

# Upcoming EPA Turbine Rules

Office of Air and Radiation

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**FEDERALISM CONSULTATION**

AUGUST 15, 2024

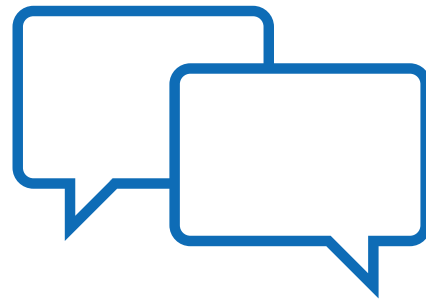
# Purpose of Federalism Consultation



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Provide information to  
State and Local  
Government Associations  
and their members on the  
EPA's Turbine rulemakings

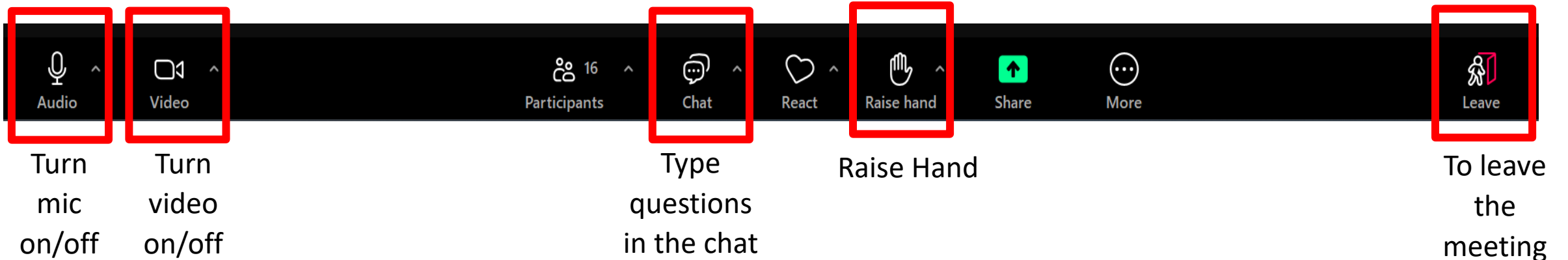
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Solicit input on key areas of  
the EPA's Turbine  
rulemakings

# Meeting Instructions and Tips

- Using Zoom
  - When a participant is called on to speak, please ensure that the line is unmuted
  - While speaking, participants are also welcome to activate the Zoom camera by clicking on the “Video” icon
  - For Zoom technical support and troubleshooting, reach out via the chat and someone from our logistics team will be happy to assist
- Meeting Questions
  - For general assistance during today’s meeting, reach out via the chat and our logistics team will help



# Welcome

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OCIR Roll Call

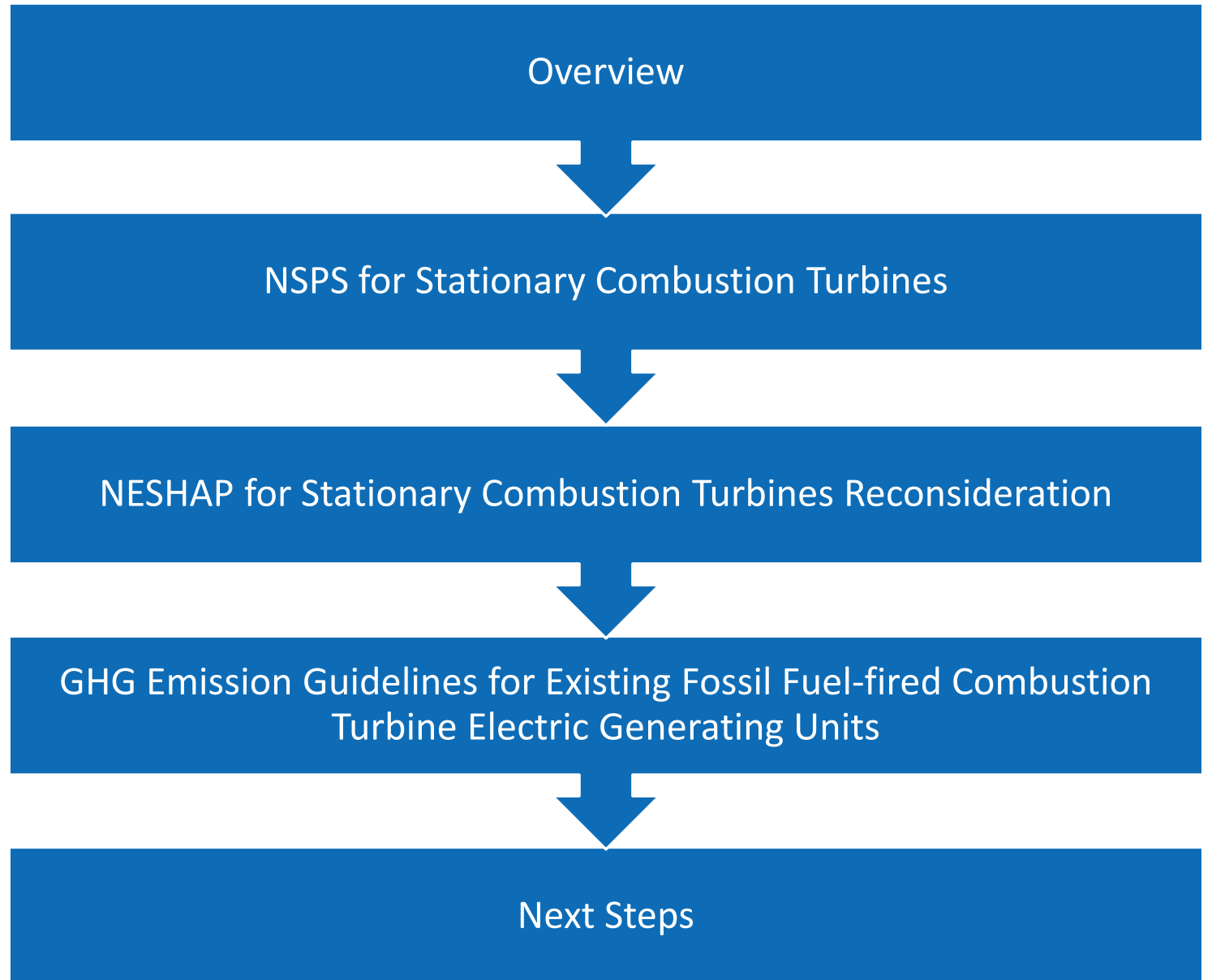
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OCIR Welcome

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OAR Welcome

# Today's Presentation



# Overview

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# Background

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In May 2023, the EPA proposed emission guidelines for greenhouse gases (GHGs) from existing combustion turbine electric generating units (EGUs). The proposal focused on the use of carbon capture and storage (CCS) or hydrogen to control emissions from the largest, most frequently-operated units. Comments included the following:

- States expressed the need to provide flexibilities, including those that build upon existing state efforts
- Environmental Justice commenters expressed concerns about the reliance on technologies such as CCS and hydrogen with potential effects on communities historically disproportionately impacted by pollution
- Environmental commenters cited the potential for increased operation of less efficient sources
- Industry expressed concern about the additional infrastructure that would be needed (*e.g.*, CO<sub>2</sub> and hydrogen pipelines, CO<sub>2</sub> sequestration facilities and hydrogen production facilities)
- Transmission organizations noted concerns about electric reliability

# Turbine Proposals and Outreach

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As a result, in February 2024, the EPA announced that it planned to take a new, comprehensive approach to cover the entire fleet of combustion turbines, as well as covering more pollutants including climate, toxic, and criteria air pollution.

## Outreach to-date:

- In March, the EPA opened a 60-day non-regulatory docket with framing questions to solicit feedback on ways to reduce GHGs from existing combustion turbines; over 120 technical comments were submitted
- In May, the EPA held a one-day public forum, with over 400 in-person and virtual attendees, to provide additional opportunity for feedback and dialogue
- Broad stakeholder outreach efforts continue with states, local communities, power companies, environmental groups, turbine manufacturers, and reliability experts: RTO/ISOs, EEI, DOE, EIA, FERC staff



# Upcoming OAR Proposals

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Criteria  
Pollutants  
(NO<sub>x</sub>, SO<sub>2</sub>)

## NSPS

Proposed New Source  
Performance Standards Review  
for Stationary Combustion  
Turbines

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Hazardous  
Air  
Pollutants  
(HAP)

## NESHAP

Proposed Reconsideration of  
National Emission Standards for  
Hazardous Air Pollutants:  
Stationary Combustion Turbines

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Greenhouse  
Gases  
(GHG)

## Emission Guidelines

Proposed Emission Guidelines  
(EGs) for Greenhouse Gas (GHG)  
Emissions from Existing  
Stationary Combustion Turbine  
EGUs

# Criteria Pollutant NSPS Review Under CAA 111(b)

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STATIONARY COMBUSTION TURBINES



## CAA 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 the 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
  - Non-air quality health and environmental impacts
  - Energy requirements
  - Technology that has been adequately demonstrated
- CAA 111(b)(1)(B) requires EPA to review, and if appropriate, revise the new source standards at least every 8 years.

# Regulatory History – NSPS

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- The original NSPS was finalized in 1979 under subpart GG of 40 C.F.R. part 60 and covers stationary combustion turbines in the power sector and industrial sectors
  - Affected sources are combustion turbines with a capacity of 10 MMBtu/h or greater that commence construction, modification, or reconstruction after the date the rule is proposed in the *Federal Register*
- The EPA last revised the criteria pollutant standards for new combustion turbines in 2006 under subpart KKKK and lowered the NO<sub>x</sub> and SO<sub>2</sub> limits to reflect advances in new turbine designs and control technologies
- To limit NO<sub>x</sub> emissions, the BSER was identified as turbine combustion controls, such as dry low NO<sub>x</sub> burners or water injection
  - Identified 14 subcategories of combustion turbines based on size and heat input
- To control SO<sub>2</sub>, the firing of low-sulfur fuels, including pipeline natural gas or low-sulfur diesel, was identified as the BSER

# Potential Control Technologies – NSPS

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- Permit searches show that the post-combustion control of NO<sub>x</sub> with selective catalytic reduction (SCR) is commonly required as the Best Available Control Technology (BACT) pursuant to state prevention of significant deterioration (PSD) permitting programs to limit emissions of NO<sub>x</sub>
  - SCR utilizes a solid catalyst to convert NO<sub>x</sub> to nitrogen gas (N<sub>2</sub>) in the turbine exhaust
  - Preliminary annualized costs for selective catalytic reduction per combustion turbine depend on cycle type and size, ranging from \$500K-\$1,500k
- Combustion controls supported by manufacturer guarantees were identified as the BSER in subparts KKKK and GG and have the potential to improve for new turbines
  - NO<sub>x</sub> formation is greater when fuels are combusted at higher temperatures
  - Ultra-dry low NO<sub>x</sub> burners can reduce flame temperatures to limit NO<sub>x</sub> formation
  - Wet controls can also reduce high flame temperatures
  - These controls are available for new combustion turbines, both large and small
- The sulfur content of fuels has continued to decrease since the last NSPS (2006)

## Potential Impacts on State and Local Governments

- Based on a review of available data from the past 5 years, the EPA estimates that approximately 15 new combustion turbines owned by states or regional entities (*e.g.*, municipalities, universities, hospitals) have been built
- Turbine owners/operators would be responsible for compliance with the emission limits in the NSPS
- The EPA sets standards directly and may also enforce directly; state and local regulatory authorities may be delegated implementation and enforcement authority
- Anticipated cost impacts are a key consideration and still being determined for the proposed NSPS

# Questions for Consideration: Criteria Pollutant NSPS

- Stakeholders have asked the EPA to consider SCR as the best system for limiting emissions of  $\text{NO}_x$  from new combustion turbines. How have state permitting authorities applied the BACT criteria in evaluating SCR?
- How should the EPA ensure that combustion turbines that fire or co-fire hydrogen are well-controlled for  $\text{NO}_x$  emissions?
- What is the availability or use of ultra-low sulfur diesel in combustion turbines located in non-continental areas, such as Hawai'i, Puerto Rico, or the U.S. Virgin Islands?
- How might the integration of collocated battery storage impact  $\text{NO}_x$  emissions from turbines? For example, do they start/stop more often?

# NESHAP Under CAA 112

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STATIONARY COMBUSTION TURBINES  
RECONSIDERATION



# Overview of Clean Air Act Section 112

- CAA Section 112 requires the EPA to establish National Emission Standards for Hazardous Air Pollutants (NESHAP) for source categories of major and area sources of hazardous air pollutants (HAP)
  - Major source standards are based on maximum achievable control technology (referred to as "MACT standards") that require the maximum degree of reduction in HAP emissions; MACT standards are set separately for new and existing sources
  - A "major source" means any stationary source or group of sources located within a contiguous area that emits or has the potential to emit 10 tons per year of any HAP or 25 tons per year of more of any combination of HAP (112(a)(1))
- CAA Section 112(d)(6) requires the EPA to review, and revise as necessary, all NESHAPs (considering developments in practices, processes and control technologies) at least every eight years
  - Commonly referred to as the "Technology Review"
- CAA Section 112(f)(2) requires the EPA to assess the remaining health and environmental risk (*i.e.*, residual risk) within eight years after promulgation of MACT standards
  - Commonly referred to as the "Residual Risk Review"
- Combined, the CAA 112(d)(6) and (f)(2) reviews are commonly referred to as a "Residual Risk and Technology Review" or RTR

## Regulatory History – NESHAP (40 CFR Part 63, Subpart YYYY)

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### **2004: Stationary Combustion Turbine NESHAP set standards to limit formaldehyde emissions from new turbines**

- Applies to combustion turbines at major sources of HAP, which are usually very large combined cycle turbines, or those co-located with coal-fired units, refineries, chemical plants, oil & gas operations, *etc.*

### **2020: RTR completed**

- No revisions promulgated under the risk or technology reviews
- May 2020: Sierra Club submitted a petition for reconsideration for the 2020 RTR citing failure to set standards for several HAP emitted by turbines, including metals (*e.g.*, arsenic, cadmium, chromium, lead, and mercury) and acid gases (such as hydrogen chloride)

**This proposal will review the formaldehyde limits for combustion turbines and consider standards for unregulated HAP (such as metals and acid gases) pursuant to the decision in *Louisiana Environmental Action Network (LEAN) v. EPA***

# NESHAP

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## Data Collection

- In 2022, the EPA sent a CAA Section 114 information request to 22 turbines owned by eight companies, collecting emissions data for formaldehyde, HAP metals, and acid gases
  - Emission testing included turbines from a variety of manufacturers, subcategories, fuels, and applications
  - Testing included turbines with and without an oxidation catalyst, which is the primary control for formaldehyde
  - Measurable emissions of HAP metals, particularly chromium, nickel, and manganese, were collected from turbines burning a variety of fuels
  - These data will be used for setting standards and are available at <https://www.epa.gov/stationary-sources-air-pollution/stationary-combustion-turbines-national-emission-standards>

## Engagement

- We are consulting with turbine manufacturers and control device vendors to gather information about costs and feasibility of emission controls

# NESHAP – Potential Impacts on State and Local Governments

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- We are aware of 87 gas turbines owned at 24 state and local government facilities in 9 states (California, Florida, Georgia, Iowa, Kansas, Michigan, Missouri, New Jersey, Ohio) and Puerto Rico
- Some facilities may need to install controls (*e.g.*, oxidation catalyst) to meet the formaldehyde limits expected to be proposed in this rulemaking
  - Preliminary annualized costs for an oxidation catalyst per turbine depend on cycle type and size, ranging from \$200K-\$700K for simple cycle turbines and \$1.2MM-\$4.1MM for combined cycle turbines
- Some turbines may be able to meet the standard through low emission turbine combustor design and would not require additional add-on controls
- Facilities may also need to conduct periodic stack testing

# Questions for Consideration: NESHAP

- Is there information on the performance or cost of new or additional control technologies, improved methods of operation, improvements or upgrades to existing controls, or other practices and technologies that may result in cost-effective reductions of HAP emissions from combustion turbines, particularly from those that burn landfill gas?
- What is the precise mechanism leading to metal HAP and acid gas emissions?
- What actions could a manufacturer or operator take to reduce emission rates of metal HAP or acid gases and what are the costs associated with those actions?

# GHG Emission Guidelines Under CAA 111(d)

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EXISTING FOSSIL FUEL-FIRED COMBUSTION TURBINE  
ELECTRIC GENERATING UNITS

## CAA Section 111(d)

- 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 the EPA to:
  - Establish standards of performance for new sources and
  - Issue emission guidelines that identify the BSER and degree of emission limitation for existing sources
- In response to the EPA's emission guidelines, states are required to craft plans that establish **standards of performance for existing sources** and submit that plan to the EPA for review and approval
- When applying standards of performance to particular existing sources, States may consider their **remaining useful lives and other factors**

# Applicability and Affected Sources

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- All states have at least one stationary combustion turbine EGU
  - A state or territory with stationary combustion turbine EGUs may be required to develop and implement a state plan
- In the state plan, the state generally establishes standards of performance for each affected source based on the degree of emission limitation EPA identifies in the emission guideline
  - The majority (about 80%) of stationary combustion turbine EGUs are owned and operated by investor-owned utilities, independent power producers, cooperatives, or a federally-owned utility
  - State, municipal, or locally owned EGUs may also be subject to standards established in state plans:

Owner type	Number of Power Plants	Number of Turbine EGUs
State-owned Utility	16	32
Municipally-owned Utility	101	225
Local/other	48	121

*Note: Numbers are approximate and for the contiguous U.S. only; actual coverage will depend on the final rule.*



# Recent Regulations of GHGs from EGUs

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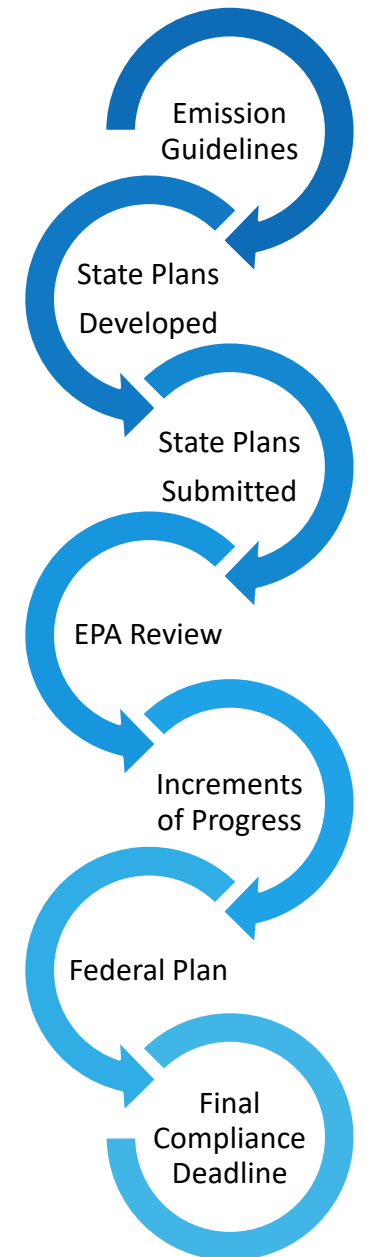
- Finalized GHG EGs for existing steam generating units (40 C.F.R. Part 60, Subpart UUUUb)
- Finalized 2024 GHG NSPS for fossil fuel-fired new combustion turbine EGUs (40 C.F.R. Part 60, Subpart TTTTa)
  - Base load (capacity factors > 40%): Highly efficient combined cycle generation, 90% CCS by January 1, 2032
  - Intermediate load (20% to 40% capacity factor): Highly efficient simple cycle generation
  - Low load (< 20% capacity factor): Use of lower-emitting fuels (< 160 lb. CO<sub>2</sub>/MMBtu)
- Proposed, but did not finalize EGs for large, frequently operated existing combustion turbine EGUs (capacity factors greater than 50% or > 300 MW), with BSER of either CCS or hydrogen co-firing

# Questions for Consideration: GHG EGs

- 2024 final rules and the prior proposal for existing CT EGUs identified options for systems of emission reduction that included carbon capture and storage (CCS), hydrogen co-firing and efficiency
  - What are your views on the feasibility, cost, pollution impacts, energy impacts or other advantages and disadvantages of these systems?
  - Are there other systems (*e.g.*, efficiency improvements, batteries) that the EPA should consider?
- Historically, the EPA has subcategorized combustion turbine EGUs based on capacity factor and size (*i.e.*, nameplate capacity or maximum hourly heat input)
  - Are there particular types or subcategories of EGUs for which one or more of the potential systems of emission reduction would be particularly appropriate or inappropriate?
  - Are there other approaches to subcategorization that the EPA should consider?

# EPA and State Partners at Work

- Establishing standards of performance for sources under 111(d) involves actions by both the EPA and the states
  - The EPA promulgates emission guidelines which include the best system of emissions reduction (BSER), the degree of emission limitation achievable through application of the BSER and, often, presumptive standards of performance
  - States use this information to set standards of performance for each designated facility (*i.e.*, existing fossil fuel-fired combustion turbines). These standards must generally be at least as stringent as EPA's emission guidelines. States may also consider source-specific factors in applying less stringent standards to particular sources
  - States submit this and other required information to the EPA as a part of a state plan. The EPA approves state plans that are satisfactory, at which point the standards of performance become federally enforceable
  - If the EPA determines that a state plan is not satisfactory, the Agency is required to promulgate a federal plan for the state



# Questions for Consideration: GHG EGs

- CAA Section 111(d) gives states responsibility for designing state plans that establish, implement, and enforce standards of performance for GHG from existing combustion turbine EGUs
  - What compliance flexibilities would states and utilities find useful to include in state plans?
  - What alternative forms of emission limitations (*e.g.*, state-wide emissions budgets, trading) might be helpful? What limitations, conditions or criteria might be necessary to ensure that plans that include such alternative forms are satisfactory?
  - States are permitted to consider a particular source’s “remaining useful life and other factors” in applying a standard to that source. Is there guidance, in addition to that provided by the general implementing regulations, that would be helpful for states in considering source-specific factors for GHGs from existing combustion turbine EGUs?
  - What, if any, steps might states take in plan development that are specific to addressing existing combustion turbines, and how long might those steps reasonably take?

# Questions for Consideration: GHG EGs

- Because states and the federal government have a shared responsibility in the regulations under 111(d), there is also a shared responsibility to understand the local and broader environmental justice (EJ) impacts of these regulations
  - How much engagement and consideration do states initiate on EJ impacts for 111(d) state plans? What is the level of resources and cost for this?
  - What guidance, tools and resources can the EPA provide to enable states to improve air quality and reduce emissions in communities with EJ concerns through the state plan process?

# Next Steps

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# Input Requested

## Criteria Pollutant NSPS, NESHAP, and GHG Emission Guidelines

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- The EPA would appreciate feedback on data provided, including costs and other actionable information
- Additional information or concerns you would like to share with the EPA

# Next Steps

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- The EPA encourages intergovernmental associations to forward briefing materials to their members following this meeting
- The EPA requests written comments or recommendations by October 15, 2024 (*i.e.*, within 60 days following today's meeting)
  - Submit comments to Lisa Thompson at [thompson.lisa@epa.gov](mailto:thompson.lisa@epa.gov)
- EPA is seeking input from other key stakeholders and entities
  - Tribal government officials
  - Environmental justice-related organizations
  - Public health organizations
  - Nongovernmental organizations
  - Power generators
  - Balancing Authorities
  - Labor
  - Federal partners
  - Others



# For More Information

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## Regulatory Questions

### **Lisa Thompson**

EPA Office of Air and Radiation  
Email: [thompson.lisa@epa.gov](mailto:thompson.lisa@epa.gov)

## General Consultation Questions

### **Andrew Hanson**

EPA Office of Congressional and  
Intergovernmental Relations  
Email: [hanson.andrew@epa.gov](mailto:hanson.andrew@epa.gov)

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## Links to Regulatory Websites

NSPS: <https://www.epa.gov/stationary-sources-air-pollution/stationary-gas-and-combustion-turbines-new-source-performance>

NESHAP: <https://www.epa.gov/stationary-sources-air-pollution/stationary-combustion-turbines-national-emission-standards>

Emission Guidelines: <https://www.epa.gov/stationary-sources-air-pollution/greenhouse-gas-standards-and-guidelines-fossil-fuel-fired-power>