2023 Proposed Greenhouse Gas Standards for Fossil Fuel-Fired Power Generation Industry

On May 23, 2023 EPA published proposed new standards in the Federal Register to limit emissions of greenhouse gases (GHG) from the electric power generation sector, with proposed standards for certain new natural gas-fired combustion turbines, and emission guidelines for existing fossil fuel-fired electric generating units (EGUs) and certain existing combustion turbines. The proposed standards represent EPA's latest approach to regulating GHG emissions from this industry, following the 2015 Clean Power Plan, and 2019 Affordable Clean Energy Rule. As part of this proposal, the Affordable Clean Energy Rule has been formally repealed. The proposal, which would create and amend multiple rules under 40 CFR 60 relies significantly on carbon capture and sequestration (CCS) as well as co-firing with low-GHG hydrogen (often referred to as "green hydrogen") as available technologies to reduce GHG emissions from the electric power generation sector.

New/Reconstructed Stationary Combustion Turbines

EPA proposes new and updated emission standards for new or reconstructed fossil fuel-fired stationary combustion turbine EGUs, with sub-categorization based on the frequency of operation. All stationary combustion turbines subject to the proposed standard would be subject to numeric emission limitations upon initial startup, with baseload and intermediate load turbines required to use of CCS or co-firing of green hydrogen beginning in the early to mid-2030's to achieve emission reductions. See attached Table 1 for details.

Existing Fossil Fuel Fired Electric Generating Units

EPA proposes new emission guidelines for certain existing fossil fuel-fired steam generating EGUs, to be implemented in plans submitted by the states for EPA's approval. In the case of coal-fired units, those who intend to fire coal beyond 2040 will be expected to install and operate CCS, while those who cease operation prior to then will be subject to less intrusive standards, based on the date in which the unit removes the ability to fire coal. See Table 2 for details. Separate standards are proposed for existing fuel oil and natural gas fired EGUs, which do not require CCS or green hydrogen co-firing, and are provided in Table 3.

In its proposal, EPA describes that states will have 2 years from the date the final rule is published to develop and submit plans for EPA's approval. States are to use EPA's best system of emission reduction (BSER) as a basis for establishing requirements for affected sources, noting that states may allow, but are not obligated to allow, trading and averaging so that sources in the state, on average, achieve the reductions which would occur if each source applied BSER, but in that scenario, certain sources may be approved to apply a less than BSER-level degree of reductions.

Scan the QR Code to learn more about Barr's services to the Electric Power Industry!

Existing Large Baseload Stationary Combustion Turbines

Finally, EPA is proposing new emission guidelines for existing stationary combustion turbines that are greater than 300 MW in capacity and operate at a greater than 50% capacity factor. The BSER for designated facilities is similar to the proposed standards for new, baseload stationary combustion turbines; details are available in Table 4. Similar to the Existing Fossil Fuel-Fired EGU's, states will have a 2-year period to propose plans that address impacted facilities on a unit-by-unit basis, for EPA's approval.

Important Milestones

August 8, 2023:	Deadline for comments on proposed rules
Summer 2024	EPA expected finalization of rules
Summer 2026 (2 years following rule finalization)	State Plan Submittal Deadline
January 1, 2030	Compliance deadline for existing EGU's. Implement CCS, natural gas co-firing, or Operation & Maintenance procedures depending on planned future coal firing
January 1, 2031	New Baseload Turbines must notify EPA of which BSER pathway they intend to comply with
January 1, 2032	Imminent-Term EGU's cease coal firing
2032 (Specific date undefined)	New Intermediate and Baseload Turbines complying via green hydrogen must co-fire 30%
December 31, 2034	Near-Term EGU's cease coal firing
2035 (Specific date undefined)	New and Existing Baseload Turbines complying via CCS must implement CCS
2038 (Specific date undefined)	New Intermediate Load Turbines and New Baseload Turbines complying via green hydrogen co-firing must co-fire 96%
January 1, 2040	Medium-Term EGU's cease coal firing

Considerations and Preparation

The proposed GHG standards for the power generation industry is one of many contemporary drivers for change in the American electric power generation portfolio. Add to these influences, other recent environmental requirements, ESG pressure, and capital and operating costs can drive change at a rapid pace. Turn to Barr for integrated engineering and environmental solutions to optimize future generation.

Contact your Barr Project Manager or Adam Driscoll (adriscoll@barr.com) for further assistance.

Table 1 – New & Reconstructed Stationary Combustion Turbines

Sub-Category	NSPS TTTTa Applicability		Phase 1			Phase 2			Phase 3		
	Heat Input	Capacity Factor	Requirement	Date	Standard	Requirement	Date	Standard	Requirement	Date	Standard
Low Load Turbines	> 250 MMBtu/hr heat input of fossil fuel (alone or in combination with any other fuel)	</= 20% [1]	Lower emitting fuels [3]	Initial Start Up	120-160 lbs CO_2/MMBtu	N/A [7]			N/A		
Intermediate Load Turbines		> 20% and ≤ Site-specific value determined based on design efficiency of affected facility - 33-40% simple cycle - 45-50% combined cycle [2]	Highly efficient generation	Initial Start Up	1,150 lbs CO_2/MWh-gross [4]	+ Co-firing 30%v low-GHG hydrogen	2032	1,000 lb CO_2/MWh-gross	N/A [8]		
Base Load Turbines		> Site-specific value determined based on design efficiency of affected facility - 33-40% simple cycle - 45-50% combined cycle [2]	Highly efficient generation	Initial Start Up	770 lbs CO_2/MWh-gross (Heat Input > 2,000 MMBtu/hr) [5] --- 900 - 770 lbs CO_2/MWh-gross (250 MMBtu/hr < Heat Input < 2,000 MMBtu/hr) [6]	+ 90% CCS [8] [9]	2035	90 lb CO_2/MWh-gross	N/A		
						+ Co-firing 30%v low-GHG hydrogen [10]	2032	680 lb CO_2/MWh-gross	+ Co-firing 96%v low-GHG hydrogen	2038	90 lb CO_2/MWh-gross

[1] Soliciting comment on a range of 15-25% percent, or be determined by a site-specific threshold based on three-quarters of the design efficiency of the combustion turbine
[2] Soliciting comment on a range of 29-35% for simple cycle combustion turbines to and to 40-49% for combined cycle combustion turbines, depending on the design efficiency
[3] Natural gas and/or distillate fuel oil
[4] Soliciting comment on 1,100 lb CO_2/MWh-gross or 1,200 lb CO_2/MWh-gross
[5] Soliciting comment on if natural gas-fired baseload combustion turbines with a heat input rating that is > 2,000 MMBtu/h should have a range of 730-800 lbs CO2/MWh-gross and if >250 MMBtu/h should have a range of 850-900 lbs CO_2/MWh-gross
[6] Site-specific emission limit calculated based on base load rating
[7] Soliciting comment on the addition co-firing low-GHG hydrogen
[8] Soliciting comment on whether a single standard of performance based on the application of CCS should be used instead, with co-firing low-GHG hydrogen being available as a compliance pathway rather than a separate BSER
[9] Soliciting comment on >/=95% CCS, with associated emission rate reduction range of 75-90%
[10] Soliciting comment on the addition co-firing 96%vol low-GHG hydrogen by 2032

Table 2 – Existing Coal-Fired Electric Generating Units

Definition	Applicability		Requirements		
	Sub-Category	Cease Coal Firing Date	BSER	Compliance Date	Additional Requirements
> 25 MW [1] --- Fires Coal>10% avg heat input on coal during three calendar years prior to compliance deadline OR >15% during any one of those calendar years --- Retains ability to fire coal beyond 12/31/2029	Imminent Term	1/1/2032	Operation & Maintenance [2]	2030	No Increase in Emission Rate
	Near Term	12/31/2034	Operation & Maintenance [2]		No Increase in Emission Rate --- Annual Capacity Factor 20% Limit
	Medium Term	1/1/2040	Co-firing 40% annual heat input natural gas [3]		N/A
	Long Term	Beyond 1/1/2040	90% CCS [4]		N/A

[1] Exemptions include units with limits to sell ≤ 33% of potential electric output or 219,000 MWh or less, non-fossil fuel fired units that limit 10% or less of heat input from fossil fuel, municipal waste incinerators, commercial or industrial solid waste incinerators
[2] Soliciting comment on co-firing low levels of natural gas
[3] Soliciting comment on co-firing 30-50% annual heat input natural gas
[4] Soliciting comment on 90-95% CCS

Table 3 – Existing Fuel Oil and Natural Gas-Fired Electric Generating Units

Definition	Applicability		Requirements*		
	Sub-Category	Annual Capacity Factor	BSER	Compliance Date	Additional Requirements
25 MW [1] --- Fires FO/NG < 10% avg heat input on coal during three calendar years prior to compliance deadline AND <15% during any one of those calendar years --- No longer retains ability to fire coal beyond 12/31/2029	Non-Intermediate or Baseload	<8%	N/A	2030	N/A [2]
	Intermediate	8-45%	Operation & Maintenance		No Increase in Emission Rate --- 1,500 lb CO_2/MWh-gross
	Baseload	>45%	Operation & Maintenance		No Increase in Emission Rate --- 1,300 lb CO_2/MWh-gross

** Non-continental oil-fired units will only be subject to routine maintenance, and a requirement of no increase in emission rate requirements*
[1] Exemptions include units with limits to sell ≤ 33% of potential electric output or 219,000 MWh or less, non-fossil fuel fired units that limit 10% or less of heat input from fossil fuel, municipal waste incinerators, commercial or industrial solid waste incinerators
[2] Soliciting comment on 120-130 lb CO2/MMBtu for natural gas and 150-170 lb CO2/MMBTU for fuel oil

Table 4 – Existing Large Baseload Stationary Combustion Turbines

Sub-Category	Applicability	Phase 1		Phase 2	
		BSER	Date	BSER	Date
Base Load Turbines	>300 MW --- Annual Capacity Factor >50%	90% CCS	2035	N/A	
		Co-firing 30%v low-GHG hydrogen	2032	+ Co-firing 96%v low-GHG hydrogen	2038