

Final Rules Affecting Biomass-Fired Boilers

U.S. Environmental Protection Agency
April 14, 2011



Overview of EPA actions

- **EPA issued three rules that will reduce emissions of air pollutants from:**
 - Boilers at large sources of hazardous air pollutants (“major sources”)
 - Boilers at small sources of hazardous air pollutants (“area sources”)
 - Incinerators that burn solid waste at industrial and commercial facilities (CISWI)
- **EPA also issued a final rule that defines “solid waste”**
 - Necessary to determine whether a facility has to meet a boiler standard or an incinerator standard
- **A federal court required EPA to issue these standards no later than February 21.**
 - Prior Administration’s standards were overturned in court.
 - Final standards signed on February 21, 2011
 - Final Rules published in the Federal Register on March 21, 2011
- **EPA is initiating a reconsideration process for the two boiler rules and the Commercial, Industrial Solid Waste Incinerator (CISWI) rule.**

How are these rules related?

- Units that burn SOLID WASTE would be subject to requirements under CAA section 129
- Units that burn materials that are NOT A SOLID WASTE would be subject to requirements under CAA section 112

Differences Between the Boilers and CISWI Rules

- Boilers (sec. 112)
 - Major sources (10 tons of any one toxic/25 tons of all toxics annually)
 - Standards must be set for all emitted toxic air pollutants
 - Limits must be based on “maximum achievable control technology” (MACT)
 - Area sources
 - Smaller sources (not major) may be regulated based on less stringent “generally achievable control technology” (GACT)
 - Exception for certain pollutants (e.g., mercury, polycyclic organic matter)
- CISWI units (sec. 129)
 - Standards must be set for 9 specific pollutants, not all of which are “air toxics”
 - Additional siting and operator training requirements
 - No provision authorizing GACT for smaller sources

Reconsideration

- EPA is initiating a reconsideration of certain aspects of the two boiler rules and Commercial Solid Waste Incinerator (CISWI) rule
 - Final rules reflect reasonable approaches consistent with requirements of Clean Air Act,
 - Some of the comments raise difficult technical issues that would benefit from additional public involvement.
 - Stakeholders may petition for reconsideration of other issues.

Benefits and Costs of These Rules

- **For every \$1 that these rules will cost society, the public will see at least \$10 to \$24 in public health benefits.**
- **Installing and maintaining pollution controls for these rules is estimated to cost \$2.1 billion per year.**
- **Costs of the combined final rules are about 50 percent less than at proposal.**
- **These rules will create jobs**
 - Analysis of the major and area source boiler rules' positive and negative impacts on employment indicate that they alone will create a net gain of about 2,200 jobs.

Major Source Boiler Rule

- National Emission Standard for Hazardous Air Pollutants (NESHAP) for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters
 - 40 CFR Part 63 Subpart DDDDD

Boilers and process heaters at major sources (i.e., Boiler MACT)

- Expected to apply to about 13,800 boilers located at 1,600 facilities, primarily larger industrial sources such as refineries, chemical and manufacturing plants, pulp and paper mills
 - Also includes boilers at some larger commercial and institutional facilities, such as shopping malls and universities
- About 420 (about 3%) of boilers are biomass-fired.
- Standards vary slightly for existing units vs. new units
- Biomass unit defined as a unit that burns at least 10% biomass on an annual heat input basis

Establishing MACT standards

- Section 112 of 1990 Clean Air Act Amendments
 - Required Maximum Achievable Control Technology (“MACT”) standards for relevant categories
 - For existing sources, at least as stringent as the average of the best performing 12 percent of sources in the subcategory.
 - For new sources, at least as stringent as the emission control achieved by the best controlled similar source.
- Section 112 allows the Administrator to set work practice standards (such as an annual tune-up requirement) in certain limited situations.
- Section 112 allows the Administrator to subcategorize, which allows similar equipment to be treated similarly.

Boiler MACT – Final Subcategories

- **Fifteen subcategories based on design type:**
 - **Solid fuel**
 - Pulverized coal units
 - Coal-fired stokers
 - Coal-fired fluidized bed combustion units
 - **Biomass-fired stokers**
 - **Biomass-fired fluidized bed combustion units**
 - **Biomass-fired Dutch Ovens/Suspension burners**
 - **Biomass-fired fuel cells**
 - **Biomass-fired hybrid suspension/grate units**
 - Liquid fuel-fired units
 - Liquid fuel-fired units located in non-continental States and territories
 - Gas 1 (Natural gas/refinery gas)
 - Gas 2 (other gases)
 - Metal processing furnaces (natural gas-fired)
 - Limited Use

Boiler MACT: Compliance Requirements for Biomass Units

Summary of requirements for boilers at major sources

- **Existing large boilers** (≥ 10 mm/BTU)
 - **Solid fuel (coal or biomass)**
 - Numeric emission limits for 5 pollutants
mercury, dioxin, particulate matter (PM), hydrogen chloride (HCl), carbon monoxide (CO)
 - 1-time energy assessment
- **New large boilers** (≥ 10 mm/BTU)
 - **Solid fuel** (coal or biomass)
 - Numeric emission limits for 5 pollutants
mercury, dioxin, particulate matter (PM), hydrogen chloride (HCl), carbon monoxide (CO)
- **Existing small boilers** (< 10 mm/BTU)
 - **Gas, solid fuel, oil, or limited use**
 - Tune-up every other year
 - 1-time energy assessment
 - No numeric emission limits
- **New small boilers** (< 10 mm/BTU)
 - **Gas, solid fuel, oil, or limited use**
 - Tune-up every other year
 - No numeric emission limits

Boiler MACT

Testing and Monitoring Requirements

- Boilers 10 million Btu/hour or greater
 - Testing requirements
 - Initial and annual stack tests*:
 - PM, mercury, HCl, CO
 - Initial stack test only:
 - Dioxin/furan
 - Establish operating parameter limits during initial tests:
 - For example, pressure drop, injection rate, power input, oxygen
 - Monitoring requirements
 - Continuous process parameter or opacity

*performance tests can be conducted less often than annually if emissions are at or below 75 percent of emission limit, and no changes in operation or air pollution control

Boiler MACT Rule – Initial Notification and Compliance Dates

- Existing Sources (commenced construction before June 4, 2010)
 - Must comply by March 21, 2014
 - Initial notification due September 17, 2011
- New Sources (commenced construction on or after June 4, 2010)
 - Must comply by May 20, 2011, or upon startup, whichever is later
 - Initial Notification
 - If startup before May 20, 2011, due September 17, 2011
 - If startup on or after May 20, 2011, due 15 days after startup

Area Source Boiler Rule

- National Emission Standard for Hazardous Air Pollutants (NESHAP) for Area Sources: Industrial, Commercial, and Institutional Boilers
 - 40 CFR Part 63 Subpart JJJJJJ

Boilers at area sources (i.e., Boiler Area Source Rule)

- Expected to apply to about 187,000 boilers located primarily at commercial facilities (e.g., hotels, office buildings, restaurants) and institutional facilities (e.g., schools, hospitals, prisons)
- Rule does NOT apply to boilers that are gas-fired
- About 11,000 (or 6%) of area source boilers are biomass-fired.
- Standards vary slightly for existing units vs. new units
- Biomass boiler defined as a boiler that burns at least 15% biomass on an annual heat input basis

Establishing GACT Standards

- Methods, practices and techniques which are commercially available and appropriate for application by sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems

Area source boiler rule: Compliance requirements

- **Existing large boilers** (≥ 10 mm/BTU)
 - **Biomass, Oil**
 - Tune-up every other year
 - 1-time energy assessment
 - No numeric emission limits
- **Existing small boilers** (< 10 mm/BTU)
 - **Coal, Biomass, Oil**
 - Tune-up every other year
 - No numeric emission limits
- **New large boilers** (≥ 10 mm/BTU)
 - **Biomass, Oil**
 - Numeric emission limit for 1 pollutant
particulate matter (PM)
 - testing every 3 years
 - monitoring opacity or control device parameter
 - Tune-up every other year
- **New small boilers** (< 10 mm/BTU)
 - **Coal, Biomass, Oil**
 - Tune-up every other year
 - No numeric emission limits

Area Source Rule – Initial Notification and Compliance Dates

- Existing Sources (commenced construction before June 4, 2010)
 - Tune-up required by March 21, 2012
 - Compliance with energy assessments by March 21, 2014
 - Initial notification due September 17, 2011
- New Sources (commenced construction on or after June 4, 2010)
 - Must comply by May 20, 2011, or upon startup, whichever is later
 - Initial notification due September 17, 2011, or 120 days after the source becomes subject to the standard

- For more information on these rules, visit

www.epa.gov/ttn/atw/boiler/boilerpg.html

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Appendix-Emission Limit Tables

Emission Limits for Major Source Boilers

| Subcategory | Proposed limits, lb/MMBtu unless noted | | | | | Final limits, lb/MMBtu unless noted | | | | | | | |
|---------------------------|--|----------|-------|---------|--------------|-------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-----|-------|
| | Hg, lb/TBtu | HCl | PM | CO, ppm | D/F, ng/dscm | Hg, lb/TBtu | HCl | PM | CO, ppm | D/F, ng/dscm | | | |
| New coal stoker | 2.0 | 0.00006 | 0.001 | 7 | 0.003 | 3.5 | 0.0022 | 0.0011 | 6 | 0.003 | | | |
| New coal fluid. bed | | | | 30 | 0.00003 | | | | Solid fuel subcat. | Solid fuel subcat. | Solid fuel subcat. | 18 | 0.002 |
| New coal PC | | | | 90 | 0.002 | | | | | | | 12 | 0.003 |
| New biomass stoker | 0.2 | 0.004 | 0.008 | 560 | 0.00005 | Solid fuel subcat. | Solid fuel subcat. | Solid fuel subcat. | 160 | 0.005 | | | |
| New biomass fuel cell | | | | 270 | 0.0005 | | | | 470 | 0.003 | | | |
| New biomass fluid. bed | | | | 40 | 0.007 | | | | 260 | 0.02 | | | |
| New biomass dutch oven | | | | 1,010 | 0.03 | | | | 470 | 0.2 | | | |
| New biomass susp./grate | -- | -- | -- | -- | -- | Solid fuel subcat. | Solid fuel subcat. | Solid fuel subcat. | 1,500 | 0.2 | | | |
| New liquid | 0.3 | 0.0004 | 0.002 | 1 | 0.002 | | | | 0.21 | 0.00032 | 0.0013 | 3 | 0.002 |
| New gas 2 | 0.2 | 0.000003 | 0.003 | 1 | 0.009 | | | | 7.9 | 0.0017 | 0.0067 | 3 | 0.08 |
| New non-cont. liquid | -- | -- | -- | -- | -- | | | | 0.78 | 0.00032 | 0.0013 | 51 | 0.002 |
| Exist. coal stoker | 3.0 | 0.02 | 0.02 | 50 | 0.003 | 4.6 | 0.035 | 0.039 | 270 | 0.003 | | | |
| Exist. coal fluid. Bed | | | | 30 | 0.002 | | | | Solid fuel subcat. | Solid fuel subcat. | Solid fuel subcat. | 82 | 0.002 |
| Exist. coal PC | | | | 90 | 0.004 | | | | | | | 160 | 0.004 |
| Exist. biomass stoker | 0.9 | 0.006 | 0.02 | 560 | 0.004 | Solid fuel subcat. | Solid fuel subcat. | Solid fuel subcat. | 490 | 0.005 | | | |
| Exist. biomass fuel cell | | | | 270 | 0.02 | | | | 690 | 4 | | | |
| Exist. biomass fluid. bed | | | | 250 | 0.02 | | | | 430 | 0.02 | | | |
| Exist. biomass dutch oven | | | | 1,010 | 0.03 | | | | 470 | 0.2 | | | |
| Exist. biomass sus./grate | -- | -- | -- | -- | -- | Solid fuel subcat. | Solid fuel subcat. | Solid fuel subcat. | 3,500 | 0.2 | | | |
| Exist. liquid | 4.0 | 0.0009 | 0.004 | 1 | 0.002 | | | | 3.4 | 0.00032 | 0.0075 | 10 | 4 |
| Exist. gas 2 | 0.2 | 0.000003 | 0.05 | 1 | 0.009 | | | | 13 | 0.0017 | 0.043 | 9.0 | 0.08 |
| Exist. non-cont. liquid | -- | -- | -- | -- | -- | | | | 0.78 | 0.00032 | 0.0075 | 160 | 4 |

New and existing small (<10 MMBtu/hr) units, natural gas-fired units, metal process furnaces, units combusting other clean gases, and limited use units will be subject to work practice standards.

Emission Limits for Area Source Boilers

| Subcategory | Proposed Emission Limits | | | Final Emission Limits | | |
|------------------|--------------------------|---------|--------------|-----------------------|---------|---|
| | Hg, lb/TBtu | CO, ppm | PM, lb/MMBtu | Hg, lb/TBtu | CO, ppm | PM, lb/MMBtu |
| New Coal | 3.0 | 310 | 0.03 | 4.8 | 400 | 0.03 (> 30 MMBtu/h) 0.42 (10 to 30 MMBtu/h) |
| New Biomass | - | 100 | 0.03 | - | - | 0.03 (> 30 MMBtu/h) 0.07 (10 to 30 MMBtu/h) |
| New Oil | - | 1 | 0.03 | - | - | 0.03 |
| Existing Coal | 3.0 | 310 | - | 4.8 | 400 | - |
| Existing Biomass | - | 160 | - | - | - | - |
| Existing Oil | - | 2 | - | - | - | - |

New and existing small (<10 MMBtu/hr) boiler, existing and new biomass-fired boilers, and new and existing oil-fired boilers are subject to a biennial tune-up requirement.

Final Emission Limits for Existing CISWI Sources

| Pollutant (units) ¹ | CISWI Subcategories | | | | | | | | | | |
|---------------------------------|---------------------|--------|-----------------------|------------------------------------|--------------------------------------|---------------------|----------|--------------------|----------|----------------------------|--------|
| | Incinerators | | Energy Recovery Units | Energy Recovery Units - Liquid/Gas | Energy Recovery Units - Solids | Waste-burning kilns | | Burn-off Ovens | | Small, remote Incinerators | |
| | Proposed | Final | Proposed | Final | Proposed | Final | Proposed | Final ² | Proposed | Final | |
| HCl (ppmv) | 29 | 29 | 1.5 | 14 | 0.45 | 1.5 | 25 | 130 | - | 150 | 220 |
| CO (ppmv) | 2.2 | 36 | 150 | 36 | 490 (biomass units)/59 (coal units) | 710 | 110 | 80 | - | 78 | 20 |
| Pb (mg/dscm) | 0.0026 | 0.0036 | 0.002 | 0.096 | 0.0036 | 0.0027 | 0.0026 | 0.041 | - | 1.4 | 2.7 |
| Cd (mg/dscm) | 0.0013 | 0.0026 | 0.00041 | 0.023 | 0.00051 | 0.0003 | 0.00048 | 0.0045 | - | 0.26 | 0.61 |
| Hg (mg/dscm) | 0.0028 | 0.0054 | 0.00096 | 0.0013 | 0.00033 | 0.024 | 0.0079 | 0.014 | - | 0.0029 | 0.0057 |
| PM, filterable (mg/dscm) | 13 | 34 | 9.2 | 110 | 250 | 60 | 6.2 | 33 | - | 240 | 230 |
| Dioxin, Furans, total (ng/dscm) | 0.031 | 4.6 | 0.75 | 2.9 | 0.35 | 2.1 | 0.2 | 310 | - | 1,600 | 1,200 |
| Dioxin, Furans, TEQ (ng/dscm) | 0.0025 | 0.13 | 0.059 | 0.32 | 0.059 | 0.17 | 0.007 | 25 | - | 130 | 57 |
| NO _x (ppmv) | 34 | 53 | 130 | 76 | 290 (biomass units)/340 (coal units) | 1,100 | 540 | 120 | - | 210 | 240 |
| SO ₂ (ppmv) | 2.5 | 11 | 4.1 | 720 | 6.2 (biomass units)/650 (coal units) | 410 | 38 | 11 | - | 44 | 420 |
| Opacity (%) ³ | 1 | - | 1 | - | - | 4 | - | 2 | - | 13 | - |

1 All emission Limits are measured at 7% oxygen.

2 Determined that burn-off ovens are not subject to this final action.

3 EPA is not promulgating opacity limits for CISWI units at this time.

Final Emission Limits for New CISWI Sources

| Pollutant (units) ¹ | CISWI Subcategories | | | | | | | | | | |
|---------------------------------------|---------------------|---------|-----------------------------|--|---|--------------------|----------|--------------------|----------|-------------------------------|--------|
| | Incinerators | | Energy Recovery Units | Energy Recovery Units - Liquid/ Gas | Energy Recovery Units - Solids | Waste-buring Kilns | | Burn-off Ovens | | Small, remote Incinerators | |
| | Proposed | Final | Proposed | Final | Proposed | Final | Proposed | Final ² | Proposed | Final | |
| HCl (ppmv) | 0.074 | 0.091 | 0.17 | 14 | 0.45 | 1.5 | 3.0 | 18 | - | 150 | 200 |
| CO (ppmv) | 1.4 | 12 | 3.0 | 36 | 160 (biomass units)/46 (coal units) | 36 | 90 | 74 | - | 4 | 12 |
| Pb (mg/ dscm) | 0.0013 | 0.0019 | 0.0012 | 0.096 | 0.0031 | 0.00078 | 0.0026 | 0.029 | - | 1.4 | 0.26 |
| Cd (mg/ dscm) | 0.00066 | 0.0023 | 0.00012 | 0.023 | 0.00051 | 0.00030 | 0.00048 | 0.0032 | - | 0.057 | 0.61 |
| Hg (mg/ dscm) | 0.00013 | 0.00016 | 0.00013 | 0.00025 | 0.00033 | 0.024 | 0.0062 | 0.0033 | - | 0.0013 | 0.0035 |
| PM, filterable (mg/dscm) | 0.0077 | 18 | 4.4 | 110 | 250 | 1.8 | 2.5 | 28 | - | 240 | 230 |
| Dioxin, Furans, total (ng/dscm) | 0.0093 | 0.052 | 0.034 | (no limit) | 0.068 | 0.00035 | 0.090 | 0.011 | - | 1,200 | 1,200 |
| Dioxin, Furans, TEQ (ng/dscm) | 0.00073 | 0.13 | 0.0027 | 0.002 | 0.011 | 0.000028 | 0.0030 | 0.00086 | - | 94 | 31 |
| NO _x (ppmv) | 19 | 23 | 75 | 76 | 290 (biomass units)/340 (coal units) | 140 | 200 | 16 | - | 210 | 78 |
| SO ₂ (ppmv) | 1.5 | 11 | 4.1 | 720 | 6.2 (biomass units)/650 (coal units) | 3.6 | 38 | 1.5 | - | 43 | 1.2 |
| Opacity (%) ³ | 1 | - | 1 | - | - | 1 | - | 2 | - | 13 | - |

1 All emission Limits are measured at 7% oxygen.

2 Determined that burn-off ovens are not subject to this final action.

3 EPA is not promulgating opacity limits for CISWI units at this time.