EPA's Boiler MACT: Controlling Emissions of Hazardous Air Pollutants

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Summary

On December 2, 2011, EPA Administrator Lisa Jackson signed proposed revisions to EPA's recently promulgated Maximum Achievable Control Technology standards for boilers (the "Boiler MACT"). Publication of the proposed revisions in the *Federal Register* on December 23 began a 60-day public comment period, after which EPA will complete reconsideration of the rule—presumably by mid-2012. The Boiler MACT standards now being reconsidered were promulgated March 21, 2011, to meet the requirements of Section 112 of the Clean Air Act, but EPA stayed implementation of the requirements until it completes the reconsideration process. There is widespread interest in the rule's requirements and their potential effects, because boilers are used as power sources throughout industry and for power or heat by large commercial establishments and institutions as well.

EPA developed the regulations because it has found, based on emissions data, that boilers (including coal-, biomass-, and liquid-fired boilers) are major sources of hazardous air pollutants (HAPs). The Clean Air Act defines a major source as any facility that emits 10 tons or more of a single listed HAP or 25 tons of any combination of HAPs annually. The HAPs themselves (187 substances) were listed by Congress in the 1990 Clean Air Act Amendments.

When finalized, the rule will replace a 2004 version of the rule that was vacated and remanded to EPA by the D.C. Circuit Court of Appeals. EPA has been under a court order to promulgate a replacement.

As proposed December 2, the MACT would affect about 14,000 boilers and process heaters, with capital costs of $5.4 billion, according to the agency; annualized costs, which spread the costs of capital over the expected life of the equipment and include operating and maintenance expenses, are estimated at slightly less than $1.5 billion per year. In response to comments on an earlier proposal and on the promulgated rule, the current EPA proposal would reduce the number of units expected to require controls, and make the emissions standards much less stringent, reducing the agency's estimate of annualized control costs from $2.9 billion to $1.49 billion. Most of the costs would be borne by boilers that burn coal, biomass, or liquid fuels; only 12% of all the units covered by the rule will need to install equipment to meet it. Most of the boilers affected by the rule (83%) are fueled by natural gas or refinery gases. These boilers would not have to install pollution control equipment and most would experience cost savings under the rule, according to EPA. For the rule as a whole, EPA estimated that benefits—including the avoidance of 3,100 to 8,000 premature deaths annually—would outweigh costs by at least $25 billion per year.

Affected industries and many in Congress have raised objections to the rule as proposed and as promulgated, and bills have been introduced in both the House and Senate (H.R. 2250 and S. 1392) to alter the rule's requirements and delay its implementation. H.R. 2250 passed the House 275-142 on October 13. Provisions similar to H.R. 2250 were offered as an amendment (S.Amdt. 1660) to the Senate version of the surface transportation bill (S. 1813) on March 8, 2012, but were not adopted.

In addition to the Boiler MACT, this report discusses three related rules that EPA promulgated at the same time, dealing with smaller "area source" boilers and with commercial and industrial boilers that burn solid waste (the "CISWI" and solid waste rules). The latter two rules have also been controversial. Like the Boiler MACT, the CISWI rule was stayed by EPA, pending reconsideration.

Contents

Tables

Contacts

Introduction

This report provides information concerning EPA's Maximum Achievable Control Technology standards for boilers (the Boiler MACT), an EPA rule designed to reduce emissions of hazardous air pollutants. On December 2, 2011, EPA proposed changes to the Boiler MACT standards that it had promulgated March 21, 2011.[1] The agency expects to finalize its reconsideration of the rule within the next few months, after which owners and operators of affected boilers would begin the process of obtaining or revising permits and installing equipment necessary to meet the new emission standards. The final standards are also likely to be challenged in the U.S. Court of Appeals for the D.C. Circuit, where numerous parties have already filed suit based on the March 2011 version of the rules.[2]

In addition to the Boiler MACT, this report discusses three related rules that were promulgated on March 21, 2011, and for which changes have also been subsequently proposed. The related rules set standards for small boilers ("area sources") and boilers that use solid waste as fuel ("commercial and industrial solid waste incinerators"), and they identify what materials EPA considers to be solid waste. Because boilers are used as power sources throughout industry, and for power or heat by large commercial establishments and institutions, there has been widespread interest in the requirements of all four of these rules and their potential effects.

Under the March 2011 rules, major source boilers subject to the MACT rule would have faced a May 2014 deadline for compliance. On May 16, 2011, however, EPA announced that it was staying the effective dates[3] of the Boiler MACT and one of the related rules, in order to take additional public comment and reconsider what it had promulgated, leaving in doubt both the final form of the rules and when the standards might go into effect. The federal District Court for the District of Columbia vacated the agency's stay on January 9, 2012,[4] but the court's action appears to have had little effect, as EPA subsequently issued a "No Action Assurance Letter." The letter states that the agency will exercise its enforcement discretion to not enforce certain notification deadlines in the March 2011 rule.[5] The agency also proposed, in its reconsideration of the rules, to extend the effective date (and hence the required compliance date) of the Boiler MACT until three years after completion of the rules' reconsideration.[6] Assuming the agency finalizes this proposal, it will have added at least 15 months to the date when emissions sources will have to comply.

A March 5, 2012 letter from EPA Administrator Lisa Jackson to Senator Ron Wyden elaborated further:

[1] The proposed changes appeared in the *Federal Register* December 23, 2011 (76 *Federal Register* 80598). The *Federal Register* notice and background information are available at http://www.epa.gov/airquality/combustion/actions.html. The March 2011 standards are at U.S. EPA, "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Final Rule," 76 *Federal Register* 15608, March 21, 2011, which is also accessible through EPA's boiler webpage.

[2] United States Sugar Corp v. EPA, No. 11-1108 (D.C. Cir. filed April 14, 2011).

[3] The rules, as promulgated, had effective dates of May 20, 2011, although compliance with their emission standards would not have been required until at least three years later.

[4] Sierra Club v. Jackson, No. 11-278 (D.D.C. Jan. 9, 2012).

[5] The No Action Assurance Letter, dated February 7, 2012, can be found at http://www.epa.gov/ttn/atw/boiler/boiler_ciswi-no_action_2012-02-07.pdf.

[6] 76 *Federal Register* 80616, December 23, 2011.

> In the proposal, EPA proposed to "reset" the three year compliance clock to give entities the full amount of time available under the Clean Air Act upon finalization of the rule, and, subject to the formal rulemaking process, expects to do so in the final rule. The Act also gives state and local permitting authorities the ability to provide up to a one-year extension of that deadline, on a case-by-case basis, as necessary, for the installation of controls.[7]

Thus, the agency envisions up to a four-year compliance deadline if sources can demonstrate that extra time is needed for the installation of controls.

Even before EPA's May 16 decision to delay the rules' effective date, the agency had announced its intention to reconsider the promulgated rules. The Notice of Reconsideration, which appeared in the March 21 *Federal Register*,[8] listed 14 provisions (including the subcategories the agency used to set standards and the emission standards themselves) for which the agency thought additional opportunity for public review and comment should be obtained. It stated that the agency might seek public comment on other aspects of the rules, as well.

The May 16 notice[9] established a 60-day public comment period, which ran through July 15, and it delayed the effective date of the rules until EPA completes its reconsideration of the rules or until proceedings for judicial review of the rules are complete, whichever is earlier. EPA subsequently announced that it expected to propose any changes to the rules by October 31, 2011, and finalize its decisions by April 30, 2012. The October deadline slipped to December 2. It would seem likely that the April 30 deadline for the final version of the reconsidered rules will also slip, as the agency must review and respond to public comments and undergo interagency review of the reconsidered regulations before they can be finalized.

Given the rules' potential impacts and the uncertainty of their final form, there continues to be concern among stakeholders as to the final requirements. EPA estimates that, as proposed on December 2, the Boiler MACT would affect about 14,000 boilers and process heaters.[10] In order to reduce emissions of a wide array of hazardous air pollutants, about 12% of the affected units would be required to install pollution control equipment. The 12% include coal-fired, biomass-fired, and liquid-fired boilers. The agency estimates the capital costs associated with the rule at $5.4 billion to meet the compliance deadline in 2015; annualized costs, which spread the costs of capital over the expected life of the equipment and include operating and maintenance costs as well, were estimated at $1.49 billion per year. These cost estimates are about half the estimated cost of EPA's originally proposed version of the rule, for reasons that we will explore below.

Most boilers—83% of those affected by the rule—are fueled by natural gas or similar gases such as refinery gas, according to EPA. These gas-powered boilers would incur capital costs averaging a little less than $6,500 per unit, according to the agency. Through fuel savings, the agency

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[7] Letter of EPA Administrator Lisa P. Jackson to Senator Ron Wyden, March 5, 2012, at http://www.eenews.net/assets/2012/03/05/document_pm_02.pdf.

[8] U.S. EPA, "National Emission Standards for Hazardous Air Pollutants; Notice of Reconsideration," 76 *Federal Register* 15266, March 21, 2011.

[9] The May 16 announcement appeared in the May 18 *Federal Register*. See http://www.gpo.gov/fdsys/pkg/FR-2011-05-18/pdf/2011-12308.pdf.

[10] The data in this paragraph are from U.S. EPA, Fact Sheet, "Proposed Amendments to the Air Toxics Standards for Industrial, Commercial, and Institutional Boilers at *Major* Source Facilities," December 2011, at http://www.epa.gov/airquality/combustion/docs/20111202msboilerfs.pdf, and the *Federal Register* notice, at http://www.gpo.gov/fdsys/pkg/FR-2011-12-23/pdf/2011-31667.pdf.

expects a reduction in operating costs to more than compensate for the capital expenditures of most gas-powered units.

Why Is EPA Considering Regulating These Sources?

EPA has developed regulations addressing boiler emissions because it has found, based on emissions data, that the coal-fired, biomass-fired, and liquid-fired units are major sources of hazardous air pollutants (HAPs). Section 112 of the Clean Air Act, which requires controls on major sources of HAPs, defines a major source as any facility that emits 10 tons or more of a single listed HAP or 25 tons of any combination of HAPs annually. The HAPs themselves (187 substances) were listed by Congress in the 1990 Clean Air Act Amendments.

Boilers emit at least 20 of the listed HAPs, including mercury, arsenic, chromium, cadmium, selenium, nickel, lead, manganese, phosphorous, antimony, beryllium, polycyclic organic matter, benzene, formaldehyde, acetaldehyde, dioxins, furans, hydrogen chloride, hydrogen cyanide, and hydrogen fluoride. Six of these 20 are classified as known or probable human carcinogens. Others affect the lungs, skin, central nervous system (including adverse developmental effects), and/or kidneys.[11] By controlling boiler emissions, EPA expects to avoid 3,100 to 8,000 premature deaths annually, as well as many other health effects, including 4,900 nonfatal heart attacks annually.[12]

The Boiler MACT will replace a rule promulgated on September 13, 2004, and subsequently vacated and remanded to EPA by the D.C. Circuit Court of Appeals.[13] The court vacated that rule in 2007, saying EPA had wrongly excluded many industrial boilers from the definition of solid waste incinerators, which have more stringent emissions requirements under the Clean Air Act. EPA was under a court order to finalize replacement rules by February 21, 2011.

Reconsideration of the Rule

In early December 2010, the agency petitioned the District Court for the District of Columbia for up to 15 months of additional time to complete the rulemaking. The agency argued that in light of the extensive comments it received on the proposed rules, "EPA believes that the overall public interest is best served by allowing EPA to re-propose the rules so that [it] will be able to issue emission standards that are based upon a thorough consideration of all available data and reduce potential litigation risks."[14] The court had issued a summary judgment against the agency in 2006 for failure to discharge fully its duty to promulgate standards for emissions of hazardous air

[11] U.S. EPA, "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Proposed Rule," 75 *Federal Register* 32048, June 4, 2010. Also, see Comments of Clean Air Task Force, Earthjustice, Natural Resources Defense Council, and the Sierra Club on National Emission Standards for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters: Proposed Rule, Docket ID No. EPA-HQ-OAR-2002-0058, August 23, 2010, p. 3.

[12] U.S. EPA, "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters," pre-publication copy, December 2, 2011, p. 141, at http://www.epa.gov/airquality/combustion/docs/20111202msboilerproposal.pdf. Hereinafter referred to as "Proposed Amendments."

[13] Natural Resources Defense Council v. EPA, 489 F. 3d 1250, 1257–61 (DC Cir. 2007).

[14] Sierra Club v. Jackson, No. 01-1537, 2001 Westlaw 181097, at *7 (D.D.C. January 20, 2011).

pollutants.[15] On March 31, 2006, the court imposed a schedule under which EPA was to have discharged all of the statutory duties at issue by June 15, 2009. That deadline was subsequently extended by more than a year and a half.

On January 20, 2011, the court denied EPA's request for a further 15-month extension, concluding that EPA had engaged in discretionary delay in the face of a congressional directive (i.e., the 1990 Clean Air Act Amendments, under which the rules were to have been promulgated by November 2000); the court gave the agency one month to issue final rules.[16] Having been denied the extension it sought, the agency issued a statement saying, "The standards will be significantly different than what EPA proposed…. The agency believes these changes still deserve further public review and comment and expects to solicit further comment through a reconsideration of the rules."[17]

True to its word, the agency issued a Notice of Reconsideration at the same time that it promulgated the final rule. As noted earlier, the notice listed 14 provisions for which the agency thought additional opportunity for public review and comment should be obtained, and it stated that the agency might seek public comment on other aspects of the rules. The 14 provisions included such basic elements as the subcategories used to set standards in the boiler rule, the emission standards themselves, and the monitoring requirements. This left numerous questions concerning not only the substance of the rule, but the schedule for implementation. Following promulgation, existing facilities would normally have three years to comply with the standards, but if the agency is reconsidering key aspects of the rules, one was left to wonder how regulated entities should determine what standards they will ultimately be required to comply with, and on what schedule. By staying the effective date of the standards on May 16, 2011, the agency addressed this uncertainty, effectively giving itself and regulated entities an extension of time similar to what the court had denied them.

The Promulgated Standards

Standards for Existing Coal, Biomass, and Liquid Units

In order to understand the standards that EPA proposed December 2 and the controversy surrounding them, it helps to begin with the agency's June 4, 2010, proposal (which we refer to, generally, in this report as the standards EPA "originally" proposed). In that proposal, EPA divided boilers into 11 subcategories, with separate emission limits for new and existing units in 9

[15] Sierra Club v. Johnson, 444 F. Supp. 2d 46, 47 (D.D.C. 2006). This case is separate from the vacatur and remand of the Boiler MACT in the 2007 NRDC v. EPA decision. In effect, there are two courts in two separate proceedings overseeing EPA's boiler rules.

[16] *Sierra Club*, 2001 Westlaw 181097.

[17] U.S. EPA, "EPA Announces Next Steps on Emissions Standards for Boilers, Certain Incinerators," Press Release, January 20, 2011, at http://yosemite.epa.gov/opa/admpress.nsf/6424ac1caa800aab85257359003f5337/58f5bee5e13c61228525781e007e9881!OpenDocument.

of the 11.[18] The nine subcategories included three types of coal-fired boilers and four types of biomass-fired boilers.[19]

The proposed emission limits covered five substances (or groups of substances): mercury; dioxins/furans; particulate matter (as a surrogate for non-mercury metals); hydrogen chloride (as a surrogate for all acid gases); and carbon monoxide (as a surrogate for non-dioxin organic air toxics, including formaldehyde).[20] As explained below, EPA is now proposing to replace the emission standards for dioxins/furans with a work practice standard; if the agency finalizes this proposal, the emission standards would only address four groups of pollutants.

The Clean Air Act requires that MACT emission standards be based on the emission control achieved by the best controlled similar sources. Thus, the emission limits originally proposed for the five groups of pollutants were based on monitoring data obtained from facilities in each of the nine subcategories of existing boilers.[21]

- For *new* sources, the statute requires (in §112(d)(3)) that standards be based on the emission control achieved by the best controlled similar source.
- For *existing* sources, on the other hand, the same subsection of the statute requires standards no less stringent than the average emission limitation achieved by the best performing 12% of existing sources. The performance of the best 12% is generally referred to as the "MACT floor," since it sets the minimum requirements for MACT standards. The MACT floor is based solely on the performance of existing facilities in the category or subcategory of sources, with no consideration of the cost or economic impacts thereof. The Administrator is only allowed to take costs, health, energy, and environmental factors into consideration to the extent that she considers setting standards that go beyond the floor.

Given the statutorily required methodology for identifying the MACT floor, the number of subcategories the agency identifies is an important factor in determining how stringent the

[18] The other two subcategories were only required to meet work practice standards. Work practice standards require certain actions from the regulated entity (e.g., the boiler must be tuned up annually, or the owner must conduct an assessment to identify energy conservation opportunities), but they don't set numeric standards for emissions.

[19] The three types of coal-fired boiler identified in the proposed rule were coal stoker, coal fluidized bed, and pulverized coal. The four types of biomass-fired boilers were biomass stoker, biomass fluidized bed, biomass suspension burner/Dutch oven, and biomass fuel cells. In addition, the agency proposed emission limits for liquid-fueled boilers, and gas-fired boilers using "other process gases."

[20] Hydrogen chloride is often referred to as hydrochloric acid, because when the gas encounters water in the atmosphere it forms an acidic solution of hydrochloric acid. The specific emission limits EPA proposed for each of the five pollutants can be found in the June 4, 2010, *Federal Register* at p. 32012, Table 1.The final standards are at 76 *Federal Register* 15612, Table 1, March 21, 2011.

[21] EPA has acknowledged that it did not have as much data as it might have wished to use in establishing the boiler subcategories and the proposed MACT standards. In a September 28, 2010, letter, the Administrator stated: "In an effort to establish subcategories wherever appropriate, and to calculate accurately the standards for each subcategory, EPA asked the affected companies and institutions for technical data about their facilities long before the court-ordered deadline for publishing a proposal. As is often the case in §112 rulemaking efforts, however, EPA did not receive many data. While the agency was not left entirely lacking in relevant information, the limited response from affected businesses and institutions did make it difficult for EPA to delineate subcategories and calculate standards that fully reflected operational reality. The agency nevertheless was legally required to publish proposed subcategories and standards based on the information it had at the time." Letter of EPA Administrator Lisa P. Jackson to Senator Mary L. Landrieu, September 28, 2010, p. 2.

standards will be: the more subcategories EPA identifies, the more variation there will be in the MACT floor for each, and thus the more flexibility the agency will have in setting different, potentially less stringent emission standards for different boiler types. If, because of subcategorization, the Administrator decided that a subcategory's MACT floor did not provide sufficient protection for human health or the environment, she would still have the authority to set "beyond the floor" standards for a subcategory: in doing so, however, she could consider the cost of the standards and other factors. Thus, one issue raised by commenters on the proposed rule was whether EPA's subcategorization of the boiler universe appropriately considered the differences in size, fuels, boiler design, location, etc., or whether the subcategories should be modified from those originally proposed.

In the final rule, EPA responded to the comments it received by modifying its subcategories. Instead of 11 types of boiler, the final rule identified 15, including an additional biomass subcategory, a limited-use subcategory,[22] and a subcategory for "non-continental" (i.e., Hawaiian, Puerto Rican, and U.S. island territories) liquid-fueled boilers.[23] Based on new data provided by industry and on some corrections to the data it had used earlier, the emission standards for almost every subcategory were modified, mostly making the standards less stringent.

In the re-proposal signed by the Administrator December 2, 2011, three additional subcategories were added, bringing the total to 18. The new proposal adds two biomass-fueled subcategories (bringing the number of biomass subcategories to seven) and divides liquid-fueled boilers into those that burn heavy-liquid fuel and those burning light liquid fuel. The re-proposal also sets new emission limits for the pollutants emitted from each of the subcategories.

The net effect of all these changes is a substantial easing of the proposed standards' stringency. As shown in **Table 1**, existing coal-fired boilers will be allowed 40% to 340% more particulate matter (PM) depending on boiler type, 10% more hydrogen chloride (HCl), and 3% more mercury than would have been allowed by the original June 2010 proposal. The increase in allowable emissions is even greater for most of the pollutants emitted by existing biomass units: they will be allowed to emit more than triple the HCl and mercury that would have been allowed under the originally proposed standards, and as much as 22 times the PM originally proposed. The standards for liquid-fueled units also changed, allowing six times as much mercury and at least seven times the carbon monoxide.

Of the changes provided by the most recent proposal, the dioxin/furan standards are perhaps the most significant. EPA determined that the dioxin limits in the March 2011 standards had been set below levels that could be accurately measured. As a result, the agency proposes to replace the numeric emission limits that it had set in March 2011 with work practice standards: the latter will require an annual tune up of the boiler to ensure good combustion, which EPA believes will ensure minimal dioxin emissions without requiring emissions monitoring.

A second issue raised by critics of the agency's proposal had to do with the way that EPA identified the best performers within the subcategories. As it has done previously for other categories of sources, EPA has averaged the emissions performance of the top 12% of existing

[22] The agency defined limited use units as those having a federally enforceable limit of no more than 876 hours per year of operation (i.e., operable at most 10% of the year). 76 *Federal Register* 15684, March 21, 2011.

[23] In the rule's preamble, EPA stated that there was a "need for a noncontinental liquid fuel subcategory for island units that have limited fuel options and other unique circumstances." 76 *Federal Register* 15633, March 21, 2011. See also discussion at p. 15635.

units separately for each of the four pollutants subject to emission limits. Critics who believed the proposed standards were too stringent argued that by considering the pollutants separately, the agency was, in effect, cherry-picking the best performers and setting a combined standard for the pollutants that no existing facility may actually meet.

Table 1. Change in Emission Standards for Existing Major Source Boilers, December 2011 Re-Proposed Boiler MACT vs. June 2010 Proposed Rule

(% change in proposed emission standards)

Subcategory	Estimated Number of Units	Particulate matter (PM)	Hydrogen chloride (HCl)	Mercury	Carbon monoxide
Coal					
Coal Stoker	616	+40%	+10%	+3%	+340%
Coal Fluidized Bed		+340%			+87%
Pulverized Coal		+120%			-54%
Biomass					
Biomass – Wet Stoker / Sloped Grate / Other	508	+45%	+267%	+244%	+41%
Biomass – Kiln-Dried Stoker / Sloped Grate / Other		+1,500%			-55%
Biomass Fluidized Bed		+450%			+48%
Biomass Suspension Burner		+155%			-94%
Biomass Dutch Ovens / Pile Burners		+80%			-20%
Biomass Fuel Cells		+65%			+455%
Biomass Hybrid Suspension Grate		+2,100%			+286%
Liquid					
Heavy Liquid	947	+1,450%	+33%	+550%	+900%
Light Liquid		-15%			+600%
Non-continental Liquid		+100%			+1,700%
Gas					
Other Process Gases (Gas 2)	129	-87%	+56,566%	+3,850%	+300%

Source: U.S. EPA, with calculations performed by CRS.

Notes: In addition to these changes to the numeric emission standards, the agency's December 2011 proposal would replace the emission standards for dioxins and furans with a work practice standard.

This question—whether one identifies the best-performing sources pollutant-by-pollutant or for all the pollutants as a group—was addressed in regard to another standard, the Hospital/Medical/Infectious Waste Incinerator rule, which EPA promulgated in October 2009.[24] In promulgating that rule, the agency stated:

> There is no reason not to consider emissions data and controls in use at sources that may be the best performers from some pollutants but not for other pollutants. The MACT floor controls applicable for one pollutant do not preclude the use of MACT floor controls for another pollutant. Therefore, it is appropriate to consider controls at sources employing MACT controls for some pollutants, but not all.[25]

EPA acknowledged in the preamble to that rule that "there appears … to be a substantial ambiguity in the statutory language about whether the MACT floor is to be based on the performance of an entire source or on the performance achieved in controlling particular hazardous air pollutants."[26] But the agency noted that commenters in the past have not objected to the use of the pollutant-by-pollutant approach. They also noted that the D.C. Circuit Court of Appeals has reviewed MACT floor determinations made on a pollutant-by-pollutant basis without finding error in the approach.[27] Thus, the agency believes the best reading of the act is that the standards are to be set on a pollutant-by-pollutant basis—the only exception being if there is reason to believe that control of one pollutant will lead to increased emissions of another.

In the preamble to the March 2011 Boiler MACT standards, EPA provided a similar discussion, concluding that, although the language of Section 112(d)(3) is ambiguous, "EPA's HAP-by-HAP approach fulfills the evident statutory purpose and is supported by the most pertinent legislative history."[28]

Standards for Existing Gas-Fired Units

In the final and re-proposed rules, two subcategories are not subject to emission limits: natural gas/refinery gas/clean gas (a subcategory that EPA calls Gas 1) and limited-use units (defined as units that operate less than 10% of the time). For these two, the agency set only a work practice standard, requiring that boilers be tuned up annually and that the owners submit reports to EPA setting forth specific information from the tune-up procedure. The Administrator has authority to substitute a work practice standard for emission standards when, in her judgment, it is not feasible to prescribe or enforce an emission standard. As noted earlier, 83% of existing boilers fall into the natural gas/refinery gas/other clean gas subcategory, and thus are only subject to the tune-up requirements. Limited use boilers that burn liquids would also qualify for work practice standards, requiring a tune-up every two years.

All boilers would also be required to perform a one-time energy assessment to identify cost-effective energy conservation measures.

[24] Medical Waste Institute et al. v. EPA, No. 09–1297 (D.C. Cir.).

[25] U.S. EPA, "Standards of Performance for New Stationary Sources and Emissions Guidelines for Existing Sources: Hospital/Medical/Infectious Waste Incinerators; Final Rule," October 6, 2009, 74 *Federal Register* 51381.

[26] Ibid.

[27] Ibid. The case in question was Sierra Club v. EPA, 167 F.3d 658, 660 (D.C.Cir. 1999).

[28] The full discussion is found in Section V.A. of the Preamble, at 76 *Federal Register* 15621-15623, March 21, 2011.

Standards for New Boilers

EPA also promulgated MACT standards for new (as opposed to existing) major source boilers. These standards are, in all cases, more stringent than the standards for existing units—in many cases, substantially so.[29] The agency assumes that no new coal-fired major source boilers (and very few major source boilers of any kind) will be built in the next three years. The agency has stated that the projected type and number of new boilers comes from the Energy Information Administration at the Department of Energy and is not based on the Boiler MACT.[30]

Of the estimated 1,844 new units, the agency expects 1,762 to be powered by natural gas, with annualized costs of compliance averaging $2,900 apiece. The other 82 new boilers are projected to be fueled by biomass, with annual compliance costs of $1.2 million each.[31]

EPA's Estimates of the Boiler MACT's Costs and Benefits

Among the boilers affected by the Boiler MACT rule, there are an estimated 947 units that burn liquids and 1,124 units that burn solids (616 of them coal-fired and the rest biomass-fired). The rule also applies to other types of boilers, but these 2,071 units, which account for 14.4% of the affected units, account for 100% of the compliance cost for existing units.

In general, the promulgated emission limits apply to boilers that have a designed heat input capacity of 10 million Btu per hour or greater. How big is this? A coal-fired boiler subject to the MACT would be one that is capable of burning roughly 1,000 pounds (a half-ton) of coal per hour.[32] Wood has less energy per pound than coal: a biomass-fired boiler burning wood might require as much as 1,500 pounds of wood per hour to produce 10 million Btus. A boiler burning fuel oil would need to burn about 70 gallons per hour. Many of the boilers to be regulated are substantially larger than this. An analysis released by the Council of Industrial Boiler Owners (CIBO), for example, used a 250 million Btu/hour boiler as the base for its cost estimates.[33] For a boiler burning fuel oil, this would mean burning 1,750 gallons per hour.

In order to comply with the rule's emission limits, these facilities may need to install fabric filters (also known as baghouses) to achieve PM and mercury control; wet scrubbers to meet the hydrochloric acid limits; replacement burners, tune-ups, and combustion controls for carbon monoxide and organic HAPs; and carbon injection for mercury control. These are the available technologies for maximum control of the relevant emissions.

[29] 76 *Federal Register* 15612, Table 1, March 21, 2011.

[30] Letter of EPA Administrator Lisa P. Jackson to Senator Mary L. Landrieu, September 28, 2010, p. 2.

[31] Proposed Amendments to the Boiler MACT Rule, pre-publication copy, December 2, 2011, p. 136.

[32] A rough rule of thumb for coal is that it contains about 10,000 Btus of energy per pound. To be more precise, the heating value ranges from 6,500 to 13,000 Btus per pound, depending on rank (i.e., type of coal), with bituminous coal containing more than 10,000 and subbituminous and lignite less.

[33] IHS Global Insight for CIBO, *The Economic Impact of Proposed EPA Boiler/Process Heater MACT Rule on Industrial, Commercial, and Institutional Boiler and Process Heater Operators*, August 2010, Appendix A, p. 28.

Some observers maintain that, because EPA weakened the standards as compared to what it originally proposed, the vast majority of facilities won't have to install these technologies. The National Association of Clean Air Agencies (NACAA), the association that represents state air pollution control officials, surveyed its members in 2008 to determine what should be defined as MACT. Using the data it obtained from state officials, NACAA concludes that EPA's final mercury emission standard for coal-fired boilers is almost 16 times higher than the average of the best performing 12%; the carbon monoxide standard is 213 times what the MACT floor should be, according to NACAA. The problem according to NACAA's Executive Director, is that "Compliance test results provided by state and local permitting officials were not used [in setting the MACT standards]; instead EPA relied on industry data."[34]

EPA explains that some of the data that NACAA provided could not be used, because the test reports were incomplete. The agency also notes that its process for setting a standard is more complicated than simply averaging the best test results. Specifically, the agency subjects the emissions data to what is called a "variability analysis." This type of analysis attempts to recognize that operating conditions and resulting emissions vary over time, yet facilities need to be in compliance with emissions limits at all times. Emissions can change for several reasons: there is variation in the amount of contaminants in fuel, for example; the boiler will sometimes be operating at less than full load; and statistical tests applied to the data are used to set the actual standard. The agency first identifies the best 12% by ranking the units based on their best test results. In the next step they add all available test results for those units. Finally, using a statistical test, they calculate a standard that these units can meet 99% of the time, despite variability in operating conditions. This results in standards that are less stringent than the straight average of the best 12% test results.[35]

EPA's Projected Costs

As shown in **Table 2**, EPA estimates the capital costs of the re-proposed rule to be $5.4 billion, with annualized costs of nearly $1.5 billion.[36] These costs fall almost entirely on units burning solids (coal or biomass) or liquids. Most boilers, which are fueled by natural gas, will experience a reduction in operating costs that more than compensates for any capital costs, according to EPA.

Despite the clear advantage that the promulgated rule would give to natural-gas-fired boilers, EPA did not consider fuel-switching as a potential compliance strategy, for a variety of reasons. In the preamble to the originally proposed rule, the agency stated: "This decision was based on the overall effect of fuel switching on HAP emissions, technical and design considerations discussed previously in this preamble, and concerns about fuel availability."[37] Although switching from solid to gaseous fuels "would decrease PM and some metals emissions, emissions of some

[34] Bill Becker, "Clean Air Issues Facing States and Localities: Regulatory Update," presentation, Institute of Clean Air Companies, April 27, 2011.

[35] For a further discussion of variability analysis, see Amanda Singleton, ERG (Eastern Research Group, Inc.), "Revised MACT Floor Analysis (2011) for the Industrial, Commercial, and Institutional Boilers and Process Heaters National Emission Standards for Hazardous Air Pollutants – Major Source," Memorandum to Brian Shrager, U.S. EPA, January 4, 2011, at http://www.epa.gov/ttn/atw/boiler/rev_mact_floor_analysis_major_boilers_process_heaters.pdf.

[36] Proposed Amendments to the Boiler MACT Rule, pre-publication copy, December 2, 2011, pp. 134-135.

[37] U.S. EPA, Proposed Boiler MACT, 75 *Federal Register* 32019, June 4, 2010.

organic HAP (e.g., formaldehyde) would increase,"[38] according to the agency's analysis. Further, the agency maintained, natural gas may be unavailable:

> Natural gas pipelines are not available in all regions of the U.S., and natural gas is simply not available as a fuel for many industrial, commercial, and institutional boilers and process heaters. Moreover, even where pipelines provide access to natural gas, supplies of natural gas may not be adequate.[39]

Table 2. Estimated Costs to Existing Boilers for Compliance with EPA's Re-Proposed Boiler MACT

Subcategory	Estimated Number of Affected Units	Capital Costs ($ million)	Annualized Cost ($ million)	Annualized Cost per Unit ($ thousand)
Coal units	616	$2,713	$953	$1,550
Biomass units	508	$639	$169	$333
Heavy-liquid units	322	$769	$264	$820
Light-liquid units	581	$930	$277	$477
Non-continental liquid units	44	$181	$42	$955
Gas 1 (natural gas / refinery gas / other clean gas) units	11,911	$77	($295)	($25)
Gas 2 (other) units	129	$132	$55	$426
Total	14,111	$5,441	$1,465	—

Source: U.S. EPA, Proposed Amendments to Boiler MACT Final Rule, Table 5, pre-publication copy, pp. 135-136.

Notes: (1) Parentheses indicate lower costs, resulting from fuel savings. (2) Per unit cost was calculated by CRS. Some of the difference in unit costs could be accounted for by differences in boiler size.

Nevertheless, if the cost of compliance is sufficiently great, the incentive to explore fuel-switching would seem substantial, particularly for facilities not burning a byproduct of the plant's operation. Recent accounts of the substantial increases in gas reserves as shale gas resources are developed could ease some of the natural gas availability concerns, and might bear further analysis.[40]

EPA used a multi-market partial equilibrium model developed for its Office of Air Quality Planning and Standards to determine how stakeholders in 100 U.S. industries might respond to

[38] Ibid.

[39] Ibid.

[40] See, for example, the U.S. Energy Information Administration's *Annual Energy Outlook 2010 with Projections to 2035*, at http://www.eia.doe.gov/oiaf/aeo/gas.html: "A 4-fold increase in shale gas production from 2008 to 2035 more than offsets a 31-percent decline in other lower 48 onshore natural gas production in the AEO2010 Reference case. Significant increases in shale gas production are expected in the Northeast, Gulf Coast, and Midcontinent regions…." Also, CRS Report R41543, *Global Natural Gas: A Growing Resource*, by Michael Ratner.

the promulgated rule. The model found no U.S. industry in which production would decline by more than 0.05%.[41]

EPA's Projected Benefits

EPA estimates that implementation of the Boiler MACT, as promulgated, would reduce nationwide emissions from major source boilers and process heaters by

- 0.5 to 1.8 tons per year (tpy) of mercury,
- 2,200 tpy of non-mercury metals,
- 37,000 tpy of hydrogen chloride,
- 41,200 tpy of particulate matter (PM),
- 4,700 tpy of volatile organic compounds, and
- 558,430 tpy of sulfur dioxide.[42]

For most of these pollutants, the expected reductions are similar to those of the originally proposed rule. This is not the case for mercury, however. The June 2010 proposed version of the rule was estimated to reduce mercury emissions by 7.5 tons, at least four times as much as the current proposal. Boilers are currently thought to be the fourth-largest stationary source of mercury, yet other categories of sources have been required to reduce mercury emissions to a greater extent than will be required by the promulgated or re-proposed Boiler MACT rule.[43] EPA's explanation for the continued mercury emissions is that much of the remaining mercury comes from small oil-fired boilers, which do not currently have controls, and which individually emit relatively small amounts of mercury. Thus, when the agency defined MACT for these units, it did not result in substantial mercury reductions.[44]

According to EPA, beginning in 2014, emission reductions resulting from the rule would lead to important health benefits, including the annual avoidance of:

- 3,100 to 8,000 premature deaths,
- 2,000 cases of chronic bronchitis,
- 4,900 nonfatal heart attacks,
- 5,350 hospital and emergency room visits,
- 4,600 cases of acute bronchitis,
- 390,000 days when people miss work,

[41] U.S. EPA, Regulatory Impact Analysis, Appendices A and B, February 23, 2011, at http://www.epa.gov/ttn/ecas/regdata/RIAs/boilersriafinal110221_psg.pdf. Hereafter referred to as "Regulatory Impact Analysis."

[42] EPA Fact Sheet, p. 2, at http://www.epa.gov/airquality/combustion/docs/20111202msboilerfs.pdf.

[43] EPA National Emissions Inventory, "Trends in Mercury Air Emissions Between 1990 and 2005," June 28, 2010, and U.S. EPA, "Emissions Overview: Hazardous Air Pollutants in Support of the Proposed Toxics Rule," March 15, 2011, available on request.

[44] Personal communication, U.S. EPA, Office of Air Quality Planning and Standards, December 15, 2011.

- 51,000 cases of aggravated asthma, and
- 96,000 cases of respiratory symptoms.[45]

EPA estimates the annual value of these benefits to range from $27 billion to $67 billion in 2015—outweighing the annualized costs by at least $25 billion. In its Regulatory Impact Analysis, the agency states that it was only able to provide a partial estimate of the value of the rule's benefits:

> We were unable to monetize the direct benefits associated with reducing HAPs in this analysis. In Section 7.5.5 of this RIA, we provide a full qualitative discussion of the direct health benefits associated with the reductions in emissions of HAPs anticipated by these rules, including a full discussion of the complexity associated with monetizing HAP benefits. We also provide maps of reduced mercury deposition in that section. Therefore, all monetized benefits provided in this analysis only reflect improvements in ambient $PM_{2.5}$ and ozone concentrations. Thus, the monetized benefits estimate is an underestimate of the total benefits. The extent of this underestimate, whether small or large, is unknown.[46]

Other Cost Estimates

Not surprisingly for a rule of this size, EPA's cost estimate is not the only one available. Industry-funded studies of the originally proposed rule, including one from the Council of Industrial Boiler Owners (CIBO), placed the costs of the rule substantially higher than EPA's estimate, while an analysis by the National Association of Clean Air Agencies concluded that CIBO's study exaggerated the potential costs.

The CIBO Study

CIBO's study concluded that capital costs of the proposed Boiler MACT would be $20.7 billion, more than double EPA's cost estimate for the rule as originally proposed, and four times EPA's estimated cost of the rule as promulgated and re-proposed.[47] CIBO estimated the cost of carbon monoxide controls at $2.7 billion, 200 times EPA's estimate; and the report estimated the cost of carbon injection at $1.7 billion, 180 times the EPA amount. CIBO's estimate for hydrogen chloride controls was only three times as expensive as EPA's estimate; but, because EPA's

[45] Proposed Amendments, previously cited, p. 141.

[46] Regulatory Impact Analysis, previously cited, p. 7-3. In the qualitative discussion of the benefits of reducing HAP emissions, the RIA states that the effects of exposure to HAP emissions can include neurological, cardiovascular, liver, kidney, and respiratory effects as well as effects on the immune and reproductive systems and cancer. Reducing emissions may reduce these effects, but none of these benefits were quantified in the benefit estimates. As summarized by the agency's Science Advisory Board, "(T)he challenges for assessing progress in health improvement as a result of reductions in emissions of hazardous air pollutants (HAPs) are daunting ... due to a lack of exposure-response functions, uncertainties in emissions inventories and background levels, the difficulty of extrapolating risk estimates to low doses and the challenges of tracking health progress for diseases, such as cancer, that have long latency periods." (RIA, p. 7-43) As a result, the agency concluded, "Large reductions in HAP emissions may not necessarily translate into significant reductions in health risk because toxicity varies by pollutant and whether or not there are exposures at or above levels of concern is not known." (RIA, p. 7-41)

[47] IHS Global Insight for CIBO, *The Economic Impact of Proposed EPA Boiler/Process Heater MACT Rule on Industrial, Commercial, and Institutional Boiler and Process Heater Operators*, August 2010, pp. 29-30. Hereinafter, "CIBO Study."

estimate was already more than $3 billion, the difference would add $6 billion to the total cost of the rule.

CIBO identified six factors that accounted for most of the difference. According to the CIBO study:

- EPA used outdated control cost estimates;
- to achieve the proposed carbon monoxide (CO) limits, it would have been necessary to implement combustion controls, fuel feed system improvements, or install a CO catalyst, at far greater cost than EPA's conclusion that a tune-up or burner replacement would be adequate to achieve the CO limits;
- activated carbon injection, in addition to fabric filters, would be required to achieve the proposed rule's mercury limits at a far higher number of boilers, and EPA underestimated the cost of this technology by a factor of 15;
- PM emission controls would require fabric filters, which are more expensive than EPA's assumption that electrostatic precipitators (ESP) would be adequate to meet the standard;
- more expensive scrubbers than EPA identified would be required for hydrogen chloride control; and
- more facilities than EPA estimated would need to control dioxin/furan emissions.

Using an estimate of 16,000 jobs "at risk" of being eliminated for each billion dollars of cost, CIBO concluded that 337,702 jobs would be at risk from implementation of the proposed rule.[48] Nearly 70,000 of these would be in the directly affected industries; the rest would be in supplier industries or spread across local economies through reductions in spending by workers directly and indirectly affected.

Like the cost estimates, CIBO's jobs "at risk" were much higher than EPA's estimates. EPA found that the employment impact of the proposed rule would range from a loss of 6,000 jobs to a gain of 12,000.[49] For the re-proposed rule, EPA estimates employment impacts as ranging from a loss of 3,000 to a gain of 6,300, with a central estimate showing an increase of 1,600 jobs.[50]

Several factors help explain why CIBO's estimates were so much higher than EPA's. The most important was the choice of model used to estimate the economic impacts. CIBO used an input-output (I-O) model. I-O models are deterministic, in the sense that they start with an assumption regarding a change in one industry's output and track the effect of the change on other industries' output and employment. An assumed loss in one industry translates directly to bigger losses in the economy as a whole.

[48] CIBO Study, pp. 9-10. The "at risk" jobs include direct impacts on jobs at the facilities that have to install pollution controls, indirect impacts on jobs at suppliers of those firms, and induced impacts due to reductions in spending by employees in the direct and indirect categories.

[49] Draft Regulatory Impact Analysis, pp. 1-2 and 4-6 to 4-9.

[50] Proposed Amendments, previously cited, p. 138.

In the CIBO study, the assumption was that the expenditure of $20.7 billion on pollution controls would be equivalent to a reduction of output by that amount.[51] In fact, spending on pollution control does not cause an equal reduction in output. Rather, changes in output caused by pollution control expenditures would include increases in some industries along with declines in others.

- Output declines occur in cases where industries increase prices to cover their higher costs, and consumers respond by demanding less of the affected product. In these cases, the higher costs would generally reflect "annualized costs," not the full capital cost used by CIBO.
- Meanwhile, output in other industries will usually increase. As EPA noted, in the Administrator's September 28, 2010, letter to Senator Landrieu, expenditures on pollution control are not simply a loss to the economy: they stimulate demand and provide jobs in the pollution control sector.[52]

Thus, the assumption that output would decline by $20.7 billion at the base of CIBO's analysis is flawed. As a result, little credence can be placed in CIBO's estimate of job losses.

The NACAA Critique

An analysis by the National Association of Clean Air Agencies[53] cited other flaws in the CIBO study. In addition to echoing the critiques above—that CIBO included no estimates of economic or health benefits and treated one-time costs as recurring expenses—NACAA raised two other major points. First, NACAA maintained, CIBO exaggerated the cost of the proposed rules by overestimating the number of sources that must be controlled: CIBO's estimate of the number of sources that must be controlled is "grossly in error,"[54] according to NACAA, because CIBO assumed that any source for which there were no emissions data would have to install controls. NACAA collected stack test data for boilers in 2008 in order to develop a model Boiler MACT permit for use by the states, and thus is the source of much existing emissions information. Using its existing data sets, NACAA looked at coal-fired boilers and found that 87% of the 39 units for which there were emissions data already met EPA's proposed standard for carbon monoxide. In developing its cost estimates for the coal-fired units, however, CIBO assumed that none of the remaining 146 (untested) units in the subcategory would meet the proposed standard, and thus they would all have to install additional controls. Second, NACAA concluded that the available data "reveal a continuum of emissions performance where there are substantial numbers of units whose emissions are within 10 to 40 percent of the proposed standard." For many of these units "it should be anticipated that minor changes, such as blending in small amounts of clean fuel, will suffice in lieu of major capital projects."[55]

[51] CIBO study, p. 11.

[52] Letter of EPA Administrator Lisa P. Jackson to Senator Mary L. Landrieu, September 28, 2010, p. 3. Others have also discussed the CIBO study's failure to account for the increased output in the pollution control industry, along with other criticisms of the study. See, for example, Laurie Johnson, "Boiler Industry's Junk Economic Analysis of Proposed EPA Toxic Emission Standards for Industrial Boilers," NRDC Switchboard, http://switchboard.nrdc.org/blogs/ljohnson/boiler_industrys_junk_analysis.html.

[53] National Association of Clean Air Agencies, *EPA's Proposed Regulations on Hazardous Air Pollutants from Boilers*, December 8, 2010, at http://www.4cleanair.org/Documents/EVALUATIONOFCIBOSTUDYFINAL12082010.pdf. Hereinafter, the "NACAA study."

[54] NACAA study, p. 5.

[55] Ibid.

Furthermore, according to NACAA, EPA data show a large number of sources that are capable of burning a variety of fuels. This creates "significant opportunities to reduce capital costs by shifting the mix of fuels combusted," according to NACAA, a lower-cost compliance strategy that both CIBO and EPA did not consider. NACAA provided numerous examples of how such strategies might be used by different types of boilers.[56]

The AF&PA Study

The American Forest and Paper Association (AF&PA) also sponsored a report on the proposed rule's potential impacts, and subsequently updated the report to reflect the promulgated rule.[57] The updated AF&PA study concluded that the Boiler MACT would cost pulp and paper mills $2.85 billion in capital costs, and would place 36 mills at risk of closure, threatening 20,541 jobs.[58] Although the updated study estimated the costs of the rule to be 17% ($800 million) less than their estimate for the proposed rule, the authors increased their estimate of the number of plants at risk of closure and the associated job losses by 20% and 22% respectively. The updated study does not provide a direct explanation for why a smaller increase in cost would lead to greater plant closures and job losses.[59]

Some General Thoughts on Cost and Economic Impact

In general, over the last 40 years, Clean Air Act rules have proven less expensive than both EPA and industry estimates have projected before they were promulgated. As the EPA Administrator noted in a September 2010 speech, after recounting examples of exaggerated projections of the consequences of proposed rules, "the Clean Air Act has not only reduced harmful pollution—it has also been particularly effective at proving lobbyists wrong."[60] The National Association of Clean Air Agencies reached the same conclusion: "Pre-regulation estimates by industry sources have historically overstated the cost of compliance with proposed regulations, often by substantial amounts." The NACAA report cites the Clean Air Act's acid rain program, catalytic converters on automobiles, the removal of lead additives from gasoline, the replacement of ozone-depleting substances in air conditioners, and the impacts of the 1997 National Ambient Air Quality Standards for ozone and particulate matter as examples of major regulatory programs whose costs were overestimated.[61]

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[56] Ibid., pp. 9-10.

[57] Fisher International Inc. for the American Forest and Paper Association, "Economic Impact of Pending Air Regulations on the U.S. Pulp and Paper Industry," August 2010, 8 p. The revised report is entitled, "Economic Impact of Pending Air Regulations on the U.S. Pulp and Paper Industry - Updated," September 2011, 17 p.

[58] The study also estimated capital costs of $950 million for compliance with the CISWI rule, discussed separately below. Because the earlier study lumped the costs of the two rules together, the remainder of this discussion does the same (i.e., our reference to AF&PA's revised cost estimates refers to the combined cost of both rules).

[59] The closest it comes to an explanation is a statement that average costs of production in U.S. mills increased between the two study periods and "higher costs might put more U.S. mills at risk rather than fewer because foreign mills gain a cost advantage vis-à-vis U.S. mills." AF&PA Updated Study, p. 8.

[60] Administrator Lisa P. Jackson, "Remarks on the 40th Anniversary of the Clean Air Act, As Prepared," September 14, 2010, at http://yosemite.epa.gov/opa/admpress.nsf/8d49f7ad4bbcf4ef852573590040b7f6/7769a6b1f0a5bc9a8525779e005ade13!OpenDocument.

[61] NACAA study, p. 4.

More to the point, as noted earlier, EPA legally cannot take cost or economic impact into consideration in identifying the MACT floor, and all of the numeric standards in the rule are based on the agency's determination of the MACT floor.

But the agency can distinguish among classes, types, and sizes of sources within categories or subcategories. This has led the agency to propose generally less stringent emission standards as the agency has identified additional subcategories from within the boiler universe. In response to a September 24, 2010, letter sent by 41 Senators, the Administrator stated that it was the agency's intent to "focus on making the regulatory subcategories appropriately reflect industrial variation in the real world, and on aligning the standards in each subcategory with the performance that real-word conditions prove are already achievable."[62] The Administrator explained that this would be possible because the affected companies and institutions had provided additional information in response to the EPA proposal.

The agency should not expect an entirely free hand in setting additional subcategories (or perhaps, even in promulgating standards based on the many subcategories it originally proposed). In comments on the originally proposed rule, a group of four environmental organizations that frequently have challenged EPA regulations, objected to EPA's proposed subcategorization, calling it "unlawful, arbitrary, and unsupported by the record."[63] They note that while the act provides that the Administrator *may* distinguish among classes, types, and sizes of sources within a category, such subcategorization is not *required*: "the plain text of the Act demonstrates that Congress intended EPA to creates [sic] categories and subcategories as a step towards establishing emissions standards, … not as part of a scheme to provide incentives for existing sources to avoid standards. And yet, that is the effect of EPA's subcategorization scheme."[64]

NACAA's comments also argue that EPA set several of the standards at levels that were more lenient than the MACT floor. The NACAA study provided details on two of these, the carbon monoxide and mercury standards for coal-fired boilers.[65]

Should EPA Have Set Health-Based Standards Under Section 112(d)(4)?

According to EPA, "emissions data collected during development of the proposed rule show that hydrogen chloride [HCl] emissions represent the predominant HAP emitted by industrial, commercial, and institutional (ICI) boilers, accounting for 61 percent of the total HAP emissions."[66] Given the importance of HCl emissions, one of the key issues in considering EPA's proposal was whether the agency should have exercised its authority to set standards for HCl and other acid gases under Section 112(d)(4), which gives the Administrator flexibility to set

[62] Letter of EPA Administrator Lisa P. Jackson to Senator Mary L. Landrieu, September 28, 2010, p. 3.

[63] Comments of Clean Air Task Force, Earthjustice, Natural Resources Defense Council, and the Sierra Club on National Emission Standards for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters: Proposed Rule, Docket ID No. EPA-HQ-OAR-2002-0058, August 23, 2010, p. 3.

[64] Ibid.

[65] NACAA study, pp. 5-8.

[66] Boiler MACT proposal, 75 *Federal Register* 32011, June 4, 2010.

standards less stringent than MACT for HAPs that have a health threshold (i.e., substances that are not harmful to people exposed to levels below some threshold).

In developing and promulgating other regulations, including the vacated 2004 MACT standard for boilers, EPA established that HCl has a health threshold, that it is not classified as a human carcinogen, and that there is limited health risk associated with HCl emissions from discrete units. Nevertheless, in the June 2010 proposal (and in the current re-proposal), the Administrator decided not to exercise her discretion to set less stringent standards for HCl emissions for several reasons, including

1. the agency lacked information on the peak short-term emissions of HCl from boilers and thus could not determine whether acute exposures will pose health concerns;
2. HCl emissions from boilers mix with other emissions that are respiratory irritants, and EPA has no studies explicitly addressing the toxicity of these mixtures;
3. in considering whether to exercise her discretion under Section 112(d)(4), the Administrator must determine that a health-based standard in lieu of a MACT will not result in adverse environmental effects. HCl gas forms an acidic solution in the atmosphere and could exacerbate the impacts of acid deposition from sulfur and nitrogen oxides;
4. the agency had limited information on facility-specific emissions that it would need to set a health-based standard;
5. the agency would have needed to decide whether it would be appropriate to set 112(d)(4) standards for each acid gas emitted by boilers, or a single standard as a surrogate for them all; and
6. as proposed (and as promulgated), the MACT standard would result in significant reductions in emissions of other pollutants, most notably sulfur dioxide, particulate matter, other acid gases, mercury, and other metals. These reductions would provide substantial public health benefits that would be foregone if the agency set a less stringent standard.[67]

Whether the agency should have set standards for HCl under Section 112(d)(4) was one of the key points raised in comments, including those submitted by 41 Senators in a letter to the Administrator, on September 24, 2010, and by 105 Members of the House in a letter submitted August 2, 2010. As the Senate letter stated:

> To help reduce the burden of the rule in a manner that does not compromise public health and safety, … we ask that you carefully consider the extensive record that supported the Agency's determination to include health-based emissions limitations for hydrogen chloride and manganese in the previous Boiler MACT rulemaking that was set aside by the reviewing court on wholly unrelated grounds.[68]

[67] For more information on the 112(d)(4) issue, see the discussion in the Boiler MACT proposal at 75 *Federal Register* 32030-32033, June 4, 2010.

[68] Letter of Senator Mary L. Landrieu at al. to EPA Administrator Lisa Jackson, September 24, 2010, p. 2.

In the March 2011 rule and in the December 2 re-proposal, the agency did not change its mind on the use of Section 112(d)(4), but it did significantly change the hydrogen chloride standards, presumably based on new data supplied by affected entities. The changes, which are summarized in **Table 3**, allow more HCl emissions from all types of sources, especially from biomass- and gas-fired units.

Table 3. Proposed and Promulgated Emission Limits for HCl Emissions from Existing Boilers

(lbs./million Btu)

Type of Boiler	Proposed (June 2010) Limit	Promulgated (March 2011) Limit	Re- Proposed (December 2011) Limit	% Difference (December 2011 vs. June 2010)
Coal	0.02	0.035	0.022	+10%
Biomass	0.006	0.035	0.022	+267%
Liquid	0.0009	0.00033	0.0012	+33%
Gas 2 (other process gases)	0.000003	0.0017	0.0017	+56,566%

Source: U.S. EPA, Proposed and Final Boiler MACT *Federal Register* notices, Table 1, and Proposed Reconsideration notice, Table 1.

Smaller (Area) Sources

Smaller boilers (those at facilities that emit less than 10 tons of an individual HAP and less than 25 tons of all HAPS combined) face regulations as well, but for the most part the Clean Air Act allows them to meet a less stringent standard, termed "Generally Available Control Technology" (GACT). A separate rule setting standards for these "area sources" was promulgated the same day as the MACT standards, and these standards were also re-proposed December 2.[69] Although EPA is reconsidering this rule, it did not extend the rule's effective date.

The area source rule distinguishes boilers that have a heat input capacity of 10 million Btu per hour or more from those that are smaller. The smaller units make up the overwhelming majority of the units covered by the area source rule; they would be subject to GACT. Under GACT, these units would not be required to meet emission limits. Rather, they would be required to meet a work practice standard by performing a boiler tune-up every two years. According to EPA, "By improving the combustion efficiency of the boiler, fuel usage can be reduced and losses from combustion imperfections can be minimized. Minimizing and optimizing fuel use will reduce emissions of mercury and all other air toxics."[70]

Some units under the area source rule would be subject to MACT for at least some pollutants. These are the coal-fired units that have a heat input capacity of 10 million Btu per hour or more, but are at *facilities* that don't meet the major source definition because, even counting their boiler

[69] The area source rule, as promulgated, is at 76 *Federal Register* 15554, March 21, 2011. The December 2011 re-proposal is at http://www.epa.gov/airquality/combustion/docs/20111202asproposal.pdf.

[70] U.S. EPA, "Final Air Toxics Standards for Industrial, Commercial, and Institutional Boilers at Area Source Facilities," Fact Sheet, p. 2, at http://www.epa.gov/airquality/combustion/docs/20110221aboilersfs.pdf.

emissions, they emit less than 10 tons of any individual HAP and less than 25 tons of any combination of them. According to the agency, these larger boiler units at area sources would need to meet standards based on MACT for some of the pollutants they emit: "The final standards for existing and new coal-fired boilers at area sources are based on MACT for mercury and CO, and on GACT for PM. The final standards for existing and new biomass boilers and existing and new oil-fired boilers at area sources are based on GACT."[71]

The area source rule would affect approximately 187,000 existing boilers powered by oil, biomass, and coal, located at 92,000 facilities. It would impose annualized costs of $535 million in 2014, according to EPA's Regulatory Impact Analysis. After considering fuel savings from efficiency improvements that would result from the tune-ups required by the rule, the estimated annualized cost is reduced to $487 million.[72] EPA also estimates that about 6,800 new boilers will be constructed at area sources in the next three years; net costs for meeting the area source standards at these facilities are estimated by EPA to be $48 million annually. After accounting for fuel savings from improvements in combustion efficiency, EPA estimates that new sources will experience cost savings of $3.6 million annually rather than incurring compliance costs.[73] EPA's estimate of costs at area source boilers is summarized in **Table 4**. The table displays EPA data for the promulgated (March 2011) version of the rule. The Fact Sheet accompanying the December 2011 re-proposal states, "We do not expect that the proposed amendments will result in a change in the estimated cost to comply with the rule."[74]

Table 4. Annualized Compliance Costs for Area Source Boiler Rule

Source	Subcategory	Estimated Number of Affected Units	Annualized Cost ($ million)	Annualized Cost per Unit ($ thousand)
Existing Units	Coal	3,710	$37	$10
	Biomass	10,958	$24	$2
	Oil	168,003	$374	$2
New Units	Coal	155	$0.4	$3
	Biomass	200	$2.6	$13
	Oil	6,424	$45	$7
Facility Energy Audit	All	189,450	$52	$0.3

Source: U.S. EPA, *Regulatory Impact Analysis*, Table 3-2. EPA did not change these cost estimates as a result of its December 2011 proposed amendments.

Notes: Does not include fuel savings from improving combustion efficiency. Per unit cost was calculated by CRS.

Gas-fired boilers, of which EPA estimates there are 1.3 million, would not be affected by the area source rule.

[71] Ibid., p. 5. The actual standards can be found at 76 *Federal Register* 15559, Table 1. These standards do not address most of the pollutants covered by the major source MACT. Compared to the major source MACT, they are also less stringent for the pollutants that they do address.

[72] Regulatory Impact Analysis, previously cited, p. 3-6.

[73] 76 *Federal Register* 15579, March 21, 2011.

[74] Area Source Fact Sheet, December 2011, p. 3, at http://www.epa.gov/airquality/combustion/docs/20111202asboilersfs.pdf.

Because the costs of compliance are substantially less than for the MACT rule, the area source rule has not been particularly controversial.

Related Rules on Solid Waste Incineration

The Boiler MACT and the Area Source Rule were two of four rules related to boilers that EPA promulgated the same day. The other two rules address boilers that use solid waste as fuel and identify what materials EPA considers to be solid waste. EPA projects that these rules will have less impact than the Boiler MACT, but they address the issues that were at the heart of the court decision that overturned and remanded the boiler rules in 2007. As noted earlier, the U.S. Court of Appeals for the D.C. Circuit, in *Natural Resources Defense Council v. EPA*, found that EPA had wrongly excluded many industrial boilers from the definition of solid waste incinerators, which have more stringent emissions requirements under Section 129 of the Clean Air Act.[75] Thus, in addition to the Boiler MACT and Area Source rules, the agency promulgated a rule on the Identification of Non-Hazardous Secondary Materials that Are Solid Waste,[76] and a rule that would set emission standards for Commercial/Industrial Solid Waste Incinerators (the "CISWI Rule"). The first rule identifies solid waste, and the second sets emission standards for the facilities that burn it. On December 2, EPA proposed amendments to both of these rules, as well.[77]

Defining Solid Waste

The purpose of this rule is to clarify which materials are considered solid waste when burned in combustion units and which are not. To be considered solid waste, the basic criterion is whether the material has been discarded. Discarded materials are generally considered solid waste; other materials are not. Whether a material is deemed discarded may be unclear or subject to debate, particularly to a recycler who values the material. EPA addresses this by stating that discarded materials can avoid classification as waste if they meet a number of what it calls "legitimacy criteria":

1. if the material is managed as a valuable commodity;
2. if the material has meaningful heating value (or, for a material considered an ingredient, if it makes a useful contribution to the production or manufacturing process); and
3. if the material contains contaminants at levels comparable to or lower than traditional fuels or ingredients.

Non-hazardous secondary materials that meet legitimacy criteria, such as the following, would not be considered solid waste under the rule promulgated in March 2011:

- material used as a fuel that remains within the control of the generator (whether at the site of generation or another site the generator has control over);

[75] Natural Resources Defense Council v. EPA, 489 F. 3d 1250, 1257–61 (DC Cir. 2007).

[76] 76 *Federal Register* 15456, March 21, 2011.

[77] These rules also appeared in the December 23, 2011, *Federal Register*, at 76 *Federal Register* 80452.

- scrap tires removed from vehicles and managed under established tire collection programs;
- resinated wood residuals, provided they have not been discarded and are used as fuel either by the generator or outside the generator's control;
- material used as an ingredient in a manufacturing process (whether by the generator or a third party);
- material that has been sufficiently processed to produce a fuel or ingredient product; and
- material that has been determined through a case-by-case petition process to not have been discarded and to be indistinguishable in all relevant aspects from a fuel product.[78]

Controversy over this rule centered on how EPA would interpret these criteria for certain recovered materials that are commonly used as fuel, particularly "off-spec" used oil and whole scrap tires. The originally proposed rule did not specifically identify these materials as solid waste. However, in the preamble to the proposal, EPA did identify these materials as solid waste even when they are used as fuel.

Used Oil

EPA defines used oil as either complying with limits for contaminants of concern ("on-spec") or not ("off-spec"). On-spec oil is exempt from waste management regulations, because the contaminants in it are either at the same concentration or at a lower concentration than in virgin refined fuel oil. Off-spec used oil, on the other hand, even if it is managed within the control of the generator, contains contaminants at levels that are not comparable to traditional fuels, and thus would not be considered a non-waste fuel under the legitimacy criteria described above.

Under previous regulations promulgated under the Resource Conservation and Recovery Act (RCRA, 40 CFR part 279), off-spec used oil could be burned in used-oil-fired space heaters, provided that, in EPA's words:

> (1) The heater burns only used oil that the owner or operator generates or used oil received from household do-it-yourself used oil generators; (2) the heater is designed to have a maximum capacity of not more than 0.5 million Btu per hour; and (3) the combustion gases from the heater are vented to the ambient air. The RCRA used oil regulations base this provision on a finding that uncontrolled emissions from these sources do not pose a significant threat to human health and the environment. (Used Oil Final Rule, 50 FR 49194 (November 29, 1985).) However, consistent with our determination that off-spec used oil be considered a solid waste when burned as a fuel, we believe that off-spec used oil managed within the control of the generator would not qualify for the generator controlled exclusion when burned in a used oil fired-space heater, since contaminant levels are not comparable to traditional fuels. Therefore, we are proposing that off-spec used oil combusted at a unit that is within the control of the generator would be solid waste.[79]

[78] Ibid., pp. 15459-15460.

[79] U.S. EPA, "Identification of Non-Hazardous Secondary Materials that Are Solid Waste; Proposed Rule," 75 *Federal Register* 31865, June 4, 2010.

If the used oil were classified as solid waste, then the space heater would have to meet the "CISWI" incinerator standards described below, which no space heater is likely to meet.

Most used oil is considered on-spec, but many of those who commented on the proposal argued that unless there is a general exclusion such as that written into the existing RCRA regulations, it would be necessary to test the oil and determine that it is on-spec before burning it in a space heater. Doing so would be costly and impractical. Thus, the proposed regulations, in the minds of many commenters, would have had the practical effect of banning the use of waste oil in space heaters.

The proposal also appeared to contradict the existing RCRA regulations, but did not specifically repeal them. As a result, the Code of Federal Regulations might have contained two conflicting sets of rules applicable to the combustion of used oil.

The final rule promulgated in March 2011 clarified these issues:

> EPA is specifically clarifying in this final rule that used oil combusted in an oil-fired space heater that meets the provisions of 40 CFR 279.23 [i.e., the existing RCRA regulations] need not be tested to establish whether or not such oil is on or off-spec. This includes used oil generated by small facilities such as auto repair shops and machine shops that have such units, and used oil-generated by homeowners who change their own oil (referred to as ''do-it-yourself'' or ''DIY'' oil) that are burned in such units. This is because the CISWI regulations promulgated elsewhere in the *Federal Register* today do not establish emissions limits for such units, and therefore the concerns of the commenters that such units would have to comply with CAA Section 129 standards have been addressed for this population of combustion units.[80]

Scrap Tires

The rule proposed in June 2010 also would have imposed new restrictions on the use of scrap tires as fuel:

> whole used tires (even if collected from tire dealerships and automotive shops and overseen by a state tire collection oversight program) are initially abandoned and thus meet the plain meaning of discard. As a result, whole used tires that are not processed into a legitimate fuel or ingredient (e.g., shredded/chipped with steel belts removed) would be considered a solid waste. We acknowledge that whole tires can be legitimately burned as fuel, but because they have been discarded, whole tires would be considered solid wastes and subject to the CAA section 129 requirements unless processed into a non-waste fuel product.[81]

This would have been a change from current policy and would have affected the use of scrap tires as fuel.

EPA reversed itself in the March 2011 final rule:

> After careful consideration of the comments and all the material in the rulemaking record, including documents cited in the ANPRM [Advance Notice of Proposed Rulemaking] and

[80] 76 *Federal Register* 15502, March 21, 2011.

[81] U.S. EPA, "Identification of Non-Hazardous Secondary Materials that Are Solid Waste; Proposed Rule," 75 *Federal Register* 31864, June 4, 2010.

> the preamble to the proposed rule, the Agency agrees that a system where scrap tires are removed from vehicles and are collected and managed under the oversight of established tire collection programs are not "discarded in the first instance." Such tires (including both whole tires and tires that have been shredded—with or without metal removal) are non-waste when used as a fuel in combustion units. These programs ensure that the tires are not discarded en route to the combustor for use as fuel and are handled as a valuable commodity as required in the legitimacy criterion in today's rule at § 241.3(d)(1)(i).[82]

Further Clarification

In the December 2 re-proposal, EPA has attempted to further clarify what fuels would be considered non-hazardous secondary materials (NHSM), as opposed to solid waste, generally broadening the definitions and criteria to permit more such materials to be used in boilers without the boiler being considered an incinerator.[83]

The CISWI Rule

The Commercial/Industrial Solid Waste Incinerator (CISWI) rule promulgated on March 21 would set emission standards for commercial and industrial facilities that burn materials determined to be solid waste (i.e., materials that do not meet the above criteria).[84] CISWI's emission standards are required to be set under Section 129 of the Clean Air Act, which has more stringent requirements than Section 112. In addition to the five groups of pollutants addressed by the Boiler MACT, the CISWI rule sets emission limits for lead, cadmium, sulfur dioxide, and nitrogen oxides. Section 129 also makes no distinction between major sources and area sources, thus setting the more stringent MACT standards for smaller facilities.

EPA has identified five subcategories of CISWI facilities: incinerators, energy recovery units for solids, energy recovery units for liquids and gases, waste burning kilns, and small remote incinerators—a total of 95 existing facilities. The total nationwide annualized costs of compliance

[82] 76 *Federal Register* 15491-15492, March 21, 2010 [footnotes omitted].

[83] The agency identified numerous materials that it considers to be within the definition of "clean cellulosic biomass," and thus are non-waste fuels, including "agricultural derived biomass, other crop residues (including vines, orchard trees, hulls, seeds), other biomass crops used for the production of cellulosic biofuels, hogged fuel, untreated wood pallets, wood pellets, and wood debris from urban areas."

The agency also identified two secondary materials, resinated wood products and tires managed under the oversight of established tire collection programs, as non-wastes, stating further that it "recognizes that certain NHSMs may not meet the legitimacy criteria in all instances, but after balancing the legitimacy criteria with other relevant factors, the material would still generally be considered a non-waste fuel." In addition, the agency is seeking comment on whether pulp and paper wastewater treatment sludges and coal refuse from legacy piles should also be categorically identified as non-wastes.

Finally, EPA proposes to revise the legitimacy criteria to clarify that for the purposes of deciding whether a material contains contaminants at levels comparable to or lower than traditional fuels or ingredients, NHSMs may be compared to any traditional fuel that a combustion unit is designed to burn; also, comparisons can be made for groups of pollutants (such as volatile organic compounds) rather than individual contaminants. For more information, see U.S. EPA, "Fact Sheet: Proposed Revisions to the Identification of Non-Hazardous Secondary Materials That Are Solid Wastes Final Rule," at http://www.epa.gov/wastes/nonhaz/define/pdfs/fs12-2-11.pdf.

[84] U.S. EPA, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units; Final Rule," 76 *Federal Register* 15704, March 21, 2011.

for these units were estimated to be $270 million. EPA estimates the benefits of the final rule, including the avoidance of 40-100 premature deaths annually, at $330 million-$800 million.[85]

Controversy over the originally proposed CISWI standards focused on a category called "burn-off ovens." Burn-off ovens, as defined by EPA in the proposed rule, are units that combust residual materials off racks, parts, drums or hooks so that those items can be re-used in various production processes. Operators of such facilities stated that there are more than 15,000 such units (EPA had identified 36), and they maintained that the units should not be characterized as incinerators, but should be considered boilers, subject to either the Boiler MACT or the Area Source rule. In the final CISWI rule, EPA concluded that it didn't have sufficient data for burn-off ovens, and removed them and several other types of units from the incinerator definition. The preamble to the December 2 proposal repeats the agency's conclusion that it does not have data that would allow it to establish standards for the various burn-off oven subcategories.

Conclusion

EPA's Boiler MACT remains controversial. The version of the rule promulgated March 21, 2011, and the amendments proposed December 2, 2011, are much less stringent than the rule as first proposed, and the standards could change further before the reconsideration process now underway is completed. The proposed amendments to the rules have been subject to further public comment and the agency hopes to finalize them by late spring 2012.

Members of Congress have been active participants in EPA's public comment process (more than 100 Members of the House and more than 40 Senators wrote EPA regarding the originally proposed rule) and they remain interested in these rulemakings. Bills have been introduced in both the House and Senate (H.R. 2250 and S. 1392) to change the Clean Air Act requirements for these rules and the deadlines for implementation. The bills would provide additional time for implementation of standards and would change key aspects of the Section 112 requirements as they apply to boilers and CISWI units. They would revoke the standards promulgated on March 21, 2011, and require promulgation of replacements for the Boiler MACT and related rules 15 months after the date of the bills' enactment; and they would require EPA to set a compliance date no earlier than five years after the date of promulgation. At a minimum, this would give the affected units three years of additional time to comply with MACT standards.

The bills would also make substantive changes in the Section 112 requirements as applied to boilers and CISWI units. They would remove the requirements that currently apply in the absence of EPA regulation—what are called the "MACT hammers": under current law, permits issued in the absence of MACT regulations are required to include MACT emission limits determined on a case-by-case basis. The bills define certain sources currently considered as "new" to be "existing" sources, which would be subject to less stringent requirements. And they set less stringent

[85] The source of the mortality data was U.S. EPA, "Final Amendments to New Source Performance Standards and Emission Guidelines for Commercial and Industrial Solid Waste Incineration Units," Fact Sheet, February 21, 2011, pp. 2-3, at http://www.epa.gov/airquality/combustion/docs/20110221ciswifs.pdf. The agency states in the pre-publication version of the December 2 amendments that, "Due to last minute changes to the March 2011 final CISWI rule, we were unable to incorporate the final engineering costs and emission reductions into the RIA, which would decrease the costs by approximately 22 percent and increase the monetized benefits by approximately 4 percent from those shown here." See Proposed Amendments to the CISWI Rule, p. 79, at http://www.epa.gov/airquality/combustion/docs/20111202ciswiproposal.pdf.

requirements for the standards themselves, requiring EPA to choose the "least burdensome" regulatory alternative, and requiring that standards can be met "consistently and concurrently with emission standards for all other air pollutants," which might prohibit EPA's use of the "pollutant by pollutant" approach that it used in setting the currently promulgated standards.

H.R. 2250 passed the House, 275-142, on October 13. A Senate version similar to H.R. 2250 was offered as an amendment (S.Amdt. 1660) to the surface transportation bill (S. 1813) on March 8, 2012, but was not adopted on a vote of 52-46 (60 votes being necessary for adoption).

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