

Update on EPA's Rulemakings Affecting Biomass-Fired Boilers

Emissions and Health Impacts of Biomass Combustion
State College, PA
May 20, 2010

Rules & Rulemakings

- **Industrial Boiler and Process Heater NESHAP**
 - Subpart DDDDD of part 63
 - Promulgated – September 13, 2004
 - Vacated by Court – July 30, 2007
 - Applies to boilers at major sources of HAP
- **Area Source Rulemaking for Boilers**
- Industrial Boiler NSPS
 - Subpart Dc of part 60
- Residential Wood Heaters NSPS
 - Subpart AAA of part 60

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Litigation

- **Critical Issues**
 - Failed to establish limits for all subcategories and HAP groups
 - “No emission reductions” MACT floor
 - Adopted risk-based exemptions
 - HCl Health-Based Compliance Alternative
 - Manganese Health-Based Compliance Alternative
 - Regulated solid waste incineration units under the Boiler MACT, instead of the CISWI rule
 - “if a unit burns **any** solid waste it is an incinerator subject to regulation under section 129 of the CAA and is not an industrial boiler regulated under section 112 of the CAA”

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Litigation

- **March 13, 2007 - Brick Decision**
 - “no emission reduction” floor unlawful
 - Cannot use work practice without making finding required by 112(h)
- **June 19, 2007 – Boiler MACT Decision**
 - Vacated CISWI Definition Rule
 - Inconsistent with plain language of section 129
 - Vacated Boiler MACT
 - Court concluded that the Boiler MACT must be substantially revised due to vacatur of CISWI Definition Rule
 - Did not rule on Boiler MACT issues

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Background - What Sources Will The Boiler Rules Cover?

Boiler MACT

- Cover about 13,555 boilers and process heaters at about 1,600 major source facilities
 - 11,500 of the major source units are gas-fired
- Major source facilities are mostly industrial but include universities, municipalities, and military installations
 - About 9% of major source facilities are small entities

Boiler Area Source Rule

- Cover about 183,000 boilers at an estimated 92,000 area source facilities
 - There are 1.3 million gas-fired boilers located at area sources that are not included in source category
- Area source facilities are mostly commercial (e.g., hotels, office buildings, restaurants) and institutional (e.g., schools, hospitals, prisons) but include industrial sources
- About 85% of area sources are estimated to be small entities

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Overview of Section 112

- Mandates that EPA develop standards for hazardous air pollutants (HAP) for both major and area sources listed under section 112(c)
- Definitions
 - Major source is a facility that emits or has PTE 10 tons per year of single HAP or 25 tpy of total HAP
 - Area source is a facility that is not a major source
- Standards are based on the maximum achievable control technology (MACT)
- Sets minimum stringency criteria (MACT Floor)
- MACT may differ for new and existing sources

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Section 112

- Contains list of HAP
- Requires EPA to publish a list of major and area sources that emit HAP
 - Listings
 - 112(k) area source category list
 - Industrial boilers
 - Institutional/commercial boilers
 - 112(c)(6) list of source categories accounting for 90% of emissions of 7 listed HAP
 - Industrial boilers
 - Institutional/commercial boilers
- Allows EPA to establish work practice requirements
- Section 112 (d)(1) allows EPA to subcategories based on class, type, or size of sources in establishing standards.

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MACT Floor

- **For existing sources:**
 - “The average emission limitation achieved by the best performing 12 percent of existing sources..”
- **For new sources, the MACT floor is:**
 - “The emission control achieved in practice by the best controlled similar source...”

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Area Source Provisions

- Section 112(d)(5) allows for area source standards based on GACT (Generally Available Control Technology)
 - Major source standards are based on MACT
 - Under GACT may consider costs and economic impacts
- Focus of standards is on the 30 Urban HAP
- Section 112(h) allows EPA to promulgate a work practice standard, if it is not feasible to enforce an emission standard
 - **Not feasible** means the application of measurement methodology is not practicable due to technological and economic limitations
- EPA may exempt area sources from Title V if we determine compliance would be impracticable, infeasible, or unnecessarily burdensome
- Section 112(c)(6) requires listed categories be subject to MACT
 - Both industrial boilers and institutional/commercial boilers are on list of 112(c)(6) source categories
 - Mercury
 - POM

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Boiler MACT - Proposed Subcategories

- **Eleven subcategories based on design type:**
 - 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**
 - Liquid fuel-fired units
 - Gas 1 (Natural gas/refinery gas)
 - Gas 2 (other gases)
 - Metal process furnaces (natural gas-fired)

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Boiler MACT -Proposed Standards

- **Existing units**
 - Proposed limits for nine of the eleven subcategories for:
 - PM (as surrogate for non-mercury metals)
 - Mercury
 - HCl (as surrogate for acid gases)
 - CO (as surrogate for non-dioxin organic HAP)
 - Dioxin/Furan
 - Technology basis - baghouse (metals/Hg)/carbon injection (Hg/dioxins)/scrubber (HCl)/good combustion practices (organic HAP)
 - Emissions limits only applicable to units with heat input capacities 10 million Btu/hour or greater
 - Work practice standard (annual tune-up) proposed under section 112(h) for:
 - Units with heat input capacities less than 10 million Btu/hour
 - Units in Gas 1 and Metal Process Furnaces subcategories
 - Beyond-the-floor standard proposed for
 - **All** major source facilities – to conduct an energy assessment

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Boiler MACT -Proposed Standards

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 - Proposed limits for nine of the eleven subcategories for:
 - PM (as surrogate for non-mercury metals)
 - Mercury
 - HCl (as surrogate for acid gases)
 - CO (as surrogate for non-dioxin organic HAP)
 - Dioxin/Furan
 - Technology basis - baghouse (metals/Hg)/carbon injection (Hg/dioxins)/scrubber (HCl)/good combustion practices (organic HAP)
 - Emissions limits applicable to all units, regardless of size
 - More stringent than limits for existing sources
 - No work practice standards or beyond-the-floor standards proposed

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Boiler MACT - Proposed Testing and Monitoring Requirements

- Testing:
 - Initial compliance tests (PM, HCl, mercury, THC, and Dioxins)
 - Annual performance tests
 - Annual tune-up for units less than 10 million Btu/hour in size and units in Gas 1 and Metal Process Furnaces subcategories
 - Allows emission averaging among existing units in same subcategory
- Monitoring
 - CO CEMS for units with heat input capacity of 100 million Btu/hour or greater
 - PM CEMS for units combusting coal, biomass, or residual oil and having a heat input capacity of 250 million Btu/hour or greater
 - Process parameters (opacity, pressure drop, sorbent injection rate, fuel, etc.)
- Continuous Compliance
 - Demonstrated by maintaining operating limits (process parameters)
 - Demonstrated by maintaining CEMS values (30-day average) below emission limits

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Boiler MACT - Impacts

- Cost Impacts
 - Total capital investment (TCI) = \$9.5 billion
 - Total annualized cost (TAC) = \$2.9 billion
 - Testing/monitoring TAC = \$140 million
 - Energy Assessment (Audit) = \$26 million (One-time cost)
- Emission Reductions (tons/year)

	<u>Existing</u>	<u>New</u>
HCl =	37,000	9
Mercury =	8	0.001
Metals =	3,200	0.6
PM =	50,000	130
SO ₂ =	340,000	500
VOC =	1,800	4

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Economic Analysis of Major Source Rule

- Engineering Costs = \$3.2 billion
- Social Costs = \$2.9 billion
 - Consumer Surplus loss of \$0.8 billion
 - Domestic Producer Surplus Loss of \$2.5 billion
 - Other Countries Surplus Gain of \$0.1 billion
 - Fuel savings and other costs not included in market model net gain of \$0.4 billion
- Price and Quantity Changes
 - Average National prices for industrial sectors increase by 0.01%
 - Domestic Production may fall by 0.01%
- Employment Changes
 - Near-term job losses less than 8,000
 - Long-term effects range between 6,000 job losses to 12,000 job gains
- Small Business
 - SBAR Panel
- Monetized Health Benefits
 - \$17 to \$41 billion (3% discount)
 - \$15 to \$37 billion (7% discount rate)
- All estimates in 2008\$

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Boiler Area Source Background

- The area source boilers have generally not been subjected to regulation/permitting, so little is known about them.
- Natural gas is the principal fuel type used, but many do combustion wood.
- Control techniques for area sources are similar to those used on major sources, such as, scrubbers, baghouses, ESP, and good combustion practices (GCP) which control carbon monoxide and organic HAP.

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Boiler Area Source Rule - Proposed Subcategories

- **Three subcategories based on design type:**

- Coal-fired units
 - 3,700 units
- **Biomass-fired units**
 - 11,000 units
- Liquid fuel-fired units
 - 168,000 units

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Boiler Area Source Projected National Distribution

- Total = 1.37 million existing boilers
 - Size
 - 1.33 million (97%) less than 10 million Btu/hour
 - Fuel
 - Coal: 3,450 units - 89% less than 10 MMBtu/hr
 - Biomass: 10,500 units - 93% less than 10 MMBtu/hr
 - Natural Gas: 1.23 million units - 98% less than 10 MMBtu/hr
 - Fuel Oil: 123,000 units - 95% less than 10 MMBtu/hr

Sector	Projected US Total	Biomass-fired
– Schools	221,500	353
– Church/Temple	97,000	181
– Hotel/Motel/Inn	44,500	171
– Apartments	332,500	433
– Health Services	48,500	101
– Food	20,700	262
– Restaurant	21,500	40
– Municipal Facilities	31,000	171
– Lumber	1,400	685

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Boiler Area Source Rule -Proposed Standards

- **Existing units**

- Coal-fired boilers
 - Proposed emission limits for:
 - Mercury – based on MACT
 - CO (as surrogate for POM and other urban organic HAP) – based on MACT
 - Technology basis - baghouse (metals/Hg)/good combustion practices (organic HAP)
- Biomass-fired boilers and oil-fired boilers
 - Proposed emission limits only for CO (as surrogate for POM) – based on MACT
- Emissions limits only applicable to units with heat input capacities 10 million Btu/hour or greater
- Work practice standard (biennial tune-up) proposed under section 112(h) for units with heat input capacities less than 10 million Btu/hour
- Work practice standard (energy assessment) proposed for area source facilities having boilers with heat input 10 million Btu/hour or greater as a beyond-the-floor standard.

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Boiler Area Source Rule -Proposed Standards

- **New units**

- Proposed emission limits:
 - For coal-fired boilers
 - PM (as surrogate for urban metals)
 - Mercury (only for coal-fired boilers)
 - CO (as surrogate for POM and other urban organic HAP)
 - For biomass-fired boilers and oil-fired boilers
 - PM (as surrogate for urban metals)
 - CO (as surrogate for POM and other urban organic HAP)
 - Technology basis - baghouse (metals/Hg)/good combustion practices (organic HAP)
- Emissions limits applicable to all units, regardless of size
- No work practice standards proposed
- No beyond-the-floor standard proposed

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Boiler Area Source Rule - Proposed Testing and Monitoring Requirements

- Testing:
 - Initial compliance tests (PM, mercury, and CO)
 - Annual performance tests
 - Biennial tune-up for boilers less than 10 million Btu/hour in size
- Monitoring
 - Process parameters (opacity, pressure drop, sorbent injection rate, fuel, etc.)
 - CO CEMS for units with heat input capacity of 100 million Btu/hour or greater
- Continuous Compliance
 - Demonstrated by maintaining operating limits (process parameters)
 - Based on averages set during compliance test

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Boiler Area Source Rule - Impacts

- Cost Impacts
 - Total capital investment (TCI) = \$2.5 billion
 - Existing units = \$1.8 billion
 - New units (6,779 estimated) = \$0.7 billion
 - Total annualized cost (TAC) = \$1.0 billion
 - Existing units = \$0.7 billion
 - New units = \$0.3 billion
 - Testing/monitoring TAC = \$290 million
 - Energy Assessment (Audit) = \$52 million

- Emission Reductions (tons/year)

	<u>Existing</u>	<u>New</u>
Mercury =	0.63	0.10
Metals =	210	40
PM =	6,300	1,300
SO ₂ =	1,400	150
VOC =	890	290
HCl =	120	8

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Economic Analysis of Area Source Rule

- Social Costs = \$0.5 billion
 - Consumer Surplus loss of \$0.3 billion
 - Domestic Producer Surplus Loss of \$0.3 billion
 - Other Countries surplus Gain \$0.1 billion
 - Fuel savings and other costs not included in market model net cost of \$0.1 billion
- Price and Quantity Changes
 - Average National prices for industrial sectors less than 0.01%
 - Domestic Production may fall by less than 0.01%
- Employment Changes
 - Near Term job losses 1,000
 - Long-term effects range between 1,000 job losses to 3,000 job gains
- Small Business
 - SBAR Panel
- Monetized Health Benefits
 - \$1.0 to \$2.4 billion (3% discount)
 - \$0.9 to \$2.2 billion (7% discount rate)
- All estimates in 2008\$

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Appendix-Emission Limit Tables

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Emission Limits for Existing Major Source Boilers and Process Heaters, lb/MMBtu

Subcategory	PM	HCl	Hg	CO (ppm @3% O ₂)	D/F (TEQ)(ng/dscm)
Coal Stoker	0.02	0.02	0.000003	50	0.003
Coal Fluidized Bed	0.02	0.02	0.000003	30	0.002
Pulverized Coal	0.02	0.02	0.000003	90	0.004
Biomass Stoker	0.02	0.006	0.0000009	560	0.004
Biomass Fluidized Bed	0.02	0.006	0.0000009	250	0.02
Biomass Suspension Burner/Dutch Oven	0.02	0.006	0.0000009	1010	0.03
Biomass Fuel Cells	0.02	0.006	0.0000009	270	0.02
Liquid	0.004	0.0009	0.000004	1	0.002
Gas (Other Process Gases)	0.05	0.000003	0.0000002	1	0.009

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Emission Limits for New Major Source Boilers and Process Heaters, lb/MMBtu

Subcategory	PM	HCl	Hg	CO (ppm @3% O ₂)	D/F (TEQ)(ng/dscm)
Coal Stoker	0.001	0.00006	0.000002	7	0.003
Coal Fluidized Bed	0.001	0.00006	0.000002	30	0.00003
Pulverized Coal	0.001	0.00006	0.000002	90	0.002
Biomass Stoker	0.008	0.004	0.0000002	560	0.00005
Biomass Fluidized Bed	0.008	0.004	0.0000002	40	0.007
Biomass Suspension Burner/Dutch Oven	0.008	0.004	0.0000002	1010	0.03
Biomass Fuel Cells	0.008	0.004	0.0000002	270	0.0005
Liquid	0.002	0.0004	0.0000003	1	0.002
Gas (Other Process Gases)	0.003	0.000003	0.0000002	1	0.009

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Emission Limits for Area Source Boilers, lb/MMBtu

Source	Subcategory	PM	Hg	CO, ppm
New Boiler	Coal	0.03	3.0E-06	310 (@ 7% O ₂)
	Biomass	0.03		100 (@ 7% O ₂)
	Oil	0.03		1 (@ 3% O ₂)
Existing Boiler	Coal		3.0E-06	310 (@ 7% O ₂)
	Biomass			160 (@ 7% O ₂)
	Oil			2 (@ 3% O ₂)

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NSPS Review – Subpart AAA Residential Wood Heaters

- Applicability
 - Wood heaters
 - An enclosed wood burning appliance capable of and intended for space heating or domestic water heating
 - Firebox volume less than 20 cubic feet
 - Minimum burn rate 11 pound per hour
 - Manufactured after July 1, 1988, or
 - Sold at retail after July 1, 1990
- Devices exempt
 - Masonry fireplaces
 - Boilers
 - Solid fuel burning appliance used for heating spaces, other than the space where appliance is located, by distribution through pipes of a gas or fluid heated in appliance
 - Furnaces
 - Cookstoves
- Standards
 - PM limit:
 - If equipped with catalytic combustor: 4.1 grams per hour
 - If equipped without a catalytic combustor: 7.5 grams per hour
- Compliance
 - May be determined by manufacturer on model line

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NSPS Review Timeline

- September 2010 -- Complete staff draft of options, background materials and draft proposal package
- October 2010 -- Options Selection with Assistant Administrator
- April 2011 – Administrator Signs Proposal
- May 2011 -- Proposal in Federal Register
- April 2012 – Administrator Signs Promulgation
- May 2012 – Promulgation in Federal Register

INFORMATION AND CONTACT

- Information on the MACT, NSPS, and area source rulemakings for industrial, commercial, and institutional boilers is available on EPA's web site at:
 - www.epa.gov/ttn/atw/combust/list.html
- Contact: William Schrock
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