relief device
TRUCS	Technology Resource Use Case Scenario
TSD	Technical Support Document
TW	Terawatt
U.S.	United States
UAW	United Auto Workers
UFP	Ultrafine Particles
UN	United Nations
UN ECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
URE	Unit Risk Estimate
USA	United States of America
USABC	US Automotive Battery Consortium
USC	Unites States Code
USD	United States Dollars
USDOT	United States Department of Transportation
USGCRP	Unites States Global Change Research Program
USGS	United States Geological Survey
USPS	United States Postal Service
VIN	Vehicle Identification Number
VIUS	Vehicle Inventory Use Survey
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
VPP	Virtual Power Plant
VSL	Value of Statistical Life
WTI	West Texas Intermediate
WTP	Willingness To Pay
ZEP	Zero Emission Powertrain
ZETI	Zero-Emission Technology Inventory
ZEV	Zero-Emission Vehicles