Reducing Hazardous Air Pollutants from Industrial Boilers: Model Permit Guidance

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About NACAA

The National Association of Clean Air Agencies (NACAA) is the association of air pollution control agencies in 53 states and territories and more than 165 major metropolitan areas throughout the country. The members of NACAA have primary responsibility for implementing our nation's air pollution control laws and regulations. The association serves to encourage the exchange of information and experience among air pollution control officials; enhance communication and cooperation among federal, state and local regulatory agencies; and facilitate air pollution control activities that will result in clean, healthful air across the country. NACAA has its headquarters in Washington, DC.

For further information, contact NACAA at 444 North Capitol Street, NW, Suite 307, Washington, DC 20001 (telephone: 202-624-7864; fax: 202-624-7863; email 4cleanair@4cleanair.org) or visit our association's web site at www.4cleanair.org.

Acknowledgements

On behalf of the National Association of Clean Air Agencies ("NACAA"), we are pleased to provide *Reducing Hazardous Air Pollutants from Industrial Boilers: Model Permit Guidance.* NACAA has undertaken a review of available emissions information and applicable law to develop a Permit Guidance to assist state and local permitting authorities in their efforts to comply with section 112(j) of the Clean Air Act ("CAA"). This law requires these agencies to issue permits on a case-by-case basis to limit emissions of hazardous air pollutants from industrial, commercial and institutional boilers and process heaters ("ICI Boilers") by application of the Maximum Achievable Control Technology ("MACT"). This Permit Guidance outlines the substantive legal and engineering issues and the procedural, data and timing requirements for development and issuance of permits under section 112(j).

NACAA expresses its gratitude to Bruce Buckheit for his assistance in compiling the underlying data and drafting this document. We also thank Vinson Hellwig (MI) and Robert Colby (Chattanooga, TN), the co-chairs of NACAA's Air Toxics Committee, under whose guidance this document was prepared. We also acknowledge and appreciate the efforts of the NACAA ICI Boiler Permit Guidance workgroup, particularly Praveen Amar (NESCAUM), Elizabeth Basil (SC), Andrew Bodnarik (NH), Patricia Buonviri (VA), Daniel Donohoue and Michelle Komlenic (CA), Lance Ericksen (Monterey, CA), Michael Mills and Mohsen Nazemi (Los Angeles, CA), Gerald Ebersole (OR), Roger Fritz (WI), David Riddle (MI), James Hodina (Cedar Rapids, IA), William O'Sullivan, Sunila Agrawal, Olga Boyko, Yogesh Doshi, John Jenks, Ray Papalski, Erica Snyder and John Walsh (NJ), John Paul, Jennifer Marsee and Chris Clinefelter (Dayton, OH), Brad Reid (NE), Jim Snead and William Harris (DE) and Christine Weaver (MT). We are grateful for the comments and input provided by other state and local air pollution control officials, who helped shape the options presented in this document. Finally, we thank S. William Becker, Executive Director of NACAA, and Mary Sullivan Douglas, Senior Staff Associate of NACAA, who oversaw the project.

NACAA believes this Permit Guidance will serve as a useful and important resource for states and localities as they develop approaches to regulate emissions of toxic air pollutants from ICI Boilers and thank all of those who contributed to its development.

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Executive Summary

Reducing Hazardous Air Pollutants from Industrial Boilers: Model Permit Guidance is intended to provide state and local air pollution control agencies with important tools for regulating hazardous air pollution from the approximately 3,000 industrial, commercial and institutional boilers and process heaters (ICI Boilers), ranging from refineries and paper mills to manufacturing plants, operating in every state in the country.

NACAA published Permit Guidance in response to a June 2007 decision by the U.S. Court of Appeals (*Natural Resources Defense Council v. EPA*, No. 04-1385) vacating rules promulgated by the U.S. Environmental Protection Agency ("EPA") under Section 112 of the Clean Air Act ("CAA") establishing emission limits for hazardous air pollutants ("HAPs") for these facilities. When EPA fails to meet a deadline for establishing limits under section 112 of the CAA (or where the Court vacates a rule), state and local permitting authorities are required under section 112 (j) – the "hammer provisions" – to set the limits for the affected facilities on a case-by-case basis. These limits must be based on the use of the Maximum Achievable Control Technology ("MACT") and may not be less stringent than the MACT floor, defined as the average of the best performing 12 percent of sources in the industrial category.

Because of the potentially significant workload associated with developing MACT limits on a case-by-case basis for the large number of affected sources, and the short deadlines imposed by the CAA for state and local actions, the NACAA Board of Directors authorized the development of this Permit Guidance. NACAA selected a technical workgroup, comprised of 17 state and local air pollution control agencies, to gather and review available information and provide recommendations for making MACT determinations. A consultant assisted the association in its efforts.

In the course of developing this guidance, in November 2007, NACAA requested that its members forward to the workgroup existing emissions data relating to ICI Boilers. The workgroup received several thousand emissions data points, including over 750 for two "criteria pollutants" – carbon monoxide ("CO") and particulate matter ("PM") – that could serve as regulatory surrogates for acetaldehyde, benzene, cadmium, chromium, manganese and numerous other organic and metal hazardous air pollutants (HAPs). The emissions data are available on www.4cleanair.org (under "Our Projects"). Thereafter, the workgroup held teleconferences on a bi-weekly basis to discuss the data as they were being received and to develop a set of recommendations for MACT, available technologies and permit conditions.

What NACAA found is quite revealing. In most instances, EPA's vacated emission limits would have required no emissions reductions at all from ICI Boilers. NACAA's recommendations, on the other hand, are far more stringent than the limits in EPA's vacated

rule and require reductions in emissions from between 55 and 85 percent of existing ICI Boilers. Table 1 compares the NACAA recommended limits with those in EPA's vacated rule.

NACAA has also reviewed the technologies that are available to allow existing sources to comply with its recommended MACT limits. These technologies have been commonly employed for many years to control criteria pollutants, and have been demonstrated to be technologically-feasible and cost-effective.

NACAA believes the process of developing this Permit Guidance has been inclusive, objective and transparent. We hope permitting authorities will find it helpful and informative as they proceed to craft permits for the ICI Boilers within their jurisdictions.

TABLE 1 – SUMMARY OF EPA AND NACAA RECOMMENDED LIMITS FOR ICI BOILERS

(In lb/MMBtu, unless otherwise noted)

		Gas-fired	Coal-fired	Wood-fired	Oil-fired
Carbon Monoxide	**NACAA Database**	161 boilers	10 boilers	57 boilers	114 boilers
	Average of Top 12% (or top 5)	less than 0.0007 (1 ppm)	0.018 (20 ppm)	0.042 (54 ppm)	0.0007 (1 ppm)
	EPA Vacated Rule	400 ppm for new large and limited use boilers; no limit for others	400 ppm for new large and limited use boilers; no limit for others	400 ppm for new large and limited use boilers; no limit for others	400 ppm for new large and limited use boilers; no limit for others
	NACAA Proposal	3 -10 ppm (0.002 - 0.007)	35 - 60 ppm (0.025 - 0.040)	100 -150 ppm (0.08 - 0.12)	3 -10 ppm (0.002 -0.007)
Particulate Matter	**NACAA Database**	No data	67 boilers	109 boilers	58 boilers
	Average of Top 12% (or top 5)		0.005	0.007	0.011
	EPA Vacated Rule	Not applicable No control	0.025 new boilers; 0.07 existing large boilers; 0.21 existing limited use boilers; no limit for small boilers	0.025 new boilers; 0.07 existing large boilers; 0.21 existing limited use boilers; no limit for small boilers	0.03 new boilers; no limit for existing boilers
	NACAA Proposal	Not applicable No control	0.008 - 0.012 for existing boilers	0.01 - 0.02 for existing boilers	0.015 - 0.025 for existing boilers
Hydrogen Chloride	**NACAA Database**	Insufficient data	14 boilers	11 boilers	3 boilers
	Average of Top 12% (or top 5)	N/A	0.010	0.004	N/A
	EPA Vacated Rule	No control	0.02 new units; 0.09 existing units	0.02 new units; 0.09 existing units	0.0005 large new unit; 0.0009 small and limited-use new unit; 0.09 existing large unit
	MACT Floor Derived from Data	No control	0.015 – 0.03	0.006 – 0.012	90 -95% removal, 0.006 existing units
Mercury	**NACAA Database**	Insufficient data	10 boilers	8 boilers	No data
	Average of top 12% (or top 5)	N/A	3.15 lb/TBtu	1.65 lb/TBtu	N/A
	EPA Vacated Rule	No control	3.00 lb/TBtu new boilers; 9 lb/TBtu existing boilers	3.00 lb/TBtu new boilers	No control
	MACT Floor Derived from Data	No control	4.50 – 7.50 lb/TBtu 90% removal	2.50– 4.50 lb/TBtu	No proposal

Background

When initially adopted in 1970, the CAA included section 112[1], intended by Congress to establish National Emission Standards for Hazardous Air Pollutants[2] ("NESHAPs"), just as sections 110 and 111 were to address the environmental impacts of "criteria" pollutants. In its initial form, section 112 required the EPA to publish a list of air pollutants determined to be hazardous and, within one year of publication of the list, adopt emission standards "at the level which in [the Administrator's] judgment provides an ample margin of safety to protect the public health" from such hazardous air pollutant. Under this program, EPA was required to make its determination that a given level of exposure was "safe" without regard to costs, which could only be considered in determining the additional margin of safety[3]. For a variety of reasons, this "risk-based" approach to the regulation of HAPs proved unworkable. During the 20 years of the initial program, EPA had developed NESHAPs for only seven (asbestos, beryllium, mercury, radionuclides, inorganic arsenic, benzene and vinyl chloride) of the hundreds of HAPs that were commonly understood to present a human health risk. For example, no regulations had been adopted for such obviously hazardous pollutants as acrolein, chromium, cadmium and nickel. Even where NESHAPs had been promulgated, substantial, time-consuming litigation over data, testing and risk analysis methods ensued and coverage was often limited to only a small subset of emitting sources.

The 1990 Clean Air Act Amendments ("CAAA") sought to remedy these failures by fundamentally restructuring the program. In lieu of the prior risk-based program, Congress provided for a technology-based program in which it identified the air pollutants adjudged to create an excessive level of risk and specified the level of technology to be applied to all major sources of HAPs. In the first phase, technology-based solutions were to be employed without consideration of risk. Only after[4] Maximum Achievable Control Technologies MACT had been employed would "risk-based" regulatory approaches be used to determine whether even greater reductions of certain HAPs were necessary to protect public health.

To avoid the litigation that had paralyzed the earlier program and ensure that a minimum level of technology would be employed in accordance with its schedule, Congress

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[1] See, 42 U.S.C. 7412.

[2] In 1977 the definition of "hazardous air pollutant" was expanded to mean "an air pollutant to which no ambient air quality standard is applicable and which in the judgment of the Administrator causes, or contributes to, air pollution which may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitatingly reversible, illness." 42 U.S.C. 7412. Section 122, requiring EPA to study the need for regulation of four specific HAPs, was also added at this time.

[3] See, *Natural Resources Defense Council v. EPA*, 824 F.2d 1146 (D.C. Cir 1987) (en banc).

[4] Section 112(f) requires EPA to promulgate a risk-based standard within eight years of promulgation of a technology-based standard for a category if a more stringent standard is necessary to protect public health with an ample margin of safety.

constrained EPA's discretion in developing and implementing the technology-based provisions of the program. Thus, while Congress provided to EPA the discretion to categorize[5] such sources to facilitate developing regulations applicable to a group of sources, it did not empower EPA to determine the level of actual or potential emissions that would subject a specific source to regulation. Instead, Congress made that determination and, in addition, developed and promulgated a list[6] of 189 chemicals[7] (and chemical compounds) that were considered "hazardous" and required EPA to promulgate a NESHAP[8] for each identified category and subcategory of sources of actual or potential emissions of these pollutants. The Act defines the technology-based emission limit as

> "the maximum degree of reduction in emissions of the hazardous air pollutants subject to this section (including a prohibition on such emissions, where achievable) that the Administrator, taking into consideration the cost of achieving such emissions reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing sources…." See, 42 U.S.C. 7412(d)(2).

The discretion[9] provided the Administrator in determining what is "achievable" in setting emission limits under section 112(d)(2) is limited by a narrow and objectively determined "MACT floor" set out in section 112(d)(3). This provision provides that the maximum emission reduction that is deemed achievable for new sources

> "shall not be less stringent than the emission control that is achieved in practice by the best controlled similar source, as determined by the Administrator." See, 42 U.S.C. 7412(d)(3).

For existing sources, the Act provides that the emission limits promulgated by the Administrator

1. may be less stringent than the new source emission limits, and

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[5] EPA is authorized to add to or revise the list of categories of sources (see, 42 U.S.C. 7412 (c)) in response to new information and has done so on several occasions. With respect to the ICI Boiler category, EPA revised the list to combine industrial boilers with commercial and institutional boilers and process heaters. In its vacated rule EPA appears to have impermissibly attempted to "delist" or exempt indirect-fired process heaters and fire-tube boilers. Under the CAAA such sources must be included in some category unless they are not major sources of listed HAPs. Since the required promulgation date for all categories has now passed, section 112(j) would seem to apply to any major source of HAP (in a listed source category) not subject to some MACT standard.

[6] This approach is similar to that employed by Congress under the Clean Water Act ("CWA"). The 1977 CWA Amendments incorporated a list of 129 toxic water pollutants (now 148) to be regulated (33 U.S.C. 1317(a)).

[7] One of the initial listed HAPs has been "delisted" in accordance with a procedure set out in the CAAA.

[8] Such standards are technically "NESHAPs" under the CAA. Standards developed under the CAAA are required to be based on the application of "Maximum Achievable Control Technology" and are colloquially known as "MACT standards."

[9] That Congress did not provide *carte blanche* to EPA in determining whether a technology was "achievable" can be inferred from the fact that Congress was familiar with EPA practice in implementing Best Available Control Technology requirements, which also provide for consideration of costs, in implementing New Source Review requirements under the CAA and employed nearly identical language in establishing the MACT provision.

2. may be more stringent, but may not be less stringent, than the average emission limitation achieved by the best performing 12 percent of existing sources (for which the Administrator has emissions information) or the average emission limitation achieved by the best performing five sources in a category or subcategory with fewer than 30 sources. Id.

On September 13, 2004, EPA promulgated a MACT Standard for the ICI Boiler category.[10] On June 8, 2007, the U. S. Court of Appeals for the District of Columbia issued its decision in *Natural Resources Defense Council v. EPA*, No. 04-1385, a case that involved challenges to two rules promulgated by EPA. The first rule attempted to define the universe of facilities subject to emission limitations for both hazardous and criteria pollutants for commercial and industrial solid waste incineration units under section 129 of the CAA. The second rule was the ICI Boiler MACT rule. The challenges to these two rules were consolidated by the Court because the issues are related. If a source is subject to regulation under section 129, it may not be regulated under section 112. The Court determined that EPA's definition of "solid waste" under section 129 was impermissibly narrow and that this decision would necessarily impact the calculation of the MACT floor for ICI Boilers. For this reason the Court "vacated" both rules.

Where the Court "vacates" a regulation, as distinct from "remanding" it to the agency for further consideration, it is as if the regulation never was promulgated. As a consequence, section 112(j) of the CAA has been triggered. The matter is further complicated because permitting authorities cannot simply adopt the vacated ICI Boiler MACT standard. EPA's ICI Boiler MACT rule was adopted at about the same time as a number of other MACT standards and used the same general approach to calculating the MACT floor as was employed in those standards. In resolving challenges to those other standards[11], the Court determined that EPA's basic approach to calculating the MACT floor did not comply with the CAA and rejected EPA's attempts to create exemptions not authorized by the statute. Sources within this ICI Boiler category must obtain permits[12] issued by state or local permitting authorities on a case-by-case basis incorporating emission limits that the state or local permitting authority determines is equivalent to the limitation that would have applied if EPA had issued the ICI Boiler MACT standard in a timely manner.

The ICI Boiler category is large and diverse. It includes approximately 3,000 units that combust coal, natural gas, distillates, residual oils, wood and agricultural materials that are located at a "major source" of hazardous air pollutants. "Major source" is defined as

> "any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants…." See, 42 U.S.C. 7412 (a)(1) and 40 CFR 63.2.

[10] This standard is found in 40 CFR 63, Subpart DDDDD.
[11] See, *Sierra Club v. EPA,* 479 F3d 875 (D.C. Cir. 2007).
[12] Under applicable regulations, these permits are to be written as modifications to the operating permit issued to the source under Title V of the CAA. 42 U.S.C. 7661. See also, 40 CFR 65.52(a).

Among the sources that are within this major source category are petroleum and natural gas extraction operations; pulp and paper mills; refineries; blast furnaces, manufacturers of steel, rubber and plastic products; as well as automobile parts manufacturing and electroplating operations. In addition to such industrial operations, the major source category encompasses commercial and institutional boilers providing heat and/or power at educational institutions, prisons and office buildings, as well as small electric generating units of less than 25 megawatts ("MW"). The statutory definition does not limit applicability to individual units that emit a threshold amount of HAPs. Instead, it includes all HAP-emitting units at a source where the total HAP emissions from the source exceed the threshold. This requirement makes sense in many applications, such as refineries, where many smaller units at the source may emit the majority of certain HAPs from the source. However, this structure does present challenges to EPA and section 112(j) permit writers in other instances – at a large paper mill, even a residential-sized hot water heater servicing the employees' locker rooms is theoretically subject to regulation[13].

[13] NACAA proposes a solution to this problem below.

Section 112(j) Requirements

In pleadings filed with the Court by the U.S. Department of Justice on behalf of EPA, the federal government has stated that the requirements of section 112(j) of the CAA would apply if the Court vacated the ICI Boiler MACT. EPA has also acknowledged this obligation in notices relating to EPA's compliance with the Paperwork Reduction Act. See, 72 FR 62226, November 2, 2007. Section 112(j) applies to sources located in a state with an effective Title V permit program[14] that are within a category or subcategory for which a MACT standard was required to be promulgated by a certain date and EPA failed to promulgate the standard by the required date.

Sources subject to the requirements of section 112 are required to submit a permit application to the permitting authority[15] within 18 months of the statutory date for issuance of the MACT standard at issue. See, section 112(j)(2). The date specified by statute for sources in the industrial boiler and process heater category to submit a complete[16] permit application is August 13, 2005. However, the statute did not contemplate the retroactive failure to issue a standard that occurs when the Court vacates a standard in its entirety rather than remanding the standard to the agency for further proceedings. Since the vacatur did not occur until June 2007, literal compliance with the statute was impossible. For this reason there is an ongoing debate over how long sources should be allowed, under present circumstances, to reach compliance with the statutory requirement. Some may argue that sources should be allowed an additional 18 months to submit an application[17], while others will suggest that sources are under an obligation to apply for a permit as soon as practicable and that the information required is not substantial. (See exemplar permitting authority section 112(j) application forms, Appendices 1 and 2). Under 40 CFR 63.52(a)(2) if a permitting authority notifies a source that one or more emission units at the facility are within the industrial boiler and process heater category, the source must submit an application within 30 days. This suggests that sources are not expected to need a substantial amount of time to submit their applications. Other provisions respecting the

[14] The CAAA also adopted requirements that major sources obtain operating permits that consolidate emission limits imposed under different CAA programs and improve emission monitoring. These requirements are found in Title V of the CAA.

[15] An additional copy must also be submitted to EPA. See, 40 CFR 63.55(b).

[16] EPA regulation (40 CFR 63.53) sets out the requirements for a complete application, which includes a Part 1 (notice only) and a Part 2 (information about each covered emission point).

[17] This argument is rapidly becoming moot since December 2008 is 18 months from the date of the Court's decision. Some industry representatives have argued that case-by-case permitting should be deferred and that EPA should be provided sufficient time to propose and promulgate a new rule. This position would, in effect, eliminate the "hammer" provision and is clearly contrary to the statute.

submission of section 112(j) applications also suggest that the time frame allowed for submission of applications should be relatively short[18].

Within 60 days of submittal of a Part 2 application, the permitting authority must notify the source operator in writing of its determination as to whether the application is complete and provide an additional reasonable period of time, not to exceed six months, to remedy any deficiencies. During this period the permitting authority may require the source to provide additional information needed to process the permit application. Submission of a timely and complete application constitutes compliance by the source with section 112(j), unless a delay in issuing the final permit is occasioned by a source's subsequent failure to provide information in a timely manner. The permitting authority is required to issue the Title V permit, meeting section 112(j) requirements, within 18 months of the submittal of a complete Part 2 MACT application. See, 40 CFR 63.52(g).

The CAA requires that the Title V permit contain emission limitations that the permitting authority determines on a case-by-case basis are equivalent to the limitation that would apply to the source had EPA promulgated a MACT standard in a timely manner. Where, as here, EPA's central methodology for issuing a MACT floor has been found unlawful, permitting authorities cannot be expected to divine the specific standard that will ultimately be promulgated. Given the range of policy choices involved in the case-by-case determinations, it is also likely that permitting authorities will reach different decisions in certain areas. Section 112 can only be read to require that each of the case-by-case determinations be within the range of decisions authorized by the CAA.

EPA has generally interpreted section 112 to require only that decisions of the permitting authority be consistent with the statutory definitions of MACT, and that the permit contain monitoring, certification and reporting requirements consistent with the Title V permit program. See, 40 CFR 63.55. EPA's regulation requires that in the course of making a section 112(j) determination, the permitting authority must establish a MACT floor based on available information and establish a MACT limit that is not less stringent than the floor. See, 40 CFR 63.55(a)(2). EPA further notes[19] that nothing prevents a state or local permitting authority from establishing an emission limitation that is more stringent than required by federal regulations.

NACAA's Response

Because of the potentially significant workload associated with developing MACT floors and MACT limits for the large number of affected sources and the relatively short deadlines for state or local action imposed by the CAA, the NACAA Board of Directors

[18] The regulations provide that where events subsequent to the effective date of a MACT standard cause a MACT standard to be applicable to a source for the first time, the source must submit its application for a Title V MACT permit limit within 30 days of the triggering event. See, 40 CFR 63.52(b)(1), (b)(2), (b)(3) and (c)(2). In one instance the regulations provide six months for a source (that becomes a major source by virtue of state action) to submit a permit application. See, 40 CFR 63.52(b)(4). Here, sources have been on notice of their status as major sources for several years and are not being transformed from a minor source to a major source by virtue of state action.

[19] 40 CFR 63.55(a)(5).

directed the association's staff to draft model guidance to assist state and local permitting authorities in developing MACT permits for ICI Boilers. A technical workgroup, with representatives from approximately 17 state and local air pollution control agencies, was formed to review available information and provide recommendations for case-by-case MACT determinations and development of MACT floors. A consultant was retained to assist the workgroup in gathering relevant information, collating this information in a usable format and drafting (pursuant to direction from the technical workgroup) a Permit Guidance that permitting authorities may draw from as they see fit.

In the course of preparing this report, NACAA has engaged in the following activities:

- reviewed the relevant legal decisions;
- reviewed EPA regulations and policy statements relating to the section 112(j) process;
- reviewed selected state regulations and section 112(j) application forms;
- reviewed the vacated ICI Boiler rule, as well as related rules, such as the Plywood MACT standard and the Brick and Clay MACT standard;
- reviewed significant comments on the proposed EPA rule;
- reviewed EPA rule-development materials and emissions data available in the public docket;
- discussed data issues with current EPA employees involved in the MACT-development process;
- met with representatives of vendors of pollution control equipment;
- met with representatives of the operators of industrial boilers;
- met with and/or had telephone conversations with key state officials;
- met with representatives of environmental groups involved in the Boiler MACT litigation; and
- commented on EPA's proposed information collection request ("ICR") concerning section 112(j) permit application forms and on EPA's proposed ICR to support promulgation of a new proposal for a federal MACT standard for this category.

The data utilized by EPA in establishing the vacated standard largely consisted of information concerning gaseous, liquid and solid fuel-fired boilers and process heaters gathered for the Industrial Combustion Coordinated Rulemaking ("ICCR"). Based on its initial review of these materials, NACAA concluded that this data set was extremely limited[20] and likely not representative of current operation of this category of sources, with much of the available data from testing conducted 20 years ago or more. Moreover, as discussed above, the earlier data-gathering efforts were based on an approach to setting the MACT floor that has subsequently been rejected by the Courts. EPA has since reached the same conclusion about the adequacy of the earlier data set and has announced plans to conduct a multi-year data acquisition and stack testing program before attempting to repropose a MACT standard for ICI Boilers.

[20] In establishing the limits in the now-vacated rule, EPA often relied on data relating to "a few" or "several" sources.

In the course of developing this Permit Guidance, NACAA engaged in a far more rigorous and expansive data-collection effort than undertaken by EPA in developing prior MACT standards[21]. In November 2007 NACAA requested that its members forward to the technical workgroup existing emissions data relating to ICI Boilers for (1) hazardous air pollutants identified by EPA as associated with this category and (2) criteria pollutants that may serve as regulatory surrogates. See, Appendix 3. Replies were received from more than 40 state and local permitting authorities in all regions of the country. In a number of instances the permitting authorities reported that they did not have any useful information. However, those authorities that did have information provided several thousand emissions data points. These data were screened to eliminate data in forms (such as tons per year or pounds per hour) that could not readily be employed to compare emissions performance between different-sized units. As of the date of publication of this Permit Guidance, NACAA's data set included over 750 usable data points for carbon monoxide ("CO") and particulate matter ("PM"), reflecting the CO and PM performance of emission units of a wide range in sizes, fuels and locations. These data (see www.4cleanair.org, under "Our Projects") all reflect the results of reference method testing, similar to the test results employed by EPA. Moreover, since the permitting authorities that did have information provided data on all sources within their jurisdictions, there is no reason to suspect a bias in NACAA's data. We further believe that the NACAA data population is sufficient in size and diversity to characterize CO and PM performance of ICI Boilers nationally.

The statute reflects an understanding that emissions data for all sources in the category are not required or expected. Under section 112(j) the determination of the MACT floor is to be based on the average of the best performing 12 percent of existing sources **(for which the Administrator has emissions information)** (emphasis provided). Moreover, in its implementing regulations at 40 CFR 63.51, EPA attempts to preclude permitting authorities from requiring additional source stack tests under section 112(j) by excluding information that is not "available" (as of the date on which the first Part 2 MACT application is filed in the relevant source category in the jurisdiction) from consideration in setting the MACT floor.

Thereafter, the data were sorted and analyzed to generate emissions profiles for the relevant subcategories, and the average emissions performance of the best performing 12 percent of existing sources[22] for which emissions data were available was calculated. Finally, replicate testing of sources within the subcategories was reviewed and statistical techniques used to calculate a variability factor to be applied to the average of the top performing 12 percent in setting a MACT limit based on the available emission data.

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[21] EPA has been and will continue to be involved in this process. NACAA representatives have met with EPA senior managers and technical staff on several occasions and have received excellent cooperation to date. EPA staff has been quite helpful in identifying existing sources of information. NACAA's intent throughout this process has been to work with EPA to gather information in a manner that avoids duplication of effort and inconsistent data-gathering formats. However, as set out in the CAAA, where EPA has failed to meet a statutory deadline for promulgation of a MACT standard, case-by-case MACT permit determinations are state and local functions, not an EPA function. NACAA has neither sought nor obtained the consent of EPA for its efforts. NACAA's efforts were neither requested by nor directed by EPA. These efforts are by and for the state and local permitting authorities that are required by the CAAA to issue permits within very tight timeframes.

[22] Where the data subset contained fewer than 30 sources, the floor was calculated using the average of the best performing five sources. See, 42 U.S.C. 7412(d)(3)(B).

Recommended Subcategories

EPA's vacated rule had created nine subcategories within the original category of industrial boilers and process heaters – small, large and intermittent-use solid-fired units; small, large and intermittent-use liquid-fired units; and small, large and intermittent-use gas-fired units. While the category of industrial boilers and process heaters was established many years ago and is not challenged, the workgroup reviewed EPA's initially suggested subcategories and determined that a different subcategorization was more appropriate. The Permit Guidance recommends several changes to EPA's approach:

1. Divide EPA's solid fuel subcategory into two subcategories – coal and wood/biomass. In the judgment of the workgroup, the emissions and performance characteristics of these two groups would likely differ substantially. The data confirm the workgroup's judgment. NACAA believes that it would be exceedingly difficult for sources that combust wood to match the CO performance expected of coal-fired boilers (and inappropriate to allow coal-fired boilers to emit at the rate expected for wood-fired boilers). Similarly, it would be inappropriate to require coal-fired boilers to match the mercury emission limitations achieved by wood-fired boilers (or to allow wood-fired boilers to emit at the rates expected of coal-fired boilers).

2. Retain the gas- and liquid-fired subcategories.

3. Eliminate the size subcategories adopted by EPA[23], absent additional data demonstrating that there are fundamental differences in achievable performance to justify a subcategory.

4. Delete EPA's "intermittent use" subcategory, which appeared to be an effort to inject cost considerations into the process of setting the MACT floor rather than a reflection of inherent design or performance limitations.

Accordingly, NACAA is recommending four subcategories: coal, wood/biomass, gaseous and liquid (primarily oil). However, NACAA understands that as the case-by-case review of approximately 3,000 ICI Boilers unfolds, permitting authorities may become aware of other types of sources where creation of an additional subcategory may be appropriate[24]. NACAA is continuing to evaluate whether to create an additional subcategory within the wood-fired boiler category and whether a separate category for residual oil should be created within the liquid/oil-fired subcategory.

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[23] The absence of a compelling reason to stratify the category on the basis of the size of the unit can be seen in the NACAA data set. For example, the 10 wood-burning boilers with the lowest CO emissions in NACAA's data set ranged in capacity from 8.2–320 MMBtu/hr (4 of 10 units in this group were smaller than 60 MMBtu/hr). Similarly, the 10 wood-burning boilers with the lowest PM emissions ranged from 37.3 – 355 MMBtu/hr in capacity (4 of 10 units had a capacity of 60 MMBtu/hr or less). Two 760 MMBtu/hr units are the 11th and 12th ranked units, while a 60 MMBtu/hr unit is ranked 13th.

[24] CO boilers, which combust nearly 100 percent CO (and therefore would not emit the HAP of concern), would likely best be addressed by a separate subcategory, as would many externally fired process heaters.

Finally, it appears that the section 112(j) process applies to all industrial boilers, including those that combust waste material, until such time as EPA promulgates an effective EPA rule under section 129 that regulates such boilers.

Hazardous Air Pollutants -- ICI Boilers

In the course of developing the Permit Guidance, the workgroup reviewed the HAPs of concern within the industrial boiler and process heater category, as identified by EPA, and selected surrogate parameters or pollutants, where control of the parameter or pollutant will ensure good control of the HAP. The following elements, chemicals and compounds were identified by EPA in its initial source characterization:

ethyl benzene
(O-)xylene
arsenic compounds
benzene
cadmium compounds
chromium compounds
lead compounds
manganese compounds
mercury compounds
nickel compounds
selenium compounds
hexane
toluene
formaldehyde
beryllium compounds
phosphorous
polycyclic organic matter

In the preamble to the vacated rule, EPA stated that emissions from ICI Boilers "include arsenic, cadmium, chromium, hydrogen chloride (HCl), hydrogen fluoride (HF), lead, manganese, mercury, nickel and various organic HAP." See, 69 FR 55218, September 13, 2004. EPA also noted that formaldehyde, benzene, and acetaldehyde emissions represent "essentially all of the mass of organic HAP emissions" from this group and that its toxics screening mechanism had identified manganese and chlorine emissions as creating the greatest chronic health risk. Id, at 55220. A synopsis of known effects taken from EPA's *Health Effects Notebook for Hazardous Air Pollutants*[25] and from EPA's IRIS system is provided in Appendix 4.

[25] http://www.epa.gov/ttnatw01/hlthef/hapindex.html.

Surrogates

The U.S. Court of Appeals[26] has held that EPA may use reasonable surrogates in setting technology-based standards under sections 112(d)(2) and (3) where the target pollutant is invariably present in the surrogate; the control technology indiscriminately captures both the target and the surrogate and control of the surrogate is the only means by which facilities achieve reductions in the target HAPs.

In the course of its rulemaking, EPA determined that CO emissions may serve as a reasonable surrogate for control of the organic HAPs, that HCl may serve as a reasonable surrogate for control of inorganic (acid gas) HAPs and that PM may serve as a reasonable surrogate for a number of non-volatile metal HAPs[27]. This determination was generally accepted at the time by both industry[28] and environmental organizations. NACAA agrees that ensuring low CO, PM and HCl emissions is the most practical means of controlling organic, metal and inorganic (acid gas) HAPs. Accordingly, NACAA concurs with EPA's determinations and utilizes these surrogates in this Permit Guidance.

[26] *National Lime Association v. EPA*, 233 F.3d 625, at 639 (D.C. Cir 2000).
[27] 69 FR 55218, 55223, September 13, 2004.
[28] For example, the Council of Industrial Boiler Operators ("CIBO") submitted an extensive, 98-page, comment on EPA's proposed rule, noting, but not objecting to, the use of the above-listed surrogates. See, EPA-HQ-OAR-2002-0058-0449, March 13, 2003. CIBO has recently commented that it continues to support the concept of the use of surrogates, but offers a concern that variability in source operation should be taken into account in establishing MACT floors.

Establishing a MACT Floor

EPA regulation requires the states to establish a MACT floor for new and existing units as part of the section 112(j) process and to set MACT limits that are not less stringent than the floor. The floor is to be based on available data and is not limited to data from sources with emission controls. CO, PM and HCl were determined to be reasonable surrogates for the relevant HAPs. Emissions data for these pollutants and mercury were identified as essential to the development of the MACT floor. Accordingly, the Permit Guidance development included a reasonable effort to identify and evaluate all existing relevant data for these pollutants, including a review of AP-42 and RACT/BACT/LAER Clearinghouse[29] information and other databases. In addition, NACAA engaged in an extensive effort to obtain all existing relevant emissions data for ICI Boilers. The NACAA-generated data set is the most comprehensive and robust compilation of data available for establishing a MACT floor for several surrogates. Where the NACAA data are limited, other information, including the ICCR data, is also considered.

EPA's Approach

In establishing the vacated MACT floor, EPA did not consider the actual performance of sources in each subcategory. Instead, EPA attempted to identify a "MACT control technology" where more than 12 percent of the units in a subcategory employed post-combustion control devices. The "MACT control technology" was that used by the median performing unit within the group that employed controls. EPA did not then set the MACT floor at the level achieved by that unit. Nor did EPA set the MACT floor at the average performance of the top 12 percent of the units with controls.

Rather, EPA set the MACT floor at the "worst" emission level that other units employing the "MACT control technology" might be expected to achieve. EPA determined the "worst" performance by the use of a nonstatistical "variability factor" based on an even smaller subset of data – units employing the "MACT control technology" for which multiple emissions test data were available[30]. Where such emissions data were unavailable, EPA looked to fuels data to determine the potential variability in emissions from uncontrolled units. In this manner EPA calculated the "worst conceivable performance" of a few units employing the selected add-on controls and for which more than one set of HAP emissions data was available.

[29] The RACT/BACT/LAER Clearinghouse is maintained by EPA as a source of information concerning permitting decisions that require the stated level of control. Similarly, AP-42 is an EPA-maintained compendium of emission factors for existing sources.

[30] EPA's rulemaking record is not altogether clear. It appears that in some instances EPA may have considered the variability in performance between different units rather than the variability in performance of a given unit.

Because of the limitations in the data set employed by EPA and the specific approach selected by the agency, the variability in the small data set determined the MACT floor in EPA's vacated rule, rather than the average control performance of the group. For example, EPA reported that the average HCl emission limit from the best controlled eight large solid-fueled boilers was 0.00962 lb/MMBtu, and the average "variability level" for this group was a factor of 9.08. Incorporating this "variability," EPA then calculated the MACT floor emission level for HCl for this subcategory to be 0.09 lb/MMBtu – 9.08 times higher than the average emission limit of the best performing 12 percent of the sources with controls and fairly close to the uncontrolled performance of those units. In establishing the MACT floor limit for HCl for liquid-fired boilers, EPA selected a variability level of 160 (16,000 percent) as the multiplier to be applied to the average of the best-performing 12 percent, thus assuring that no ICI Boiler would have to reduce acid gas emissions. In the case of CO emissions, EPA declined to establish a MACT floor because it asserted that fewer than 6 percent of the ICI boilers were subject to pre-existing CO limits. This assertion is suspect as a factual matter. More importantly, the existence or lack of pre-existing enforceable limits is not determinative of the level of a MACT floor.

This vacated EPA approach also failed to consider the effect of cleaner fuels in the overall emission performance of sources in the several subcategories. EPA has acknowledged that in several instances units without add-on controls (using cleaner fuels) outperformed EPA's best-performing units with add-on controls. Additionally, as a consequence of its approach, where fewer than 12 percent of the sources within a subcategory employed add-on pollution control devices, EPA declined to set a MACT floor. In the Brick and Clay MACT decision[31] the Court reiterated its earlier rulings that the EPA approach[32] to establishing the MACT floor is inconsistent with the plain reading of section 112. The Court specifically ruled that EPA erred when it considered only the effect of add-on controls and ignored HAP emission reductions that may occur as the result of fuel switching or other emission-reducing techniques. Section 112(d)(2) is explicit in setting out a list of other pollution-reduction techniques, including process changes, substitution of materials, enclosure of systems or processes and work-practice requirements, that must be considered in setting a MACT standard.

NACAA's Approach

NACAA's approach is an attempt at straightforward compliance with the CAA as written by Congress and interpreted by the Court. NACAA set out to gather all available emissions data concerning HAPs emitted by the category and criteria pollutants that may serve as surrogates. As mentioned earlier, these data reflect the results of reference method testing and are of equal or better quality than the test results employed by EPA. Moreover, since the permitting authorities that did have data provided information on all

[31] *Sierra Club v. Environmental Protection Agency*, No. 03-1202 (March 13, 2007).

[32] In the Brick and Clay MACT rulemaking EPA had established the MACT floor as the performance of the worst-performing unit that employed the same technology as the median of the top 12 percent of the units that employed add-on controls.

sources within their jurisdictions, there is no reason to suspect a bias in NACAA's data. This absence of bias cannot be asserted for information submitted by sources to EPA's rulemaking docket in support of an argument for less stringent regulation[33]. NACAA further believes that the association's data population is sufficient in size and diversity to characterize CO and PM performance of ICI Boilers nationally. Where sufficient comparable data existed to calculate the average of the best-performing units, NACAA has done so. In some instances the data set was robust and there is a relatively high degree of confidence that the data reflect the performance of the particular subcategory. Here we believe it is likely that the MACT floor accurately represents the performance of the best- performing units and likely represents MACT. In other instances far less data were available and overall confidence in the degree to which the "floor" represents an accurate emissions profile of the subcategory is much lower. In these instances NACAA has also identified percent reductions of recommended control devices that should lead to MACT levels of emissions when applied to a particular source.

After calculating the "average limitation achieved by the best performing 12 percent of existing sources," NACAA developed a "variability factor" based on an analysis of year-over-year testing of a number of sources in the data base. Generally, the workgroup did not attempt to discern why emissions varied over time.[34] The workgroup's conclusion was that a variability factor of 1.5 to 2.5[35], and, based on engineering judgment, sometimes up to 3.0 (150 to 250 or 300 percent) would reasonably account for test-to-test variability of a given unit. A closer examination of each of these sources may suggest that the variability is overstated[36] and more data are always desired. Nonetheless, given the time and budgetary constraints of this project, NACAA is comfortable with the selected adjustment factors.

As part of the process of setting the MACT floor, NACAA also examined the impact of the proposed floor limits on existing sources. It is reasonable to conclude that, given the structure of the MACT floor requirement, Congress expected that a properly established MACT floor would require a substantial portion of each subcategory (nominally 94 percent) to have to take some action to reduce emissions (even if only by a small amount).

[33] NACAA has no reason to suspect that such information is incorrect, but notes that a commenter in a rulemaking matter is under no obligation to identify or supply information that may contravene its argument.

[34] In one instance an extremely large variance was noted, however, the permitting authority indicated that, in response to the earlier high emission test result, the source had installed a fabric filter that was responsible for the much lower results. This result was not employed in establishing the variability factor.

[35] The factor of 1.5 reflects an average ratio between the mean of the sample and the 90th percentile confidence margin, while the 2.5 factor is the average ratio between the mean of the sample and the 99th percentile confidence margin.

[36] Most states use a smaller "variability factor" in translating the results of a reference method compliance test (which is supposed to be conducted under "reasonable worst-case conditions") to an enforceable limit.

Existing Source MACT Floor

The following is a series of NACAA recommendations for setting the MACT floor. As can be seen in the figures, EPA's vacated rule would have required very few sources to reduce emissions. In contrast, NACAA's recommended MACT floor limits require between 55 and 80 percent of existing sources to take some action to reduce emissions. Below we provide below a detailed comparison of the vacated EPA limits, the NACAA recommendations and the emissions data for the ICI Boiler subcategories.

Carbon Monoxide

Gas-Fired Boilers

Figure 1 displays the 161 CO emission test results for gas-fired ICI boilers that are in the NACAA data set, ranked from lowest-to-highest emission level. Also displayed are EPA's intended emission limit for new sources and NACAA's recommended range for a MACT floor determination for existing sources. Here it can be seen that EPA's limit of 400 parts per million ("ppm") for **new** gas-fired boilers is easily met by almost all **existing** boilers. EPA did not establish either a MACT floor or MACT standard for existing gas-fired sources. Accordingly, EPA's standard would have led to no reduction of HAP emissions from this large subcategory of ICI boilers.

The NACAA workgroup was surprised that so many sources had been tested at such low levels. Accordingly, the workgroup examined this matter more closely. Direct inquiries were made of the state and local air pollution control officials who had witnessed the tests to confirm these results. Based on these additional efforts, NACAA is confident that a large portion of gas-fired boilers, of all sizes, will show CO emission levels at or near detection levels when subjected to federal reference testing.

Figure 1

Gas-Fired Boilers
Carbon Monoxide Emissions

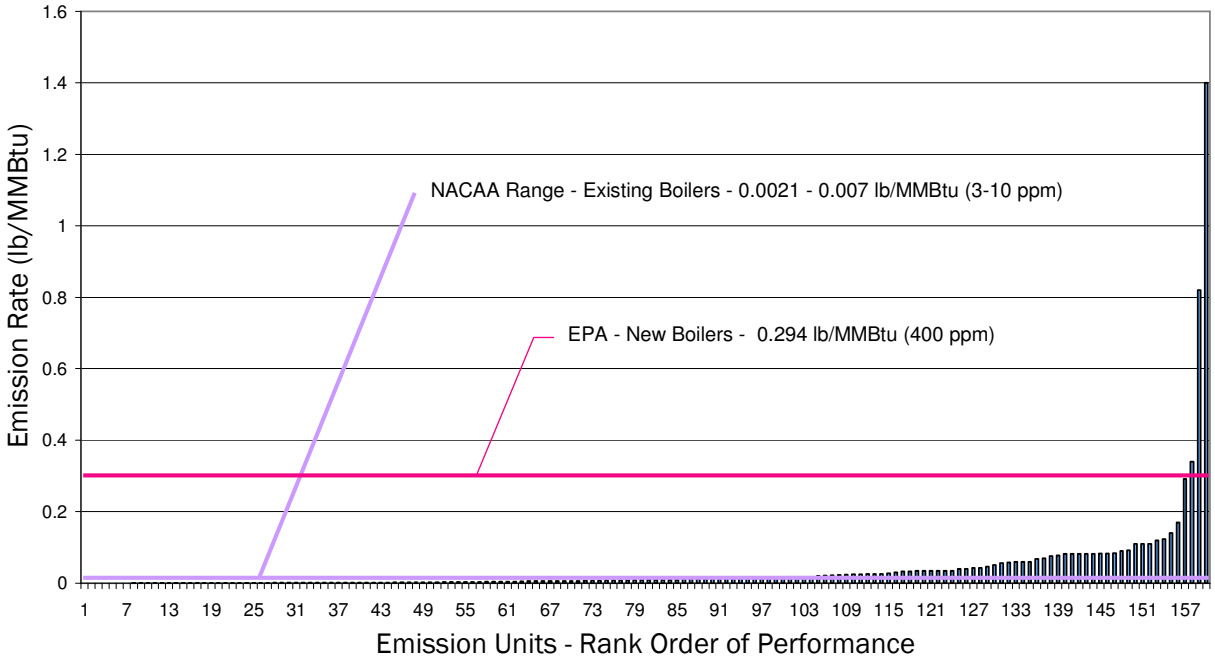
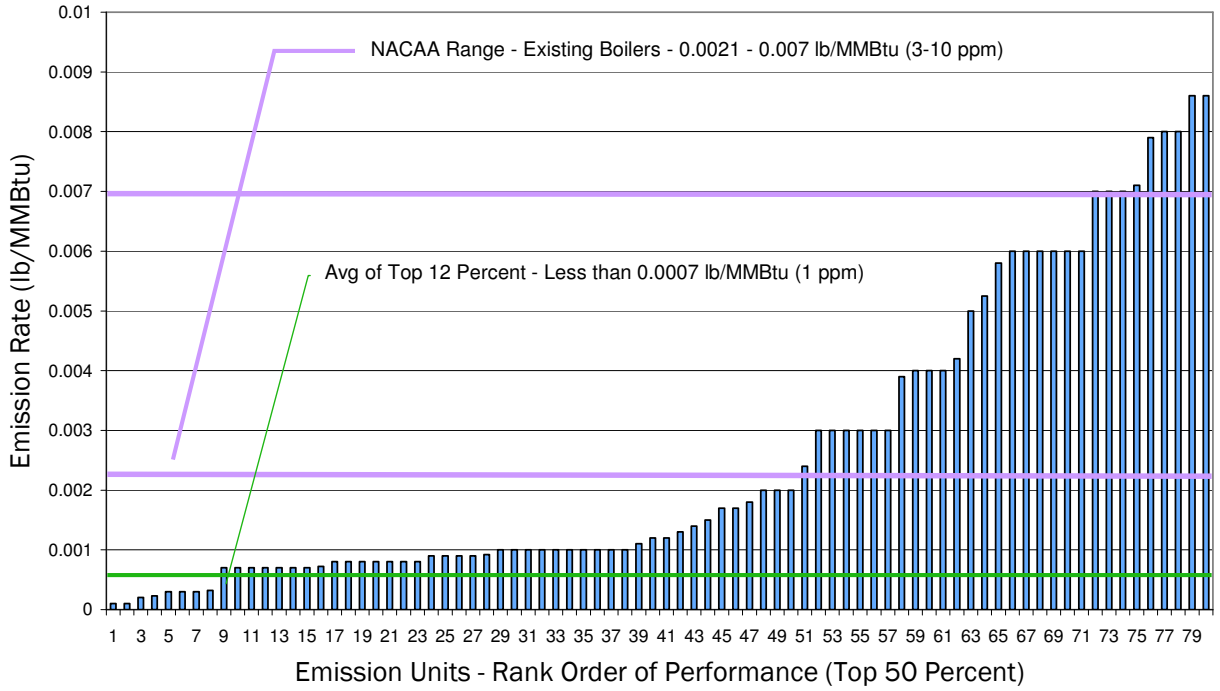


Figure 2 presents the same data as above, but limited to the best-performing 50 percent of the sources on the previous figure.

Figure 2

Gas-Fired Boilers
Carbon Monoxide Emissions
Top 50 Percent



The data are presented in this fashion to expand the scale of the figure so as to allow the reader to evaluate the likely impact of NACAA's recommended range. NACAA's recommended MACT floor range for this subcategory (3 to 10 ppm) would require 85 to 110 sources of the total of 161 sources within this data set to undertake some level of emission-reduction effort to comply. That 51 to 76 sources would not have to take action is reflective of the large number of sources that have reduced CO emissions substantially. NACAA is recommending a very broad range that is larger than the calculated variation among sources to accommodate concerns about a potential tradeoff between CO and NO_x emissions at very low CO levels and an understanding that, even at 10 ppm, CO levels in this subcategory are far lower than will be required of solid-fueled ICI boilers. NACAA believes this outcome is reasonable and more consistent with Congressional intent than that achieved by EPA's approach.

Oil-Fired Boilers

Figures 3 and 4 present the CO emission testing results for the oil-fired boilers in the NACAA data compendium. Again, it is evident that EPA's intended standard for new units has been exceeded by a wide margin by almost all existing units. Since EPA did not promulgate any standard for existing units, the vacated rule would not have achieved any reduction in HAP emissions from this subcategory.

Figure 3

Oil-Fired Boilers
Carbon Monoxide Emissions

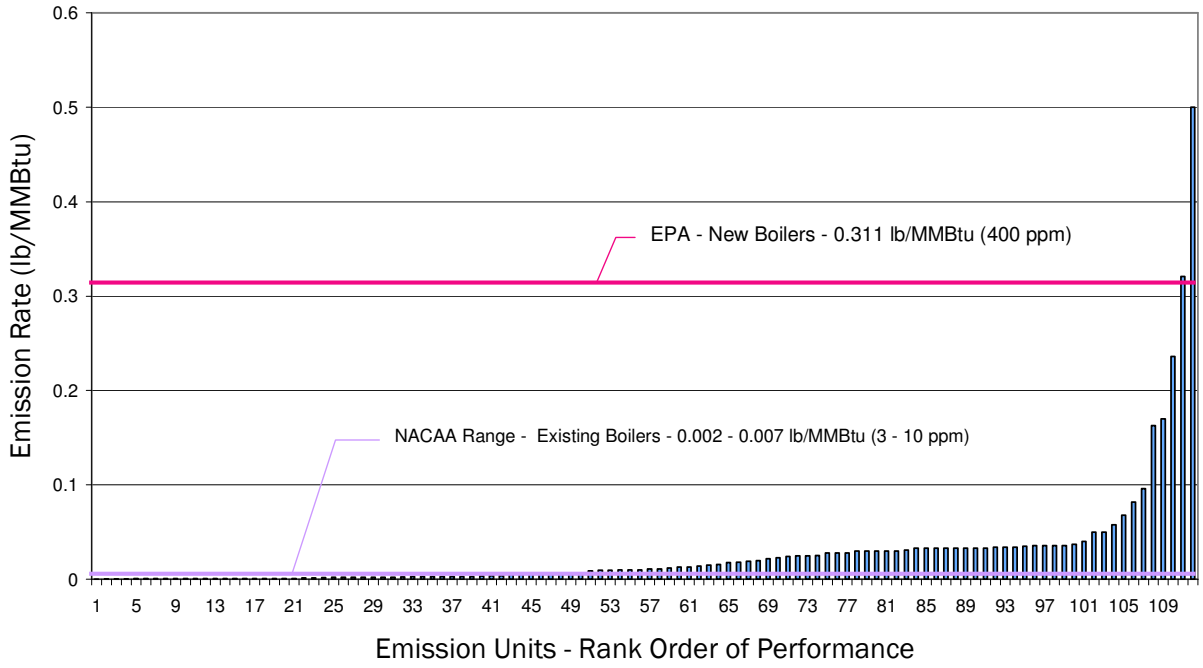
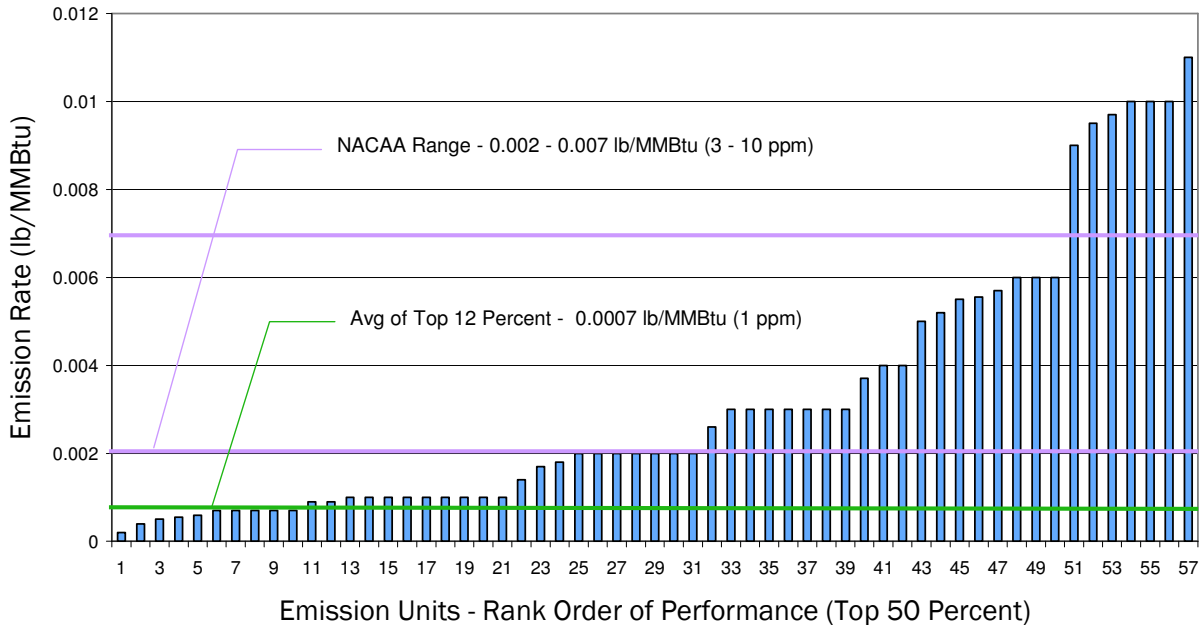


Figure 4 again examines the likely impact of NACAA's recommended MACT floor range on existing units in the subcategory. As in the gas-fired subcategory, NACAA is recommending a broad range (from 3 to 10 ppm) to accommodate NO_x/CO tradeoff concerns and to recognize the difference in expected performance of oil-fired boilers compared to solid-fired boilers. Twenty-seven to 45 percent of the existing sources in our database have already tested at levels below our recommended range. Again, we do not believe that it is unreasonable to adopt a standard that requires some level of HAP reduction from 55 to 73 percent of sources in the better-performing subcategory.

Figure 4

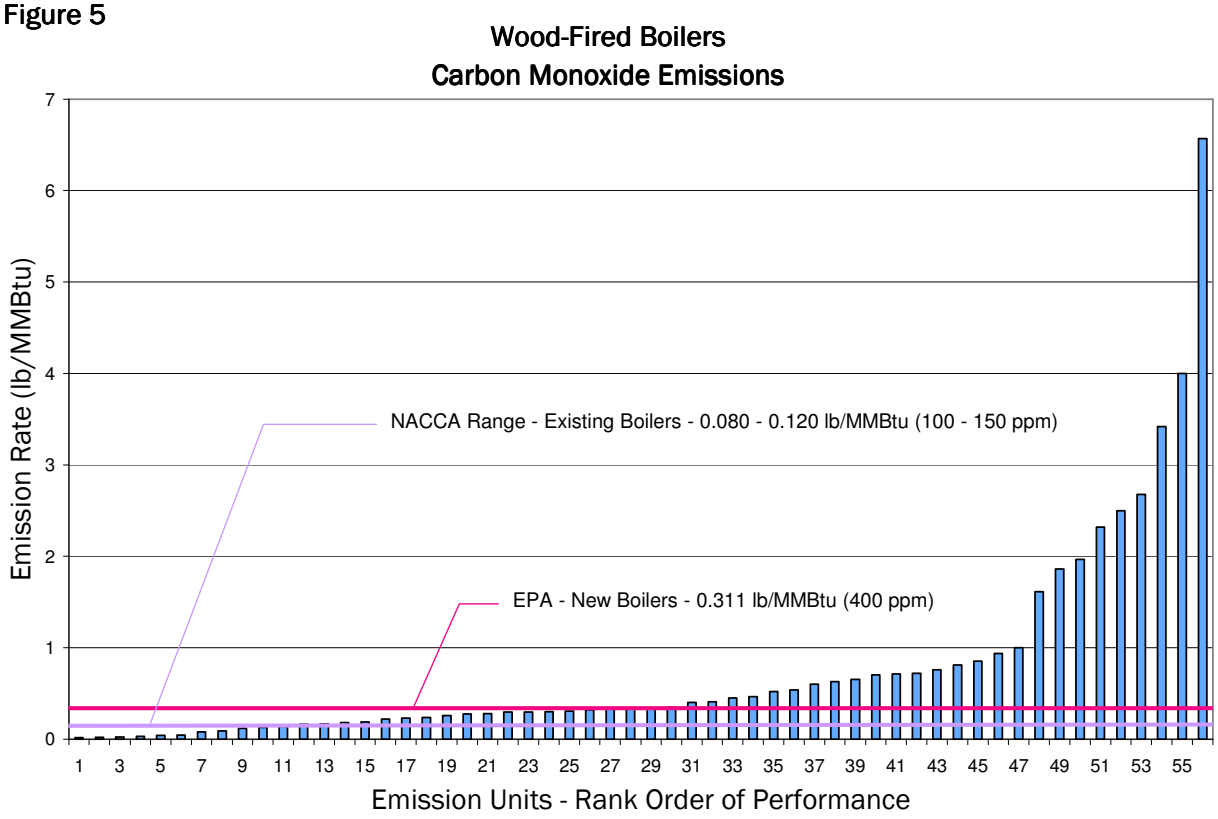
Oil-Fired Boilers
Carbon Monoxide Emissions
Top 50 Percent



Wood-Fired Boilers

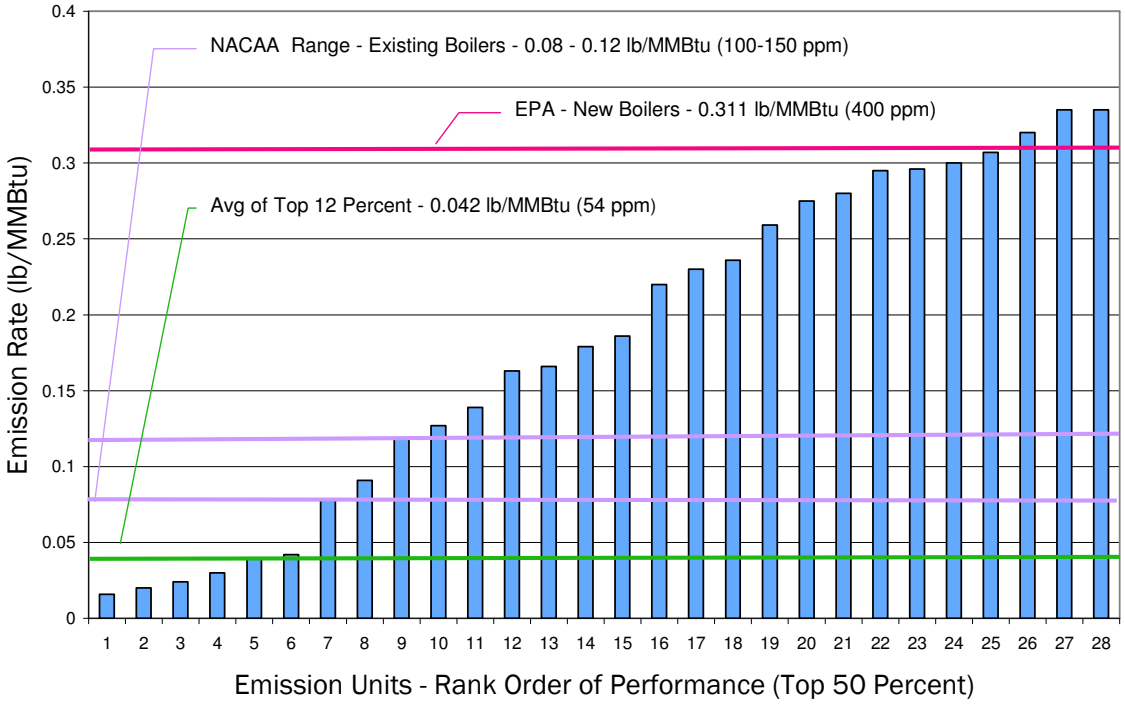
Figures 5 and 6 examine the performance of existing wood-fired boilers. Overall CO emissions are higher and EPA's vacated limit for new sources comes closer to what one might anticipate as a limit for existing sources. The average emission limitation achieved by the best-performing 12 percent of the sources is 54 ppm. Applying the calculated variance to this result would lead to a recommendation of 80 ppm to 125 ppm. The engineering judgment of the workgroup was that a larger variance was needed to accommodate unavoidable variations in moisture; accordingly, NACAA is recommending a range of 100 ppm to 150 ppm.

Figure 5



In Figure 6 we examine the likely impact of the NACAA recommended range of 100 ppm to 150 ppm. Over 15 percent of existing sources already meet NACAA's recommended limits. This is consistent with the statutory scheme that nominally requires the MACT floor to be set at the 94th percentile of existing units. Moreover, the incomplete combustion represented by the current CO levels inevitably results in high levels of organic HAP emissions that the statute was intended to reduce. The data demonstrate that the recommended CO range for this subcategory is achievable by a wide range of sources. Our recommended range for CO is 10 to 50 times higher for wood-fired boilers than for gas-fired or liquid-fired boilers.

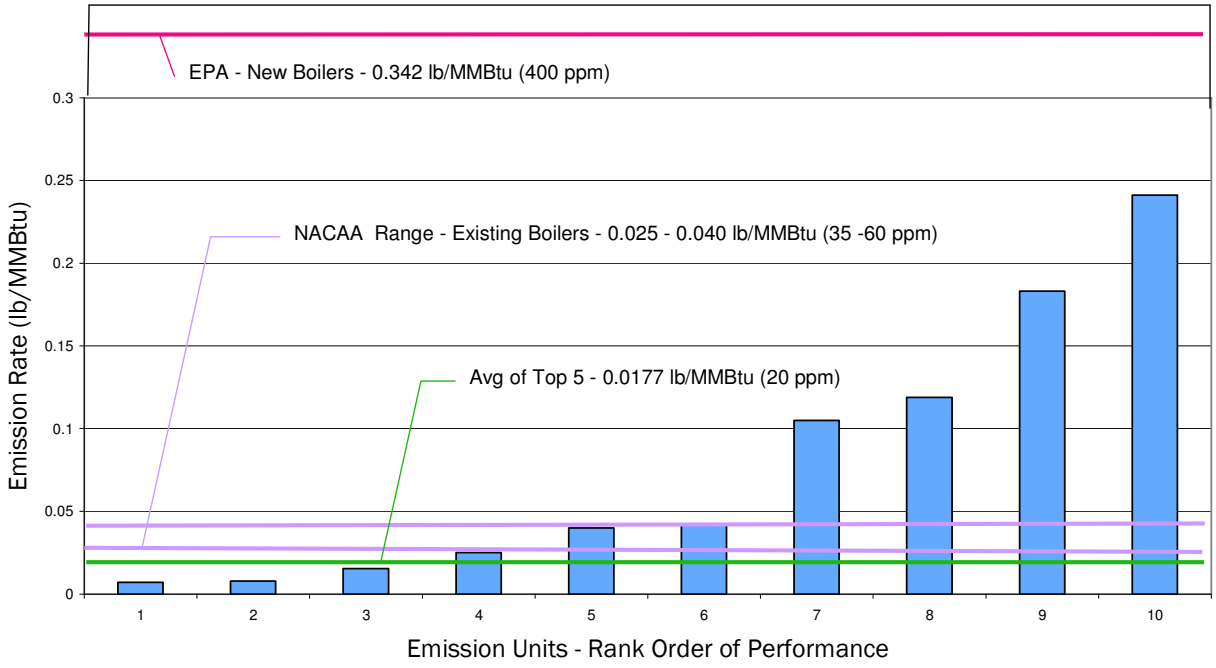
Figure 6 **Wood-Fired Boilers**
Carbon Monoxide Emissions
Top 50 Percent



Coal-Fired Boilers

As Figure 7 shows, NACAA's CO data set for coal-fired boilers is more limited than for other subcategories and so, as the law requires, the association has determined the MACT floor by calculating the average of the top five sources rather than the top 12 percent. In this subcategory all sources were well below EPA's limit of 400 ppm for new sources. The average of the five best-performing sources was 20 ppm. After applying a variance factor, the workgroup recommended a MACT floor range from 35 to 60 ppm. Six of the 10 units represented in our data set would comply with this recommended range of limits. The overall result is consistent with the experience of the workgroup: one would expect that gas-fired and liquid-fired boilers would have lower emissions than coal-fired boilers and that each of these subcategories would have lower CO and organic HAP emissions than wood-fired boilers.

Figure 7 **Coal-Fired Boilers**
Carbon Monoxide Emissions



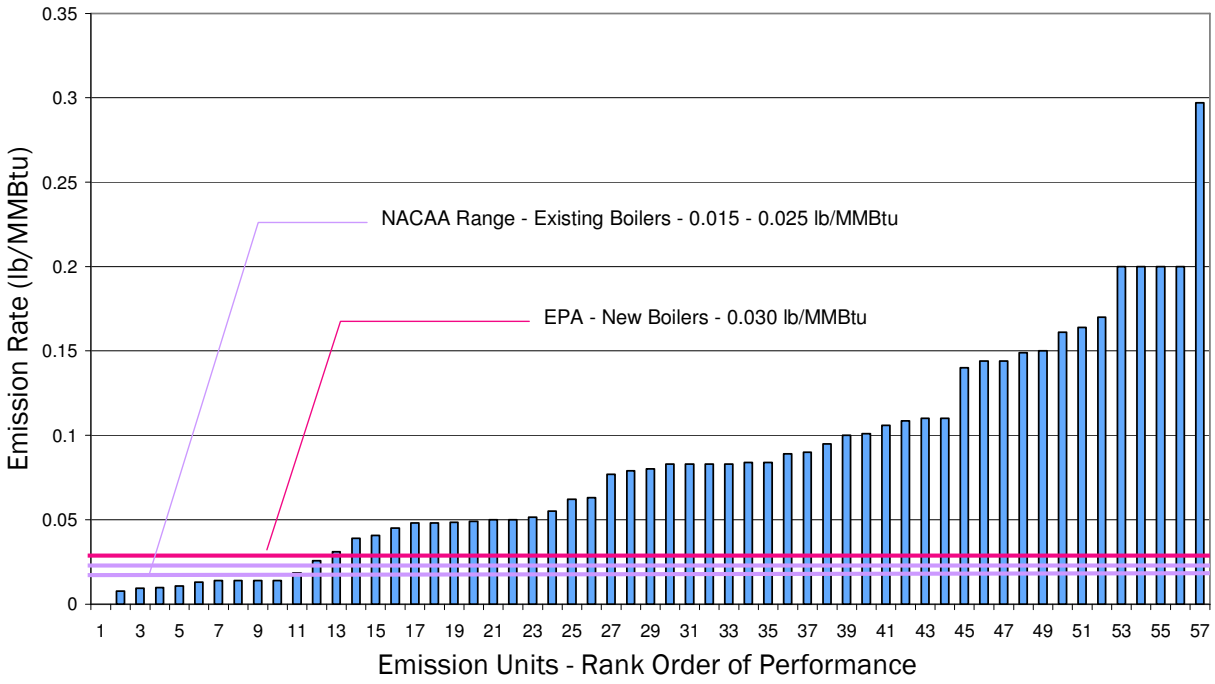
Particulate Matter

Oil-Fired Boilers

Figures 8 and 9 present NACAA's data for Particulate Matter for oil-fired boilers. EPA's intended new source limit is not met by many existing sources within the subcategory, and, in fact, is reasonably close to NACAA's recommended MACT floor range for existing units. However, EPA did not set a MACT floor or a MACT limit for existing sources and any new sources would likely have been required to meet the emission limitations of the best-performing sources by installing Best Available Control Technology ("BACT") under the New Source Review ("NSR ") program. Accordingly, EPA's rule would not have resulted in any metal HAP emission reductions.

Figure 8

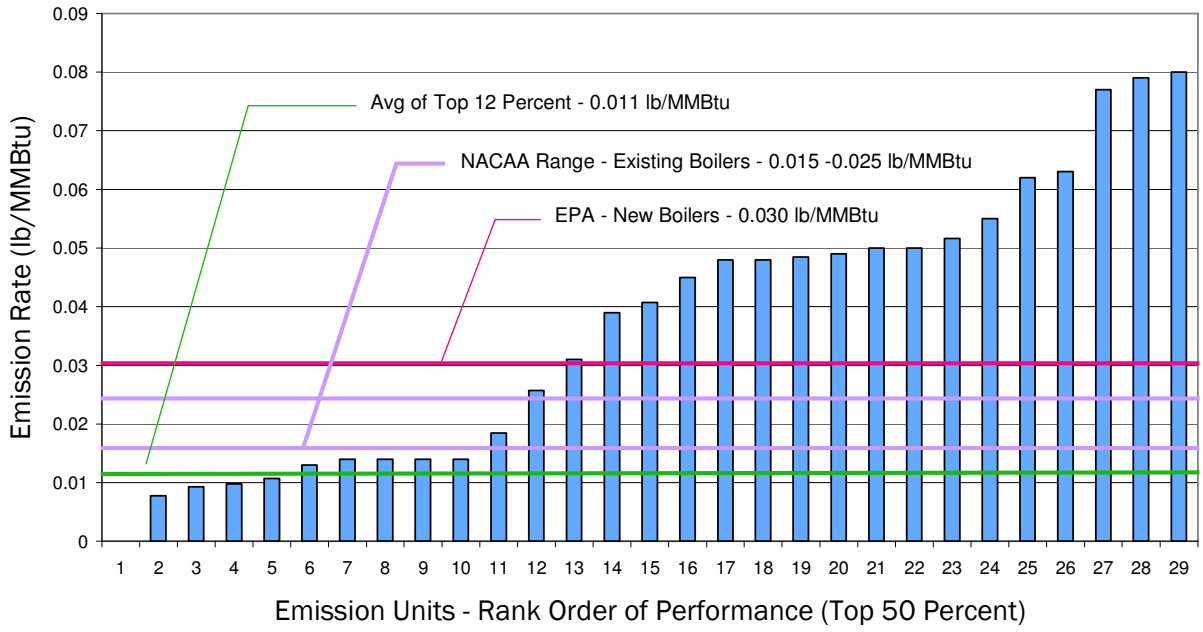
Oil-Fired Boilers
Particulate Matter Emissions



As noted in Figure 9, the average of the top 12 percent of units in PM emissions testing of oil-fired units in NACAA's data set was 0.011 lb/MMBtu. After applying the computed range of variance factors, the workgroup recommended a MACT floor range of 0.015 to 0.025 lb/MMBtu. Approximately 20 percent of the units in our data set meet this limit. Again, where the statute contemplates that 94 percent of existing sources will have to take some steps to achieve compliance, a MACT floor that is calculated in accordance with both the existing data and the decisions of the Court should produce the result that a substantial portion of the subcategory, here 80 percent, exceeds the floor. The NACAA data set includes testing for particulate matter smaller than 10 microns in diameter ("PM_{10}"), as well as PM. While PM_{10} is not used as a surrogate, the emissions profile for this pollutant is similar to the results displayed here. The PM_{10} data confirm that 20 percent of the existing units have far lower PM emissions than the balance of the units in the subcategory.

Figure 9

Oil-Fired Boilers
Particulate Matter
Top 50 Percent

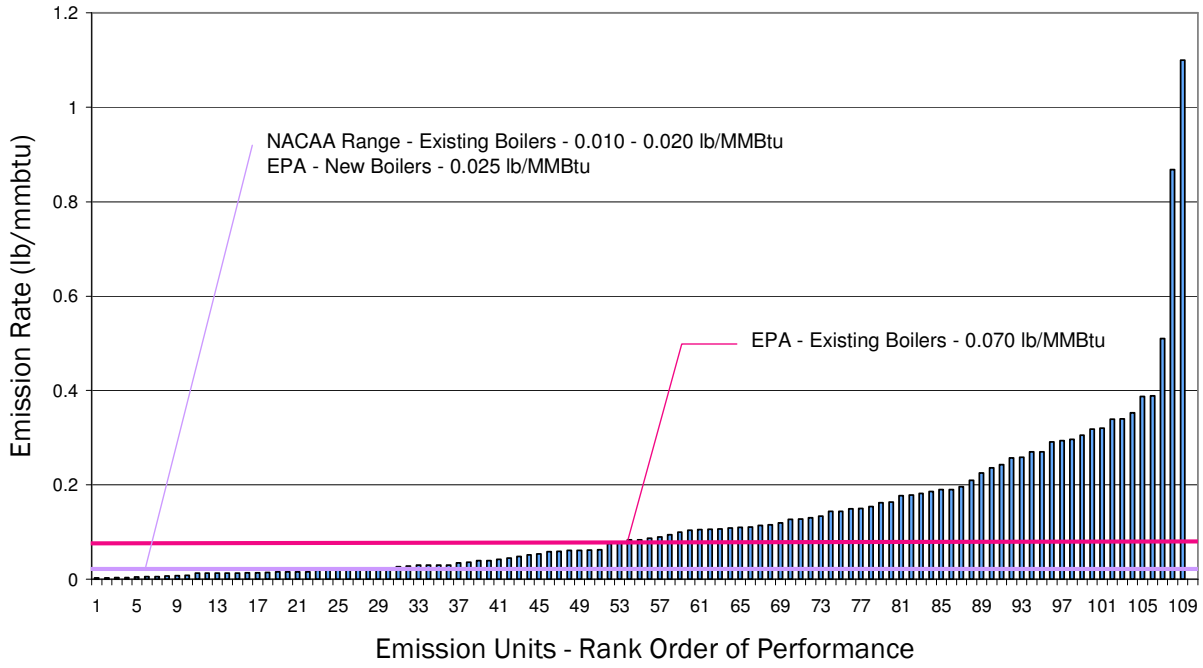


Wood-Fired Boilers

The NACAA data for wood-fired boilers in Figures 10 and 11 include results for 109 sources. As Figure 10 depicts, for its solid-fuel subcategory, EPA had set a limit, based on a MACT floor calculation, for new solid-fired boilers of 0.025 lb/MMBtu. EPA also established a MACT floor limit of 0.07 lb/MMBtu for existing large units and 0.021 lb/MMBtu for existing, limited-use units. EPA's limit for new sources is reasonably close to NACAA's recommendation for existing units and EPA's limit for large existing units would not have been met by approximately half of the existing units. Here, it is likely that the vacated rule would have led to some reductions. The extent of those reductions cannot be estimated because the number of sources that would have avoided emission reductions due to emissions averaging, alternate "Total Selected Metals" ("TSM") limits, size or risk-based exemptions provided by the rule is unknown.

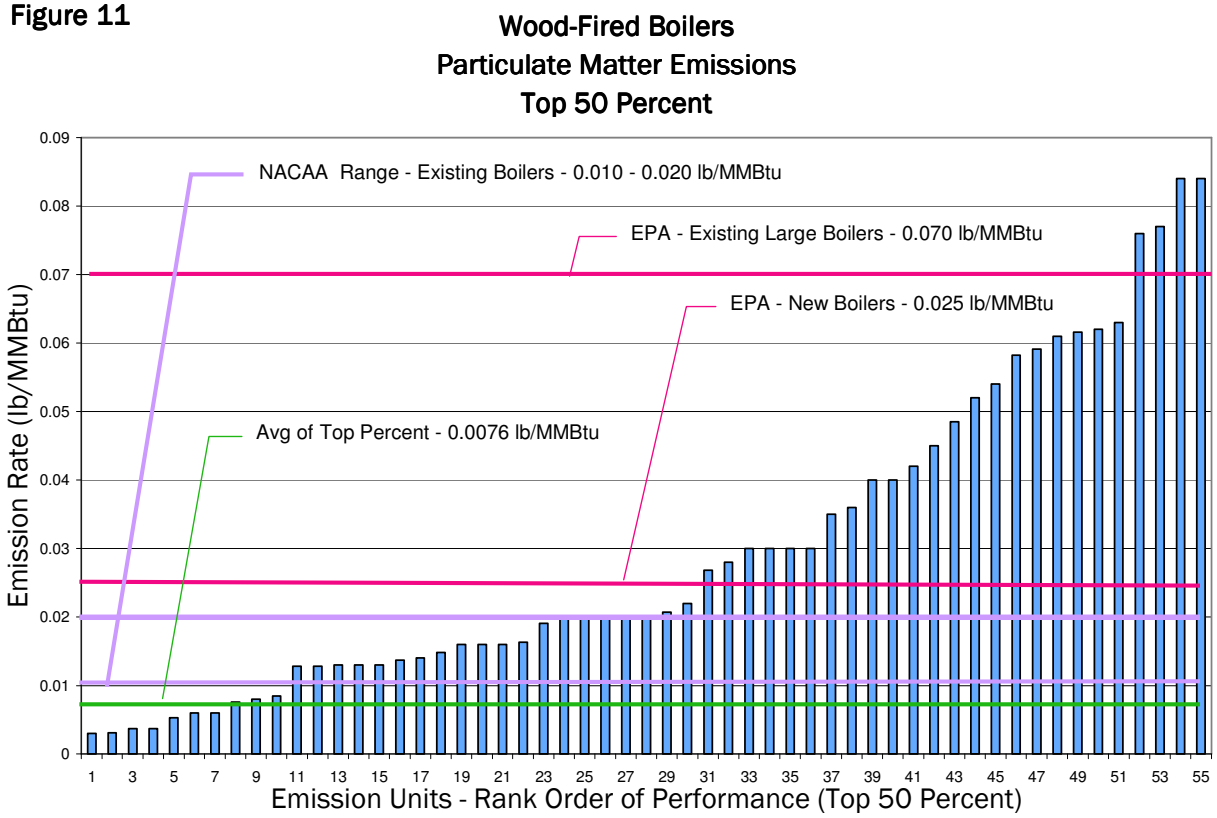
Figure 10

Wood-Fired Boilers
Particulate Matter Emissions



In Figure 11, the calculated "average of the top 12 percent" in this instance is 0.0076 lb/MMBtu. NACAA's recommendation, after applying a variance factor, is 0.010 to 0.020 lb/MMBtu. Based on existing data, this range is met by 10 to 25 percent of existing units and should be achievable through use of conventional PM controls that have been available for many years.

Figure 11

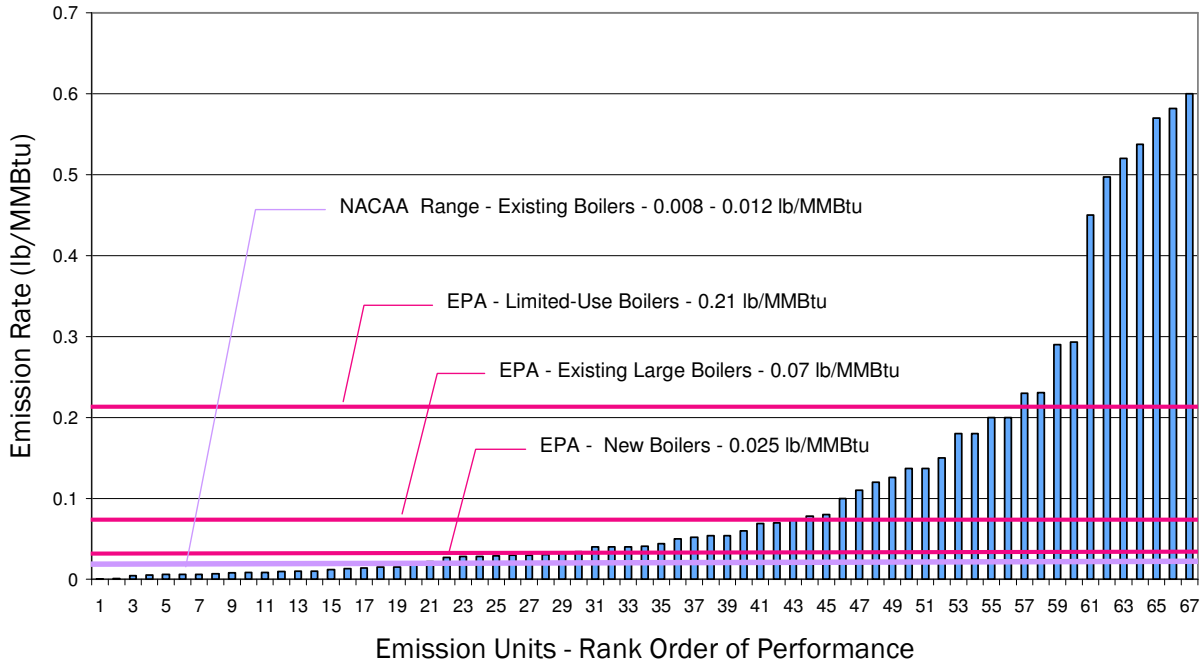


Coal-Fired Boilers

The NACAA PM data compilation, displayed in Figure 12, includes results for 67 coal-fired units. These results are similar to the PM results for wood-fired units. EPA's limits for solid-fueled units apply to this subcategory as they did to the wood-fired subcategory. Approximately one-third of existing units tested would not meet EPA's vacated limit for existing large, solid-fueled boilers. Some portion of the remaining units would fall into EPA's small- or limited-use subcategories, while others might be exempt under one of the risk-based exemptions. Accordingly, it is likely that only a minor percentage of coal-fired ICI Boilers units would have been required to reduce metal HAPs under the vacated EPA standard.

Figure 12

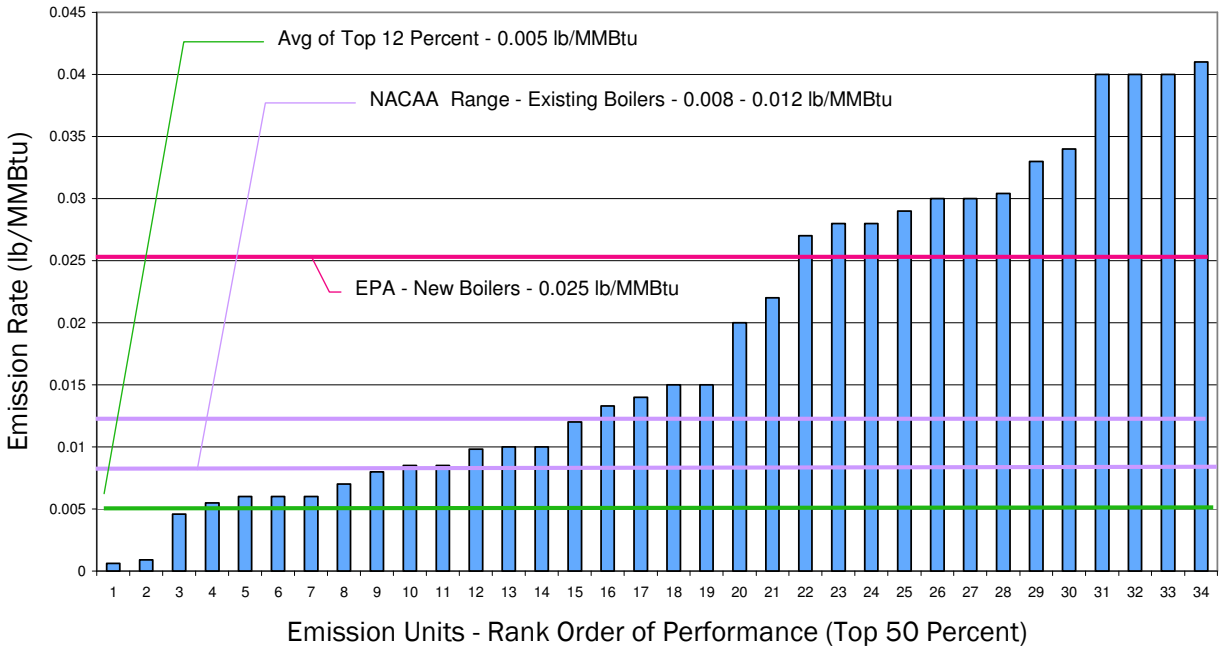
Coal-Fired Boilers
Particulate Matter Emissions



As Figure 13 shows, NACAA's calculation of the "average of the top 12 percent" for coal-fired boilers was 0.005 lb/MMBtu. After incorporation of a variance factor, the NACAA recommended range for a MACT floor is 0.008 to 0.012 lb/MMBtu of PM.

Figure 13

Coal-Fired Boilers
Particulate Matter Emissions
Top 50 Percent



If this range is adopted by permitting authorities, one would expect that 15 to 25 percent of existing sources would comply without taking further steps. NACAA believes this result is consistent with the data, with the association's understanding of the emissions profile of the subcategory and with the statute.

Hydrogen Chloride

The vacated rule contained the following HCl emission limits:

New solid-fuel units (all)	0.02 lb/MMBtu
New large, liquid-fuel units	0.0005 lb/MMBtu
New small and limited-use-liquid fuel units	0.0009 lb/MMBtu
Existing large solid-fuel units	0.09 lb/MMBtu

EPA's HCl MACT floor analysis for **existing** solid-fired units was based on 21 test results for eight ICI Boilers deemed to have control devices that were present on 12 percent or more of the units in this subcategory for which EPA had such information. NACAA agrees with EPA's determination that acid gas scrubber technology is employed in enough units within the wood-fired subcategory that the MACT floor should be at least as stringent[37] as the performance expected from these technologies. However, EPA's treatment of the

[37] The Courts have made it clear that if a unit achieves a lower emission rate without employing a particular technology it must be included in the calculation of the MACT floor.

emissions data resulted in an EPA limit for units that employ these technologies that is five to 50 times higher than it otherwise should be.

The first questionable decision is the way EPA treated a key test result that appears to have been an outlier. EPA reported that the average of the 21 test results of eight units in the agency's database was 0.0096 lb/MMBtu[38]. In this calculation EPA included a single test result that was six and 30 times higher, respectively, than the other two tests for that unit and an order of magnitude higher than the average of the data set. Recognizing that this result was an outlier, EPA did not include this result in its subsequent analysis of variability (see below). This one test result is so much higher than the other 20 tests in the data set that its inclusion raised the average of the data set by 70 percent. At a minimum, this test result should have been reviewed, and a reason for the extremely high emission rate determined, before being incorporated in the average. Since EPA excluded this datum from the variability analysis, it should also have been excluded from the calculation of the average.

The second technically questionable decision is EPA's use of non- standard statistical calculation procedures to determine the variability of emission unit performance. For four of these nine units, EPA had two or more test results. Rather than employ standard statistical techniques, EPA defined a "variability factor" to be the average of the ratio between the highest and lowest test result for each of these four units. EPA then multiplied the average of the test results (0.0096 lb/MMBtu) by this very large variability factor (9.08) to determine the limit of 0.09 lb/MMBtu[39].

It should be noted that in this process EPA was not examining the variability that a given unit with a given fuel supply might experience if retested for compliance purposes. Instead it looked at the variability that might result if a source burned a different mix of fuels. In the majority (18 of 22) of the tests relied on by EPA, the boiler combusted an undefined mix of fuels, including fuels (gas and liquid non-fossil fuels) from different subcategories, which would be expected to have differing emission levels. None of the testing for the four sources EPA used to generate its variability factor for solid fuels appears to be limited to coal, wood or solid fuel. Moreover, the variability between testing was greatest in the cleanest units[40] and it is only when this variability is multiplied by an average that includes units with substantially higher emissions does the result approach EPA's limit.

For example, one of the units in EPA's group, when tested using as many as seven different combinations of fuels, emitted between 0.000236 lb/MMBtu and 0.00534 lb/MMBtu of HCl. While variable, each of these results is far less than the resulting EPA limit. Nonetheless, EPA's non-standard approach results in a calculated variability factor of

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[38] See, *Memorandum: Re-Revised MACT Floor Analysis for the Industrial, Commercial, and Institutional Boilers and Process Heaters National Emission Standards for Hazardous Air Pollutants Based on Public Comments, AppendixC-3 Calculation of HCL Emission Limits for Large Solid Fired Unit,* EPA-OAR-2002-0058-0659.

[39] Where the control device achieves on the order of a 90-percent reduction, applying a multiplier of nine to the "controlled" emission rate has the effect of setting the standard at the level of uncontrolled units.

[40] EPA's calculated variability factor for a "clean" unit (0.0017 lb/MMBtu average emission rate) was 22.6, whereas another unit's emissions were substantially higher (0.0098 lb/MMBtu average emission rate), but its EPA calculated variability factor was only 1.07.

22.6 for this unit. This emission factor for this unit contributed to the large variability factor that EPA subsequently applied to the higher average emission rate for the subcategory. Applying standard statistical techniques yields a variability factor of 2.65, which NACAA believes is a more reasonable estimate of variance than that which resulted from EPA's method. Similarly, recalculating the EPA variance factor employing standard statistical methods reduces the variance factor for the a second unit in that group from 14.3 to 2.53. Recalculating the entire EPA data set in this fashion yields a variability factor of 2.68. This figure is at the upper bound of NACAA's calculated variance factor range of 1.5 to 2.5, but is reasonable since the data set includes testing using a mix of fuels from different subcategories.

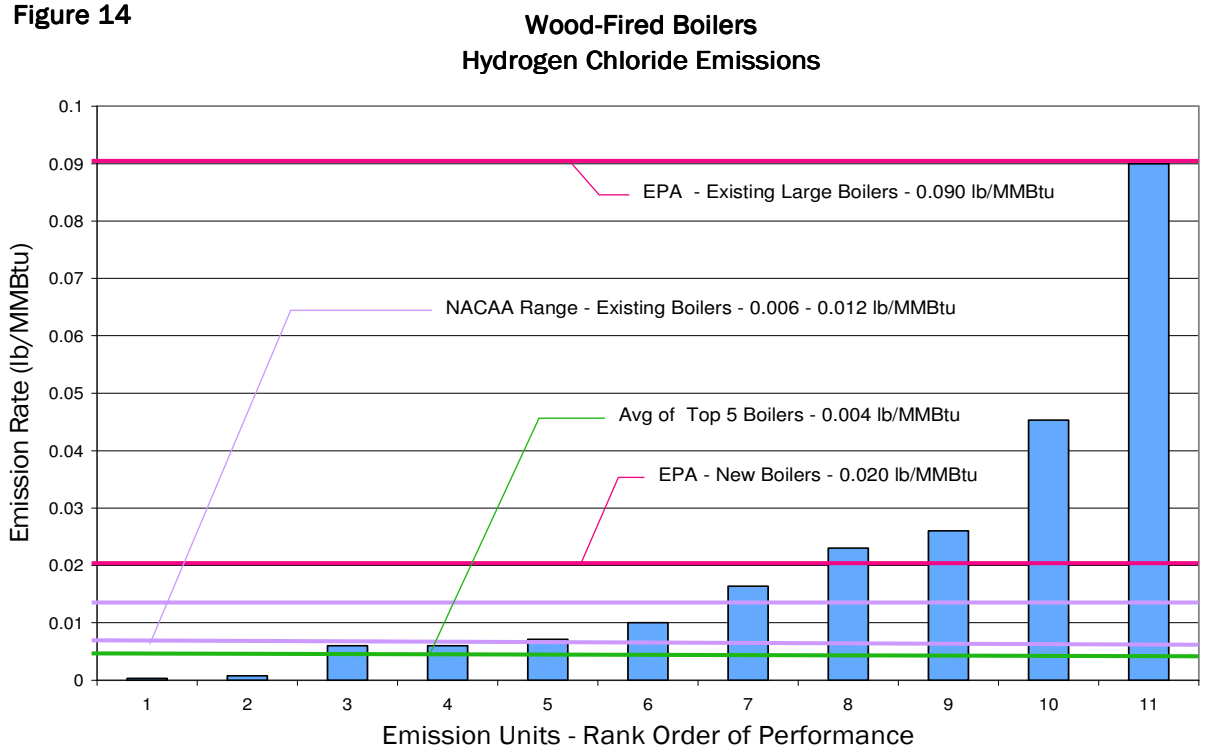
Correcting for each of the two questionable calculation decisions reduces the MACT floor emission limit for HCl for **existing** solid-fired boilers from 0.09 lb/MMBtu to a range of 0.015 to 0.025 lb/MMBtu. This result is consistent with the MACT floor determined by evaluation of the NACAA data set.

An additional questionable analytical technique is found in EPA's calculation of the variability factor for **new** solid-fuel boilers. Rather than employ the variability factor it had calculated for **existing** units, EPA chose to ignore these data and generate a variability factor based on the ratio of chlorine content in coal. The resulting factor of 181 (18,100 percent) is so high that it renders the new source MACT floor useless. EPA offers no justification as to why the variability factor it had determined based on emission reduction performance of existing units should not be employed. EPA does not discuss or analyze whether the sampling processes associated with the fuel data involve an averaging period or are instantaneous "grab" samples that may be more variable than emissions averaged over a three-hour period. EPA acknowledges that it employed its technique in an attempt to ascertain what emission performance is achievable without consideration of cleaner fuels. In its recent decisions, the U.S. Court of Appeals has determined that, in setting MACT floors, the appropriate inquiry is the level of performance that has been achieved by the best-performing 12 percent, not the level that is achievable without cleaner fuels.

Wood-Fired Boilers

Figure 14 illustrates NACAA's data set of 11 tests of wood-fired boilers where only a single fuel was employed during testing. These data show that all 11 existing wood-fired boilers would currently meet EPA's vacated limit for existing sources and seven of the 11 existing sources would meet EPA's standard for new sources.

Figure 14



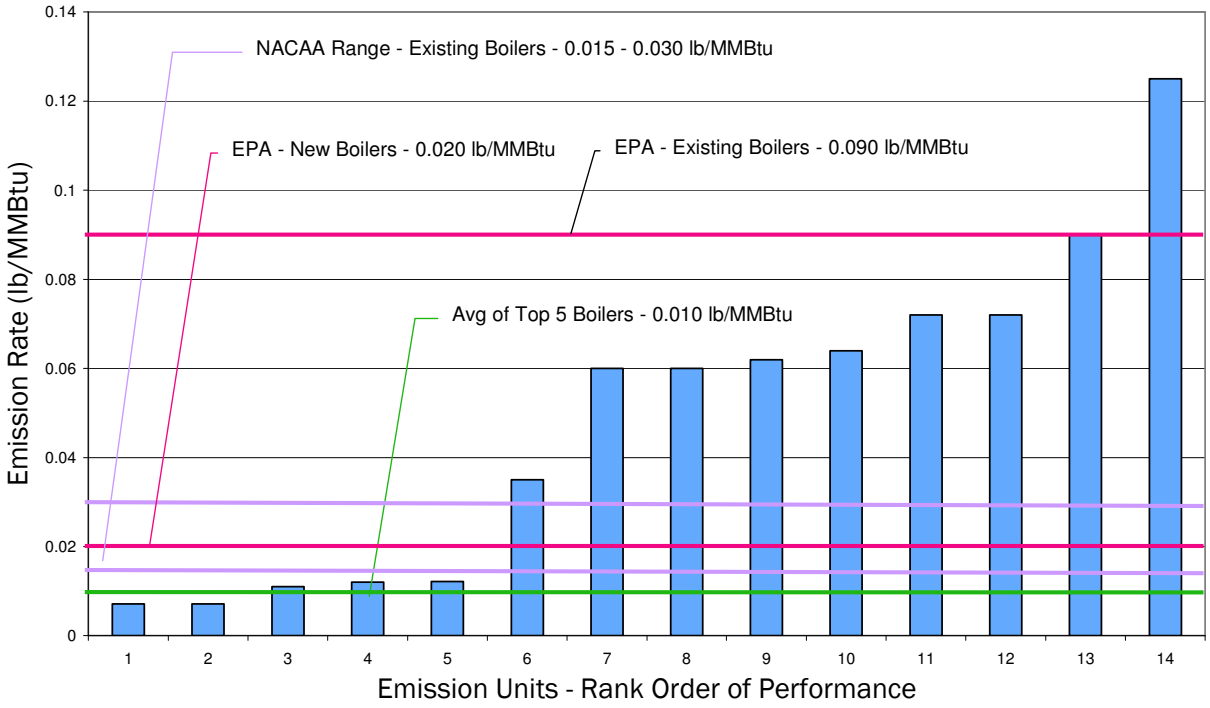
The average of the test results for the best-performing 12 percent of the wood-fired units for which NACAA has information is 0.004 lb/MMBtu. After applying a variability factor, the limited data indicate that the existing source MACT floor would be determined to be in the range of 0.006 to 0.012 lb/MMBtu. Six of the 11 units in the data set comply with the limits in this range.

Coal-Fired Boilers

The NACAA data set included HCl emissions data for 14 existing coal-fired ICI Boilers. See Figure 15. Thirteen of these boilers currently meet EPA's limit for existing boilers and five of these units currently emit less than EPA's limit for new boilers. Thus, it can be seen that the EPA methodology led to a result that is inconsistent with the Congressional intent that a substantial number of existing units should be required to take some steps to reduce HAP emissions.

Figure 15

Coal-Fired Boilers
Hydrogen Chloride Emissions



The average emission rate of the best performing five coal-fired ICI Boilers is 0.010 lb/MMBtu. After applying the variability factors, the limited data set indicates that the MACT floor for HCl emissions in the coal-fired subcategory is from 0.015 to 0.030 lb/MMBtu. Five of the 14 units in the data set currently meet this range.

Oil-Fired Boilers

EPA had no HCl emissions data for liquid-fired ICI Boilers and so determined the MACT floor by calculating an emission level assuming that all of the chlorine in the fuel was converted to HCl. EPA had chlorine content data for seven sources, but rather than set the existing source MACT floor on the average of the best-performing five sources, as required by the statute, EPA used the worst-performing unit in its data set. Applying EPA's calculation methodology to the average of the top five performers in that database provides a MACT floor for existing, liquid-fired sources of 0.006 lb/MMBtu, rather than 0.009 lb/MMBtu.

NACAA's data set for liquid-fired boilers contains emission test results for only three units -- 0.0007 lb/MMBtu, 0.0005 lb/MMBtu and 0.16 lb/MMBtu. While limited, these data are consistent with the best-performing units in EPA's data base.

Additional Data

There are two potential data sources that merit discussion. The first is emissions information provided to permitting authorities by sources that intended to assert the "health-based alternate compliance option" (risk-based exemption) for acid gases contained in EPA's rule. NACAA understands that EPA had, at one time, intended to maintain a database of test results for such sources, but has not done so as of this date. However, at least one state has HCl emissions data for such sources. These data are contained in the background materials for this Permit Guidance posted by NACAA, but have not been considered as a valid data set for establishing a MACT floor, since they appear to be biased towards the highest emitting sources that could not meet EPA's limit.

The second potential source is EPA's initial database. In its MACT floor analysis, EPA had ignored test results in that database showing very low emissions because no specific pollution control device was identified.[41] Accordingly, one could attempt to use the best performing boilers in that database in calculating a MACT floor. However, unlike NACAA's data collection effort, which attempted to gather all emissions information from all sources, the EPA effort appears to have been focused on ascertaining the emissions performance of those sources with the most effective controls. This resulting data set appears to be biased towards the cleanest units in the category.[42] Thus, using this data set in this way may focus on the "best of the best," rather than the average of the best-performing 12 percent of all existing units. While the CAA does not require either EPA or a permitting authority to obtain additional information when developing rules or permits under section 112, NACAA believes that a fair inference of Congressional intent is that the data set for determining the MACT floor should be representative of the subcategory as a whole. Even though they may not be representative of the emissions profile of the subcategory, the EPA data do establish that well-controlled units can meet the MACT floors recommended in this Model Permit Guidance.

Mercury

EPA's data base contains mercury emissions data on 10 solid-fired units (six coal-fired units and four units that burned wood or mixed fuels during the testing). EPA's analytical approach was similar to that employed for HCl and contains some of the same flaws. However, the data set did not contain outliers and so the effects of EPA's approach were not as significant. The average of these units was 3.02 pounds per trillion BTU ("lb/TBtu") and the agency-determined variability factor[43] was 2.98. The average of the top five coal-fired units was 3.20 lb/TBtu, while the average for the top 4 wood-fired units was 2.58 lb/TBtu. From these data, EPA set the existing unit MACT floor at 9.00 lb/TBtu. The best-performing unit in EPA's data set was a coal-fired unit whose emission rate was 0.230

[41] These data are incorporated in the background material for this Permit Guidance posted on the NACAA website.

[42] NACAA is encouraging EPA to engage in broad, unbiased, emissions data-gathering as it prepares to develop a standard for ICI Boilers.

[43] EPA again employed the average of the ratio of highest-to-lowest result rather than standard statistical rechniques.

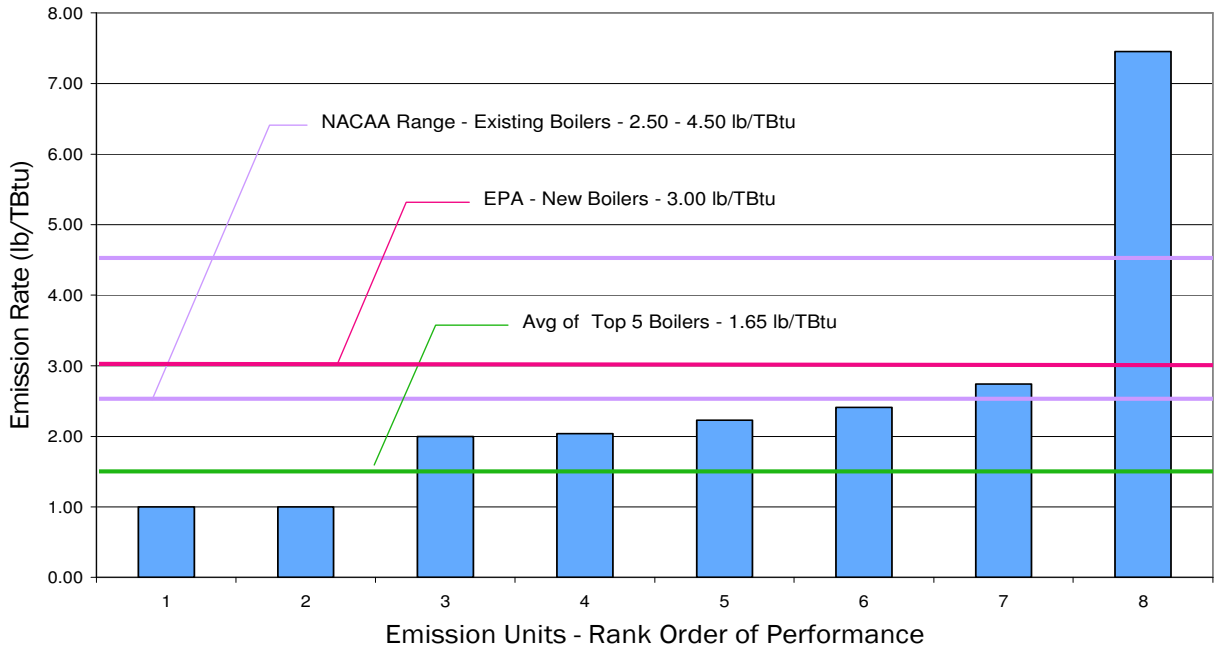
lb/TBtu. The best-performing wood-fired unit in this data set had an emission rate of 0.266 lb/TBtu. Rather than using the variability factor determined from testing of existing units, EPA used the ratio of the highest to lowest mercury content in its fuels data base. In this instance the fuels content ratio was 12.54 (1,254 percent) and the new source mercury limit in the EPA proposed rule was set at 3.00 lb/TBtu.

Wood-Fired Boilers

The NACAA data for ICI Boilers that were tested while combusting only wood or other non-fossil solid fuels (such as bagasse) are presented in Figure 16. All eight of the boilers tested would comply with EPA's limit of 9.00 lb/TBtu, while seven of the eight existing units would meet EPA's new source limit of 3.00 lb/TBtu. Based on these data, EPA's vacated rule would not have reduced mercury emissions from wood-fired boilers.

Figure 16

Wood-Fired Boilers
Mercury Emissions



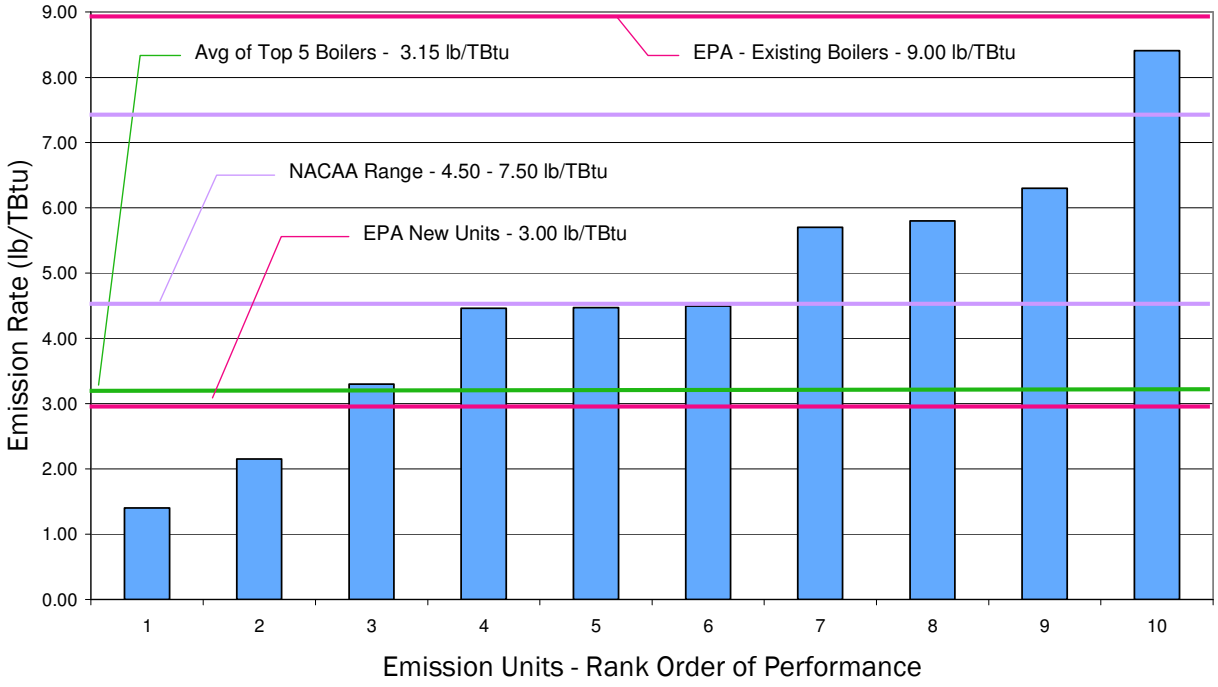
The average performance of the best performing five wood-fired ICI Boilers in the NACAA database was 1.65 lb/TBtu. When adjusted for variability, these data suggest a MACT floor of 2.50 to 4.50 lb/TBtu. The fact that almost all of the existing units would meet this floor is likely reflective of the limited number of tests in the NACAA data set. The median performance of the best performing boilers combusting wood in EPA's data set is substantially lower than these figures (approximately 0.5 lb/TBtu).

Coal-Fired Boilers

The NACAA data set contains mercury emissions data on 10 coal-fired ICI Boilers. The data set did not distinguish between types of coal. As illustrated in Figure 17, all of the boilers in the NACAA data set would comply with the EPA limit for existing sources, while between 60 and 90 percent would meet a MACT floor based on NACAA's data and 20 percent would meet a MACT limit based on the anticipated median performance of MACT technologies.

Figure 17

Coal-Fired Boilers
Mercury Emissions



The average mercury emission rate of the five best-performing coal-fired boilers was 3.15 lb/TBtu, while the median emission level for "best-performing" units in EPA's data set was 1.14 lb/TBtu. Applying the NAACA variability factor to the limited NACAA data set yields a MACT floor of between 4.50 lb/TBtu and 7.50 lb/TBtu, while establishing a MACT limit on the basis of the median performance of the "best of the best" would yield a limit of between 1.50 and 3.00 lb/TBtu.

Control Strategies – Techniques and Costs

CO Control for Organic HAP Reduction

For the past several decades, air pollution control efforts have focused on SO_2, NO_x, Volatile Organic Compounds ("VOC") and PM emissions. Nearly all of the country has been in compliance with the CO National Ambient Air Quality Standard ("NAAQS") for many years, and for most sources CO emissions are well below NAAQS-driven permit limits. For this reason, CO is the "forgotten" criteria pollutant. For NAAQS purposes, sources typically do not need to take specific steps to reduce CO and are not concerned that a stack test for CO will show a violation of a NAAQS-based limit. Notwithstanding the lack of need for a focus on CO emissions over the years, combustion technology has advanced (perhaps because more complete fuel combustion represents improved efficiency that reduces manufacturing costs) to the point where very low CO emissions (in the range of 1 ppm) are generated by a substantial portion of sources that combust gaseous or liquid fuels.

NACAA recognizes that sources whose current emissions may be greater than the association's recommended ranges may be concerned that the cost of compliance with limits within the recommended ranges may be high. We do not believe this is likely to be the case, since, unlike SO_2, NO_x and PM control, effective CO control is ordinarily achieved by managing the combustion process better (and thereby lowering operating costs) than by post-combustion controls. Moreover, NACAA's data suggest a continuum of emissions performance within the fleet – a substantial number of sources will require only modest reductions in emissions, while some sources will need to dramatically reduce emissions to meet the recommended emission limits. Accordingly, NACAA suggests the following hierarchy of control measures for sources that need to reduce CO emissions to meet recommended ranges.

1. Install a continuous CO monitor – NACAA believes that a continuous CO monitor should be considered part of the control system for all sources larger than 50 to 100 MMBtu/hr. NACAA also recommends the use of such monitors at sources whose CO emissions are variable and potentially large, such as sources that combust wet wood. Use of a continuous CO monitor over a period of time will assist the operator and permitting authority in understanding those combustion practices that lead to excessive CO emissions and in identifying those specific measures that will reduce CO emissions in the most cost-effective manner. Continuous CO monitors typically cost in the range of $50,000 to $65,000, with installation costs of $10,000 to $15,000. Periodic monitoring with portable hand-held monitors is likely to be a cost-effective technique for smaller sources.

2. "Tune up" the unit for CO purposes, including cleaning the system, servicing or replacing filters and maintaining induced draft fans, to insure that the air flow to the boilers is optimized. Consider adding process parametric monitoring devices, such as oxygen, flow, moisture and mass air sensors.

3. Manage fuel supplies to reduce moisture and variability, including (as necessary) establishing maximum moisture content and minimum heat content for solid fuels.

4. Blend fuels as necessary to maintain relatively constant heat and moisture inputs.

5. Evaluate the fuel delivery system to ensure that variability in fuel delivery rates is minimized.

6. Evaluate replacing burners. NACAA believes that for most units, this step, in conjunction with the above measures, should result in compliance with the NACAA-recommended ranges. The Ozone Transport Commission has estimated that replacing burners at a 250MMBtu/hr boiler would cost between $200,000 and $3,000,000. As necessary, retain a combustion expert to evaluate the process at a troublesome unit and suggest improvements.

PM Control for Metal HAP and Mercury Reduction

NACAA's data suggest a continuum of performance where a number of sources with existing PM control devices will merely need to "tune up" or upgrade existing equipment and/or improve operating practices. For those sources, NACAA recommends the techniques identified above for CO reduction. As part of the implementation of the $PM_{2.5}$ NAAQS, state and local agencies are including condensable pollutants, such as sulfur trioxide, when defining and establishing PM emission limits at a source. Additional controls, including sorbent injection, "wet" scrubbers and ESPs are effective at reducing PM emissions. Continuous PM and mercury monitors can be useful in assisting the operator in managing the combustion process and in tracking compliance.

For most solid-fuel boilers that need to control PM and mercury, activated carbon injection, perhaps utilizing brominated carbon or other additives, and the installation or upgrade of an ESP or fabric filter will be the solution of choice. NACAA believes that for most wood-fired sources that need to upgrade their PM controls, a fabric-filter system will be the most cost-effective solution because of its lower capital cost and high level of performance in controlling the smaller particulate matter that is normally associated with metal HAP emissions.

Additional details concerning PM and mercury controls are provided in NACAA's, *Controlling Fine Particulate Matter Under the Clean Air Act: A Menu of Options*, and *Regulating Mercury From Power Plants: A Model Rule for States and Localities*. These reports are available on www.4cleanair.org (under "Our Publications"). In addition, the

Northeast States for Coordinated Air Use Management[44] ("NESCAUM") is currently preparing a comprehensive detailed review of the expected cost and performance of PM and acid gas control options for ICI Boilers. Permitting authorities are encouraged to consult this source when it becomes available.

For oil-fired boilers that need to improve PM control, there are several options that may be implemented, including switching to lower-sulfur fuel, updating atomizers and burners and injecting sorbents. Switching from heavier-weight to lighter-weight oils can also achieve a significant reduction in PM emissions. Updating atomizers and burners used in oil-fired boilers to reduce unburned carbon may provide additional PM reductions. Post-combustion control options for oil-fired boilers include wet scrubbers and ESPs.

Depending on the particular application and existing emissions control configuration, a dry electrostatic precipitator (ESP) or upgrade to an existing ESP may be the control technology option of choice. Dry electrostatic precipitators are a proven technology for controlling particulate emissions from oil-fired boilers and have been installed on oil-fired boilers for more than 40 years. Dry electrostatic precipitators on coal- and oil-fired boilers are typically designed to achieve particulate emission levels of between 0.01 and 0.03 lb/MMBtu. As a rule of thumb, for each additional field added to an ESP, an additional 50-percent PM reduction can be expected. Reducing PM emissions from an existing boiler from 0.08 lb/MMBtu down to 0.02 lb/MMBtu would likely require two additional fields to the ESP. The capital cost of an ESP can vary depending on the number of treatment fields, inlet emissions and control requirements, and design chosen. Capital costs for a typical ESP applied to an industrial boiler would be in the range of $200,000 to $1.5 million.

Most solid-fuel boilers that need to control PM and mercury are likely to utilize an existing or retrofitted ESP or, where applicable, add a fabric filter. Activated carbon injection ("ACI") and other sorbent systems are widely available with growing experience with incinerators and utility boilers, and sorbents can be injected directly into the ESP or fabric filter. Slipstream testing of a boiler can help determine the relative effectiveness of a sorbent prior to making a long-term commitment to the system. Generally, activated carbon systems that are available for utility boilers are also available for industrial boilers and use the same equipment, including feeders, blowers and lances, and the sorbent is injected into either the ESP or the fabric filter. These systems typically have low capital costs and higher operation and maintenance costs. However, industrial boiler flue gas volumes are lower and a sorbent sack or pack may be employed in lieu of the silo used in utility boiler applications. Accordingly, the cost of ACI systems for industrial boilers will be on the order of a few hundred thousand dollars, compared to a range of estimated costs for large coal-fired power plants of between one and two million dollars.

There are a number of different forms of scrubbing technologies that are applicable to industrial boilers, such as wet scrubbers, sorbent injection, and furnace sorbent injection and dry or wet flue gas desulfurization technologies[45]. The technology applied depends on the fuel type, existing control configuration and emissions control requirement. Wet

[44] NESCAUM members include Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont.

[45] Flue gas desulfurization ("FGD") units are commonly referred to as "scrubbers."

scrubbers, such as venturi scrubbers, are one of the most common types of scrubbers applied to industrial boilers to control both PM and acid gases. Wet scrubbers can achieve as high as 85 to 90 percent control of PM_{10} but are less efficient with particle sizes less than 1 micron. For oil-fired boilers, venturi scrubbers are the most commonly applied wet scrubber design and are capable of removing some mercury and metal HAPs. Capital costs for wet scrubbers for typical industrial applications can range from one hundred thousand to two million dollars.

Wet electrostatic precipitators ("WESP") are another option that may be applied to existing oil-, wood-, and coal-fired boilers. WESP are more suited to capturing fine particles than a dry ESP. If a WESP were applied to an existing boiler with another type of particulate control device already in place, the WESP would be installed following the existing particulate control device. The size of the WESP required would be smaller in this instance than if it were the sole PM control device, as the upstream particulate control device would reduce the particulate loading entering the WESP. The advantage of installing a wet scrubber/WESP combination is that the scrubber will capture the acid gases and the WESP will be effective at removing acid mists, condensed metals, and other liquid droplets. The capital cost of a WESP can vary depending on the number of treatment fields, inlet emissions and control requirements, and design chosen. Capital costs for a typical scrubber/WESP combination applied to an industrial boiler would be in the range of $300,000 to $2.6 million.

A combination of ESP/WESP or ESP/wet scrubber/WESP or wet scrubber/WESP is likely the most efficient system for controlling PM, mercury and metal HAPs. The use of such a combination of emissions control technologies is common where superior control of pollutants is sought. With such a control combination, the first technology in the treatment train will typically remove the coarse particulate (PM_{10}), with the succeeding technologies addressing the final particulate ($PM_{2.5}$) and HAPs.

Acid Gas Control for Acid Gas HAP Reduction

NACAA's HCl emissions data are more limited than its CO and PM emissions data. NACAA agrees with EPA's conclusion in other MACT standards that a 90- to 95-percent reduction in emissions of HCl and hydrogen fluoride ("HF") is attainable at reasonable costs with commercially available acid gas scrubbing equipment commonly employed for SO_2 reduction. The most common way of controlling acid gas HAPs is likely to be the installation of wet scrubbers. Venturi scrubbers are the most commonly applied wet scrubber for oil-fired boilers. The capital cost of a typical wet scrubber for an industrial boiler would be between $100,000 and $2.1 million. Wet scrubbers may also be paired or integrated into a wet electrostatic precipitator (WESP) for existing oil-, wood-, and coal-fired industrial boilers for acid gas and metal HAP control. For this combination, the scrubber would be primarily designed to remove the acid gases and particulate above 2 microns in size while the WESP would serve to remove the fine particulate less than 2 microns.

HCl, as a major pollutant associated primarily with coal-fired industrial boilers, is not measured on a continuous basis, and difficult to measure on a periodic basis. Fuel

sampling and/or parametric monitoring of the post-combustion control device may be the preferred monitoring option.

Establishing MACT

The workgroup made a significant effort to develop a robust data compilation to aid in establishing a meaningful MACT floor. However, the CAA requires that the emission limit be based on MACT, not the MACT floor. Section 112(j) mandates that permitting authorities establish permit limits based on the maximum degree of reduction in emissions of the HAPs subject to section 112 that they determine is achievable. NACAA believes that in the case of its CO and PM MACT floors, the data are sufficiently comprehensive so that the MACT floor represents the level of emission reduction that would represent MACT. However, with respect to HCl and mercury, both the NACAA data set and the subset of the ICCR data used by EPA to set its floor are so limited that they may not represent the emissions profile of each of the subcategories. In addition, there may be a number of unique facilities within this broad category of sources for which there is no emissions information available to establish a MACT floor. In these circumstances permitting authorities may need to conduct a case-by-case MACT analysis. Moreover, a permit decision could be challenged on procedural grounds if a permitting authority failed to consider whether any "beyond-the-floor" requirements are appropriate.

In evaluating whether MACT limits should be more stringent than the floor, permitting authorities must consider the cost of achieving such emission reductions, and any non-air quality health and environmental impacts and energy requirements associated with such costs. MACT is not limited to post-combustion controls, but includes any available pollution-reduction technique, including process changes, substitution of fuels or other system modifications, such as the enclosure of emission sources to capture fugitive emissions. MACT may include design, equipment, operational or work-practice standards and requirements for operator training and certification. Thus, for example, if open storage of solid fuels leads to uncontrolled variability in the moisture content of the fuel, subsequent incomplete combustion and high CO and organic HAP emissions, the permitting authority may establish a maximum moisture content for the fuel to be burned. Alternatively, the agency may establish a work practice or system modification, such as a requirement that the solid fuel be "covered" in some fashion for a specified period of time before it is combusted.

EPA has, in this and in other MACT standards, rejected any "beyond-the-floor" controls as "too expensive," but has not provided any rationale for its determination or any criteria that are of use in assisting permitting authorities in making this evaluation. In the Clean Air Interstate Rule[46] and the Clean Air Mercury Rule[47], EPA has determined that the

[46] EPA's Clean Air Interstate Rule established a "cap and trade" emission reduction program for SO_2 and NOx. See, 70 FR 25162, May 12, 2005.

same acid gas and mercury controls as would likely be employed to comply with ICI Boiler MACT permits are "highly cost effective." The gross emissions of HAPs from any covered units will be several orders of magnitude less than emissions of criteria pollutants; however the risk to public health from such toxic emissions on a per-pound-of-emission basis may be much greater than for criteria pollutants. The fact that Congress understood that unit costs of control for HAPs would be higher than criteria pollutants is well documented in the legislative history and in the structure of the CAA itself. The major source threshold for HAPs is far lower for toxic air pollutants than for criteria pollutants. Further, the Act requires a MACT limit for each unit at a major source that emits a HAP – regardless of size – and requires that all units that emit a HAP meet a MACT floor – regardless of cost. Against this background, it is unreasonable to suggest that in describing the MACT process Congress intended that controls for mercury, for example, should be rejected as MACT unless mercury control costs (on a per-ton basis) were in the same range as criteria pollutant control costs.

Based on their experience over the years, permitting authorities have gained an understanding of the costs of control of criteria pollutants. The figure that each state or local permitting authority employs for determining whether costs are too high under the BACT program is not based on the relative risk associated with SO_2 emissions compared with NO_x emissions, but on the cost per ton of removal of that pollutant as generally experienced within the industry. Given the relative nature of the inquiry, there is no single cost figure that is considered "too high" for BACT for all criteria pollutants. Rather, in the BACT process permitting authorities look to determine whether unique factors exist, such that costs at a particular facility are significantly higher at the proposed facility than within the industry in general for the pollutant at issue.

The suite of controls for HAP emissions in the ICI Boiler category that is likely to be "achievable" should be familiar to permitting authorities as it is the same set of controls employed throughout the country for reducing criteria pollutants.

Under the "top-down" BACT process, the most effective control strategy that has been demonstrated in practice is to be employed unless the permitting authority determines that it is "infeasible" at that source. When considering costs, NACAA recommends that permitting authorities also recognize the co-benefits associated with the reductions in PM (especially $PM_{2.5}$) and SO_2 that would occur from control of HAP metals and acid gases.

Under this approach, a source would not need to employ "above-the-floor" controls if its HAP emissions were substantially less[48] than the emissions of its peers within the category (or subcategory) or if unique circumstances of the facility design or location led to substantially greater costs for the pollution control device or technique than would be experienced by other facilities within the subcategory.

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[47] The Clean Air Mercury Rule, 70 FR 28696, May 18, 2005, attempted to establish a "cap ad trade" emission reduction program for mercury. This rule was found to be unlawful and vacated.

[48] Presumably this could occur because of the specific design of the plant or by way of enforceable permit limits on its fuel supply.

Monitoring and Reporting Requirements

EPA's implementing regulations at 40 CFR 63.52(h) specify that permits under section 112(j) must require enhanced monitoring in accordance with section 114(a)(3) of the CAAA. This monitoring must be capable of demonstrating continuous compliance for each compliance period during the applicable reporting period and shall be of sufficient quality to be used as a basis for directly enforcing all applicable requirements, including emission limitations. Similarly, EPA's implementing regulations state that the Title V permit must specify notification, operation and maintenance, performance testing, monitoring, reporting and recordkeeping requirements, as well as any production limits, operational limits or other requirements necessary to ensure practical enforceability of the MACT emission limitation and to ensure compliance with section 114(a)(3). See, 40 CFR 63.52(f)(2).

There are several types of PM emission measuring techniques that may be applied to ICI Boilers depending on the specific application. One PM CEMS technology, beta attenuation-based systems, can be used for both wet- and dry-stack situations and the installed costs are in the range of $120,000 to $140,000. PM CEMs have been applied to coal-fired power plants with almost a dozen systems installed to date and more than a dozen required at recently permitted boilers. PM CEMs have also been applied to pulp mill recovery boilers, with one application having three years of operating data, and also applied to incinerators, with one application having two years of data. A second PM measurement technology, optical-based technology, uses a light scattering technology for dry stacks. The installed costs are approximately $25,000 for the equipment and another $20,000 to $40,000 to perform the stack test that develops the correlation curve to match instrument readings to the amount of particulate emissions.

In addition, bag leak detection systems can provide a cost-effective approach to ensuring proper operation of fabric filters. NACAA recommends that where bag leak detection systems are chosen, care be taken to set the alarm at levels that will ensure compliance with PM limits necessary to comply with MACT requirements and that an appropriate response plan is incorporated in the permit. EPA guidance on fabric filter operations can be found in a document entitled "Fabric Filter Bag Leak Detection Guidance." This document is available at http://www.epa.gov/ttnemc01/cam/tribo.pdf.

For metal HAPs, there are a few different methods for obtaining measurements. Monitoring options used on utility boilers are applicable to industrial boiler applications. Periodic stack tests provide a basic form of measurement but are limited in providing real-time process or compliance information, as well as limited in overall accuracy, as they will not necessarily account for the variability in fuel and other operating conditions that may be encountered during normal operation. Sorbent traps are a semi-continuous form of metal

HAP measurement that places an activated carbon canister in the flue gas stream to collect vapor phase mercury. The sorbent traps usually sample directly in the flue gas stream for four to 10 days, at which time they are removed and the trapped gases are analyzed to determine flue gas concentrations. Typical sorbent trap systems cost under $50,000 for capital equipment and installation, and approximately $35,000 for annual operation and maintenance of the system. Mercury CEMs provide the highest level of accuracy and continuous reporting of emissions. There are more than 500 mercury CEMs currently being installed on utility coal-fired boilers. The same CEM technology could be applied to industrial boilers and cost between $120,000 and $140,000.

Fuel sampling may also be employed as a compliance-demonstration technique. Fuel analysis costs may be reduced by composite sampling procedures. NACAA recommends that fuel sampling be conducted on an "as combusted" basis. Specifically, NACAA recommends that coal sampling be conducted as the coal is on the conveyor system, rather than sampling the coal pile itself. Under such an approach individual daily samples could be taken, combined and homogenized over a month, and the composite sample analyzed monthly. Such an approach, coupled with regular stack tests, could provide the required assurance of compliance at reasonable cost.

CO monitors range in sophistication from hand-held portables up to full-system Continuous Emission Monitoring Systems ("CEMS"). Other options include parametric monitoring and Predictive Emissions Monitoring Systems ("PEMS"). These devices typically cost as little as $1,000 for a portable CO monitor (non-continuous), up to $35,000 for a PEMS, and $35,000 to over $65,000 for a CEMs.

NACAA believes that a continuous CO monitor should be considered part of the control system for all sources larger than 50 to 100 MMBtu/hr. NACAA also recommends the use of such monitors at sources whose CO emissions are variable and potentially large, such as sources that combust wet wood or where a mix of fuels, including sludge, is used. Periodic monitoring with portable hand-held monitors is recommended for smaller sources. The need for such monitoring to ensure proper combustion to minimize organic HAP emission and performance of post-combustion control devices is clear and was recently underscored by industry comments to the effect that reference method stack tests of sources should not be used to set the MACT floor because such testing understates the "real world" emissions of ICI Boilers.

Opacity limits greater than 5 percent are unlikely to serve as an effective compliance mechanism because they will not ensure that the low PM emission rates required under the MACT limits are being met. Accordingly, NACAA recommends VE or COM monitoring for PM compliance only where opacity limits of 5 percent or less are established.

Incorporating MACT General Provisions

EPA has developed a comprehensive array of "general provisions" intended to cover administrative matters associated with MACT standards. See Subpart A of 40 CFR Part 63. The agency has recognized that some of these provisions may not be appropriate for each promulgated MACT standard. Accordingly, EPA's practice has been to list the provisions of the Part 63 requirements that it intends to apply for a specific MACT standard in the final rule for that standard. The listing of general provisions that EPA had intended to be applicable to the vacated ICI Boiler MACT is published as Table 10 to Subpart DDDDD of Part 63, 69 FR 55277, September 13, 2004. NACAA has reviewed this listing and disagrees with EPA in three instances where the agency intended to waive applicability of certain of the General Provisions:

1. EPA's vacated rule would have waived 40 CFR 63.6(h)(4) and (h)(5),[49] 40 CFR 63.7(b)(1) and 40 CFR 63.9(e) and (f), which call for prior notification of the anticipated date of conducting performance tests and opacity or visible emission ("VE") observations required under the standard. Permitting authorities should decide whether and under what circumstances such notification should be provided. NACAA recommends that, at a minimum, prior notice of all performance tests, other than opacity/visible emission observations, as well as the initial demonstration of compliance with any opacity or visible emission requirements, be required. NACAA also recommends incorporation of 40 CFR 63.6(h)(6), which requires that records of the conditions during VE observations be retained and made available to the permitting authority on request.

2. EPA's vacated rule would have waived several provisions relating to maintenance and operation of Continuous Monitoring Systems ("CMS"). NACAA recommends retention of the General Provisions found at 40 CFR 63.8(c)(4) (CMS must be operating at all times, except during breakdown, exempt operations, repair, maintenance and high-level calibration drift) and at 40 CFR 63.8(g)(5) (data collected during these out-of-calibration events may not be used in determining emissions from the facility). NACAA also recommends that, unless specific data are provided demonstrating the lack of need for or infeasibility of such provisions in a particular situation, the daily calibration and cycling requirements of 40 CFR 63.8(c)(4)(ii) and (c)(6) be retained.

[49] EPA also would have waived 40 CFR 63.6(h)(5)(ii), which requires a minimum of three hours of observation for the initial compliance demonstration of any visible emission or opacity requirement. NACAA believes this requirement is reasonable for the initial compliance demonstration and recommends that this requirement be incorporated in any MACT permit that provides for opacity as a means of demonstrating compliance with a PM limit.

3. EPA's vacated rule would have waived 40 CFR 63.9(c)(7)-(8), which requires sources that are required to employ a CEM to report periods of excess emissions and parametric monitoring exceedances and 40 CFR 63.10(e)(3), which requires semi-annual reporting (unless more frequent reporting is required on a case-by-case basis or the frequency is reduced by the permitting authority) of excess emissions and parameter monitor deviations. NACAA recommends that any MACT permit include provisions requiring all sources, including but limited to sources with CMS, to provide prompt reports of periods of excess emissions and parametric monitoring exceedances. NACAA further recommends that such excursions be clearly identified as violations of the permit unless such parameters are part of a Compliance Assurance Monitoring ("CAM") plan[50] and are not correlated with the emission limit.

EPA's vacated rule identified several of the General Provisions that do not appear to be applicable to or appropriate in the current situation. NACAA recommends that case-by-case MACT permits state that the General Provisions of 40 CFR Part 63 apply, as modified in response to the previous discussion, except for

1. 40 CFR 63.6(h)(2)(i), which provides that if a standard does not state a test method for opacity/VE standards, Method 9 (opacity) and Method 22 (VE) shall be employed. Many states employ other methods and NACAA recommends that in any such instance the permit identify the compliance method;

2. 40 CFR 63.6(h)(7)(ii), which authorizes a source to submit Continuous Opacity Monitor ("COM") data in lieu of Method 9 data, where the standard requires Method 9. NACAA supports the use of COM data, but believes that in case-by-case permitting under section 112(j), the compliance method should be specifically identified;

3. 40 CFR 63.7(a)(2)(ix), which applies only to new or reconstructed sources and so is not applicable here;

4. 40 CFR 63.8(b)(1)(iii) and 63.11 having to do with flares; and

5. 40 CFR 63.8(f)(6) and 63.10(b)(2)(xiii) relating to procedures employed by the Administrator in approving relative accuracy tests for CEMs.

[50] EPA's regulations concerning CAM plans are found at 40 CFR Part 64.

Determining a Compliance Date for Each Facility

Each case-by-case section 112(j) permit must establish a compliance date by which the owner or operator is required to be in compliance with the MACT emission limitation and all other applicable terms and conditions of the permit. See, 40 CFR 63.52(f). Under section 112(i) the schedule for compliance with MACT standards is to be "as expeditiously as practicable," but not later than three years after the effective date of the standard. The statute authorizes an additional extension of one year, where necessary, for the installation of controls.

In a number of instances, sources that were subject to the vacated rule will have installed controls and made plans to comply with the EPA rule. In other instances, particularly where CO levels at natural gas-fired units are at or near levels determined necessary to control organic HAPs, no additional controls may be necessary and so a reasonably prompt compliance date would appear to be required. In yet other instances the full statutory time period may be required for a source to comply.

While individual source factors may lead to different time frames for installation of emission controls or pollution prevention devices, NACAA believes the following schedules are reasonable for installation, shakedown and compliance testing for the identified actions:

1. Install continuous emission monitors, implement a periodic CO monitoring program or optimize combustion for CO reduction – six to 12 months;
2. Install new burners, add carbon injection where there is an existing fabric filter or upgrade existing PM controls – 12 to 18 months; and
3. Replace the firebox or the entire boiler or install a fabric filter, electrostatic precipitator or acid gas scrubbing system – three years.

Note that under 40 CFR 63.7, where a performance test is required, it must be conducted within 180 days of the compliance date set out in the permit.

Reasonable Processes and Procedures for Case-by-Case MACT Determinations

While the CAA calls for "case-by-case" determinations of MACT standards and floors for each subcategory, individual facility reviews may be burdensome and unnecessary in many instances. For example, the recommended organic HAP controls for many natural gas-fired industrial boilers are a level of CO control and monitoring to ensure complete combustion of the organic HAPs. Given the anticipated congruence of performance and costs within this subcategory, some states with large numbers of nearly identical sources may wish to develop a "permit by rule" to minimize transaction costs within industry and avoid a waste of scarce permit authority resources. Such an approach would likely need to incorporate a "safety valve," where a source could request a specific facility review in order to meet the statutory requirement of a "case-by-case" review, but would otherwise appear to be a reasonable approach that should be welcomed by all parties. In evaluating whether to pursue one or more permits "by rule," the amount of time needed to promulgate new rules should be considered, as the 18-month deadline for issuing case-by-case permits would appear to apply.

Technically, the ICI Boiler category is the "fuel combustion category" and includes combustion turbines, reciprocating internal combustion engines, engine test facilities and rocket test facilities, as well as boilers and process heaters. See, 67 FR 16582, April 5, 2002. If the permitting authority encounters a situation where the subcategories set out in this Permit Guidance do not appear to be applicable because of legitimate technical differences that distinguish the source from others in the subcategory, it should consider establishing a new subcategory. Ordinarily, this would involve ascertaining a MACT floor and MACT.

De Minimis Exemptions

The federal Courts have interpreted the CAA as generally authorizing *de minimis* exemptions or exemptions based on administrative necessity. This notion is based on the principle that "the law does not concern itself with trifling matters." *Alabama Power Co. v. Costle,* 636 F.2d 323, 360 (D.C. Cir. 1979). However, a *de minimis* exemption "is not an ability to depart from the statute, but rather a tool to be used in implementing the legislative design." Id. Unsupported assertions are not ordinarily sufficient and a *de minimis* exemption is not available if it is contrary to the intent of the statute[51]. In *Natural Resources Defense*

[51] *See, e.g., Public Citizen v. Young,* 831 F.2d 1108, 1122 (D.C. Cir. 1987) (rejecting agency's attempt to create a *de minimis* exemption for certain chemicals that caused cancer in animals but posed only minuscule risk to humans, because statute barred listing of chemicals causing cancer "in man or animal"); *Sierra Club v. EPA,* 992 F.2d 337, 343-45 (D.C. Cir. 1993); *Kokechik Fishermen's Ass'n v. Secretary of Commerce,* 839 F.2d 795, 801-02 (D.C. Cir. 1988). The Court further held that "there is likely a basis for an implication of *de minimis* authority to provide [an] exemption when the burdens of regulation yield a gain of trivial or no value." *Alabama Power,* 636 F.2d at 360-61; *see also Public Citizen v. FTC,* 869 F.2d 1541, 1556-57 (D.C. Cir. 1989) (doctrine permits exemptions when application of statute would have no benefit, not merely when agency concludes that costs exceed benefits). Additionally, the Courts have held that "the literal meaning of a statute

Council, Inc. v. EPA, 966 F.2d 1292, 1306 (9th Cir. 1992), the Court rejected a *de minimis* exemption because of "lack of data" to show that regulation would be of "trivial or no value."

De minimis exemptions are not available if they are contrary to the structure of the MACT program or if they result in more than a trivial increase in emissions. Permitting authorities should consider the use of this authority to prevent absurd or futile results as they encounter unique situations. NACAA is recommending two exemptions that have been incorporated in the Permit Guidance, based on the notion of a *de minimis* exemption:

1. The Permit Guidance does not establish MACT floors or MACT emission limits for PM, HCl or Hg for gas-fired boilers. While such boilers emit some amount of these pollutants and a "best performing 12 percent could be identified," the amount of additional HAP reductions that would be obtained is truly trivial.

2. The Permit Guidance recommends an exemption from all regulation for small hot water heaters that may be used for "domestic purposes" at facilities subject to regulation. Again, we believe this exemption is consistent with the structure and intent of the CAA and will not lead to a measurable increase in HAP emissions at any facility.

Risk-Based Exemptions

Section 112(d)(4) of the CAA provides:

> "With respect to pollutants for which a health threshold has been established, the Administrator may consider such threshold level, with an ample margin of safety, when establishing emission standards under this subsection."

Based on this provision, EPA's vacated rule adopted two "risk-based exemptions[52]" from MACT – one for HCl, the other for manganese ("Mn"). After careful review, NACAA has concluded that these exemptions are not authorized by the CAA, are not technically sound and are not in the public interest. Therefore, this Permit Guidance does not provide for or recommend the incorporation of risk-based exemptions in permits issued under section 112(j).

We note that the factual predicate for the use of section 112(d)(4) for acid gas HAP and metal HAPs – the establishment of a health threshold for each of these pollutants – has not been met. Congress authorized risk-based standards only

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need not be followed where the precise terms lead to absurd or futile results, or where failure to allow a *de minimis* exemption is contrary to the primary legislative goal." Id, at 1535. Because EPA's regulation avoided a "mammoth monitoring burden" and yet "square[d] with the health-protective purpose of the statute," the Court concluded that to require a different result would be "to adjudge Congress incompetent to fashion a rational legislative design." Id. at 1534-35.

[52] In the final rule EPA described these exemptions as "health-based compliance alternatives."

> "where health thresholds are well-established…and the pollutant presents no risk of other health effects, including cancer, for which no threshold can be established[53]…."

As identified in Appendix 4, many of the HAPs within these categories are potential or demonstrated carcinogens. Because no meaningful studies have been conducted, EPA has identified both HCl and manganese as unclassifiable for carcinogenicity. For this reason it cannot be asserted that a "well-established" threshold exists and that there is no risk of cancer.

Moreover, EPA's Integrated Risk Information System ("IRIS") reports that no studies have identified a No Observable Effects Level ("NOEL") for neurological effects for manganese[54]. Further, the CAA requires that a section 112(d)(4) standard include "an ample margin of safety." EPA's IRIS report concludes that the scientific confidence in the Oral Reference Concentration for HCl employed by EPA in the ICI Boiler "risk-based exemption" is "low.[55]" For this reason, it cannot be said that the "well established" threshold that provides an "ample margin of safety" has been established for HCl.

EPA has acknowledged that these "exemptions" are not "emission standards" for a category or subcategory under section 112(d)(2) but "alternative standards for individual sources that demonstrate eligibility." EPA Brief. at 55.[56] Such alternative emission standards are authorized under section 112 only for sources that meet the early reduction requirements of section 112(i)(5). Broader approaches for alternate emission standards were specifically rejected by Congress in the development of section 112.[57]

Whatever authority EPA may have under section 112(d)(4) was not delegated to state and local permitting authorities under section 112(j). The CAA distinguishes between the Administrator's authority to set nationwide standards (reserved to the Administrator) and the authority to issue individual permits where a nationwide standard has not been issued (provided to "the Administrator[58] [or the State]"). See, sections 112(j) (4) and (5).

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[53] S. Rep. No. 228, 101st Cong. 1st Session, (December 20, 1989), reprinted in *A Legislative History of the Clean Air Act Amendments of 1990* (Comm. Print 1993), at 8511.

[54] See, http://www.epa.gov/iris/subst/0373.htm; http://www.epa.gov/ncea/iris/subst/0396.htm.

[55] The IRIS report concludes "[t]he chronic study used only one dose and limited toxicological measurements. The supporting data consist of two subchronic bioassays; the database does not provide any additional chronic or reproductive studies. Therefore, low confidence was recommended for the study, database, and the RfC".

[56] *Initial Brief of Respondent United States Environmental Protection Agency,* No. 04-1385, September 18, 2006.

[57] Congress specifically rejected an amendment that would have provided that individual sources "could comply with alternative emission limitations in lieu of standards under this section, if the owner or operator presents evidence sufficient to demonstrate that emissions from the source in compliance with such limitations present a negligible risk to public health under criteria issued by the Administrator." 2 Legislative History, at 3939. The Act itself provides a specific alternative emission standard for coke oven batteries. Thus, a risk-based exemption for specific sources is contrary to the statutory structure and would not be approved under a *de minimis* test, even if the emissions impacts were trivial.

[58] There may be instances where EPA manages the Title V program (e.g., on Indian lands) and is obligated to issue the section 112(j) permit.

Section 112(j) does not contain language authorizing states to develop risk-based standards. While it does reference the alternate emission standards available under section 112(i)(5), it does not contain any reference to section 112(d)(4). Instead, permits under section 112(j) shall contain limitations that the state determines to be "equivalent to the limitation that would apply to such source if an emission standard had been promulgated in a timely manner under subsection (d)…." Here, the difference in treatment between sections 112(i)(5) and 112(d)(4) and EPA's acknowledgement that its risk-based exemptions are not "emission standards" under section 112(d), undercut any argument that state and local permitting authorities have the authority to provide such exemptions.

Lastly, EPA's approach to risk assessment ignores existing background concentrations of HAPs and is far too simplistic an approach to provide an "ample margin of safety" as a technical matter. It also fails to consider the risk of other HAPs that for which HCl is serving as a surrogate. EPA's history over the past 40 years in attempting to develop a risk-based approach to regulations of toxic air emissions, and in particular the development of residual risk programs under section 112, demonstrate that these issues are far too complex and significant to be delegated to individual sources as EPA intended.

Total Selected Metals Alternate Compliance Option

NACAA recommends against inclusion of EPA's provision that would have authorized sources to limit emissions of Total Selected Metals (TSM) in lieu of limiting PM emissions. The effect of this alternative was to authorize sources with high manganese emissions that employed the risk-based exemption, above, to avoid controlling the other seven metallic HAPs within the TSM group. For many sources, manganese emissions constitute 80 percent or more of TSM emissions. Under EPA's vacated TSM provision, these sources would have been authorized to (1) demonstrate that manganese emissions met the risk-based exemption and (2) assume, thereafter, that manganese levels were zero in computing compliance with EPA's TSM limit of 0.0003 lb/MMBtu. Thus, the effect of EPA's approach would be to effectively multiply the limit for the other seven TSM by a factor of five, without any reference to MACT floor data for those metals or for PM. EPA offered no technical justification for this approach and we can find none.

We also believe that TSM emissions data are limited and not as likely to provide a MACT floor that accurately reflects the best performing sources as PM data. Given the variability of metals content in fuels, the most effective MACT is control of fine PM emissions coupled with periodic fuel sampling. Accordingly, NACAA recommends that in most instances TSM limits be discouraged. NACAA strongly disagrees with that portion of EPA's vacated rule that would have relied solely on fuel sampling to determine compliance with TSM, but only require fuel sampling once every five years (even where the source of the fuel changed). This latter provision would clearly not be sufficient to ensure continuous compliance.

Establishing Limits for ICI Boilers That Burn Mixed Fuels

EPA's vacated rule contained subcategories for "solid-fueled" boilers of different sizes, but did not distinguish between types of solid fuel employed. This simplified the determination of the appropriate limit where a source employs a mixture of fuels, but only to a degree – since there are a number of sources that combust a combination of solid, liquid and gaseous fuels. There appear to be several available approaches. NACAA recommends that, in any event, the source demonstrate the ability to comply with the "pure limit" (i.e., the limit that applies when the source is only combusting one type of fuel) for each type of fuel it wishes to combust. Once the source has established the capability of complying using unmixed fuels, then it would appear that the permitting authority has two options:

1. Assume that the process behaves in a linear fashion and calculate a weighted average emission limit based on the unmixed limits and the percentage of each type of fuel that is being combusted; or

2. Assume that the emissions performance of the system is not necessarily linear (or knowable) and conduct stack tests using the desired mix of fuels and the assumed best operation of the control device.

Under either approach, the emission limit when utilizing mixed fuels should be lower than the limit derived for the "dirtiest" fuel.

Establishing CO Limits During Turndown Periods

The emissions data on which NACAA's recommended CO MACT floor limits are based typically represent source operations at 80 percent or more of maximum rated load. NACAA recognizes that some well-controlled sources may not be able meet those limits during transient operations or low-load operation. For units that normally operate at or near maximum rated load, the exemption for startup and shutdown operations may suffice to address this issue. Other units may operate for extended periods of time at less than 50 percent of rated load. In these circumstances, an additional emission limit should be established, based on the control techniques that would need to be employed to meet the MACT floor at rated load. Where the unit normally operates at less than 50 percent rated load, the permitting authority should ensure that the unit is tuned for best performance at its normal operating load.

Compiling an Administrative Record

The Permit Guidance includes a reference to a generic administrative record on NACAA's website that, along with site-specific information provided by the source in its Part 2 application, would provide a basis to support the permitting and rulemaking decisions made by the permitting authorities as they are engaged in the section 112(j) process.

Establishing MACT Limits for New ICI Boilers

Section 112(j) requires permitting authorities to develop MACT limits for new[59] sources as well as existing sources. An ICI Boiler heater is "new" if commencement of construction of the unit occurred after January 13, 2003. For the most part the process is similar to that employed in establishing existing source MACT requirements. The permitting authority must establish a MACT floor and conduct a MACT analysis. For new sources the MACT floor is to be set at the emission level achieved in practice by the best controlled similar source. NACAA has not included specific recommendations for new boiler MACT floors because the result is dependent on the performance of a single unit. While the NACAA-recommended surrogates, subcategories, emission data and variability factors can be used by permitting authorities to develop new source MACT floors, NACAA recommends that agencies undertake additional efforts to identify the most current information concerning the "best performing similar source" during the permitting of any new ICI Boiler. In addition, the new source MACT analysis is likely to include lower costs for most control options than in retrofit installations.

Section 112(j) also requires a review of permits issued under section 112(g) to determine whether the earlier limits are substantially equivalent to the limits that would be required under section 112(j). If those limits are not substantially equivalent, the earlier permit is to be revised to incorporate the more stringent limits. This may occur because of differences in the applicability of section 112(g) and section 112(j). For new greenfield facilities, sections 112(g) and (j) apply to the same units. However, the definition of "construct a major source" under section 112(g) excludes new units at an existing source where emissions are routed through a previously installed control device or where a proposed control device achieves emission reductions that are comparable to BACT levels (without consideration of a MACT floor).

[59] The requirements for new sources also apply to those sources that meet the definition of "reconstructed" sources.

Compliance Demonstrations

Permitting authorities should consider the use of the reference methods employed in establishing the MACT floor in setting emission limitations based on the floor. These data are normally the average of three one-hour runs. Accordingly, where the MACT floor is relied upon in setting the limit, shorter averaging periods should not be used for compliance purposes. Where continuous CO, mercury ("Hg"), PM or parametric monitoring is determined to be the basis of the compliance demonstration, averaging periods should not be less than three hours. However, where the permitting authority establishes a technology (such as use of a fabric filter) as MACT, any authorized method (such as an approved alternative to a Federal Reference Method) and its associated averaging period may be employed.

The variability factors identified above are based on the variability associated with repeated reference method tests of an individual unit and are intended for those situations where the permitting authority identifies reference testing, rather than continuous monitoring, as the compliance mechanism. The MACT standards are established to protect against chronic toxic effects. For this reason, averaging periods of up to 30 days may be appropriate; NACAA recommends rolling 30-day averages where continuous monitoring is employed. In these situations, the variance associated with repetitive testing tends toward zero and so a lesser compliance margin may be appropriate. NACAA believes that it is important, however, not to discourage the use of continuous monitoring by an overly stringent adjustment. Permitting authorities are encouraged to balance the competing interests in this area.

NACAA recommends against incorporating EPA's language that states that "exceedances" of operating parameters established to ensure compliance with emission limitations are not violations of the permit. Such "exceedances" should be considered violations of the permit, except where they are part of a CAM or CAM-like plan where the operating parameters are set to correlate with a level of performance that is more stringent than the emission limit. Where a permitting authority establishes parametric monitoring as part of a CAM plan, it should also establish enforceable parameters that correlate to the emission limit.

Model Permit Provisions

NACAA recognizes that many permitting authorities have specific formats developed for Title V permitting. Those formats should be employed for section 112(j) permits. The following outline is intended to illustrate the issues that need to be addressed and suggest language that permitting authorities may find helpful.

Authority

In addition to the permitting authority's standard boilerplate of authorities, the permit should state that it is being issued pursuant to 42 U.S.C. 7412(j), 40 C.F.R. Part 63, and the delegations of authority found at **{cite to the delegation/approval of the state program by EPA and any state laws and regulations that transfer authority to the permit issuer}.** The permit should also reference the necessary predicates (e.g., that the source is a major source pursuant to section 112 and 40 C.F.R. Part 63 and any analogous state regulations).

Definitions

In addition to the permitting authority's standard reference to state- or locally-defined terms, the permit should state that the words in this permit have the meaning assigned in 40 C.F.R. 63.2.

Covered Units

The permit should specifically identify all "industrial boilers and process heaters" at the source as "covered units" in the modification of the Title V permit. Ordinarily, the Title V permit will have set out specific unit identifiers that should be used for this purpose. This description should include existing pollution controls and may (in a state with a merged NSR permit program) include a description of the controls the source seeks to add.

Procedural Issues

The permit should reference that a MACT analysis was performed for each covered unit and that the emission limits selected by the permitting authority are no less stringent than the MACT floor determined by the permitting authority. The permitting authority should also ensure that all public participation requirements set out in the General Provisions or required by state law have been met.

Emission Limitations

Emission limits may be expressed as is customary in each state; most states will simply develop a table or series of tables (one for each emission unit):

Unit 527 – 250 MMBtu/hr Process Boiler

Pollutant	Emission Rate	Measurement Method
Particulate Matter (PM)	0.015 lb/MMBtu 3-hour block average	Method xx 40 CFR XXXX Incorporated as 9 VAC YYYY
Carbon Monoxide	3.5 ppm @ 3% excess O_2, 30-day rolling average, rolled every 15 minutes	CO CEM per 40 CFR XXX, incorporated as DEQ regulation 9 VAC-XXXX
Hydrogen Chloride	0.0006 lb/MMBtu 3-hour block average	Method ZZZ, 40 CFR ZZZ incorporated as 9 VAC ZZZ
Mercury	2.50 lb/TBtu 30-day rolling average, rolled every 60 minutes	Hg CEM per 40 CFR QQQ, incorporated as 9 VAC QQQ

Glossary of Abbreviations and Acronyms

ACI – Activated Carbon Injection
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990
BACT – Best Available Control Technology
CAIR – Clean Air Interstate Rule
CAM -- Compliance Assurance Monitoring
CAMR – Clean Air Mercury Rule
CEM – Continuous Emissions Monitor
CEMS – Continuous Emissions Monitoring System
CFR – Code of Federal Regulations
CMS – Continuous Monitoring System
CO – Carbon Monoxide
COM – Continuous Opacity Monitor
ESP – Electrostatic Precipitator
FR – Federal Register
HAP(s) – Hazardous Air Pollutant(s)
HCl – Hydrogen Chloride
HF – Hydrogen Fluoride
Hg – Mercury
ICI Boiler– Industrial, Commercial and Institutional Boiler and Process Heater
ICR – Information Collection Request
IRIS – Integrated Risk Information System
LAER – Lowest Achievable Emission Rate
lb/MMBtu – Pounds Per Million British Thermal Units
lb/MW/hr – Pounds Per Megawatt-hour
lb/TBtu – Pounds Per Trillion British Thermal Units
MACT – Maximum Achievable Control Technology
Mn – Manganese
MW – Megawatt
NAAQS – National Ambient Air Quality Standards
NACAA – National Association of Clean Air Agencies
NESHAP – National Emission Standards for Hazardous Air Pollutants
NOEL – No Observable Effects Level
NO_x – Oxides of Nitrogen
NSR – New Source Review
PEMS – Predictive Emissions Monitoring System
PM – Particulate Matter
PM_{10} – Particulate Matter of 10 Microns in Diameter or Less
$PM_{2.5}$ – Particulate Matter of 2.5 Microns in Diameter or Less
ppm – Parts Per Million

RACT – Reasonably Available Control Technology
SO_2 – Sulfur Dioxide
TSM – Total Selected Metals (Arsenic, Beryllium, Cadmium, Chromium, Lead, Manganese, Nickel, Selenium)
WESP – Wet Electrostatic Precipitator

APPENDIX 1 – Example Section 112(j) Part 1 Application

DEQ

Michigan Department Of Environmental Quality - Air Quality Division

National Emission Standards for Hazardous Air Pollutants
40 CFR Part 63 Section 112(j) Affected Sources
Part 1 Notification

Submittal of the completed form to the Michigan Department of Environmental Quality, Air Quality Division (AQD) will fulfill the 40 CFR Part 63 Part 1 application requirement for implementation of Section 112(j) of the federal Clean Air Act. Failure to submit information required by Article II, Chapter 1, Part 55 (Air Pollution Control) of P.A. 451 of 1994, as amended, and the Federal Clean Air Act may result in civil or criminal penalties.

1. Stationary Source Name			2. SRN
3a. ROP No.	3b. ROP Section No.	4. Primary SIC Code	5. Secondary SIC Code
6a. Address (Street Number and Name)			
6b. Address Continued			
6c. City		6d. Zip Code	6e. County
7. Location if street address is not available	a. Section	b. Township	c. Range
8. Contact Name and Title			
9. Contact Phone Number		10. Contact E-mail Address	

11. This Stationary Source has emission units subject to the following MACT Source Category or Categories:

G1 Automobile & Light Duty Truck Manufacturing	**C1** Chlorine Production	**T1** Asphalt Roofing & Processing
G2 Brick, Structural Clay Prod. & Clay Ceramics Mfg.	**C2** Flexible Polyurethane Foam Fabrication Operations	**T2** Coke Ovens: Pushing, Quenching & Battery Stacks
G3 Fabric Printing, Coating & Dyeing	**C3** Hydrochloric Acid Production/Fumed Silica	**T3** Combustion Turbines
G4 Friction Products Manufacturing	**C4** Municipal Solid Waste Landfills	**T4** Engine Test Cells/Stands
G5 Lime Manufacturing	**C5** Organic Liquids Distribution (non-gas)	**T5** Integrated Iron and Steel Manufacturing
G6 Metal Can (Surface Coating)	**C6** Reinforced Plastic Composites Production	**T6** Iron and Steel Foundries
G7 Metal Furniture (Surface Coating)	**C7** Semiconductor Production	**T7** Plywood & Composite Wood Products
G8 Misc. Metal Parts & Products Coating	**C8** Site Remediation	**T8** Primary Magnesium Refining
G9 Plastic Parts & Products Coating	**C9** Haz. Waste Combustors Phase II: Boilers & HCl Production Furnaces	**T10** Industrial, Commercial & Institutional Boilers & Process Heaters
G10 Refractories Manufacturing	**C10** Miscellaneous Organic NESHAP (Note: 23 individual source categories are included in this grouping - see instructions for further information)	**T9** Reciprocating Internal Combustion Engines
G11 Taconite Iron Ore Processing		**O1** Other
G12 Wood Building Products (surface coating)		**O2** Other

Note: If requesting a determination of MACT applicability in accordance with 40 CFR 63.52(d), Item 11 may remain blank. Sufficient information should be provided in Item 12 and/or an AI-001 form for the AQD to make the determination. (See instructions.)

12. Identify the types of emission points belonging to each relevant source category by providing the associated ROP/ MAERS/ PTI Emission Unit ID(s) for the MACT standard code(s) checked in Item 11.

13. Section 112(g) affected sources -Identify any affected sources for which a Section 112(g) MACT determination has previously been made by providing the associated ROP/ MAERS/ PTI Emission Unit ID(s).

14, Additional Information ID – *Create an Additional Information (AI) ID that is used to provide any supplemental information on AI-001 regarding this submittal.*

AI

This form must be signed and dated by a Responsible Official.

15. Name and Title of the Responsible Official. *Print or type.*

As a Responsible Official, I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this submittal are true, accurate and complete.

Signature of Responsible Official

Date

INSTRUCTIONS FOR COMPLETING THE PART I NOTIFICATION FORM

National Emission Standards for Hazardous Air Pollutants 40 CFR Part 63 Section 112(j) Affected Sources

"40 CFR 63.53 Application content for case-by-case MACT determinations.

(a) Part 1 MACT Application. The Part 1 application for a MACT determination shall contain the information in paragraphs (a)(1) through (4) of this section.

(1) The name and address (physical location) of the major source.

(2) A brief description of the major source and an identification of the relevant source category.

(3) An identification of the types of emission points belonging to the relevant source category.

(4) An identification of any affected sources for which a Section 112(g) MACT determination has been made."

AQD staff may request submission of additional information and the applicant must respond to such requests in a timely fashion. See 40 CFR 63.52 and 63.53 for further information on the federal requirements for application content, the approval process and time frames for action.

Please print or type clearly when completing this application.

1. **Stationary Source Name –** Provide the specific name that identifies the Stationary Source of the application.

2. **SRN –** Enter the State Registration Number assigned to the Stationary Source.

3a. **ROP No. –** Enter the Renewable Operating Permit (ROP) Number if the Stationary Source has been issued an ROP.

3b. **ROP Section No.** -Enter the Section Number from the ROP if the Stationary Source has been issued an ROP that has more than one Section.

4. **Primary SIC Code –** Provide the primary Standard Industrial Classification (SIC) Code for this Stationary Source. The primary SIC Code is that which results in the most actual emissions of air contaminants from the Stationary Source. See Appendix D of "RO Permit Application Form Instructions" for a list of SIC Codes.

5. **Secondary SIC Code** - If applicable, provide the secondary SIC Code for this Stationary Source. The secondary SIC Code is that which results in the second most actual emissions of air contaminants from the Stationary Source. See Appendix D of "RO Permit Application Form Instructions" for a list of SIC Codes.

6a-e. **Address –** Provide the address for the physical location of the Stationary Source identified above. A list of County names is available in Appendix C of "RO Permit Application Form Instructions."

7. **Location** - Provide the following information only if a street address is unavailable.
   a. Section: Provide the USGS geographic section code. This is a two digit number.
   b. Township: Provide the USGS geographic township code. This is a number followed by N or S.
   c. Range: Provide the USGS geographic range code. This is a number followed by E or W.

8. **Contact Name and Title. –** Provide the name and the professional title of the contact person (e.g., Plant Manager, Shift Supervisor, or Consultant).

9. **Contact Phone Number.** Provide the telephone number and extension, if applicable, of the contact.

INSTRUCTIONS FOR COMPLETING THE PART I NOTIFICATION FORM

10. **Contact E-mail Address.** Provide the e-mail address of the contact.

If the applicant is requesting that the AQD make the MACT applicability determination, Item 11 may be left blank; however, detailed information must be provided in Item 12 and/or on an AI-001 form. (See Item 12 and Item 14 instructions.)

11. **This Stationary Source has emission units subject to the following MACT Source Category or Categories:**

The source categories listed are those for which a National Emission Standard for Hazardous Air Pollutants (NESHAPS) was not promulgated by the United States Environmental Protection Agency (U.S. EPA)before an applicable Section 112(j) deadline. Information about NESHAPS applicability and the Section 112(j) implementation process may be found at the U.S. EPA Air Toxics Website at http://www.epa.gov/ttn/atw. Information about implementation of Section 112(j) provisions in Michigan is available at http://www.deq.state.mi.us/aps.

Indicate which Maximum Achievable Control Technology (MACT) source category or categories may apply to emission units at this Stationary Source by checking the associated box. Note that the Miscellaneous Organic (MON) NESHAP covers 23 source categories*. Check the MON NESHAPS box if any of these categories may apply to emission units at the Stationary Source.

* Alkyd Resins Production; Ammonium Sulfate Production; Benzyltrimethylammonium Chloride Production; Carbonyl Sulfide Production; Chelating Agents Production; Chlorinated Paraffins Production; Ethyllidene Norbomene Production; Explosives Production; Hydrazine Production; Maleic Anhydride Copolymers Production; Manufacture of Paints, Coatings, & Adhesives; OBPA/1, 3-diisocyanate Production; Photographic Chemicals Production; Phthalate Plasticizers Production; Polyester Resins Production; Polymerized Vinylidene Chloride Production; Polymethyl Methacrylate Resins Production; Polyvinyl Acetate Emulsions Production; Polyvinyl Alcohol Production; Polyvinyl Butyral Production; Quaternary Ammonium Compounds Production; Rubber Chemicals Production; and Symmetrical Tetrachloropyridine Production.

Section 112(d) MACT standards may not be promulgated by May 15, 2002, for the following additional source categories: PVC & Copolymer Production (Subpart J); Primary Copper Smelting (Subpart QQQ); Petroleum Refineries (Subpart UUU); Paper & Other Web Coating (Subpart JJJJ); Large Appliance Surface Coating (Subpart NNNN); Metal Coil Coating (Subpart SSSS); Cellulose Products Manufacturing (Subpart UUUU); and Rubber Tire Manufacturing (Subpart XXXX). In this event, if emission points at this stationary source may belong to any of these categories, the “Other” box(es) in Item 11 must be checked and the name of the source category provided. Refer to U.S. EPA Region 5’s Air Toxics Website http://www.epa.gov/region5/air/toxics/mact-fr3.htm for current information on the status of MACT standards promulgation.

12. **Identify the types of emission points belonging to each relevant source category by providing the associated ROP/ MAERS/ PTI Emission Unit ID(s) for the MACT standard code(s) checked in Item 11.** -In Michigan, emission points are commonly described as “emission units” and will be allowed to be identified accordingly. However, the emission points may be described below the emission unit level if necessary to adequately describe the emission point(s).

For each source category checked in Item 11, provide the Emission Unit ID(s) from the Stationary Source’s current ROP, Permit to Install (PTI) or Michigan Air Emission Reporting System (MAERS) report for all emission units that may be subject to that MACT standard. If more than one source category is checked, associate the Emission Unit ID(s) with the code that is given under the checkbox in Item 11 (e.g., EUBOILER1 & EUBOILER2 = T2; EUREACTOR1 through EUREACTOR9 = C9). Further information on which emission units are associated with each of the checked categories may be provided with this submittal on an AI-001 form.

If a determination of MACT applicability by the AQD is being requested for this stationary source, sufficient information must be provided to the AQD to make the determination. The following information must be included in Item 12 (or on an AI-001 form if additional space is needed) for all applicability determination requests:

- a statement that determination of MACT applicability is being requested
- an identification of each point of emission for each hazardous air pollutant or, if a definitive identification is not yet possible, a brief description of the nature, size, design and method of operation of the source.

13. **Section 112(g) Affected Sources -Identify any affected sources for which a Section 112(g) MACT determination has previously been made by providing the associated ROP/ MAERS/ PTI Emission Unit ID(s)**. If a New Source Review Permit to Install (PTI) was previously issued by the AQD that included a Section 112(g) MACT determination, provide the associated Emission Unit ID(s) from the Stationary Source's current ROP or MAERS report. If the applicable requirements from the PTI have not yet been incorporated into the ROP, provide the PTI Number and the associated Emission Unit ID(s).

14. **Additional Information ID –** Create an Additional Information (AI) ID for any additional information or attachments being provided on AI-001. Refer to AI-001 instructions to create the ID. If the additional information or attachment is more than one page, label each page to show the relationship between pages.

    If a determination of MACT applicability by the AQD is being requested for this stationary source, sufficient information must be provided to the AQD to make the determination. If not provided in Item 12, the following information must be provided on an AI-001 form for all applicability determination requests:
    - a statement that determination of MACT applicability is being requested
    - an identification of each point of emission for each hazardous air pollutant or, if a definitive identification is not yet possible, a brief description of the nature, size, design and method of operation of the source.

15. **Responsible Official -**This form must be signed by a Responsible Official authorized pursuant to R 336.1118(j) (Rule 118(j)). Print or type the name of the Responsible Official, followed by the professional title of the Responsible Official (e.g., President, Secretary, Treasurer, or Vice President). Provide signature and date where indicated.

The completed Section 112(j) Part 1 Notification and any attachments must be submitted to the attention of the appropriate Air Quality Division District Supervisor by May 15, 2002. The submittal must also be copied to U.S. EPA, Compliance and Enforcement - Michigan (AE-17J), 77 West Jackson Boulevard, Chicago, IL 60604.

APPENDIX 2 – Example Section 112(j) Part 2 Application

STATE OF DELAWARE
Department of Natural Resources and Environmental Control
Application for a 112(j) MACT Determination

AQM - J

Part 2

For Section Use Only

I.D. Number

Date Received

1. Name of plant or establishment

Date of application

2. Physical location of source (Street)

City

3. If constructing, reconstructing or modifying, provide following dates

Estimated commencement date **Estimated completion date** **Estimated start up date**

4. HAPs emission rates

Annual emission rate (At maximum capacity)

HAPs emitted	Uncontrolled	With controls
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year

If additional space is required, complete on blank page and attach

5. HAPs emission rates

Annual emission rate (At expected utilization)

HAPs emitted	Uncontrolled	With controls
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year
	Tons/year	Tons/year

If additional space is required, complete on blank page and attach

6. List any applicable Federal, State or Local limitations or requirements

If additional space is required, complete on blank page and attach

STATE OF DELAWARE Department of Natural Resources and Environmental Control Application for a 112(j) MACT Determination	AQM - J Part 2

7. Name of plant or establishment

8. Describe the current control technology in use for each emission source within the affected 112(j) source category

Emission source	Control technology	Manufacturer

9. Attach relevant information to assist in development of the MACT floors for existing and new affected 112(j) sources

For example:

- **Identify other similar facilities in the applicable 112(j) source category**
- **Identify other similar facilities in other source categories**
- **Identify, if known, the capacity of these similar sources**
- **Identify, if known, the control technology in use for the emission sources at these similar sources**
- **Identify, if known, the HAPs emitted at these similar sources**
- **Identify, if known, the controlled and uncontrolled HAPs emissions at these similar sources**
- **Identify, if appropriate, any trade association that is developing industry-wide recommendations for MACT floor determinations and MACT requirements**

10. I certify, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

By : _____ **Title :** _____

_____ **Date :** _____

Typed or Printed Name of Signatory

APPENDIX 3 – NACAA's Request for ICI Boiler Data

NACAA
national association of clean air agencies

November 15, 2007

Dear NACAA Member:

Section 112 of the Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to promulgate a National Emission Standard for Hazardous Air Pollutants[60], often referred to as a "MACT Standard," for each identified category and subcategory of sources of emissions of a lengthy list of hazardous air pollutants (HAPs) in accordance with schedules developed pursuant to Section 112(e)[61] of the Act.

The U.S. Court of Appeals for the District of Columbia has "vacated" several MACT standards promulgated by EPA, including the MACT standard for the category designated as "Industrial Boilers and Process Heaters." This category includes approximately 57,000 units that combust coal, natural gas, distillates, residual oils, wood and agricultural materials. EPA has determined that the Court's decision to vacate this standard triggers the obligations under section 112(j) of the CAA[62]. Under section 112(j) sources within the category must obtain Title V permits[63] issued by state permitting authorities on a case-by-case basis incorporating emission limits that the state determines are "the equivalent emission limitation" that would have applied if EPA had issued the MACT standard in a timely manner. Such permits must be issued within 18 months of receipt of a permit application from the source and must be based on "all available information." In addition, within 60 days of submittal of a Part 2 application, the permitting authority must notify the source operator in writing of its determination as to whether the application is complete.

Because of the potentially significant workload resulting from these activities, the large number of potentially affected sources and the relatively short deadlines for state action imposed by the CAA, the Board of Directors of the National Association of Clean Air Agencies has invested resources to assist the states in developing MACT permits for the Industrial Boiler and Process Heater category. A technical workgroup, with representatives from approximately 15 state and local air pollution control agencies, has been formed to review available information and provide recommendations for plant-by-plant MACT determinations and development of new and existing source MACT floors. A consultant has also been retained to assist the workgroup in gathering relevant information, collating this information in a usable format and drafting a "model rule" that individual states may draw from as they see fit.

EPA has been and will continue to be involved in this process. We have met with EPA senior managers and technical staff on several occasions and have received excellent cooperation to date. EPA

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[60] Such standards are required to be based on the application of "maximum achievable control technology" and are colloquially known as "MACT standards."
[61] 42 U.S.C. 7412(e)
[62] In a pleading filed with the Court of Appeals on May 4, 2007, seeking vacatur of the standard, the U.S. Department of Justice asserted on behalf of EPA that "EPA recognizes that vacatur of the standards will trigger the requirements of Clean Air Act sections 112(g) for new sources and 112(j) for existing sources."
[63] Presumably, this includes modifications to existing Title V permits as well as new Title V permits for sources covered by the listed categories.

staff has been quite helpful in identifying existing sources of information. It is our intent throughout this process to work with EPA to gather information in a manner that avoids duplication of effort and inconsistent data-gathering formats. However, EPA's data is quite limited and much of it is more than a decade old. As a consequence, EPA is contemplating a multi-tiered data gathering exercise as part of its future rulemaking efforts. This information may not be available to the states in a timeframe consistent with section 112(j) requirements.

For this reason we are asking each of the states to provide NACAA with information we believe is needed for the states to draft permits as required by section 112(j). We will collate this information and make it available to each state so that it can satisfy section 112(j)'s obligation that MACT determinations be made on the basis of "all available information." As a general matter, this information includes for all industrial boilers and process heaters:

(1) controlled and uncontrolled CO, PM and SO_2 emission data;
(2) any HAP emission data;
(3) any data correlating HAP emission control with control of criteria pollutants;
(4) cost and performance data – especially for good controls on small- and medium-size boilers and process heaters; and
(5) fuel sampling data for coal, wood and liquid fuels.

We are providing electronically with this letter EPA's spreadsheet that identifies those units that EPA believed, in 1998, to be in the category subject to these requirements. We believe this database contains a number of errors and ask that you review it to assist in determining the affected universe so that NACAA and states can accurately calculate MACT floors. We also are providing electronically Excel spreadsheet formats and more specific information about the data requested that, in the interests of providing consistent and comparable information to the states, we ask you to use in responding to this request. We ask that you provide this information electronically to Mary Sullivan Douglas of NACAA at mdouglas@4cleanair.org by **December 18, 2007.**

We will hold a conference call on November 27, 2007 from 3:00 to 4:00 p.m. (Eastern time) to answer general questions about this request. The call-in number is (866) 365-4406 (passcode 6055799#). If more than one person from your agency will participate, we ask that they try to do so from the same telephone, to minimize the number of lines needed. Also, please feel free to call Mary Sullivan Douglas at 202-624-7864, Bruce Buckheit at 703-280-1383 or any member of the NACAA technical review committee (list provided electronically) if you have any suggestions at to how best to expedite this process or if you have any specific questions not likely to be addressed on the conference call.

I understand that this data request will require that you divert scarce resources from other priorities. However, I am convinced that this process will prove to be the most efficient way to reach the environmentally responsible decisions that I know you strive for.

Our plan for the model rule is to develop a draft this winter, followed by a review period. We hope to complete the document by early spring 2008. We thank you for your assistance with this effort.

Sincerely,

S. William Becker

ADDITIONAL INFORMATION RESPECTING NACAA BOILER MACT INFORMATION REQUEST

The NACAA information request generally seeks: (1) controlled and uncontrolled CO, PM, and SO2 emission data; (2) any HAP emission data; (3) any data correlating HAP emission control with control of criteria pollutants; (4) cost and performance data for HAP emission reduction measures, especially for small and medium size boilers and process heaters and (5) fuel sampling data for coal, wood and liquid fuels. This memorandum is intended to provide additional information concerning the request and to answer several questions that have been anticipated.

The data sought by NACAA is limited to existing data and is not intended to lead to additional testing of sources. State and local authorities are; of course, free to require additional testing as they see fit. For HAP emission data, we ask that you simply forward the information electronically in whatever format is most convenient for you. The most useful HAP information is testing that enables us to determine whether a correlation exists between HAPs of concern and criteria pollutants. Initial work suggests that such a correlation may exist between CO emissions and organic HAPs, SO_2 emissions and acid gas HAP emissions and PM emissions and metal HAP emissions. If the state or local authority has not formatted its HAP data electronically, we suggest the format set out below. It is likely that there is substantially more data concerning criteria pollutants emitted by this category and so we request, where practicable, that state and local authorities use the attached spreadsheet.

Initial work also suggests the following subcategories based on type of fuel: (1) coal (all types, including waste coal); wood (including woody materials and other solid organic renewable fuels, such as bagasse); oil (all types) and gaseous fuels (all types). Where a source is actually fueled by multiple types of fuel on a regular basis, please so indicate and advise which type of fuel (including, where applicable a combination of types) the emissions data and limits represent. If one type of fuel is predominantly combusted by dual fuel capacity units, please classify that source in the appropriate subcategory.

You may also submit data concerning "similar" sources, even though they are not in the industrial and commercial boiler and process heater category, since emissions from such sources may be relevant to development of the Model Rule. If you do so, we ask that you provide a note in the "comments" section. EPA's source category listing for this category included direct-fired process heaters, but the vacated rule did not. Since we cannot now determine what path EPA will ultimately adopt, we are seeking information for the entire listed category, including direct-fired process heaters. Please identify any such sources in the comment section and include a notation for any such heaters that are subject to regulation under other MACT rules. Similarly, an undetermined number of units that combust waste materials may ultimately be subject to regulation under section 129 of the CAA rather than under section 112. EPA has wrestled with this issue for a number of years and it may be several more years before this issue is finally resolved. In addition to uncertainty as to the size and makeup of facilities subject to section 129, no determination has yet been made as to whether states are required to conduct case-by-case 112(j) MACT determinations until such time as EPA revises its definition of waste and promulgates a regulation under section 129. Pending resolution of these issues, we believe it is appropriate to at least gather information that will allow us to determine whether inclusion of

potential section 129 sources in the MACT floor data base will materially alter the determination of the MACT floors for different subcategories of units that do not burn waste.

State and local authorities may have emissions data on a particular unit that represents numerous tests over a substantial number of years. In such instances, please submit only the most recent three test results that you believe are representative of source operation under the tested conditions. Where test results vary because of known reasons, or you believe a test result is an outlier that does not accurately reflect plant emissions, please provide a comment in the "comment" field. In order to provide for comparison of common data, we have asked that all emissions date be provided in a "lb/mmbtu" format. Please let us know if this request poses a large resource problem or is inappropriate for a particular pollutant.

NACAA is also seeking performance and cost information on good performing HAP reduction options, especially for small and medium sized sources within the category. These options may include new and emerging technologies for pollution prevention or material substitutions as well as combustion or post combustion controls. We ask that you provide any information you may have on available options, in whatever form you have, including any MACT, RACT, BACT or LAER decisions that may not have been entered in the RBLC. In addition, if your jurisdiction has imposed emission limits on any the above-listed pollutants that you believe might be relevant to consideration of facility-specific MACT determinations or the development of MACT floors; please provide information concerning the limits, the affected population and any information you may have about compliance with such limits.

We would also appreciate any information you would care to provide that is relevant to any of the issues that must be resolved in developing a Model Rule that is useful to NACAA's members. These issues include identification of "achievable" control measures, developing factors for consideration of cost and other issues, developing enforceable limits on the basis of the available data as well as "enhanced" monitoring and reporting requirements. Finally, we welcome any questions or comments that you may have concerning this project and the "MACT hammer" process under section 112 of the Clean Air Act.

DESCRIPTION OF FIELDS IN BOILER MACT TABLE

FIELD	DESCRIPTION
Facility Name	The name of the facility where the emissions source is located. E.g., Becker Oil and Refining Company.
Location	The geographic location of the facility-- city and state.
Unit ID	The identification number assigned by the facility to the emissions source (unit).
Process Description	Any additional information provided in the report that describes the unit's design or use.
Capacity	The operating capacity of the emissions unit expressed in mmbtu/hr.
Pollutant	Identify the specific pollutant.
Emissions	Emissions of the designated pollutant in lb/mmbtu. Please be sure to include all available data concerning mercury compounds, acid gas (SO_2, HCl and HF), CO, NO^{64}_x, PM and PM_{10} emissions.
Emission limit	Applicable limit(s) for the specified pollutant converted to lb/mmbtu, please identify the averaging period for the limit.
Uncontrolled emissions	Uncontrolled emissions of the designated pollutant in lb/mmbtu.
Unit Type	Code assigned to each type of emissions source. "B" indicates industrial boiler, "C" indicates commercial boiler, "D" indicates direct fired process heater, "I" indicates indirect fired process heater and "S" indicates that the source is likely a solid waste incinerator.
Comments	Any comments or supplemental information. Include in this column a notation ("C") where the testing was compliance testing that was intended to replicate reasonable worst case conditions for the source

[64] We have not identified a potential correlation between a HAP of concern in this sector and NO_x emissions. We have included this pollutant so as to be able develop a comprehensive data set that minimizes the possibility of a second information request for MACT development purposes and that provides useful information to state and local air program administrators involved in $PM_{2.5}$ and ozone reduction activities.

Fuel Information	Information provided regarding the type or composition of the fuel, including mercury, metals and sulfur content and moisture content (especially for wood waste).
Control Equipment	Description of the control device in use during testing and/or used to comply with the applicable emission limits.
Additional Capacity Information	Any additional information regarding the design capacity of the unit.
MACT Status	Using the following codes, indicate whether a MACT Part 1 ("M1") or Part 2 ("M2") application has been received and whether the emissions unit was certified as in compliance with the now vacated Boiler MACT standard ("MC"). Also indicate whether the emissions unit has been the subject of a MACT determination under section 112(g) ("112(g)"), 112(j) ("112(j)") or a BACT ("BACT") or LAER ("LAER") determination.
Contact	Contact information (name, telephone number and e-mail address) of the agency person designated to receive and response to queries concerning the data submission.

NACAA Boiler MACT Spreadsheet

(original version in Excel)

Page 1

Facility Name	Location	Unit ID	Process Description

Page 2

Capacity	Pollutant	Emissions	Emission Limit	Uncontrolled emissions	Unit type
(mmbtu/hr)		(lb/mmbtu)	(lb/mmbtu)	(lb/mmbtu)	

Page 3

Comments	Fuel Information	Control Equipment

Page 4

Additional control information	Additional capacity information	Data Date	MACT Status

Page 5

Contact

APPENDIX 4 – Summary of Health Effects of Hazardous Air Pollutants Emitted by ICI Boilers

Chronic exposure to acetaldehyde is known to cause adverse effects on the nasal epithelium and mucous membranes as well as increased kidney weight. Acetaldehyde is also classified as a Group B2, probable human carcinogen.

Long-term arsenic inhalation is associated with irritation of the skin and mucous membranes and an increased risk in women of adverse reproductive effects. Inhalation of inorganic arsenic is strongly associated with lung cancer as well as skin and bladder cancer. Arsenic is classified as a Group A, known human carcinogen.

Chronic benzene inhalation is known to be associated with blood disorders including reduced red blood cell counts and leukemia. EPA has classified benzene as a Group A, known human carcinogen.

The chronic effects of inhalation exposure to beryllium are focused in the lungs, where beryllium is associated with the formation of noncancerous lesions (berylliosis) and an increased risk of lung cancer. Beryllium is classified as a Group B1, probable human carcinogen.

Chronic cadmium exposure is known to cause kidney disease and may be associated with fetal defects at high doses. EPA has classified cadmium as a Group B1, probable human carcinogen based on animal studies that show an increase in lung cancer from long-term inhalation exposure to cadmium.

Chlorine is an irritant to the eyes, the upper respiratory tract and the lungs. Chronic exposure to chlorine has led to respiratory effects, such as eye and throat irritation and airflow reduction. EPA has not classified chlorine for potential carcinogenicity.

Hexavalent chromium is a particularly hazardous air pollutant and, like beryllium, affects the respiratory tract, causing bronchitis, pneumonia and other respiratory effects at high, chronic doses. At lower chronic doses hexavalent chromium has been associated with complications during pregnancy and childbirth, nasal and sinus irritation and damage, skin irritation and ulceration and eye irritation and damage. Hexavalent chromium is also associated with lung, kidney and liver damage and with lung cancer (when inhaled). Hexavalent chromium is classified as a Group A, known human carcinogen. Trivalent chromium is substantially less toxic than hexavalent chromium and is an essential element in humans (i.e., there is a recommended minimum intake for trivalent chromium). Trivalent chromium has been identified as a sensitizer that leads to skin sensitivity and allergic response as well as asthmatic responses, but is not classified as a carcinogen.

Formaldehyde is an irritant of the eyes, nose and throat. Exposure to formaldehyde is also associated with adverse reproductive effects as well as lung and nasopharyngeal cancer. EPA has classified formaldehyde as a Group B2, probable human carcinogen.

Chronic exposure to ethyl benzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethyl benzene. Limited information is

available on the carcinogenic effects of ethyl benzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethyl benzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethyl benzene as a Group D substance, not classifiable as to human carcinogenicity.

Human chronic exposure to hexane in air is associated with polyneuropathy – a neurological disorder that occurs when many peripheral nerves throughout the body malfunction simultaneously. Symptoms include numbness in the extremities, muscular weakness, blurred vision, headache and fatigue. Neurotoxic effects have also been exhibited in rats. No information is available on the carcinogenic effects of hexane in humans or animals. EPA has classified hexane as a Group D substance, not classifiable as to human carcinogenicity.

Long-term exposure of humans to fluoride at low levels has a beneficial effect of dental cavity prevention and may also be useful for the treatment of osteoporosis. Chronic inhalation exposure of humans to hydrogen fluoride has resulted in irritation and congestion of the nose, throat and bronchi at low levels. Increased bone density has been reported among workers chronically exposed to fluorides (including hydrogen fluoride) via inhalation. Damage to the liver, kidneys and lungs has been observed in animals chronically exposed to hydrogen fluoride by inhalation. EPA has not classified hydrogen fluoride for carcinogenicity.

Manganese is essential for normal physiologic functioning in humans and animals, and exposure to low levels of manganese in the diet is considered to be nutritionally essential in humans. Chronic exposure to high levels of manganese by inhalation in humans may result in central nervous system effects. Visual reaction time, hand steadiness and eye-hand coordination were affected in chronically exposed workers. Respiratory effects have also been noted in workers chronically exposed by inhalation. No studies are available regarding carcinogenic effects in humans or animals from inhalation exposure to manganese. No studies are available regarding cancer in humans from oral exposure to manganese. Oral animal studies on manganese sulfate are reported to be inadequate, with several studies reporting negative results, one study reporting an increased incidence of thyroid gland follicular cell adenomas and hyperplasia, and one study noting an increased incidence of pancreatic tumors. EPA has classified manganese as a Group D substance, not classifiable as to carcinogenicity in humans.

Chronic effects of mercury differ, depending on the form of the mercury. The central nervous system is impaired by chronic exposure to elemental mercury. Effects noted include increased excitability, irritability, excessive shyness, insomnia, severe salivation, gingivitis and tremors. Additional chronic impacts of elemental mercury exposure include adverse kidney effects and, in some children, acrodynia, a rare syndrome characterized by severe leg cramps, irritability, paresthesia (a sensation of prickling on the skin) and painful pink fingers and peeling hands, feet and nose. The primary effect from chronic exposure to inorganic mercury is kidney damage, primarily due to mercury-induced autoimmune glomerulonephritis (induction of an immune response to the body's kidney tissue) in humans. Acrodynia may also occur from exposure to inorganic mercury compounds. The primary effect from chronic exposure to methyl mercury in humans is damage to the central nervous system. The earliest effects are symptoms such as paresthesia, blurred vision and malaise. Effects at higher doses include deafness, speech difficulties, and constriction of the visual field. Studies on the reproductive and developmental effects of elemental

mercury in humans have shown mixed results. One study did not see an association between mercury exposure and miscarriages, while another revealed an increase in the rate of spontaneous abortions. A third study showed a higher-than-expected frequency of birth defects, which was not confirmed in a fourth study. No information is available on the reproductive or developmental effects of inorganic mercury in humans. Animal studies have reported effects including alterations in testicular tissue, increased resorption rates and abnormalities of development.

Several studies have been carried out regarding elemental mercury and cancer in humans. These studies are inconclusive due to lack of valid exposure data and confounding factors. EPA has classified elemental mercury as a Group D substance, not classifiable as to human carcinogenicity, based on inadequate human and animal data. No studies are available on the carcinogenic effects of inorganic mercury in humans. A chronic study on mercuric chloride in rats and mice reported an increased incidence of forestomach and thyroid tumors in rats, and an increased incidence of renal tumors in mice. EPA has classified an inorganic mercury compound, mercuric chloride, as a Group C, possible human carcinogen, based on the absence of data in humans and limited evidence of carcinogenicity in rats and mice. No studies are available on the carcinogenic effects of methyl mercury in humans, and the one available animal study reported renal tumors in mice. EPA has classified methyl mercury as a Group C, possible human carcinogen, based on inadequate data in humans and limited evidence of carcinogenicity in animals.

Dermatitis is the most common effect in humans from chronic dermal exposure to nickel. Cases of nickel dermatitis have been reported following occupational and non-occupational exposure, with symptoms of eczema (rash, itching) of the fingers, hands, wrists and forearms. Chronic inhalation exposure to nickel in humans also results in adverse respiratory effects, including a type of asthma specific to nickel, decreased lung function and bronchitis. Animal studies have reported adverse effects on the lungs and immune system from inhalation exposure to soluble and insoluble nickel compounds (nickel oxide, subsulfide, sulfate heptahydrate). However, nickel sulfate has been determined to be not carcinogenic in either rats or mice via inhalation. EPA has not evaluated soluble salts of nickel as a class of compounds for potential human carcinogenicity. Human studies have reported an increased risk of lung and nasal cancers among nickel refinery workers exposed to nickel refinery dust. Nickel refinery dust is a mixture of many nickel compounds, with nickel subsulfide being the major constituent. Animal studies have also reported lung tumors from inhalation exposure to nickel refinery dusts and to nickel subsulfide. EPA has classified nickel refinery dust and nickel subsulfide as Group A, human carcinogens.

Most phosphorus is used in the production of phosphoric acid and phosphates, which are used in the fertilizers industry. White phosphorus is used in the manufacture of munitions, pyrotechnics, explosives, smoke bombs, artificial fertilizers, rodenticides, phosphor bronze alloy, semiconductors, electroluminescent coatings and chemicals. Chronic exposure to white phosphorus in humans results in necrosis of the jaw. Progressive symptoms begin as a local inflammation or irritation and proceed to swelling, ulceration, and destruction of the jawbone with perforation to the sinus or nasal cavities and externally to the cheek. In one occupational study, anemia and leukopenia were observed. Animal studies have reported effects on the blood from inhalation exposure to white phosphorus. No information is available on the carcinogenic effects of white phosphorus in humans or animals. EPA has classified white phosphorus as a Group D substance, not classifiable as to human carcinogenicity.

The term polycyclic organic matter (POM) defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs), of which benzo[a]pyrene is a member. POM compounds are formed primarily from combustion and are present in the atmosphere in particulate form. Sources of air emissions are diverse and include cigarette smoke, vehicle exhaust, home heating, laying tar and grilling meat. Cancer is the major concern from exposure to POM. Epidemiologic studies have reported an increase in lung cancer in humans exposed to coke oven emissions, roofing tar emissions and cigarette smoke; all of these mixtures contain POM compounds. Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and forestomach tumors, leukemia and lung tumors from oral exposure to benzo[a]pyrene. EPA has classified seven PAHs, as Group B2, probable human carcinogens.

Skin exposures to mixtures of carcinogenic PAHs cause skin disorders in humans and animals, and adverse skin effects have been noted in humans and animals following application of solutions containing benzo[a]pyrene. An epidemiological study of workers exposed by inhalation to benzo[a]pyrene and other particulate matter reported some respiratory effects. The role of benzo[a]pyrene in this association, however, is reported to be unclear. Animal studies have reported effects on the blood and liver from oral exposure to benzo[a]pyrene and a slight hypersensitivity response from dermal exposure to benzo[a]pyrene.

Selenium is a naturally occurring substance that is toxic at high concentrations, but is also an essential element in the human diet. No information is available on the chronic effects of selenium in humans from inhalation exposure. In epidemiological studies of populations exposed to high levels of selenium in food and water, discoloration of the skin, pathological deformation and loss of nails, loss of hair, excessive tooth decay and discoloration, garlic odor in breath and urine, lack of mental alertness and listlessness were reported. "Alkali disease" is a disease in livestock resulting from chronic consumption of high levels of selenium; it is characterized by hair loss, deformation and sloughing of the hooves, erosion of the joints of the bones, anemia and effects on the heart, kidney and liver. The consumption of high levels of selenium in the diet by pigs, sheep and cattle has been shown to interfere with normal fetal development and to produce fetal malformations. Epidemiological studies that used the selenium concentration in crops as an indicator of dietary selenium have generally reported an inverse association between selenium levels and cancer occurrence. Animal studies have reported that selenium supplementation, as sodium selenate, sodium selenite and organic forms of selenium, results in a reduced incidence of several tumor types. Selenium sulfide has been shown to be carcinogenic in animals (an increase in liver tumors in rats and mice and lung tumors in female mice from oral exposure). However, selenium sulfide is a pharmaceutical compound used in anti-dandruff shampoos and is unrelated to the inorganic or organic selenium compounds found in foods and the environment. EPA has classified elemental selenium as a Group D substance, not classifiable as to human carcinogenicity, and selenium sulfide as a Group B2, probable human carcinogen.

Chronic exposure of humans to mixed xylenes, as seen in occupational settings, has resulted primarily in neurological effects such as headache, dizziness, fatigue, tremors, incoordination, anxiety, impaired short-term memory and inability to concentrate. Labored breathing, impaired pulmonary function, increased heart palpitation, severe chest pain, abnormal EKG and possible effects on the kidneys have also been reported. Mixed xylenes

have been shown to produce developmental effects, such as an increased incidence of skeletal variations in fetuses, delayed ossification, fetal resorptions and decreased fetal body weight in animals via inhalation exposure. Some studies observed maternal toxicity as well.

Mixed xylenes have not been extensively tested for chronic effects, although animal studies show effects on the liver and central nervous system from inhalation and oral exposures and effects on the kidneys from oral exposure to mixed xylenes. No information is available on the carcinogenic effects of mixed xylenes in humans. An increase in tumors was not reported in rats or mice exposed to mixed xylenes via gavage (experimentally placing the chemical in the stomach). Other animal studies have reported equivocal results. EPA has classified mixed xylenes as a Group D substance, not classifiable as to human carcinogenicity.