

Reducing Toxic Pollution from Power Plants

EPA's Proposed Mercury and Air Toxics Standards

May 2, 2011



Topics

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Overview of Action

- ▶ On March 16, the Administrator signed the proposed Mercury and Air Toxics Standards, the first national standards to reduce emissions of toxic air pollutants from existing coal- and oil-fired power plants – often the biggest contributors to air pollution
- ▶ These standards would reduce emissions of:
 - ▶ Metals, including mercury (Hg), arsenic, chromium, and nickel
 - ▶ Acid gases, including hydrogen chloride (HCl) and hydrogen fluoride (HF)
 - ▶ Particulate matter
- ▶ These pollutants are linked to cancer, neurological defects (including IQ loss), heart disease, lung disease, and premature death



Overview of Action, part 2

- ▶ MATS would create uniform emissions-control requirements based on proven, currently in-use technologies and processes
- ▶ Compliance time line set by Clean Air Act:
 - ▶ Up to 4 years (3 years plus an additional year to install pollution controls if granted by the permitting authority)
- ▶ EPA is also proposing a new source performance standard (NSPS) for particulate matter, sulfur dioxide (SO₂), and nitrogen oxide (NO_x) emissions from new sources



Toxic Emissions from Power Plants are a Serious Public Health Concern

- ▶ Power plants release mercury, other metals, acid gases, and particles that all harm people's health
 - ▶ Uncontrolled releases of mercury and many of the other toxic pollutants poison our nation's lakes, streams, and fish
 - ▶ When pregnant women eat mercury contaminated fish, damage can occur to children's developing brains, reducing their IQ and ability to learn
 - ▶ Other metals such as arsenic, chromium, and nickel can cause cancer
 - ▶ Acid gases cause lung damage and contribute to asthma, bronchitis, and other chronic respiratory disease, especially in children and the elderly
 - ▶ Particles cause premature death and a wide range of lung and heart diseases
- ▶ The standards would also result in additional reductions of SO₂, preventing thousands of deaths and hundreds of thousands of illnesses from exposure to fine particulate matter (PM_{2.5}) each year



Environmental Justice Communities Experience Many of These Effects

- ▶ People who eat large amounts of fish from mercury-contaminated freshwater lakes and rivers are at the greatest risk of exposure to mercury
 - ▶ This includes Native American, Laotian, Vietnamese, African-American, Hispanic, and Caucasian subsistence fishers and their families
- ▶ Exposure to PM_{2.5} can cause or contribute to adverse health effects (like asthma and heart disease) that significantly affect many minority, low-income, and tribal individuals and their communities
- ▶ EPA's analysis of the effects of this proposed rule on sensitive and vulnerable populations indicates environmental justice communities would see substantial health benefits from this rule



- ▶ The analysis can be found in the preamble for the rule

Benefits of the Proposed Standards are Significant

This proposed rule would:

- ▶ Help reduce exposure to mercury and the risk of damage to children's developing brains
- ▶ Protect Americans from cancer and other health risks due to exposure to metals such as arsenic, chromium, and nickel
- ▶ Save thousands of lives each year by reducing the amount of dangerous particulate matter across the country
 - ▶ This includes neighborhoods near power plants and neighborhoods hundreds of miles away from the nearest power plant
- ▶ Protect thousands of lakes and streams – and the fish that live there and the mammals and birds that eat them – from mercury and acid rain pollution
- ▶ Provide employment for tens of thousands of American workers building, installing, and operating the equipment to reduce emissions of mercury, acid gases, and other toxic air pollutants

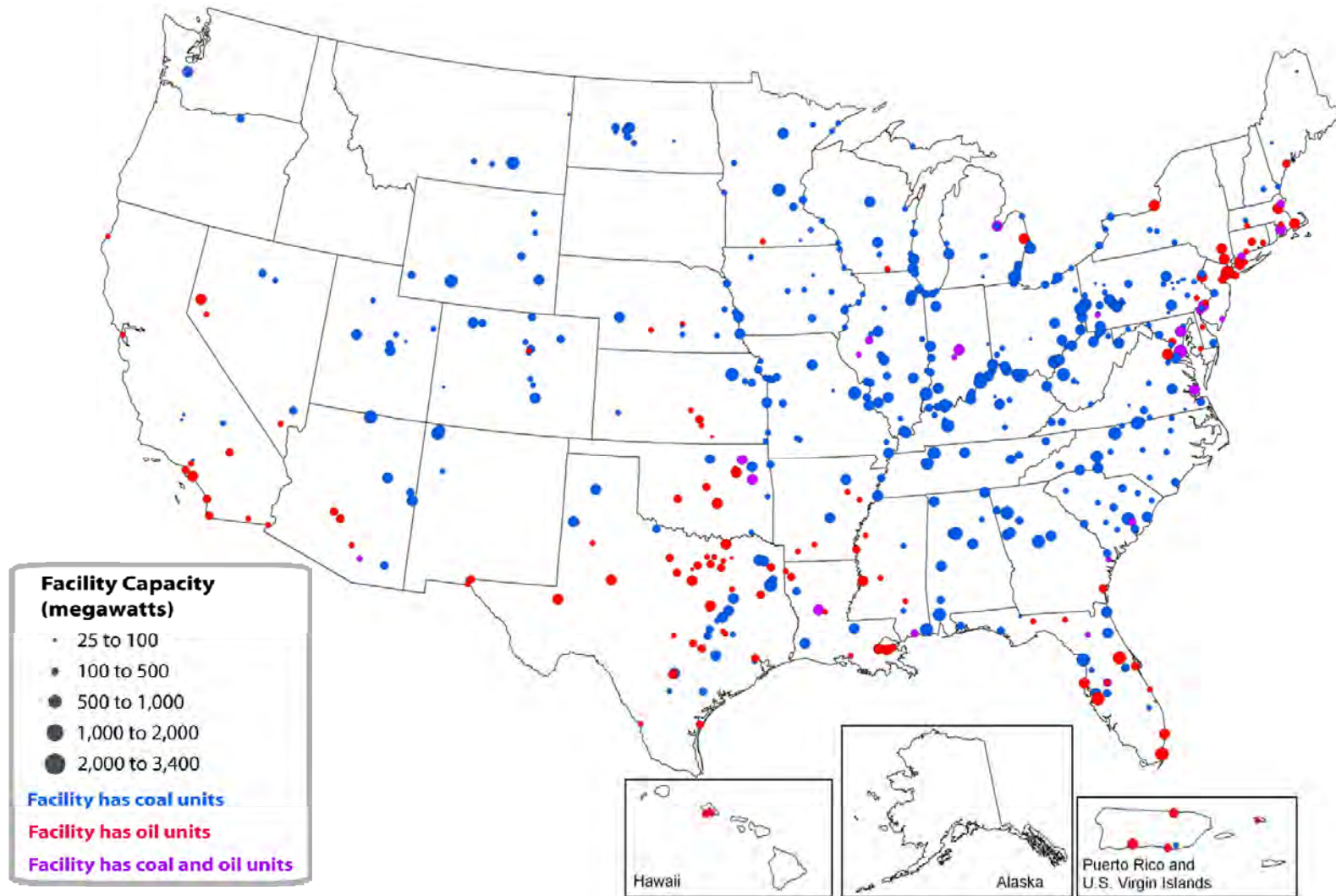


MATS Coverage

- ▶ Coal- and oil-fired power plants are covered by this rule
- ▶ Natural gas power plants are not covered
- ▶ All hazardous air pollutants must be addressed
- ▶ EPA must set emission standards for existing sources in the category that are at least as stringent as the emission reductions achieved by the average of the top 12% best controlled sources for source categories with 30 or more sources
- ▶ Affects sources nationwide



Location of Affected Power Plants - Coal and Oil Units



Source: National Electric Energy Data System (NEEDS 4.10) (EPA, December 2010)

Key Concepts for Review of Proposed Emission Limits

- ▶ Clean Air Act (CAA) allows different standards for new and existing units
 - ▶ Standards for new units are often more stringent
- ▶ CAA authorizes EPA to subcategorize units based on class, type and size of the unit and to set separate standards for each subcategory
 - ▶ EPA must have a basis for distinguishing between subcategories of units (e.g., design differences, operating mode, or other characteristics)
- ▶ Proposed standards would create 5 subcategories:
 - ▶ Coal-fired units designed for coal equal to or above 8,300 Btu per lb
 - ▶ Coal-fired units designed for coal below 8,300 Btu per lb
 - ▶ IGCC (integrated gasification combined cycle) units
 - ▶ Liquid oil-fired units
 - ▶ Solid oil-derived fuel-fired units



More Key Concepts

- ▶ CAA allows emission limits for surrogate pollutants
- ▶ CAA allows work practice standards instead of emission limits in limited circumstances
- ▶ The proposed standards do not involve emissions trading
- ▶ The proposed standards allow sources to average emissions within a single facility in certain circumstances



How the Proposed Standards Were Developed

- ▶ Proposed rule would set a Maximum Achievable Control Technology (MACT) standard for each of the 5 subcategories of units
- ▶ MACT standards do not set a “healthy” level for ambient air
- ▶ MACT standards are based on the emissions of the best-performing source or sources within a source category or subcategory
 - ▶ These emissions levels set the minimum stringency level (called the MACT floor) for the new standards
- ▶ MACT emissions limits do not dictate how compliance must be achieved but leave it up to industry to determine the most effective way to comply with the standards



Setting the MACT Floor

- ▶ Costs may not be considered
- ▶ The floor for existing sources is based on:
 - ▶ “The average emission limitation achieved by the best performing 12 percent of existing sources..”
- ▶ The floor for new sources is based on:
 - ▶ “The emission control achieved in practice by the best controlled similar source...”



After the MACT Floor is set...

- ▶ Regulatory options more stringent than the MACT floor must be considered
 - ▶ EPA can establish a more stringent standard when this makes environmental, public health, and economic sense
 - ▶ EPA proposed a more stringent standard for coal-fired units designed for coal with less than 8,300 Btu per lb for mercury emissions because better controls are widely available and cost effective
- ▶ Options other than MACT can be considered in certain circumstances
 - ▶ EPA can establish a health-based emission standards for HAP for which a health threshold has been established (considered but not proposed)
 - ▶ Work practice standards are allowed instead of emission standards if it is not feasible to prescribe or enforce an emission standard due to technological and economic limitations (proposed for organic HAP, including dioxin/furan)



Requirements for Coal-Fired Units

- ▶ Mercury
 - ▶ Numeric emission limit would prevent 91% of mercury in coal from being released to the air
- ▶ Acid gases
 - ▶ HCl numeric emission limit as a surrogate, with an alternate surrogate of SO₂
- ▶ Non-mercury metallic toxic pollutants such as arsenic and chromium
 - ▶ Numeric emission limit for total PM as a surrogate, with alternate surrogate of total non-mercury metal air toxics
- ▶ Organic air toxics (including dioxin)
 - ▶ Work practice standards, instead of numeric standards, due to low-detected emission levels, which would ensure optimal combustion, preventing organic HAP emissions



Requirements for Oil-Fired Units

- ▶ Acid gases
 - ▶ Numeric HCl and HF emission limits
- ▶ Metal air toxics
 - ▶ Numeric emission limits for total metal air toxics (including Hg) with individual metal air toxics as alternate
- ▶ Organic air toxics (including dioxin)
 - ▶ Work practice standards, instead of numeric standards, due to low-detected emissions levels, which would ensure optimal combustion, preventing organic HAP emissions



Emission Limitations for Coal-Fired and Solid Oil-Derived EGU's (Proposal Preamble, Table 10)

Subcategory	Total particulate matter (PM)	Hydrogen chloride (HCl)	Mercury (Hg)
Existing coal-fired unit designed for coal > 8,300 Btu/lb	0.030 lb/MMBtu (0.30 lb/MWh)	0.0020 lb/MMBtu (0.020 lb/MWh)	1.0 lb/TBtu (0.0008 lb/GWh)
Existing coal-fired unit designed for coal < 8,300 Btu/lb	0.030 lb/MMBtu (0.30 lb/MWh)	0.0020 lb/MMBtu (0.020 lb/MWh)	11.0 lb/TBtu (0.20 lb/GWh) 4.0 lb/TBtu* (0.040 lb/GWh*)
Existing - IGCC	0.050 lb/MMBtu (0.30 lb/MWh)	0.00050 lb/MMBtu (0.0030 lb/MWh)	3.0 lb/TBtu (0.020 lb/GWh)
Existing – Solid oil-derived	0.20 lb/MMBtu (2.0 lb/MWh)	0.0050 lb/MMBtu (0.080 lb/MWh)	0.20 lb/TBtu (0.0020 lb/GWh)
New coal-fired unit designed for coal > 8,300 Btu/lb	0.050 lb/MWh	0.30 lb/GWh	0.000010 lb/GWh
New coal-fired unit designed for coal < 8,300 Btu/lb	0.050 lb/MWh	0.30 lb/GWh	0.040 lb/GWh
New – IGCC	0.050 lb/MWh*	0.30 lb/GWh*	0.000010 lb/GWh*
New – Solid oil-derived	0.050 lb/MWh	0.00030 lb/MWh	0.0020 lb/GWh

Note: lb/MMBtu = pounds pollutant per million British thermal units fuel input
 lb/TBtu = pounds pollutant per trillion British thermal units fuel input
 lb/MWh = pounds pollutant per megawatt-electric output (gross)
 lb/GWh = pounds pollutant per gigawatt-electric output (gross)
 * Beyond the floor limit



Work Practice Standards for Coal-fired EGUs to Limit Organic HAPs

- ▶ Work practice standards are proposed for organic HAP emissions to ensure proper combustion which prevents formation of organic HAP
- ▶ Proposed work practice standard requires implementation of an annual performance (compliance) test program that includes
 - ▶ Inspecting the burner, flame pattern, and the system controlling the air-to-fuel ratio, and making any necessary adjustments and/or conducting any required maintenance and repairs
 - ▶ Minimizing CO emissions consistent with the manufacturer's specifications
 - ▶ Measuring the concentration of CO in the effluent stream before and after any adjustments are made
 - ▶ Submitting an annual report containing:
 - ▶ Concentrations of CO and O₂ measured before and after adjustments,
 - ▶ Description of any corrective actions taken as a part of the combustion adjustment
 - ▶ Type and amount of fuel used over the 12 months prior to the annual adjustment



Other Important Issues

(not covered in this presentation)

- ▶ Proposed rule would address how facilities establish compliance
- ▶ Proposed rule would establish monitoring, recordkeeping, and reporting requirements
- ▶ EPA proposed New Source Performance Standards (NSPS) to reduce emissions of PM, SO₂ and NO_x from boilers that burn fuels, including coal, oil, or natural gas to produce steam, when the steam is used to produce electricity or provide heat
 - ▶ Discussed in more detail in appendix



Schedule for This Rulemaking

- ▶ Publication of proposal – May 3, 2011
- ▶ 3 public hearings:
 - ▶ May 24, 2011 - Philadelphia, PA (Westin Philadelphia)
 - ▶ May 24, 2011 - Chicago, IL (Crowne Plaza Chicago Metro)
 - ▶ May 26, 2011 - Atlanta, GA (EPA Region 4 offices)
- ▶ Comment period is open for 60 days following publication of proposed rules in the Federal Register
- ▶ Final Rule will be signed by November 16, 2011



How to Comment on the Proposed Rules

- ▶ Submit comments by mail, fax, email, in person, or online
 - ▶ Snail mail: EPA, Mail Code 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460 (send 2 copies)
 - ▶ Via fax: 202-566-9744
 - ▶ Via email: www.epa.gov/oar/docket.html, or A-and-r-docket@epa.gov
 - ▶ In person: EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington DC 20460
 - ▶ Online: www.regulations.gov. Highlight “submit a comment” and add the docket (ID) number
- ▶ Docket number:
 - ▶ EPA-HQ-OAR-2009-0234 – Mercury and Air Toxics Standards
 - ▶ EPA-HQ-OAR-2011-0044 – New Source Performance Standards
- ▶ Additional information available at
 - ▶ <http://www.epa.gov/ttn/ataw/utility/utilitypg.html>
 - ▶ <http://www.epa.gov/airquality/powerplanttoxics/actions.html>



APPENDIX

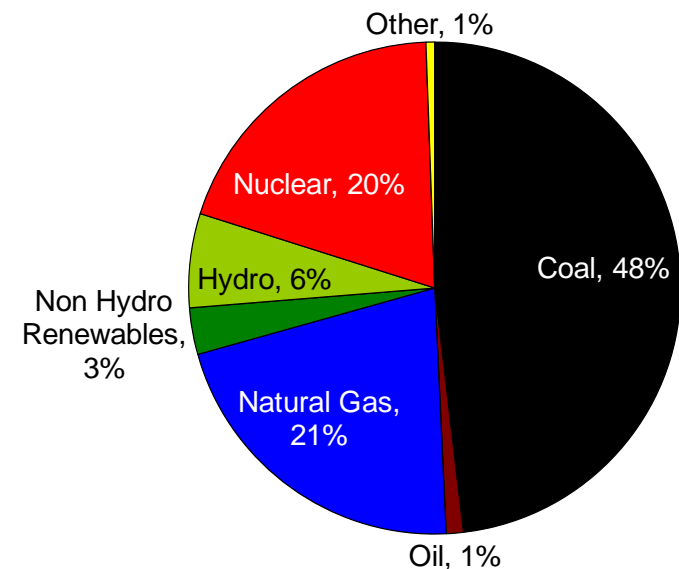
Detailed History of Power Plant Toxics Rule

- ▶ 1990: Clean Air Act Amendments required EPA to study and then, if appropriate and necessary, regulate power plants under section 112 to reduce emissions of toxic air pollutants
 - ▶ EPA was required by Congress to finalize the study within 3 years, and then regulate power plants under the air toxics provisions if the Administrator found that it was appropriate and necessary
- ▶ 1998: EPA released the study, the Utility Toxics Study Report to Congress
- ▶ 2000: EPA listed power plants for regulation under the Clean Air Act (CAA) air toxics provisions
 - ▶ EPA determined it was “appropriate and necessary” to regulate emissions of hazardous air pollutants (HAP) from coal- and oil-fired electric utility steam generating units, commonly called power plants.
 - ▶ Mercury cited as pollutant of greatest concern but other toxics include arsenic, chromium, cadmium, nickel, hydrochloric acid, dioxin/furan.
- ▶ 2005: EPA reversed power plant finding
 - ▶ EPA determined it was neither “appropriate nor necessary” to regulate HAP emissions from power plants and removed those units from the CAA section 112(c) source category list.
 - ▶ EPA issued the Clean Air Mercury Rule (CAMR), which regulated mercury from power plants through a cap and trade program under CAA section 111.
- ▶ 2008: DC Circuit Court vacated EPA’s action that removed power plants from the section 112(c) source category list and vacated CAMR
- ▶ 2011: EPA is under consent decree to sign proposed toxics standards for power plants by March 16, 2011, and sign final standards by November 16, 2011



Affected Facilities: 1,350 Coal- and Oil-Fired Units at 525 Power Plants

- ▶ Approximately 1,200 coal-fired units
 - ▶ 48% of nationwide electricity generation
 - Bittuminous coal ~ 50% of coal generation
 - Subbituminous ~45% of coal generation
 - Lignite ~ 5% of coal generation
 - Includes units that burn coal, coal refuse, a synthetic gas derived from coal, or a solid oil-derived fuel (e.g., petroleum coke) either exclusively, in any combination together, or in any combination with other supplemental fuels
- ▶ Approximately 150 oil-fired units
 - ▶ 1% of nationwide electricity generation
- ▶ Natural gas power plants *not* affected by this rule
- ▶ EPA expects most facilities will install technologies to comply with this rule



Key Definition: Electric Generating Unit (EGU)

- ▶ The “electric utility steam generating unit” source category includes those units that combust fossil fuel for the purpose of generating electricity for sale and distribution through the national electric grid to the public
- ▶ Section 112(a)(8) defines an “electric utility steam generating unit” as:
 - ▶ Any fossil fuel-fired combustion unit of more than 25 megawatts electric (MWe) that serves a generator that produces electricity for sale. A unit that cogenerates steam and electricity and supplies more than one-third of its potential electric output capacity and more than 25 MWe output to any utility power distribution system for sale is also considered an electric utility steam generating unit



Setting the MACT Floor and Variability

- ▶ Variability in emissions is considered in setting the MACT floor
 - ▶ Short-term data gathering may not adequately account for periods of time when the fuel naturally contains more or less constituent content or for periods of time when the unit is generating more or less steam and, thus, burning more or less fuel
 - ▶ The Courts have indicated that we can factor such variability into the establishment of the MACT floors
 - ▶ Must account for emissions under all operating conditions in setting the MACT floor
- ▶ May include the normal variation in amount of constituents in the fuel
- ▶ Will look at the normal variation in the load of the unit (i.e., fluctuations in the amount of electricity generated over time)
- ▶ Determine variability based on the top performing 12 percent
 - ▶ May not go outside the top performing 12 percent unless EPA can show a demonstrated relationship between the variability of the worst performers and the variability of the best performers



New Source Performance Standards: Summary

- ▶ Proposal would:
 - ▶ Set new emission limits for PM, SO₂ and NO_x from steam generating units
 - ▶ Effect only facilities that begin construction, modification, or reconstruction after the date of publication of the proposal in the Federal Register
 - ▶ Be in sync with the timing of the Mercury and Air Toxics Standards to allow owners/operators of new sources subject to both standards to better plan to comply with both sets of requirements
 - ▶ Establish new monitoring and testing requirements; new Startup, Shutdown and Malfunction requirements; and the ability to demonstrate compliance through emissions averaging
 - ▶ Allow each facility to make an individual determination of the appropriate control technologies for its system



NSPS: Proposed Emission Limits For Boilers



- PM Standard

Current Standard	Proposed Standard for Modified Units	Proposed Standard for New/Reconstructed Units
0.015 lb/MMBtu (filterable PM)	0.034 lb/MMBtu (total PM)	0.055 lb/MWh (total PM)

- SO₂ Standard

Current Standard	Proposed Standard
1.4 lb/MWh or 95% reduction	1.0 lb/MWh or 97% reduction

- NO_x Standard

Current Standard	Proposed Option 1	Proposed Option 2
1.0 lb/MWh	0.70 lb/MWh	combined NO _x + CO standard

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