



# **Final Carbon Pollution Standards to Reduce Greenhouse Gas Emissions from Power Plants**

April 25, 2024



# Outline

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  - Emission Guidelines
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- Environmental Justice
- Support for Reliability



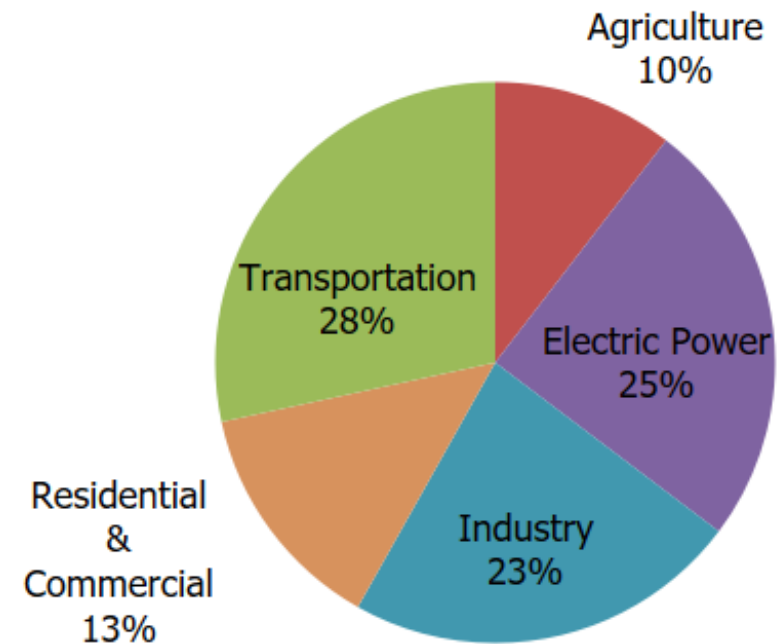
# Overview

On April 25, EPA issued final carbon pollution standards for power plants that will protect public health and reduce harmful pollutants.

The **power sector is the largest stationary source of greenhouse gases (GHGs)**. In 2022, the sector emitted 25 percent of the overall domestic emissions.

The rules address climate pollution from **existing coal-fired power plants**, which continue to be the largest source of greenhouse gas emissions from the power sector, and ensure that **new combustion turbines**, some of the largest new sources of CO<sub>2</sub> being built today, are constructed to minimize GHG emissions.

## Total U.S. Greenhouse Gas Emissions by Economic Sector in 2022



EPA (2024). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 U.S. Environmental Protection Agency, EPA 430R-24004. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022>.



# Overview

## **Types of fossil fuel-fired power plants covered by this final rule**

- New, modified, and reconstructed sources – Covered under 111(b)
  - New and reconstructed gas-fired combustion turbines
  - Modified coal-fired steam generating units
- Existing sources – Covered under 111(d)
  - Coal-, oil-, and gas-fired steam generating units

## **Technology-based standards**

- Consistent with EPA's traditional approach to establishing pollution standards under the Clean Air Act, the final limits and emission guidelines are based on proven control technology.
- Emission guidelines for the longest-running existing coal units and standards for heavily-utilized new gas units are based on carbon capture and sequestration/storage (CCS) – an available and cost-effective control technology that can be applied directly to power plants to significantly limit carbon dioxide (CO<sub>2</sub>) emissions.

## **Reduces climate and other health-harming pollution**

- The climate and health benefits of this rule significantly outweigh the compliance costs.
- Between 2024 and 2047, the regulatory impact analysis projects net climate and health benefits systemwide of \$370 billion, which is an annualized net benefit of \$20 billion.
- Expected to avoid up to 1.38 billion metric tons of CO<sub>2</sub> systemwide through 2047



# Overview

**Builds on decades of technology advancements and momentum from recent changes in the sector created by the Inflation Reduction Act and the Bipartisan Infrastructure law**

- Leverages the clean energy incentives and opportunities provided in the Inflation Reduction Act

**Provides utilities options for meeting these standards as well as the time needed to plan and invest for compliance and continue to support a reliable supply of affordable electricity.**

Compliance date is January 1, 2032, for the longest-running existing coal-fired steam generating units and heavily utilized new combustion turbines

- Includes two optional reliability-related instruments that states can consider including in their state plans

**Through the state planning process, communities will have an opportunity to be heard about the future of individual plants in their neighborhoods.**

- States, in developing plans for existing coal sources, will need to describe their meaningful engagement with affected stakeholders
- Includes communities disproportionately burdened by pollution and climate change impacts, as well as the energy communities and workers who have powered our nation for generations



# Summary of Final Standards and Guidelines

- **New gas-fired combustion turbines:**
  - Base load turbines (>40% capacity factor): initial "phase one" standard based on efficient operation of combined cycle turbine; "phase two" standard based on 90% capture of CO<sub>2</sub> with a compliance deadline of Jan. 1, 2032
  - Intermediate turbines (between 20% and 40% capacity factor): standard based on efficient operation of simple cycle turbine
  - Low load turbine (less than 20% capacity factor): standard based on low-emitting fuel
- **Existing coal-fired steam EGUs:**
  - "Long-term" units (plan to operate on or after Jan. 1, 2039): standard based on 90% capture of CO<sub>2</sub> with a compliance deadline of Jan. 1, 2032
  - "Medium-term" units (plan to operate on or after Jan. 1, 2032, with a commitment to cease operation before Jan. 1, 2039): standard based on 40% co-firing with natural gas with a compliance deadline of Jan. 1, 2030
  - Units that commit to cease operation by Jan. 1, 2032 are not subject to the rule
- **Existing oil and natural gas-fired steam EGUs:**
  - Standards based on routine operation and maintenance, with different levels of stringency for base load, intermediate, and low load units

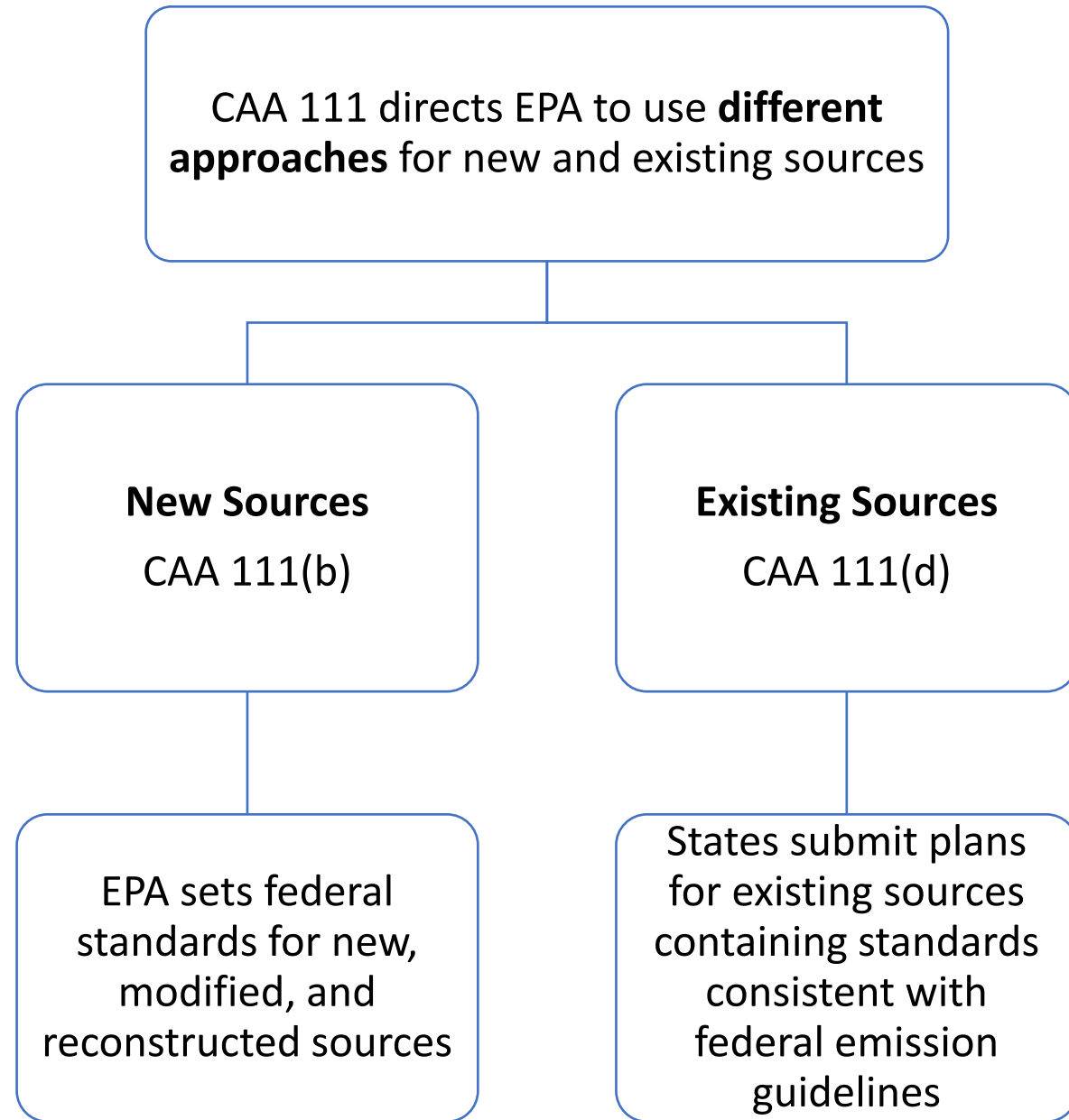


# Key Changes Since Proposal

- Existing coal-fired steam generating units
  - Two subcategories for existing coal-fired steam generating units – instead of four as proposed
    - “Long-term” units – plan to operate on or after Jan. 1, 2039
    - “Medium-term” units – plan to operate on or after Jan. 1, 2032 and permanently cease operation before Jan. 1, 2039
  - Providing an applicability exemption for units that plan to permanently cease operation by January 1, 2032
  - Extending the compliance date from January 1, 2030, to January 1, 2032, for existing coal-fired steam generating units to meet a standard of performance based on implementation of 90% CCS
- New combustion turbines
  - Have expanded applicability of most stringent “base load” standard to units operating above 40% capacity factor
  - Have moved compliance deadline for CCS-based standard for base load units to 2032 (was 2035 at proposal)
  - Have removed low-GHG hydrogen co-firing as a BSER pathway for base load and intermediate units
  - Minor changes to “phase one” efficiency-based standards for base load and intermediate units
- Adjustments for reliability
  - Revised subcategories, longer compliance timeframe for CCS installation, a suite of compliance options
  - Addition of two reliability-related instruments as an additional layer of safeguard to support power companies, grid operators, and states in maintaining the reliability of the electric grid during the implementation of these final rules.
- EPA is not finalizing proposed requirements for existing fossil fuel-fired stationary combustion turbines.



# Clean Air Act Section 111







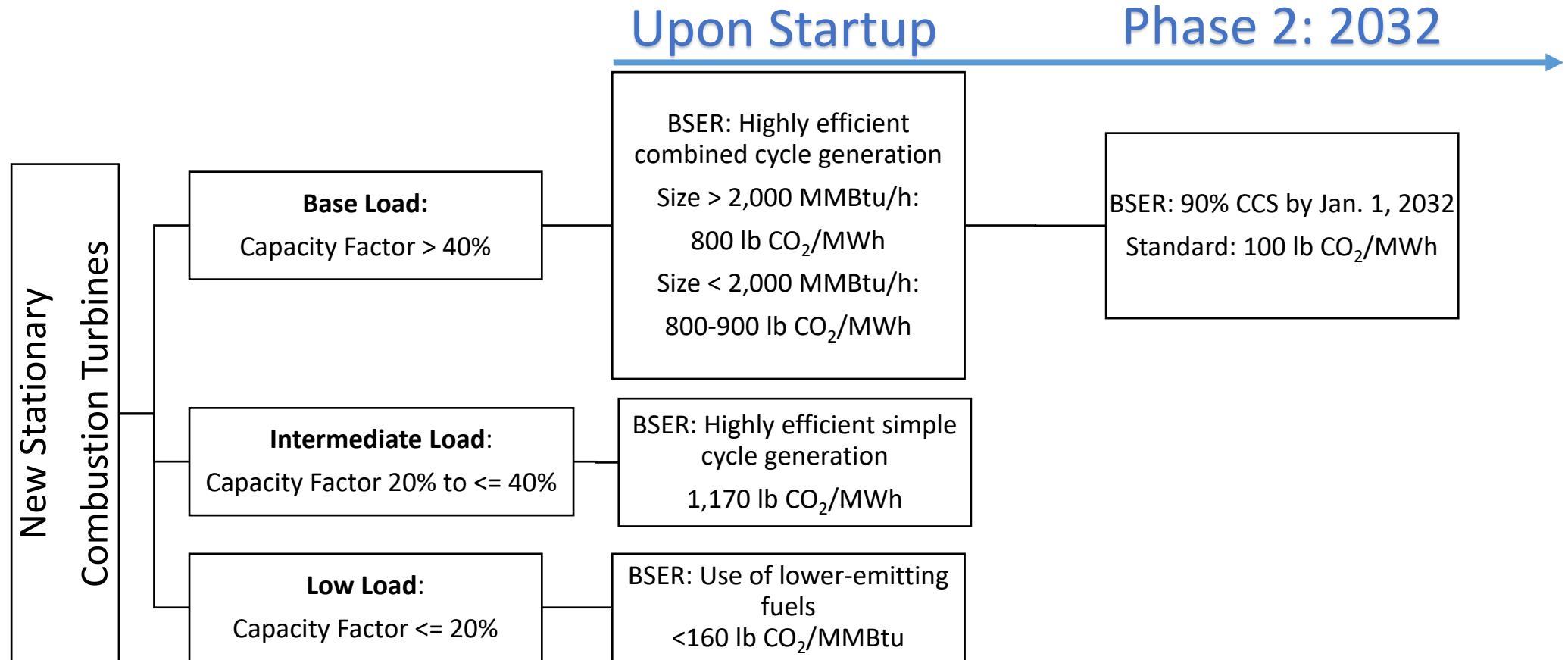
# Final Standards for New Stationary Combustion Turbines

- Clean Air Act Section 111(b)
- For source categories that cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare, CAA section 111 requires EPA to establish standards of performance for new sources
- Standards must be set based on what is achievable through the application of the best system of emission reduction (BSER)
  - Cost (must not be “exorbitant,” “greater than the industry can bear,” or “unreasonable”)
  - Non-air quality health and environmental impacts
  - Energy requirements
  - Control measures that have been adequately demonstrated



# Final Standards for New Stationary Combustion Turbines

- Standards effective from date of proposal publication (May 23, 2023)
- Three subcategories: base load, intermediate load, low load
- Standards are technology neutral, affected sources may comply with it by co-firing hydrogen





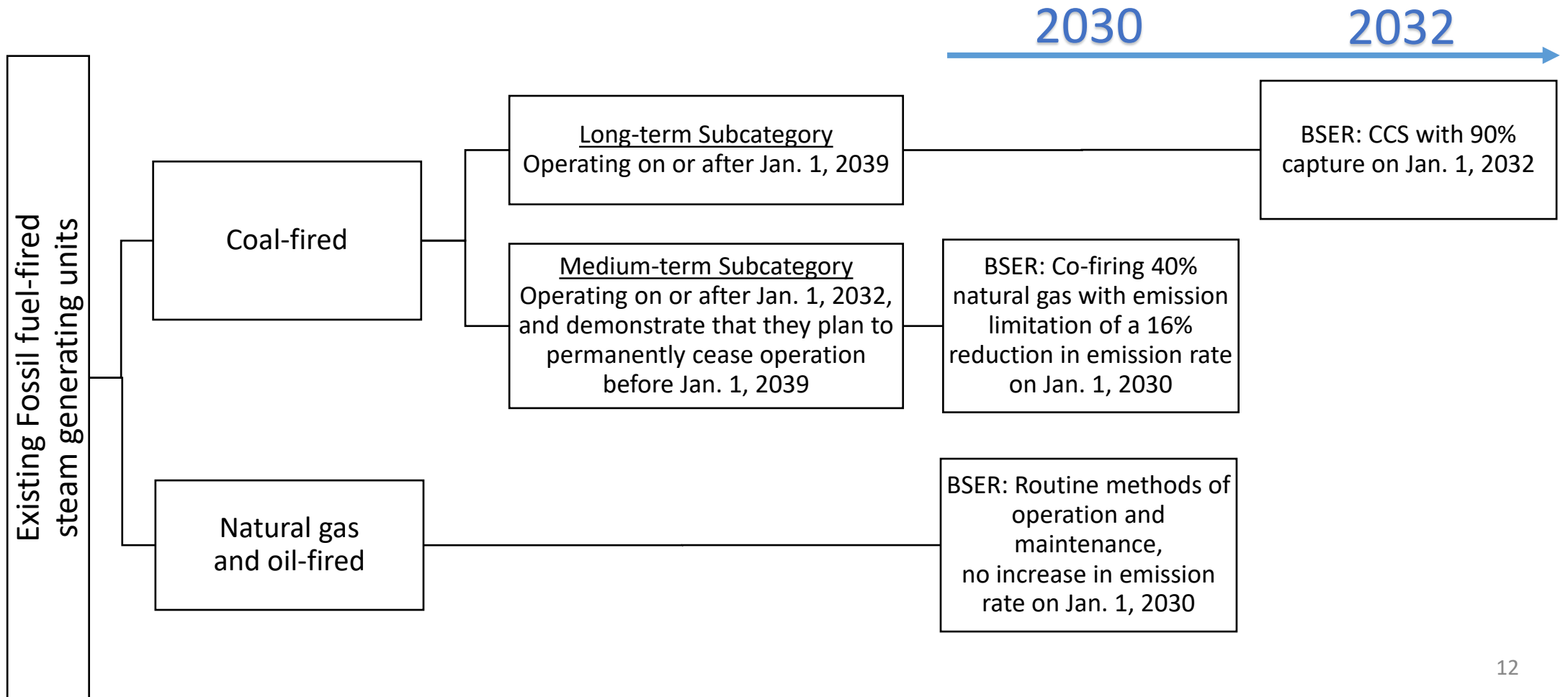
# Final Emission Guidelines for Existing Fossil Fuel-Fired Sources

- Clean Air Act Section 111(d)
- Required in certain circumstances once EPA issues New Source Performance Standards for new, modified and reconstructed sources.
- Do not impose requirements directly on sources.
- Inform states as they develop, submit and implement required plans that set standards for existing sources.
- Emission standards must be set based on what is achievable through the application of the best system of emission reduction (BSER)



# Final Emission Guidelines for Existing Steam Generating Units

- Two subcategories for existing coal-fired units, depending on operating horizon: (1) Units operating on or after Jan. 1, 2039 and (2) Units that are operating on or after Jan. 1, 2032, and demonstrate they plan to permanently cease operation before Jan. 1, 2039
- Units that demonstrate they plan to permanently cease operations before Jan. 1, 2032 are not subject to these standards





# State Plans for FINAL Emission Guidelines

## State Plan Submission Deadline

- Submission within 24 months after publication of the final emissions guidelines

## State Plan Components

- Requirements specific to these emission guidelines to ensure transparency, including a website hosted by EGU owners/operators to publish documentation and information related to compliance with the state plan

## Compliance Deadlines

- January 1, 2030, or January 1, 2032, depending on subcategory
- Compliance must be demonstrated annually
- States may include a mechanism in their plans to extend the compliance date by up to one year for affected EGUs installing a control technology that experience and subsequently provide documentation of a delay entirely outside of the owner/operator's control (e.g., permitting- or construction-related) that makes it impossible to commence compliance by the compliance deadline

## Meaningful Engagement

- General implementing regulations (Subpart Ba) apply, and require states to describe their meaningful engagement with pertinent stakeholders, including communities that are most affected by and vulnerable to emissions from these EGUs, and reliability authorities
- Helps ensure that the priorities, concerns and perspectives of these communities are heard during the planning process



# State Plans for Final Emission Guidelines

## Presumptive Standards of Performance

- For each subcategory, EPA has determined a BSER and degree of emission limitation and is providing a corresponding methodology for establishing presumptively approvable standards of performance
- Expressed as rate-based emission limitations (i.e., limitations on the amount of a regulated pollutant that can be emitted per unit of output, per unit of energy or material input, or per unit of time)

## Remaining Useful Life and Other Factors (RULOF)

- As provided in subpart Ba, under certain circumstances, states may apply a less stringent standard to a particular source based on that source's remaining useful life and other factors
- RULOF is intended as a limited variance from the EPA's determinations to address unusual circumstances at particular facilities

## Increments of Progress (IoPs) and Reporting Obligations

- Will serve as clear, transparent, and enforceable implementation checkpoints between state plan submittal and the compliance dates. Similarly, reporting obligations for affected EGUs that have demonstrated they plan to permanently cease operating provide transparency to stakeholders
- States may generally choose the calendar dates for their IoPs



# State Plans for Final Emission Guidelines

## Compliance Flexibilities

- States may incorporate compliance flexibilities, such as emission averaging, trading, and unit-specific mass-based compliance, into their state plans, subject to parameters laid out by EPA in the emission guidelines, including:
  - For mass-based compliance flexibilities, EPA is requiring the use of a backstop emission limitation applied to individual sources
  - EPA is providing a presumptively approvable methodology for unit-specific mass-based compliance for affected EGUs in the long-term coal-fired subcategory
- If a state chooses to incorporate compliance flexibilities into their state plans, the state must demonstrate that the plan achieves a level of emission reduction equivalent to each source individually achieving their rate-based standard of performance, and the state must document and justify any assumptions underlying the calculation of the aggregate standard of performance or mass limit/budget
- EPA believes that the use of compliance flexibilities, within the parameters specified in the emission guidelines, can create an incentive for overperformance and may also provide some additional operational flexibility to states and affected EGUs in achieving the required level of emission reduction



# Other Elements

- EPA is also simultaneously taking other actions, including
  - finalizing revisions to the NSPS for GHG emissions from fossil fuel-fired steam generating units that undertake a large modification, based upon the eight-year review required by the Clean Air Act;
  - repealing the “Affordable Clean Energy (ACE) rule” that was finalized in 2019 under the previous Administration; and
  - withdrawing the changes proposed to the NSPS for coal in 2018 under the previous Administration.
- EPA is not taking final action on the May 2023 proposed emission guidelines for existing combustion turbines. We are working to design a broader, more environmentally-protective approach to GHG regulation of the entire fleet of existing combustion turbines. EPA is taking this step as part of the comprehensive approach to regulation of climate, toxic and criteria air pollution from combustion turbines. As part of a robust stakeholder outreach effort, we issued framing questions and are gathering input through a non-regulatory docket that is open through May 28, 2024. Details are available at [Nonregulatory Public Docket: Reducing Greenhouse Gas Emissions from Existing Gas Turbines at Power Plants](#).





# Emissions changes, benefits, and costs

- EPA evaluated the national emissions changes, benefits and costs in a Regulatory Impact Analysis (RIA). The RIA presents systemwide information.
- Estimates are presented two ways – as present values (PV) and equivalent annualized values (EAV). The PV is the costs or benefits over the timeframe from 2024 to 2047. The EAV represents the value for each year of the analysis.
- Over the years from 2024 to 2047, EPA estimates net benefits of **\$370 billion**. This includes:
  - **\$270 billion** in climate benefits
  - **\$120 billion** in health benefits (PM and ozone)
  - **\$19 billion** in compliance costs
- For a single year, the net benefits are **\$20 billion**. This includes:
  - **\$14 billion** in climate benefits
  - **\$6.3 billion** in health benefits (PM and ozone)
  - **\$0.98 billion** in compliance costs



# Emissions changes

## Aggregate emission cuts from 2028-2047

- The Regulatory Impact Analysis projects reductions of 1.38 billion metric tons of CO<sub>2</sub> systemwide over the 2028 to 2047 timeframe along with tens of thousands of tons of PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub> – harmful air pollutants that are known to endanger public health.

## Snapshot of emissions changes

- In 2035, the power sector systemwide would emit
- 123 million metric tons less CO<sub>2</sub>
- 49,000 tons less annual NO<sub>x</sub>
- 19,000 tons less ozone season NO<sub>x</sub>
- 90,000 tons less SO<sub>2</sub>
- 1,000 tons less direct PM<sub>2.5</sub>
- About 200 pounds less mercury



# Benefits and Costs – Snapshot Years

	2028	2030	2035	2040	2045
<b>Climate Benefit</b>	\$8.4 billion	\$11 billion	\$30 billion	\$14 billion	\$12 billion
<b>PM2.5 and O3-related Health Benefits</b>	Up to \$5.8 billion	Up to \$4.0 billion	Up to \$15 billion	Up to -\$0.14 billion	Up to \$8.2 billion
<b>Total Benefits</b>	\$11 billion to \$14 billion	\$13 billion to \$15 billion	\$37 billion to \$45 billion	\$14 billion to \$14 billion	\$16 billion to \$20 billion
<b>Costs</b>	-\$1.3 billion	-\$0.22 billion	\$1.3 billion	\$0.59 billion	\$3.3 billion
<b>Net Benefits</b>	\$12 billion to \$15 billion	\$13 billion to \$16 billion	\$36 billion to \$44 billion	\$13 billion to \$13 billion	\$12 billion to \$17 billion



# Environmental Justice

- EPA engaged on multiple occasions with environmental justice organizations and representatives of communities that are affected by fossil fuel-fired EGUs, several of whom raised significant concerns about raised significant concerns about the potential health, environmental, and safety impacts of CCS. The EPA takes these concerns seriously, agrees that CCS must be deployed in a manner that protects public health, safety and the environment, and has carefully considered these concerns as it finalized its determinations of the BSERs for these rules.
- Overall, EPA modeling found that the final rule will result in large reductions of both GHGs and other emissions that will have significant positive benefits. While baseline ozone and PM2.5 concentration will decline substantially relative to today's levels in virtually all areas of the country, there is the potential for some localized increases in emissions.
- However, a robust regulatory framework exists to reduce the risks of localized emissions increases and facilitate the safe transport of CO2
  - The EPA plans to review and update as needed its guidance on NSR permitting, specifically with respect to BACT determinations for GHG emissions and consideration of co-pollutant increases from sources installing CCS
  - PHMSA is currently undertaking rulemaking to amend and enhance CO2 pipeline safety regulations
- Further, the EPA will continue to prioritize engagement with stakeholders throughout this process and is committed to engaging with all stakeholders on opportunities to ensure that deployment of CCS is done in a responsible manner.
- Each state will ultimately be responsible for determining the future operation of existing fossil fuel-fired EGUs located within its jurisdiction, and EPA's meaningful engagement requirements ensure that all interested stakeholders will have an opportunity to have their concerns heard in the state planning process.

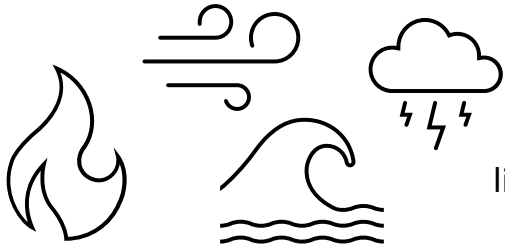


# Support for Reliability

EPA developed a four-point plan to address reliability throughout the implementation period.

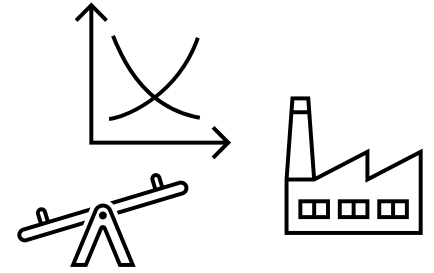
- 1) **Rule Structure**. EPA adjusted the compliance timeframe by 2 additional years for coal-fired units, to provide more time to install CCS, and streamlined the subcategories. The EPA is not regulating existing natural gas fired turbines at this time, which creates more time for a comprehensive approach, including for reliability.
- 2) **RULOF Provisions**. EPA articulated how states can use the Remaining Useful Life and Other Factors (RULOF) provisions to address reliability in state plans, as well as in state plan revisions, should circumstances change.
- 3) **Compliance Flexibilities**. Several important flexibilities are included: a flexible annual average compliance period, emissions trading/averaging, and mass-based compliance equivalency are allowed in circumstances that uphold the environmental integrity of the rule, and a 1-year compliance extension is available for new and existing units for implementation delays outside of the control the owner/operator.
- 4) **Reliability Mechanisms**. The final rule adds two optional reliability-related instruments as an additional layer of safeguards. A short-term mechanism to provide flexibility for units responding to grid emergencies and a reliability assurance mechanism for units with retirement dates with a documented and verified reliability need.

EPA completed analyses of the reliability and resource adequacy implications of these final rules, including high growth and combined regulation sensitivity analyses, that show these final rules can be implemented without adverse consequences for grid reliability. EPA will continue to engage extensively with all reliability related authorities.



## Two Additional, Optional Mechanisms to Support Reliability

EPA’s approach to supporting reliability is multifaceted, as it has always been. We listened to stakeholders and included adjustments to key provisions that will support planning and reliability -- like subcategories and time to meet the standards. We also added two reliability-related mechanisms that are voluntary for states to include in state plans for existing sources.



Short Term Mechanism		Reliability Assurance Mechanism
New or existing units during certain specified grid emergencies, like extreme weather events which can include hurricanes, wildfires, and winter storms.	<b>Who</b>	Existing units with cease operations dates.
Units responding to emergencies have access to greater compliance flexibility for those time periods.	<b>What</b>	Extensions can be granted extensions where there is a documented reliability need but is insufficient time for a state plan revision.
Short-lasting, mostly occurring over a few hours and in some rare instances can last for a few days.	<b>When</b>	Units have access to up to a 1-year extension – but no longer than what is substantiated through documentation.
A unit must submit documentation, for annual compliance purposes, demonstrating the hours in which it operated out of schedule due to a qualified grid emergency.	<b>How</b>	A unit must substantiate that is needed to maintain reliability and have fulfilled all reporting requirements.
Grid emergencies that qualify for flexibility under this mechanism are energy emergency alerts (EEA) as defined by the North American Reliability Corporation. EEA levels 2 and 3 qualify for flexibility under this mechanism	<b>More Details</b>	Extensions exceeding 1 year in duration must be addressed through a state plan revision. EPA will seek the advice of Federal Energy Regulatory Commission (FERC) for extensions longer than 6 months.



## For More Information

- Fact sheets and a copy of the final rule, RIA, and supporting documents are available at [Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants](#)



**THANK YOU**



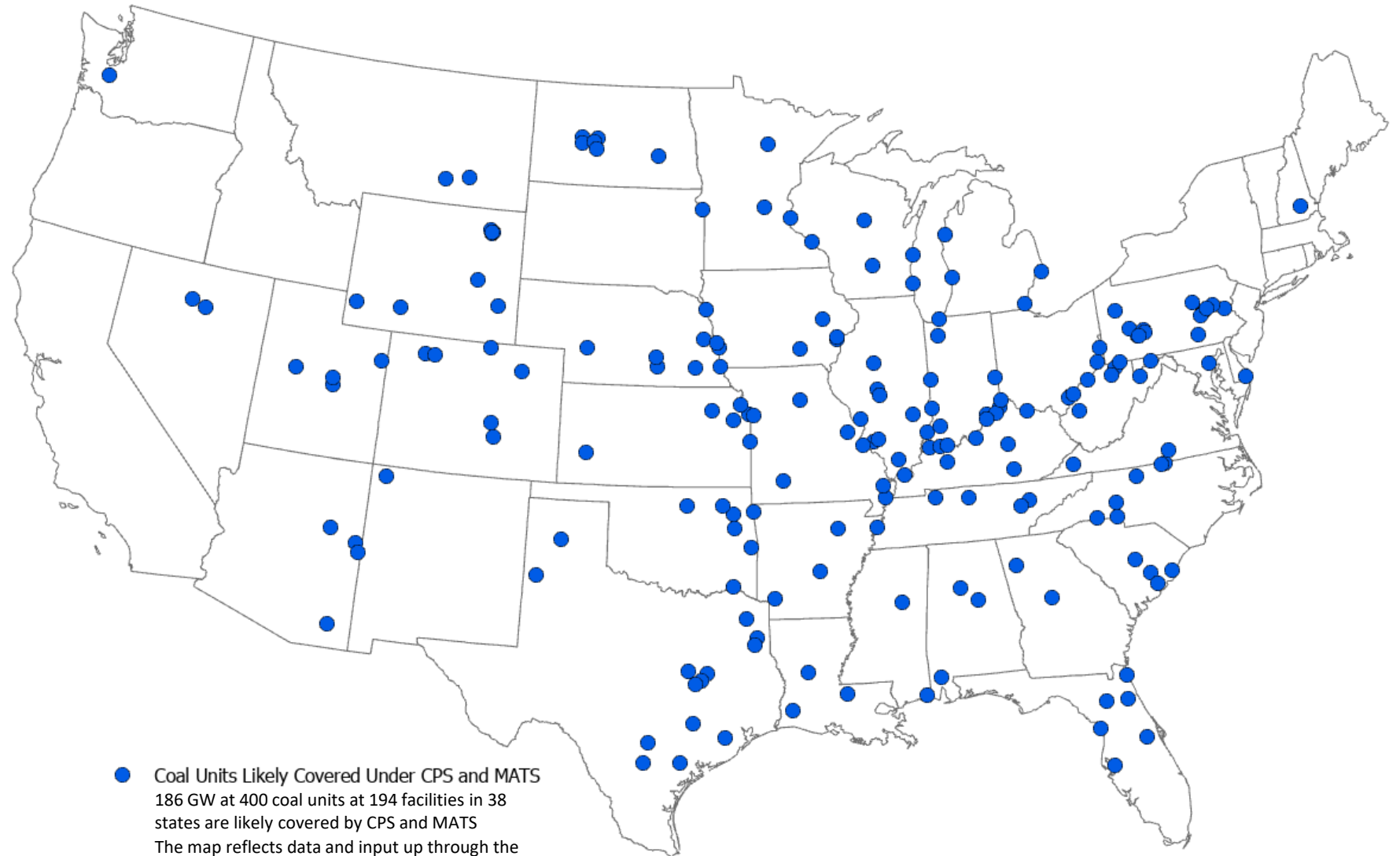


# Appendix - Maps



# Potentially Covered Coal-Fired Units: 2023

- Today, about 186 GW of coal-fired power plants are operating nationwide, this is 38% less than 10 years ago.
- Many of these have announced plans to retire or convert to natural gas (see following maps)

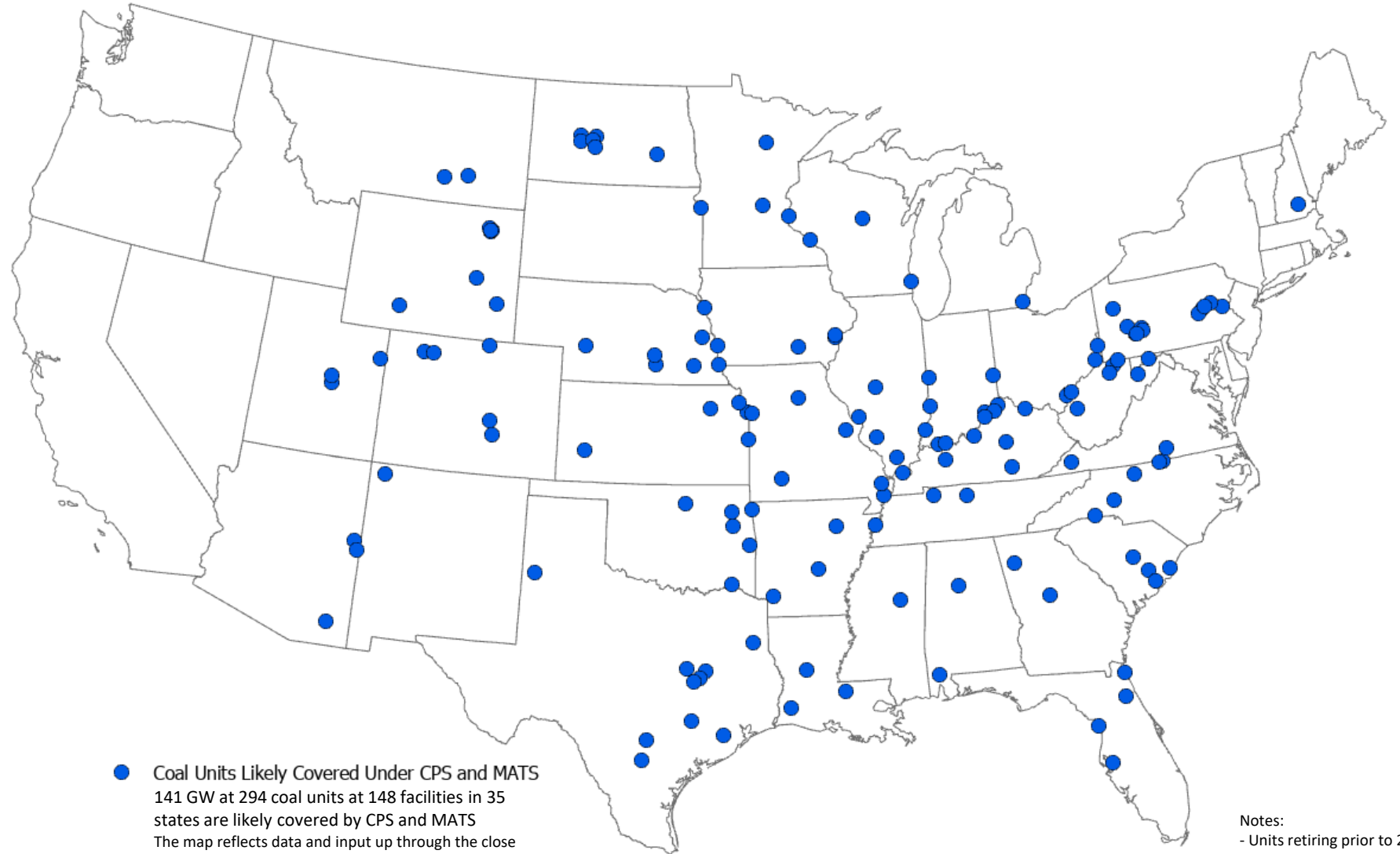


● Coal Units Likely Covered Under CPS and MATS  
186 GW at 400 coal units at 194 facilities in 38 states are likely covered by CPS and MATS  
The map reflects data and input up through the end of 2023.



# Potentially Covered Coal-Fired Units: 2029

- This map shows units for which EPA is not aware of plans to retire or switch to natural gas by 2029.
- Over the next 5 years, EPA is aware of 45 GW that have announced plans to retire or convert to natural gas, leaving a coal-fired fleet of 141 GW.
- These plans to retire or change fuel are among the many factors states and power plant owners can consider as they make decisions about CPS subcategories and/or controls for these units.
- The units on this map may be likely to be in the medium-term or long-term CPS subcategories.



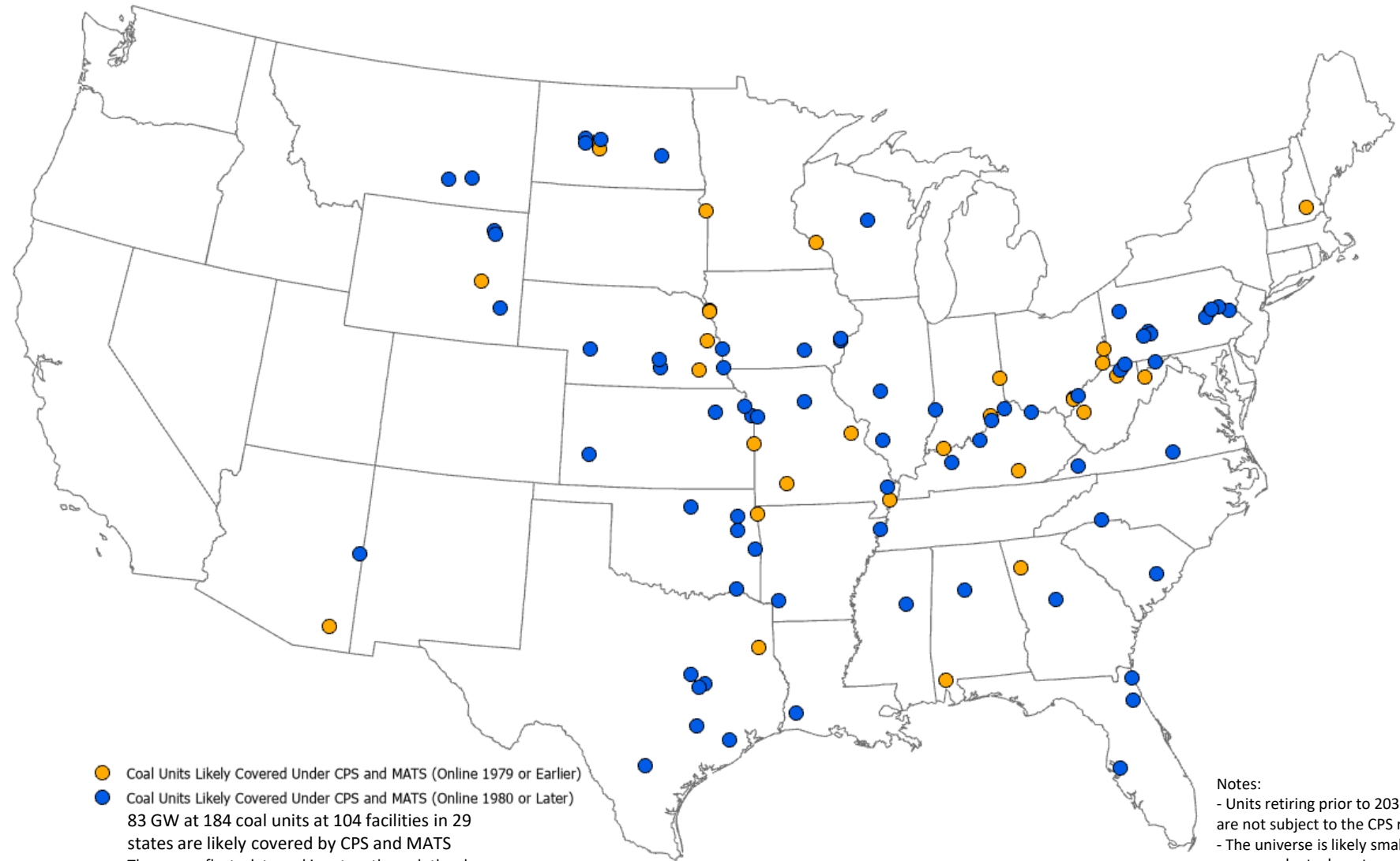
● Coal Units Likely Covered Under CPS and MATS  
141 GW at 294 coal units at 148 facilities in 35 states are likely covered by CPS and MATS  
The map reflects data and input up through the close of comment period (August 8, 2023), but may not reflect more recent announcements.

Notes:  
- Units retiring prior to 2032 are not subject to the CPS rule  
- The universe is likely smaller, as many plants do not announce retirement plans this far in advance



# Potentially Covered Coal-Fired Units: 2039

- This map shows units for which EPA is not aware of plans to retire or switch to natural gas by 2039.
- Over the next 15 years, EPA is aware of 103 GW that have announced plans to retire or convert to natural gas, leaving a coal-fired fleet of 83 GW.
- Of the remaining coal-fired fleet, 36 GW will be over 60 years old by 2039.
- The units on this map may be even more likely to be in the medium-term or long-term CPS subcategories.



● Coal Units Likely Covered Under CPS and MATS (Online 1979 or Earlier)  
● Coal Units Likely Covered Under CPS and MATS (Online 1980 or Later)  
83 GW at 184 coal units at 104 facilities in 29 states are likely covered by CPS and MATS  
The map reflects data and input up through the close of comment period (August 8, 2023) but may not reflect more recent announcements.

Notes:  
- Units retiring prior to 2032 are not subject to the CPS rule  
- The universe is likely smaller, as many plants do not announce retirement plans this far in advance