United States Environmental Protection Agency

Boiler MACT Remand
Final Rule

NACAA Air Toxics Committee

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Boilers

- Boilers are combustion devices used to generate steam or hot water for on-site use including industrial process steam and heating systems
- Depending on the fuel combusted, boilers may emit a wide variety of air pollutants including mercury, lead, arsenic, acid gases and organic HAP
- EPA estimates that there are approximately 500 boilers subject to the emission standards being revised
- Of the units covered by these revised standards, EPA estimates only 54 would need to take steps to further reduce emissions

Industry Profile

- The source category includes boilers utilized in various types of major source facilities for the primary purpose of providing steam, hot water, and/or electricity
- Most major source boilers and process heaters are located at industrial facilities
- Industrial boilers include those used in manufacturing, processing, mining, and refining
- Institutional/commercial boilers include those used in commercial establishments, medical centers, research centers, institutions of higher education, hotels, and laundries
- There are approximately 14,000 major source boilers in the U.S.
  - Vast majority (~12,000) are natural gas fired and not subject to numeric emission limits in the rule

Background

- 2011: EPA issued the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, commonly referred to as the "Boiler MACT"
  - 2013 and 2015: EPA amended these standards
- 2016: Environmental groups and industry petitioned the D.C. Circuit Court *(U.S. Sugar Corp. v. EPA)*
  - The court remanded emission standards for certain subcategories of boilers in instances where it determined EPA had improperly excluded certain units in calculating MACT floor emission standards
  - The court also remanded for further explanation EPA's use of carbon monoxide (CO) as a surrogate for organic hazardous air pollutant (HAP).
- 2018: In a separate case (*Sierra Club, et al. v. EPA*), the court remanded for further explanation EPA's rationale for setting a limit of 130 parts per million (ppm) CO as a minimum standard for certain subcategories of boilers

2022 Final Rule

- This action finalizes amendments to the Boilers NESHAP

Addresses Issues	Reductions
• Addresses several issues identified by the D.C. Circuit and will protect air quality and public health • Reducing emissions of hazardous air pollutants (HAPs) such as formaldehyde, benzene, and polycyclic organic matter	• The amendments will also result in reductions in particulate matter (PM), a surrogate for metallic HAP, by an estimated 586 tons per year and sulfur dioxide (SO_2) by an estimated 1,141 tons per year

Final Rule: Addressing Remands

Revisions

- Revisions to 34 (of 90) emission limits for new and existing affected sources;
  - Of these 34 emission limits, 28 of the revised limits are more stringent than the corresponding limits in the 2013 final rule
  - Six of the revised limits are somewhat less stringent, with no more than a 25-percent increase and are for subcategories of boilers that currently have no affected units
  - Revised limits are provided in the appendix of this presentation

Best Performing

- Additional explanation that the best performing industrial boilers do not employ downstream controls for CO or non-dioxin organic HAP because the primary control (the combustor) is effectively destroying the non-dioxin organic HAP and downstream controls are not needed to achieve additional reductions

Determination

- Additional explanation for our determination that setting a CO emission standard below 130 ppm would not result in additional organic HAP reductions and that this conclusion is supported by other studies that show similar results

Remanded Emissions Standards

1st Remand

- EPA defined each boiler subcategory based on a 10-percent threshold, that is, to be included in a subcategory, a boiler had to operate using at least 10 percent of the category-defining fuel type
  - The MACT floor analysis conducted for the rule, however, used a 90-percent threshold, thus, excluding some units from the MACT floor analyses
- The Court, in *U.S. Sugar Corp v. EPA*, ruled that if a source is to be considered in a subcategory, then the source must be accounted for in setting the MACT floor
- Based on the results of the re-analyses, EPA is finalizing revisions to 34 emission limits for new and existing affected sources
  - 28 are becoming more stringent and six are becoming less stringent

CO as a Surrogate for Organic HAP

2nd Remand

- The Court, in *U.S. Sugar Corp v. EPA*, asked EPA to respond to a public comment relating to the potential availability of control technologies that reduce organic HAP without impacting CO emissions
- In this response, EPA states that the best performing industrial boilers do not employ downstream (post-combustion) controls for CO or non-dioxin organic HAP because the primary control (the combustor) is effectively destroying the non-dioxin organic HAP and downstream controls are not needed to achieve additional reductions

CO 130 PPM Threshold

3rd Remand

- The Court, in *Sierra Club v. EPA*, found that EPA did not provide a sufficient explanation to support its rationale establishing a 130-ppm threshold as the lowest CO limit
- In the 2013 rule, EPA determined, based on its data, that no additional reduction of organic HAP would occur once CO levels had been reduced to 130 ppm
- In this response, we explain that our determination setting a CO standard below a level of 130 ppm would result in no additional organic HAP reduction is supported by an independent polycyclic aromatic hydrocarbons emission study and an EPA Office of Research and Development study
  - The results demonstrate that organic HAP levels decrease with decreasing CO levels until leveling off and then trend upward as CO levels continue to decrease

Impacts

Costs and Benefits

- EPA estimates these amendments would cost industry about $50 million per year with estimated annual benefits of $71 - $72 million (2016$)
- Small entity impacts – no SISNOSE

HAP Emission Reductions

- 110 tons/year – hydrochloric acid (HCl)
- 3 tons/year – hydrogen fluoride (HF)
- 8 lbs/year - mercury
- 4 tons/year - non-mercury metals

Non-HAP Emission Reductions

- 1,141 tons/year - sulfur dioxide (SO_2)
- 586 tons/year – filterable particulate matter (PM)
  - 446 tons/year of this is $PM_{2.5}$

Impacts (continued)

		3% Discount Rate	7% Discount Rate
Present Value (millions 2016$)	Health Benefits	$500 and $505	$350 and $353
	Compliance Costs	$315	$265
	Net Benefits	$178 and $182+ B	$80 and $83 + B
Equivalent Annualized Value (millions 2016$)	Health Benefits	$71 and $72	$58 and $59
	Compliance Costs	$45	$44
	Net Benefits	$26 and $27 + C	$13 and $14 + C

- Time period of 2022-2029 (8 years from promulgation)
- All values in 2016$, discounted to 2020
- Note that "B" captures the portion of the present value of net benefits due to the unmonetized benefits from the emission reductions of directly regulated HAP and all other emission changes resulting from this final rule, while "C" captures the portion of the equivalent annualized value of net benefits due to the unmonetized benefits from the emission reductions of directly regulated HAP and all other emission changes resulting from this final rule.
- The benefits from emission reductions of directly regulated HAP under this final rule are not monetized due to lack of appropriate valuation estimates. See the RIA, available in the docket, for more information.

Appendix

Significant Changes Since Proposal

- Data corrections after consideration of public comments
- Three emissions limits changed since proposal
  - New units that burn solid fuel (HCl)
    - Proposed emission limit based on a value equal to 3 times the representative detection level (RDL) because the calculated UPL from the best performing similar source was less than this value.
    - The RDL value established was based on the sampling times of the single best performer. For HCl, the detection level decreases with longer sampling times.
    - The EPA agreed with public comments received that sample time data should be analyzed for the entire top 12 percent of units, not just the single best performer.
    - Therefore, the EPA revised the 3x RDL values to reflect data from the top 12 percent of boilers. The data were pulled from the 2013 dataset and supporting test report files from the docket from the 2013 final rule.
    - The revised methodology and changes to the underlying data used for the 3x RDL calculations resulted in a 30 percent lower 3x RDL value than what was proposed for solid fuels.
  - New units that burn liquid fuel (HCl)
    - Basis for proposed limit, and rationale for change, same as for units that burn solid fuel (see above).
    - The revised methodology and changes to the underlying data used for the 3x RDL calculations resulted in a 122 percent higher 3x RDL value than what was proposed for liquid fuels.
  - Existing fluidized bed units designed to burn biomass (PM)
    - For existing sources, we proposed to make the PM emission limit more stringent.
    - Based on public comments received and some resulting data corrections made, the PM emissions limit for existing sources was even more stringent than that proposed.

Significant Changes Since Proposal (continued)

- Additional rationale added after consideration of public comments
  - Methodology and dataset
  - CO surrogacy issues
  - New source definition
    - Every source affected by these revised limits has 3 years to come into compliance with the revised standards following promulgation, regardless of construction date.
    - Several commenters requested that the EPA revise its definition of "new source" to base the determination of which sources must meet revised new source standards to only those sources that constructed or reconstructed after the EPA's 2020 proposed action for this final rule. The EPA disagrees that this is compelled by the statutory language and believes this final rule reflects a reasonable approach in these particular circumstances.
    - Section 112(a) defines "new source" based on when EPA "first proposes" an emissions standard for a source, and, in this particular circumstance it is reasonable to consider EPA's 2010 proposal as the date when the Agency "first proposed" an emissions standard for these sources.
    - In addition, the EPA is revising the standards to respond to the D.C. Circuit's remand in *U.S. Sugar*, and it was reasonable to assume, once that remand was issued, that revised standards would in some cases be more stringent than the remanded standards.
- Environmental justice analysis
- Updates to impacts analysis
  - Increase in estimated number of units impacted based on additional year of compliance data led to increases in costs and emission reductions
  - Benefit-per-ton analysis
  - Social cost of carbon (CO_2)

Changes to Emission Limits in the Final Action Summary

Subcategory	Pollutant	2013 Final Rule Emission Limit (lb/MMBtu of heat input or ppm at 3-percent oxygen for CO)	Revised Emission Limit (lb/MMBtu of heat input or ppm at 3-percent oxygen for CO)
New-Solid	HCl	2.2E-02	2.1E-04
New-Dry Biomass Stoker	TSM	4.0E-03	5.0E-03
New-Biomass Fluidized Bed	CO	230	130
New-Biomass Fluidized Bed	PM (TSM)	9.8E-03 (8.3E-05)	4.1E-03 (8.4E-06)
New-Biomass Suspension Burner	CO	2,400	220
New-Biomass Suspension Burner	TSM	6.5E-03	8.0E-03
New-Biomass Hybrid Suspension Grate	CO	1,100	180
New-Biomass Dutch Oven/Pile Burner	PM	3.2E-03	2.5E-03

Changes to Emission Limits in the Final Action Summary (continued)

Subcategory	Pollutant	2013 Final Rule Emission Limit (lb/MMBtu of heat input or ppm at 3-percent oxygen for CO)	Revised Emission Limit (lb/MMBtu of heat input or ppm at 3-percent oxygen for CO)
New-Biomass Fuel Cell	PM	2.0E-02	1.1E-02
New-Wet Biomass Stoker	CO	620	590
New-Wet Biomass Stoker	PM	0.03	0.013
New-Liquid	HCl	4.4E-04	1.5E-04
New-Heavy Liquid	PM (TSM)	1.3E-02 (7.5E-05)	1.9E-03 (6.4E-06)
New-Process Gas	PM	6.7E-03	7.3E-03
Existing-Solid	HCl	2.2E-02	2.0E-02
Existing-Solid	Hg	5.7E-06	5.4E-06
Existing-Coal	PM	4.0E-02	3.9E-02
Existing-Coal Stoker	CO	160	150
Existing-Dry Biomass Stoker	TSM	4.0E-03	5.0E-03

Changes to Emission Limits in the Final Action Summary (continued)

Subcategory	Pollutant	2013 Final Rule Emission Limit (lb/MMBtu of heat input or ppm at 3-percent oxygen for CO)	Revised Emission Limit (lb/MMBtu of heat input or ppm at 3-percent oxygen for CO)
Existing-Wet Biomass Stoker	CO	1,500	1,100
Existing-Wet Biomass Stoker	PM (TSM)	3.7E-02 (2.4E-04)	3.4E-02 (2.0E-04)
Existing-Biomass Fluidized Bed	CO	470	210
Existing-Biomass Fluidized Bed	PM (TSM)	1.1E-01 (1.2E-03)	7.4E-03 (6.4E-05)
Existing-Biomass Suspension Burners	PM (TSM)	5.1E-02 (6.5E-03)	4.1E-02 (8.0E-03)
Existing-Biomass Dutch Oven/Pile Burner	PM	2.8E-01	1.8E-01
Existing-Liquid	Hg	2.0E-06	7.3E-07
Existing-Heavy Liquid	PM	6.2E-02	5.9E-02
Existing-Non-Continental Liquid	PM	2.7E-01	2.2E-01
Existing-Process Gas	PM	6.7E-03	7.3E-03