

## **TECHNICAL MEMORANDUM**

TO: Docket for Rulemaking “Supplemental Federal Good Neighbor Plan Requirements for the 2015 8-hour Ozone National Ambient Air Quality Standards” (EPA-HQ-OAR-2023-0402)

DATE: December 20, 2023

SUBJECT: Summary of Proposed Rule Applicability Criteria and Emissions Limits for Non-EGU Emissions Units, Assumed Control Technologies for Meeting the Proposed Emissions Limits, and Estimated Number of Emissions Units, Emissions Reductions, and Costs **for Arizona**

### **I. Background**

On February 28, 2022, the EPA proposed the *Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standards*<sup>1</sup>, and on March 15, 2023, the EPA finalized the *Federal Good Neighbor Plan Requirements for the 2015 8-hour Ozone National Ambient Air Quality Standards* (Final Good Neighbor Plan).<sup>2</sup> For the February 28, 2022 proposal, the EPA developed an analytical framework to facilitate decisions about industries and emissions unit types for including emissions units in the non-electric generating unit “sector” (non-EGUs) in a proposed Federal Implementation Plan (FIP) for the 2015 ozone national ambient air quality standards (NAAQS) transport obligations. A February 28, 2022 memorandum documents the analytical framework that the EPA used to identify industries and emissions unit types included in the above proposed and final actions.<sup>3</sup> Lastly, for the March 15, 2023 Final Good Neighbor Plan, the EPA prepared a memorandum summarizing the emissions unit types, applicability criteria, emissions limits, estimated number of emissions units captured by the applicability criteria, and estimated emissions reductions and costs for the year 2026.<sup>4</sup>

Today, the EPA proposed FIP requirements to address five additional states’ transport obligations for the 2015 ozone NAAQS. This proposed FIP establishes emissions limitations for the industries and emissions unit types included in the Final Good Neighbor Plan for *existing* and *new* sources in Arizona, with the earliest possible compliance date of 2027.

This memorandum summarizes the emissions unit types, applicability criteria, emissions limits, estimated number of emissions units captured by the applicability criteria, and estimated emissions reductions and costs for the year 2026 associated with the proposed *Supplemental Federal Good Neighbor Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standards* (Supplemental Good Neighbor Plan). The remainder of this memorandum includes the following sections:

- II. Applicability Criteria for Non-EGU Emissions Units Subject to the Proposed Rule
- III. Emissions Limits for the Proposed Rule
- IV. Assumed Control Technologies that Meet the Emissions Limits in the Proposed Rule
- V. Estimating Emissions Units, Emissions Reductions, and Costs

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<sup>1</sup> <https://www.govinfo.gov/content/pkg/FR-2022-04-06/pdf/2022-04551.pdf>

<sup>2</sup> <https://www.govinfo.gov/content/pkg/FR-2023-06-05/pdf/2023-05744.pdf>

<sup>3</sup> The memorandum titled *Screening Assessment of Potential Emissions Reductions, Air Quality Impacts, and Costs from Non-EGU Emissions Units for 2026* is available in the docket here: <https://www.regulations.gov/document/EPA-HQ-OAR-2021-0668-0150>.

<sup>4</sup> The memorandum titled *Summary of Final Rule Applicability Criteria and Emissions Limits for Non-EGU Emissions Units, Assumed Control Technologies for Meeting the Final Emissions Limits, and Estimated Emissions Units, Emissions Reductions, and Costs* is available in the docket here: <https://www.regulations.gov/document/EPA-HQ-OAR-2021-0668-0956>.

## **II. Applicability Criteria for Non-EGU Emissions Units Subject to the Proposed Rule**

The EPA is proposing rate-based limits and production-based limits to directly control emissions of nitrogen oxides (NO<sub>x</sub>) from the types of non-EGU emissions units identified in the proposed FIP. For all of the non-EGU emissions units, the EPA developed emissions control requirements using applicability criteria based on size and type of unit and, in some cases, emissions thresholds. Table 1 below lists the nine non-EGU industries covered by the proposed rule, identified by North American Industry Classification System (NAICS) codes. Table 2 below summarizes the industries, emissions unit types, and applicability requirements.

**Table 1. Industries and NAICS Codes Covered by Proposed Rule**

<b>Industry</b>	<b>NAICS</b>
Pipeline Transportation of Natural Gas	4862
Cement and Concrete Product Manufacturing	3273
Iron and Steel Mills and Ferroalloy Manufacturing	3311
Glass and Glass Product Manufacturing	3272
Metal Ore Mining	2122
Basic Chemical Manufacturing	3251
Petroleum and Coal Products Manufacturing	3241
Pulp, Paper, and Paperboard Mills	3221
Solid Waste Combustors and Incinerators	562213

**Table 2. Summary of Industries, Non-EGU Emissions Unit Types, and Applicability Requirements**

<b>Industry</b>	<b>Emissions Unit Type</b>	<b>Applicability Requirements</b>
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engines	Nameplate rating of $\geq 1000$ braking horsepower (bhp)
Cement and Concrete Product Manufacturing	Kilns	Directly emits or has the potential to emit 100 tpy or more of NO <sub>x</sub>
Iron and Steel Mills and Ferroalloy Manufacturing	Reheat Furnaces	Directly emits or has the potential to emit 100 tpy or more of NO <sub>x</sub>
Glass and Glass Product Manufacturing	Furnaces	Directly emits or has the potential to emit 100 tons per year (tpy) or more of NO <sub>x</sub>
Iron and Steel Mills and Ferroalloy Manufacturing Metal Ore Mining Basic Chemical Manufacturing Petroleum and Coal Products Manufacturing Pulp, Paper, and Paperboard Mills	Boilers	Design capacity of $\geq 100$ mmBtu/hr
Solid Waste Combustors and Incinerators	Combustors or Incinerators	Design capacity $\geq 250$ tons of waste/day

Any emissions unit that meets the applicability criteria in the proposed rule (as summarized in Table 2) and is located at a facility in Arizona within one of the industries listed in Table 1 with non-EGU emissions control obligations would be subject to the proposed emissions limits.

## **III. Emissions Limits for the Proposed Rule**

Establishing emissions limits for emissions units based on size and type of unit and, in some cases, emissions thresholds, will achieve the necessary reductions commensurate with the EPA's analysis of non-EGU industries and emissions units at Step 3 of the interstate transport framework. Table 3 summarizes the industries, emissions unit types, the form of the proposed emissions limits, and the proposed emissions limits.

**Table 3. Summary of Non-EGU Industries, Emissions Unit Types, Form of Proposed Emissions Limits, and Proposed Emissions Limits**

Industry	Emissions Unit Type	Form of Proposed Emissions Limits	Proposed Emissions Limits
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engines	Grams per horsepower per hours (g/hp-hr)	Four Stroke Rich Burn: 1.0 g/hp-hr Four Stroke Lean Burn: 1.5 g/hp-hr Two Stroke Lean Burn: 3.0 g/hp-hr
Cement and Concrete Product Manufacturing	Kilns	Pounds per ton (lbs/ton) of clinker	Long Wet: 4.0 lb/ton Long Dry: 3.0 lb/ton Preheater: 3.8 lb/ton Precalciner: 2.3 lb/ton Preheater/Precalciner: 2.8 lb/ton
Iron and Steel Mills and Ferroalloy Manufacturing	Reheat Furnaces	lbs/mmBtu <sup>a</sup>	Test and set limit based on installation of Low-NO <sub>x</sub> Burners
Glass and Glass Product Manufacturing	Furnaces	lbs/ton glass produced	Container Glass Furnace: 4.0 lb/ton Pressed/Blown Glass Furnace: 4.0 lb/ton Fiberglass Furnace: 4.0 lb/ton Flat Glass Furnace: 7 lb/ton
Iron and Steel Mills and Ferroalloy Manufacturing Metal Ore Mining Basic Chemical Manufacturing Petroleum and Coal Products Manufacturing Pulp, Paper, and Paperboard Mills	Boilers	lbs/mmBtu <sup>a</sup>	Coal: 0.20 lb/mmBtu Residual Oil: 0.20 lb/mmBtu Distillate Oil: 0.12 lb/mmBtu Natural Gas: 0.08 lb/mmBtu
Solid Waste Combustors and Incinerators	Combustors or Incinerators	ppmvd on a 24-hour averaging period and ppmvd on a 30-day averaging period	110 ppmvd on a 24-hour averaging period 105 ppmvd on a 30-day averaging period

<sup>a</sup> Heat input limit.

#### **IV. Assumed Control Technologies that Meet the Proposed Emissions Limits**

Because the EPA does not have complete information on the operating characteristics of every emissions unit potentially captured by the applicability criteria (e.g., existing emissions limit), the EPA made assumptions for each industry and emissions unit type about the control technology needed to meet the proposed emissions limits. Table 4 summarizes the industries, emissions unit types, and assumed control technologies that the EPA anticipates would meet the proposed emissions limits. The estimated emissions reductions and costs presented in Section V below reflect these assumed control technologies. A more detailed discussion of the EPA's basis for concluding that these assumed control technologies would meet the proposed emission limits is included in the Final Non-EGU Sectors TSD located in the docket.<sup>5</sup>

<sup>5</sup> For the Final Good Neighbor Plan, the EPA prepared the Final Non-EGU Sectors TSD, available in the docket here: <https://www.regulations.gov/document/EPA-HQ-OAR-2021-0668-1110>.

**Table 4. Summary of Non-EGU Industries, Emissions Unit Types, Assumed Control Technologies that Meet Proposed Emissions Limits**

<b>Industry</b>	<b>Emissions Unit Type</b>	<b>Assumed Control Technologies that Meet Proposed Emissions Limits</b>
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engines	Layered Combustion (2-cycle Lean Burn) <sup>a</sup> SCR (4-cycle Lean Burn) NSCR (4-cycle Rich Burn)
Cement and Concrete Product Manufacturing	Kilns	SNCR
Iron and Steel Mills and Ferroalloy Manufacturing	Reheat Furnaces	LNB
Glass and Glass Product Manufacturing	Furnaces	LNB
Iron and Steel Mills and Ferroalloy Manufacturing	Boilers	LNB + FGR (Natural Gas, No Coal or Oil)
Metal Ore Mining		SCR (Any Coal, Any Oil)
Basic Chemical Manufacturing		
Petroleum and Coal Products Manufacturing		
Pulp, Paper, and Paperboard Mills		
Solid Waste Combustors and Incinerators	Combustors or Incinerators	ANSCR <sup>b</sup> LN <sup>tm</sup> and SNCR <sup>b,c</sup>

<sup>a</sup> Some emissions units, or engines, in the 2019 inventory had Source Classification Codes (SCC) indicating that the units were reciprocating without specifying the type of engine. We assumed NSCR or layered combustion as the control for these emissions units.

<sup>b</sup> *Municipal Waste Combustor Workgroup Report*, prepared by the Ozone Transport Commission Stationary and Area Sources Committee, Revised April 2022.

<sup>c</sup> Covanta has developed a proprietary low NO<sub>x</sub> combustion system (LN<sup>TM</sup>) that involves staging of combustion air. The system is a trademarked system and Covanta has received a patent for the technology.

## **V. Estimating Emissions Units, Emissions Reductions, and Costs**

For a detailed discussion of the methodologies used to estimate the number of emissions units captured by the applicability criteria, as well as the estimated emissions reductions and costs for the year 2026, refer to the memorandum prepared for the Final Good Neighbor Plan titled *Summary of Final Rule Applicability Criteria and Emissions Limits for Non-EGU Emissions Units, Assumed Control Technologies for Meeting the Final Emissions Limits, and Estimated Emissions Units, Emissions Reductions, and Costs*.<sup>6</sup>

Table 5 summarizes the industries, emissions unit types, assumed control technologies, and number of control installations expected to meet the proposed rule emissions limits. Table 6 summarizes the industries, emissions unit types, assumed control technologies, and estimated average cost/ton values. Table 7 summarizes the industries, emissions unit types, assumed control technologies, estimated total annual costs, and estimated ozone season NO<sub>x</sub> emissions reductions in 2026.

The estimates presented below using the 2019 inventory and information from the control measures database<sup>7</sup> identify proxies for emissions units, as well as emissions reductions, and costs associated with the assumed control technologies that would meet the proposed emissions limits. Emissions units subject to the proposed rule emissions limits may be different than those estimated in this assessment; the estimated emissions reductions from and costs to meet the proposed rule emissions limits may be different than those estimated in this

<sup>6</sup> Available in the docket here: <https://www.regulations.gov/document/EPA-HQ-OAR-2021-0668-0956>.

<sup>7</sup> More information about the control measures database (CMDDB) can be found at the following link: <https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-analysis-modelstools-air-pollution>.

assessment. The costs do not include monitoring, recordkeeping, reporting, or testing costs. In the proposed regulatory provisions that implement these emissions limits at Step 4, the EPA has incorporated mechanisms that are designed to accommodate unique circumstances on a unit-specific basis, such as allowing for an extension of time to install controls or developing an alternative emissions limit where it can be established to be necessary.

**Table 5. Summary of Non-EGU Industries, Emissions Unit Types, Assumed Control Technologies that Meet Proposed Emissions Limits, Estimated Number of Control Installations**

Industry/Industries	Emissions Unit Type	Assumed Control Technologies that Meet Proposed Emissions Limits	Estimated Number of Units Per Assumed Control
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engines	NSCR or Layered Combustion (Reciprocating)	--
		Layered Combustion (2-cycle Lean Burn)	6
		SCR (4-cycle Lean Burn)	--
		NSCR (4-cycle Rich Burn)	--

**Table 6. Summary of Non-EGU Industries, Emissions Unit Types, Assumed Control Technologies, Estimated Average Cost/Ton (2016\$)**

Industry/Industries	Emissions Unit Type	Assumed Control Technologies that Meet Proposed Emissions Limits	Average Cost/Ton Values (2016\$)
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engine	Layered Combustion (2-cycle Lean Burn)	5,457

**Table 7. Summary of Non-EGU Industries, Emissions Unit Types, Assumed Control Technologies, Estimated Total Annual Costs (2016\$), Ozone Season NOx Emissions Reductions in 2026**

Industry/Industries	Emissions Unit Type	Assumed Control Technologies that Meet Proposed Emissions Limits	Annual Costs (2016\$)	Ozone Season Emissions Reductions
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engine	Layered Combustion (2-cycle Lean Burn)	4,309,893	329

#### Attachments:

AZ Pipeline Natural Gas\_Engines Analysis data.xlsx  
NEI 2019 v3 Units with SCCs – AZ with HP.xlsx