Addendum to Final Phase 1 EPA Heavy-Duty Vehicle and Engine Greenhouse Gas Emissions Compliance Report (Model Year 2022)

United States Environmental Protection Agency

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

NOTICE

This technical report does not necessarily represent final EPA decisions or positions. It is intended to present technical analysis of issues using data that are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments.

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This addendum to the "Final Phase 1 Heavy-Duty Vehicle and Engine Greenhouse Gas Emissions Compliance Report (Model Years 2014 – 2020)" supplements the report with Model Year 2022 data. This addendum is part of the U.S. Environmental Protection Agency's (EPA's) commitment to provide the public with information about the heavy-duty vehicle and engine manufacturers' performance in meeting the agency's greenhouse gas emission (GHG) standards. The comprehensive, previously published report as well as the addendum with credit data through model year 2021 are located on the EPA website: https://www.epa.gov/compliance-and-fuel-economy-data/epa-heavy-duty-vehicle-and-engine-greenhouse-gas-emissions. EPA recognizes significant stakeholder interest in the compliance status of manufacturers subject to the regulatory programs. We are providing this supplemental data summary in advance of the next full report, anticipated to be published in late 2024 or early 2025.

In 2011, EPA, along with the Department of Transportation's National Highway Traffic Safety Administration (NHTSA), adopted the first-ever greenhouse gas emission and fuel efficiency standards for heavy-duty engines and vehicles. The comprehensive program the agencies created was designed to address the intertwined challenges of reducing dependence upon oil, achieving energy security, and the amelioration of global climate change. The program also served to enhance American competitiveness and job creation, benefit consumers and businesses by reducing the costs of transportation of goods, and spur growth in the clean energy sector. The Phase 1 Heavy-Duty Vehicle and Engine Greenhouse Gas Rule became mandatory in 2014 and fully phased-in by the 2017 model year. The objective of the Phase 1 program was to reduce GHG emissions from the heavy-duty sector, the transportation sector's second largest contributor to GHG emissions. The program aimed to expand the use of more efficient commercially available technologies.

The Phase 2 Heavy-Duty Vehicle and Engine Greenhouse Gas Rule was adopted in 2016 and began implementation with the 2021 model year. In designing the Phase 2 program, EPA considered credit balances available after the Phase 1 program and concluded that manufacturers should be allowed to largely carry the Phase 1 credit balances into the Phase 2 program. However, some restrictions were adopted for certain circumstances, primarily to avoid the potential for credit disparities to disrupt the competitive marketplace. Nevertheless, the quantity of credits potentially being carried into the Phase 2 program was deemed sufficiently large to be considered in setting the stringency of the Phase 2 standards (i.e., the Phase 2 standards are more stringent than they otherwise would have been had manufacturers not demonstrated the ability to over comply with the Phase 1 standards).

The commercial transportation industries that use the products covered through these regulations are incredibly diverse with a wide range of operating and use patterns. As a result, the heavy-duty vehicle and engine industry is itself quite diverse and offers an almost unbelievable range of different products and options in order to best serve the needs of their customers. EPA and NHTSA in developing the Phase 1 and 2 programs, included a number of design elements intended to improve fuel consumption and lower GHG emissions without limiting the ability of manufacturers to offer the diverse range of products their customers expected and need. These flexibilities were expected to provide sufficient lead time for manufacturers to make necessary technological improvements, help increase the rate of which new technologies can be implemented, and reduce the overall cost of the program, without compromising overall environmental objectives. The primary flexibility is an engine and vehicle averaging, banking, and trading (ABT) program in which CO_2 credits may be generated for vehicles/engines that overachieve, relative to the standards. With these ABT provisions, manufacturers can offer the right product for the right consumer need (some of which may over or under perform against the fleet average GHG standards), balance market fluctuations impacting their sales volumes, and still move the entire fleet of vehicles toward increasing levels of energy efficiency and lower GHG

emissions. The EPA ABT program allows for emission credits to be averaged, banked, or traded within each of the "averaging sets" described in this interim report, allowing manufacturers the opportunity to comply on a fleet average basis with the emission standards. Participation in this ABT program is optional and manufacturers can alternatively choose to certify all of their heavy-duty vehicles/engines to meet the applicable standards.

This addendum provides an overview of the GHG compliance status of manufacturers of heavy-duty combination tractors, vocational vehicles, and the engines that power these vehicles. Heavy-duty combination tractors are the semi-trucks that typically pull trailers and are built to mainly move freight. Vocational vehicles consist of a very wide variety of truck and bus types including delivery, refuse, utility, dump, cement, transit bus, shuttle bus, school bus, emergency vehicles, motor homes, tow trucks, and many more. This addendum also summarizes the current CO_2 credit situation at the conclusion of Model Year 2022 (the second year of the Phase 2 program) for each manufacturer participating in either of the vehicle or engine ABT programs. Model year 2022 was also the first year that heavy-duty engine and vehicle entities that meet the small business qualifications of 13 CFR 121.201 were no longer excluded from these regulations, and thus were required to certify their vehicle/engine products for introduction into US commerce.

Phase 2 also introduced new vehicle averaging sets for certain types of vocational vehicles by allowing a manufacturer to optionally certify using the custom chassis provisions of 40 CFR Part 1037. Banking of excess credits is not allowed for these custom chassis vehicles at the conclusion of a model year. The vehicle manufacturer must have a positive number of credits or they are deemed non-compliant for the year. Any excess credits are not able to be banked and carried over for use in future model years. The credits earned for these custom chassis averaging sets are not presented in this interim report as each manufacturer that certified using the custom chassis provisions was compliant in Model Year 2022 by either having a positive credit balance in each of these averaging sets or by using Phase 1 Advanced Technology credits to offset a negative credit balance. Please refer to the report referenced above for a better description of Phase 1 Advanced Technology credits and their continued flexibility within the Phase 2 program.

The success of the heavy-duty GHG program is measured in the industry's ability to create the systems and processes necessary to demonstrate compliance with the program, improve their products to lower their GHG emissions and fuel consumption, and finally through their reporting to the Agency demonstrate that the fleet of vehicles they produced complied with the aggregated fleet standards. It is a significant accomplishment that the entire industry was able to implement and begin complying with this program and has demonstrated through their reporting that GHG emissions have been reduced to such an extent that all manufacturers are compliant, and most have created significant credit banks reflecting better overall fleet performance than the agencies originally projected in setting up the program.

Table 1 of this addendum documents that all vehicle manufacturers are not merely compliant, but that all manufacturers participating in ABT have generated a positive banked credit balance through model year 2022 in each of the three averaging sets for vehicles. This table also presents currently available Phase 1 Advanced Technology banked credits which maintain their flexibility into the Phase 2 program until they expire (see report referenced above for additional information about these flexibilities). Similarly, Table 2 shows the updated credit balance values for all engine manufacturers in each of the three averaging sets (Heavy-Duty Spark Ignition engines are not part of this report) after model year 2022 (there were no Advanced Technology credits generated in Phase 1 so there is no corresponding

column in this table to reflect those credits). All engine manufacturers except for Ford Motor and Volvo Group have zero or positive credit balances in each of the averaging sets showing their overall compliance to the current Phase 2 program. A negative balance is allowed by the regulations, however, a manufacturer having a negative credit balance may utilize three model years to achieve a zero or positive credit balance. This is the second consecutive year that Ford Motor has run a deficit in the MHD engine averaging set which results in a deficit balance of -16,672 Mg of CO2, and the first year of running a deficit for Volvo Group in the HHD Engine averaging set with a deficit balance of -8,634 Mg of CO2.

Table 1
Heavy-Duty Vehicles Averaging Set Summary
GHG Credits (Mg CO2) Banked Summary - Through Model Year 2022

	LHD	MHD	HHD	Total
Manufacturer	Total Credit Balance	Total Credit Balance	Total Credit Balance	Phase 1 AT Credit Balance
ARBOC Specialty		2,952		
Autocar		1,952	601,310	
Battle Motors		35,253	9,784	3,259
Blue Bird Body		146,178	57,156	233,283
BYD Auto		157,249	313,254	
Chanje				715
Chrysler Group	934,168			
Daimler Coaches			179	
DTNA Trucks		1,685,582	11,647,130	
E-One			23,666	
El Dorado			21,590	
EVO Bus			235	
Ferrara Fire			2,457	
Ford Motor	3,550,566	1,614,636	8,114	
General Motors	129,815	117,026		
Gillig LLC		0	95,738	3,098
Hino Manufacturing		6,262	10	
Hino Motors	5,395	145,243	1,491	
Isuzu Motors	948,155	71,010		
Kovatch Mobile			9,732	
Mitsubishi Fuso	4,899			9,618
Motor Coach Ind.			103,300	2,046
Navistar, Inc.	22,985	1,859,581	3,232,342	
New Flyer		0	102,455	425,198
Nikola			932,817	
Oshkosh			75,879	
PACCAR, Inc.	346	449,998	4,294,337	14,293
Rosenbauer Motors			4,365	
Spartan Fire			6,049	
Terex Corporation			6,479	
Van Hool			372,264	1,013
Volvo Group		296,438	4,135,967	0
XOS Trucks		21		150,668
TOTALS	**5,596,329**	**6,589,381**	**26,058,100**	**843,191**

Table 2
All Heavy-Duty CI Engines - Averaging Set Summary
GHG Credits (Mg CO2) Banked Summary - Through Model Year 2022

	LHD	MHD	HHD
	Credit Balance	Credit Balance	Credit Balance
Manufacturer	Net CO2	Net CO2	Net CO2
Cummins		2,968,111	1,821,794
Detroit Diesel		357,000	1,988,900
Ford Motor	925,975	-16,672	
Isuzu Motors	65,489		
Navistar	86,684		210,454
PACCAR			1,586,894
Volvo Group			-8,634
Westport Fuel		55,779	48,836
TOTALS	**1,078,148**	**3,308,439**	**5,599,408**