IX. EPA'S PROPOSED NESHAPS DO NOT REFLECT THE MAXIMUM ACHIEVABLE REDUCTION IN HAZARDOUS AIR POLLUTANTS

A. EPA's Mercury Limits Should Be Strengthened

1. EPA's Proposed Mercury Limits for Coal-fired EGUs with Design Coal Equal to or Greater than 8300 Btu/lb

EPA has subcategorized the MACT limits for mercury into two categories: coal-fired units designed for coal with heat value greater than or equal to 8,300 Btu/lb (">8300 Btu/lb") and coal-fired units designed for coal with heat value less than 8,300 Btu/lb ("<8300 Btu/lb").[1] This sub-section addresses EPA's proposed MACT standards for the category that covers most coal-fired EGUs –those units designed for coal with a heat value equal to or greater than 8,300 Btu/lb.

a) New Source Mercury Standard for Units Designed for Coal with Heat Value Equal to or Greater than 8300 Btu/lb

i. EPA's Proposed New Source MACT Floor for Mercury Fails to Reflect Emissions of the Best Controlled Similar Source

EPA has proposed a mercury standard for new coal-fired EGUs in the >8,300 Btu/lb category of 0.0002 lb/GW-hr.[2] EPA also determined the MACT floor emission rate in terms of lb/MMBtu to be 1.8466 x 10^{-8} lb/MMBtu or 0.018 lb/TBtu.[3] EPA's proposed standard is set at the level determined by EPA to be the floor.

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[1] *See*, e.g., 76 Fed.Reg. 25027 (May 3, 2011), Table 10.

[2] Note that EPA initially proposed a new source mercury MACT standard of 0.000010 lb/GW-hr for the >8300 Btu/lb subcategory in its May 3, 2011 proposed rulemaking. *See,* e.g., 76 Fed.Reg. 25027. However, in response to a submittal from the Utility Air Regulatory Group (UARG), EPA acknowledged some errors in the determination of this emission limit, and EPA revised the proposed new source limit to 0.0002 lb/GW-hr. *See* May 18, 2011 letter from EPA to Hunton & Williams (Docket no. EPA-HQ-OAR-2009-0234-16628), and EPA's spreadsheet entitled "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041).

[3] *Id.*

EPA ignored the two lowest emitting units in the >8,300 Btu/lb subcategory in its determination of new source MACT floor for mercury. Specifically, EPA ignored the Spruance Genco Units 2 and 3. EPA's justification for ignoring the Hg emission rates achieved at these two units was that "both are of a unique size and design that most likely will not be representative of newly built units."[4] EPA has not, however, demonstrated that the Spruance Genco units,(both of which are are stoker fired units) are dissimilar from the remaining units in the category as far as mercury emitting characteristics are concerned. A "similar source" is:

> . . .a stationary source or process that has comparable emissions and is structurally similar in design and capacity to a constructed or reconstructed major source such that the source could be controlled using the same control technology.

EPA did not explain if, or why, the size or design of the Spruance Genco units affect the application of those units' mercury control technologies to other units.

There are seven other units that are achieving mercury emission rates similar to those of the Spruance units (i.e., 2.63×10^{-9} to 8.54×10^{-9} lb/MMBtu[5]). These lowest emitting units tend to burn bituminous coal, except for one unit burning coal refuse (Seward). Almost all of the units are burning coal with similar mercury content.[6] Bituminous coals are known for having high levels of chlorine; chlorine helps oxidize elemental mercury, enables the mercury to adhere to particles, and to be captured in downstream

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[4] *See* May 18, 2011 Memo with Subject "National Emission Standards for Hazardous Air Pollutants (NESHAP) Maximum Achievable Control Technology (MACT) Floor Analysis for Coal- and Oil-fired Electric Utility Steam Generating Units – REVISED" ("MACT Floor Memo") at 11 (Docket no. EPA-HQ-OAR-2009-0234-9858).

[5] *See* EPA spreadsheet with filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at the worksheet entitled "Hg_New_>8300 Btulb_MMBtu."

[6] *Id.*

scrubbers and particulate control devices.[7] The coal refuse utilized at the Seward units also has high chlorine levels.[8] All of these units have baghouses for particulate control. Further, the lowest emitting units all have dry scrubbers or are fluidized bed combustors which inject lime into the combustor (with the same effect as a scrubber).

The Spruance units are comparable to other coal-fired EGUs, and can be controlled with the same mercury controls as other coal-fired EGUs (and, in fact, are controlled in a similar manner as the other top ranked EGUs). While the Spruance units are smaller in size than many other units (57 MW), EPA has not explained why smaller size affects a plant's ability to control mercury emissions. EPA has, accordingly, failed to provide adequate justification for ignoring the lowest two emitting coal-fired EGUs in determining the new source MACT floor for mercury.

After EPA determined the MACT floor, EPA accounted for variability in the lb/MW-hr emission rate achieved at the EGU EPA considered to be the top ranked EGU (Nucla Unit 1) by determining the 99th percentile UPL. Not only did EPA determine the 99th percentile UPL emission rate for Nucla Unit 1, EPA then rounded up that value in coming up with a new source MACT floor emission limit. Specifically, EPA determined the average lb/MW-hr emission rate of the best controlled similar source to be 5.0036×10^{-8} lb/MW-hr, and then EPA determined the 99th percentile UPL of that source's data to be 1.7324×10^{-7} lb/MW-hr.[9] EPA then rounded up this value to the nearest 10 to arrive at a floor value of 2×10^{-7} lb/MW-hr or 0.0002 lb/GW-hr. EPA has

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[7] *See* March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule at 76 (Docket no. EPA-HQ-OAR-2009-0234-3048).

[8] *See* EPA spreadsheet with filename "floor_analysis_coal_hcl_031611.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-3036) at the worksheet entitled "AcidGas_coal."

[9] *See* EPA spreadsheet with filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at the worksheet entitled "Summary."

not provided adequate justification for going beyond the 99th percentile UPL in its determination of the MACT floor emission rate for mercury. In fact, there is no technical justification for rounding up any of the floor limits.

A long-term averaging time with compliance determined by mercury CEMs can effectively account for variability in emissions. Such an approach would be preferable to the 99th percentile UPL analysis, which goes well beyond predicting the worst reasonably foreseeable conditions. An adjusted averaging time will adequately account for the worst reasonably foreseeable circumstances while at the same time more accurately reflecting the average mercury emission rate of the lowest emitting EGU in the <8300 Btu/lb subcategory. In addition, by requiring use of mercury CEMs and imposing a long averaging time, EGU owners will be more vigilant about the EGU's mercury emissions on a day in-day out basis to make sure the mercury controls are being operated in a manner to ensure continuous compliance with the MACT limits.

ii. EPA Did Not Adequately Justify Why It Did Not Evaluate a Beyond the Floor Mercury MACT Limit for New Sources

EPA did not evaluate whether mercury emission rates lower than its determination of MACT floor could be met at coal-fired EGUs in the >8,300 Btu/lb subcategory. EPA justifies that decision asserting that the agency could not identify any control technologies that could achieve greater emission reductions of HAP than the control technologies they expected to be used to meet the MACT floor level of control.[10] That is not the appropriate test to follow in determining whether to evaluate beyond the floor MACT requirements. *See* 42 U.S.C. §7412(d)(2) (requiring maximum achievable reduction, and requiring consideration of costs, reductions, non-air-quality impacts, and energy impacts).

Given that there are various "control methods" in play that determine the amount of mercury emitted by a coal-fired EGU, EPA cannot simply

[10] *See* 76 Fed.Reg. 25046 (May 3, 2011).

assume that the best controlled source of mercury could not reduce its emissions even more than it already is. For example, EPA's determination of best performing similar source is Nucla Unit 1 which is a fluidized bed boiler with SNCR and a fabric filter.[11] This unit does not have activated carbon injection. In fact, most of the lowest mercury emitting units do not have activated carbon injection. Further, for those EGUs that do have activated carbon injection, this mercury control technology can be operated at varying levels of mercury control. Thus, in evaluating whether to propose a more stringent emission rate than the MACT floor, EPA cannot simply assume that new units cannot lower mercury emissions any lower than the MACT floor. EPA should perform a beyond the floor analysis to ensure that it is setting a MACT emission limit for new sources reflective of the maximum achievable reduction in mercury emissions.

a) Proposed Existing Source MACT Standards for Coal-Fired Units in the >8300 Btu/lb Subcategory

i. EPA's Proposed Existing Source MACT Floor for Mercury

To determine the mercury MACT floor for existing sources for the subcategory >8300 Btu/lb coal, EPA took the average of the mercury emission rates for the top performing 12% of the 330 EGUs for which it had mercury data – i.e., the lowest emitting 40 EGUs.[12] In response to a letter from the Utilities Air Regulatory Group (UARG), EPA issued a revised MACT floor memo as well as a revised mercury MACT floor spreadsheet that indicated a higher mercury MACT floor for existing sources than that previously presented by EPA in its May 3, 2011 proposed rulemaking. The table below

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[11] *See* EPA spreadsheet with filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at the worksheet entitled "Hg_New_>8300 Btulb_MMBtu."

[12] *See* May 18, 2011 National Emission Standards for Hazardous Air Pollutants (NESHAPs) Maximum Achievable Control Technology (MACT) Floor Analysis for Coal- and Oil-Fired Electric Utility Steam Generating Units – REVISED at 3. (Docket no. EPA-HQ-OAR-2009-0234-9858.)

shows the differences between EPA's existing source MACT floor determination issued March 16, 2011 and the existing source MACT floor determination issued May 18, 2011.

Changes in EPA's Existing Source Mercury MACT Floor Determination Coal>8300 Btu/lb

Mercury- Coal>8,300 Btu/lb	**3-16-11 Existing Source MACT Floor Determination[13]**	**5-18-11 Existing Source MACT Floor Determination[14]**
Mean of top 40 EGUs (lb/MMBtu)	6.8578×10^{-9} lb/MMBtu	2.1250×10^{-8} lb/MMBtu
UPL (lb/MMBtu)	8.4657×10^{-7} lb/MMBtu	1.1812×10^{-6} lb/MMBtu
Floor Value (lb/TBtu)	1 lb/TBtu	1.20 lb/TBtu
Mean of top 40 EGUs (lb/MW)	1.2129×10^{-6} lb/MW	2.0899×10^{-6} lb/MW
UPL (lb/MW)	7.9161×10^{-6} lb/MW	1.2329×10^{-5} lb/MW
Floor Value (lb/GWh)	0.008 lb/GWh	0.013 lb/GWh

We could not find an explanation from EPA regarding the change in the existing source MACT floor, other than the UARG letter and EPA's response. UARG pointed out that EPA incorrectly converted emission rates from lb/MWh to lb/GWh.[15] UARG stated that at least half of the 40 units identified as best performing have mercury emission rates 1000 times higher than assumed by EPA in its existing source MACT floor analysis.[16] EPA's May 18, 2011 response to UARG acknowledges discrepancies in the recalculations of mercury emissions data and states that the revised MACT

[13] From EPA Spreadsheet with Filename "floor_analysis_coal_hg_031611.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-3037) at Summary tab.
[14] From EPA Spreadsheet with Filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at Summary tab.
[15] *See* May 6, 2011 letter from Hunton & Williams on behalf of UARG to EPA at 2 (Docket no. EPA-HQ-OAR-2009-0234-9859).
[16] *Id.* at 3.

floor analysis for existing coal fired power plants increased from 1.0 to 1.2 lb/TBtu.[17]

A comparison of the March 16, 2011 spreadsheet to the May 18, 2011 spreadsheet shows that the lb/MMBtu mercury emission rates were changed for at least the 13 top ranked units in EPA's March 16, 2011 spreadsheet, including Deepwater Unit 1, Dallman Units 31 and 32, Will County Unit 4, Joliet 9 Unit 5, Escalente, TS Power Plant, Waukegan Unit 8, Dallman Unit 33, Crawford Unit 7, Joliet 29 Unit 8, St. Nicholas Cogen Project Unit 1, and Joliet 29 Unit 7. For all of these units except Waukegan Unit 8, EPA increased both the lb/MMBtu and the lb/MW emission rates of these units by a factor of 1,000 in the May 18, 2011 ranking. The Waukegan Unit 8's mercury emissions rate was increased by a factor of 425 in the May 18, 2011 ranking. These changes in these units' emissions (and presumably several others, as we did not check each unit), resulted in a change in the mean emission rate of the lowest emitting 40 units from 1.0 lb/TBtu to 1.2 lb/TBtu.

After determining the 1.2 lb/TBtu average emission rate of the lowest mercury-emitting 40 EGUs, EPA applied various factors to account for variability and also converted the data to a lb/MW-hr emission limit as an alternative compliance limit to a lb/TBtu. As a result of those manipulations, EPA's proposed MACT floor limits for existing sources in the >8300 Btu/lb subcategory fails to adequately reflect the mercury emissions levels emitted by the top performing 12% of coal-fired EGUs.

(1) EPA Should Consider Other Approaches to Accounting for Variability in Setting a Mercury Emission Limit Which Accurately Reflects the Mercury Emissions Achieved by the Best Performing EGUs

To account for variability in the emissions of the top performing 12% of EGUs, EPA determined the 99th percentile Upper Prediction Limit (UPL) to the test data for the lowest emitting 40 EGUs. As noted elsewhere, that high

[17] *See* May 18, 2011 EPA letter to Hunton &Williams at 1 (Docket no. EPA-HQ-OAR-2009-0234-16628).

UPL inappropriately inflates the proposed standards. Below, we offer the following comments specific to applying this approach to the mercury MACT floor determination.

In setting an emission rate reflective of the MACT floor, EPA has, as we understand it, sought to determine the emissions rate achieved by the best controlled similar source under the worst reasonably foreseeable circumstances. In a November 2003 memo to the Utility MACT Project File, EPA explained its approach to variability, within that framework. Specifically, EPA stated "there are two fundamentally different approaches to incorporating variability into the proposed [MACT] rule: (1) including variability in the MACT floor calculation; *or* (2) including variability in the compliance method."[18] EPA further stated:

> Addressing variability in the compliance method would involve allowing an averaging time for compliance that would accommodate variations in pollutant emissions over time. For example, averaging over a month or year of data will provide opportunity for variations in the amount of a constituent in the fuel to be accommodated without exceeding the emission limitation.[19]

Use of a long-term average evens out the ups and downs or variability in measured data. This is shown in Figure 7.1 from Ex. 9-3, which graphically displays the same data set on an instantaneous basis (as measured by a CEMS), on a one-hour basis, and on a four-hour basis. This chart shows that the longer 4-hour averaging time results in a straight line as a function of time. The shorter term data varies more sharply.

Long term testing at coal-fired electric utility steam generating units with mercury controls shows very little variability in mercury emissions; a long averaging time could readily address the few excursions that may occur

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[18] 11/26/03 Memorandum from William Maxwell to Utility MACT Project Files at 2 (9-2).
[19] *Id.*

in mercury emissions. For example, the Hardin Station is equipped with a dry scrubber, baghouse and ACI system and burns subbituminous coal.[20] Once carbon injection started, the Hardin station's Hg CEMs showed only a few elevated mercury concentrations over a 10 month period.[21] Long term mercury testing has also been conducted for the Toxecon installation for mercury control at Units 7-9 of the Presque Isle power plant in Michigan. Summaries from various presentations and reports on the long term operation of the Toxecon mercury controls shows the units consistently achieve over 90% mercury control based on monthly averages.[22]

EPA's approach to account for variability in emissions at the 12% best performing units results in a MACT floor determination that fails to reflect the average emissions of the best performing units. Specifically, EPA determined the 99th percentile UPL mercury emission rate to be 1.1812×10^{-6} lb/MMBtu.[23] This is over 55 times higher than the *actual* average emission rate (i.e., 2.1250×10^{-8} lb/MMBtu) of EPA's data for the lowest emitting 40 EGUs. Of all the test results presented in EPA's mercury MACT floor spreadsheet from the lowest emitting 40 EGUs[24], only two test results were over 1.1812×10^{-6} and the majority was at least an order of magnitude lower than 1.1812×10^{-6}lb/MMBtu. Further, in the entire 330 EGU mercury

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[20] *See* Amrhein, Jerry, *Results of a Long Term Mercury Control Project for a PRB Unit with an SCR, Spray Dryer and Fabric Filter*, 11th Annual EUEC Conference, January 30, 2008, Ex. 9-4.

[21] *Id. See* top graph on 17th slide, HgT out (magenta line) and Hg0out (blue line). Note that, for the most part, the Hg0 and HgT are identical and are represented in the graph with one line for Hg0 out (typically less than 0.5 $\mu g/m^3$).

[22] *See Toxecon Retrofit for Mercury and Multi-Pollutant Control on 3 90-MW Coal Fired Boilers*, April 2009, Ex. 9-5; s*ee also* Exs. 9-6 through 9-10.

[23] *See* EPA Spreadsheet with Filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at Summary tab.

[24] *Id.* at Hg_Avg_>8300 Btulb_MMBtu tab. For some EGUs, several test results were provided.

emissions dataset, more than half of the EGUs (153 units) had minimum mercury emission rates lower than EPA's 99th percentile UPL.

(2) EPA's Mercury MACT Floor Limit in Units of lb/MW-hr Is Flawed

EPA determined a mercury MACT floor limit in terms of lb/MW-hr as well as lb/TBtu. EPA has not specified how it determined the lb/MW-hr MACT floor limit. It appears that EPA first converted mercury emissions in terms of lb/MMBtu to lb/MW-hr for each coal fired EGU based on a unit-specific heat rate. EPA then calculated the unit-specific heat rate by dividing the total generating capacity of the unit in MW by the total maximum heat input in MMBtu/hr.[25] If so, EPA has failed to accurately determined the necessary heat rates.

With respect to the total maximum heat input data, many companies may be reporting the maximum possible heat rate of the boiler rather than typical maximum heat input need to achieve MW capacity. For example, for Seward Unit 1, EPA indicated the total maximum heat input was 6,200 MMBtu/hr, whereas EPA's Clean Air Markets Database identifies the maximum heat input to this boiler as 3,180MMBtu/hr.[26] For Valley Units 1, 2 and 3, EPA indicated that the total maximum heat input for each unit was 1,736 MMBtu/hr whereas the Clean Air Markets Database identifies the maximum heat input to these boilers to be 1000, 959, and 1192 MMBtu/hr, respectively.[27]

Many of the calculated unit heat rates given in EPA's spreadsheet for the mercury MACT floor analysis are entirely implausible – such as unit heat rates as low as 4.65 MMBtu/MWh or as high as 13.07 MMBtu/MWh. Further, even if the data EPA was using was accurate and reflective of maximum heat

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[25] *Id.* at "Hg_Avg_>8300Btulb_MMBtu" tab.
[26] *Id.* and see http://camddataandmaps.epa.gov/gdm/index.cfm for Clean Air Markets Database data.
[27] *Id.*

input at maximum generating capacity, EPA's approach to determining heat rate fails to reflect the heat rate the unit operates at during lower loads or differences during the summer or winter.

Regardless, the alternative lbMW-hr MACT are intended to encourage efficiency. Instead of determining a mercury MACT floor limit based on EPA's calculations of lb/MW-hr emission rates, EPA should simply convert the average mercury emission rate in lb/MMBtu to lb/MWh (or lb/GW-hr) based on a reasonable heat rate (at a minimum, improved heat rates should be required as a "beyond the floor" method of reducing emissions). The alternative lb/MW-hr limits for both total particulate matter and HCl reflect an assumed heat rate of 10,000 Btu/kW-hr. This reflects approximately 34% thermal efficiency. However, a comparison of EPA's existing source mercury MACT floor determinations in lb/MMBtu to lb/GW-hr shows that the lb/GW-hr limit reflects a heat rate of 10,438 Btu/kW-hr or 32.7% thermal efficiency. Not only is this heat rate higher than the assumed heat rate for the conversions of the HCl and total PM MACT limits to units of lb/MW-hr, this heat rate is even higher than the average heat rate of the coal-fired EGU fleet of 10,400 Btu/kW-hr.[28]

According to data compiled by the Center for Integrative Environmental Research at the University of Maryland, the top 50 performing EGUs in 1998 had average heat rates of 9,854 Btu/kW-hr based on data from the U.S. Energy Information Administration.[29] This reflects an efficiency being achieved at the most efficient EGUs of 34.6%, and it was being achieved over ten years ago. Lower heat rates have been achieved in

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[28] *See* Sargent & Lundy Report, Coal-Fired Power Plant Heat Rate Reductions, SL-009597, January 22, 2009, at 1-1, which states that the average annual heat rate of the existing coal-fired EGU fleet in the US is 10,400 Btu.kW-hr. Attached as Ex. 9-1.

[29] *See* April 17, 2001 Review of Potential Efficiency Improvements at Coal-Fired Power Plants, at 2. Attached as Ex. 9-11.

recent years through boiler, turbine and other plant modifications.[30] EPA should not assume a heat rate any higher than 9,854 Btu/kW-hr in developing a mercury MACT limit in terms of lb/GWH-hr to comply with the goal of rewarding energy efficiency. Converting EPA's 99th percentile UPL value of 1.2 lb mercury/TBtu heat input, a more appropriate mercury floor emission limit in terms of lb/GW-hr would be 0.0118 lb/GW-hr. Or, if EPA were to adopt a mercury MACT floor of 2.125×10^{-2} lb/TBtu applicable over a rolling 12 month average as we recommend above (rather than determining the 99th percentile UPL), an appropriate alternative limit would be 0.0002 lb/GW-hr. This would much more accurately reflect the actual average mercury emissions achieved by the 12% best performing EGUs and the alternative limit would much more likely encourage energy efficiency.

(3) EPA Has Appropriately Assumed that the Lowest Emitting 12% of the EGUs for Which it has Mercury Emissions Data Reflect 12% of the Coal-Fired EGUs with Design Coal Equal to or Greater than 8300 Btu/lb

Although there are flaws in EPA's mercury MACT floor determination and we believe that the mercury MACT limit for existing sources should be lower than the floor proposed by EPA, we do think it was appropriate for EPA to determine the average of the lowest 12% of the EGUs for which it had mercury emissions test data (i.e., the lowest emitting 40 units out of the 330 EGUs for which EPA has test data). EPA could only justify relying on the average of a larger number of EGUs if EPA knew with certainty that it had captured the lowest mercury-emitting units of all the coal-fired EGUs in the >8300 Btu/lb subcategory in the U.S.

Because there are numerous factors that can influence the mercury emissions rate from a coal-fired EGU, it would be virtually impossible for EPA to know with any certainty that it had captured the emissions of the

[30] *See* Sargent & Lundy Report, Coal-Fired Power Plant Heat Rate Reductions, SL-009597, January 22, 2009 (Ex. 9-1).

lowest emitting coal-fired EGUs without testing all of the EGUs. Mercury can take three different forms in the flue gas – elemental mercury that is usually emitted as Hg^0, Hg^{+2}, and particle bound mercury Hg^p. As EPA has acknowledged, the amount of mercury that is removed is dependent on the form of the mercury in the flue gas. Characteristics of the coal, such as high chlorine levels, can help oxidize the mercury so that the mercury more readily adheres to particles to be collected in scrubbers or particulate control devices. Selective catalytic reduction (SCR) systems, used primarily for NOx control, can also help to oxidize the mercury. Characteristics of the boiler can also impact the form of the mercury, impacting the removal efficiency of mercury in the downstream controls. Electrostatic precipitators (ESPs) can provide good mercury removal depending on the form of the mercury in the flue gas, although baghouses typically do a much better job. Activated carbon injection, especially halogenated activated carbon, can achieve very high levels of mercury control. But even units without carbon injection can achieve high levels of mercury reduction, depending on the characteristics of the coal, boiler and the pollution controls. These various factors that influence mercury emissions are discussed in the preamble to EPA's proposed MACT rule. *See* 76 Fed.Reg. 25014 (May 3, 2011). In addition, the concentration of mercury in the coal also has an impact on the amount of mercury emitted. Because there are so many different variables that account for mercury emission rates from coal-fired EGUs, EPA cannot be assured that it has collected data on the lowest mercury emitters. In fact, a review of the lowest mercury-emitting 40 units for which EPA has emissions data shows a wide variety of unit sizes, coal types, and pollution controls.

Due to all of these factors that influence mercury emissions, EPA is entirely justified in assuming that 12% of the 330 EGUs for which EPA has collected mercury emissions (or the lowest emitting 40 EGUs) are reflective of 12% of the 1,061 EGUs in the >8300 Btu/lb subcategory.

ii. Beyond the Floor for Existing EGUs: EPA is Obligated to Evaluate Beyond the Floor Mercury Emission Limits for Coal-Fired EGUs with Coal > 8300 Btu/lb

EPA did not undertake any meaningful evaluation of control technologies or methodologies that would enable units to achieve mercury emission reductions beyond EPA's proposed mercury floor emissions rates. EPA justifies that refusal by claiming that it could not identify any control technologies that could achieve greater emission reductions of HAP than the control technologies they expected to be used to meet the MACT floor level of control.[31] That does not suffice; the record indicates that methods exist to reduce mercury emissions below EPA's proposed standard. The law requires EPA to assess such reductions.

(1) Several States Have Required Lower Mercury Emission Limits for Existing Coal-Fired EGUs than EPA's Proposed MACT Standard for Existing Coal-Fired EGUs

EPA proposed a mercury MACT standard of 1.20 lb/TBtu or 0.013 lb/GW-hr for existing coal-fired EGUs in the >8300 Btu/lb subcategory.[32] As EPA itself has noted in its March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule at pages 3-8 (Docket no. EPA-HQ-OAR-2009-0234-3048), many states have adopted more stringent numerical mercury emission limits for existing coal-fired EGUs, typically applicable to those EGUs >25 MW in size. For example, Arizona, Colorado, Connecticut, and Delaware have emission limits for EGUs of 0.0087 lb/GW-hr or 90% mercury removal to be met in 2008 (Connecticut), 2013 (Delaware), and 2017 (Arizona and Colorado). This numerical limit is 33% lower than EPA's proposed 0.013 lb/GW-hr mercury limit. Massachusetts has even lower mercury limits of 0.00250 lb/WH-hr or a 95%

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[31] *See* 76 Fed.Reg. 25046 (May 3, 2011).
[32] *See* EPA Spreadsheet with Filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at Summary tab.

mercury removal requirement to be met by 2013 at its Brayton Point, Mystic Generating Station, Somerset Station, Mount Tom, Canal and Salem Harbor power plants. Montana has a 0.9 lb/TBtu mercury limit to be met at all non-lignite coal units by 2010. New York has a 0.60 lb/TBtu mercury limit for all coal-fired power plants developed after November 15, 1990. Oregon has a 0.6 lb/TBtu mercury limit or a 90% removal requirement for all existing coal-fired EGUs >25 MW to be met by 2012. Last, Wisconsin has a 0.0080 lb/GW-hr mercury limit or a 90% mercury removal requirement for all coal-fired EGUs that are greater in size than 150 MW to be met by 2015. Other states that have adopted 90% mercury removal requirements for existing EGUs include Illinois, Maryland, Michigan, Minnesota, New Jersey, and Utah. New Jersey has required coal-fired EGUs >25 MW to comply with a 90% mercury removal requirement since 2007.

Those state requirements, and the plants meeting them, demonstrate the achievability of additional mercury reductions. EPA is obligated to evaluate these lower mercury emission limits as part of its national MACT rulemaking to ensure that its proposed emission limits reflect the maximum degree of emission reductions that can be achieved, taking into account costs of control and any non-air quality, environmental, and energy impacts.

(2) EPA Has Already Determined that 90% Mercury Removal is Achievable and Cost Effective, But EPA's Proposed Mercury Emission Limits Do Not Require 90% Mercury Removal at all EGUs

In EPA's Integrated Planning Model (IPM) used to evaluate costs and benefits for the proposed MACT rule, EPA assumed a mercury emission reduction level of 90% with the use of brominated activated carbon injection required at most coal-fired EGUs.[33] However, EPA's proposed MACT floor

[33] *See* March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule at pages 76-82 (Docket no. EPA-HQ-OAR-2009-0234-3048). The only EGUs that EPA did not model with

emission limit of 1.2 lb/TBtu for the >8300 Btu/lb subcategory only reflects 90% mercury removal for some coals; it reflects much less than 90% mercury removal for other coals. In Table 5-11 of Chapter 5 of EPA's August 2010 Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model (at page 5-17), EPA identified various coal types by sulfur grade and uncontrolled mercury emission factors based on mercury concentration in the coal. In the table below, we have reprinted that information with the exception of the lignite coals that we assume would be covered under EPA's <8300 Btu/lb subcategory, and we have also included calculations of the % removal that the 1.2 lb/TBtu MACT floor emission limit reflects from mercury in these various coals.

Uncontrolled Mercury in the Coal For Various Coal Types and Clusters[34] and Percent Removal Required to Comply with EPA's Proposed 1.2 lb/TBtu Existing Source Mercury MACT Limit.

Coal Type by Sulfur Grade	**Cluster #1**		**Cluster #2**		**Cluster #3**	
	Hg lb/TBtu	**% Removal to Comply with 1.2 lb/TBtu**	**Hg lb/TBtu**	**% Removal to Comply with 1.2 lb/TBtu**	**Hg lb/TBtu**	**% Removal to Comply with 1.2 lb/TBtu**
Low Sulfur Eastern Bit (BA)	3.19	62.4%	4.37	72.5%	---	
Low Sulfur Western Bit (BB)	1.82	34.0%	4.86	75.3%	---	
Low Med Sulfur Bit	5.38	77.7%	8.94	86.6%	21.67	94.5%

ACI to meet a 90% mercury removal rate were those units that were already likely achieving 90% or greater mercury removal as a cobenefit of SO2, NOx and PM control technologies. *See* Section 5.4.3 and Table 5-16 of March 2011 Documentation Supplement (Docket no. EPA-HQ-OAR-2009-0234-3048).

[34] Data on uncontrolled mercury and coal types is from Table 5-11 of Chapter 5 of EPA's August 2010 Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model (at page 5-17) (Docket no. EPA-HQ-OAR-2009-0234-3049).

(BD)						
Medium Sulfur Bit (BE)	19.53	93.9%	8.42	85.7%	---	
High Sulfur Bit (BG)	7.10	83.1%	20.04	94.0%	14.31	91.6%
High Sulfur Bit (BH)	7.38	83.7%	13.93	91.4%	34.71	96.5%
Low Sulfur Subbit (SA)	4.24	71.7%	5.61	78.6%	---	
Low Sulfur Subbit (SB)	6.44	81.4%	---		---	
Low Medium Sulfur Subbit (SD)	4.43	72.9%	---		---	

The proposed 1.2 lb/TBtu mercury emission limit would only require 90% mercury control or better at those EGUs burning low - medium sulfur bituminous coal in Cluster #3, medium sulfur bituminous coal in Cluster#1, and high sulfur bituminous in Clusters #2 and #3. There are numerous coal-fired EGUs for which the 1.2 lb/TBtu mercury emission limit won't require anywhere near 90% mercury removal, including those units that burn all grades of subbituminous coals, low sulfur western bituminous coals, and low –medium sulfur eastern bituminous coals.

The EPA's proposed 1.2 lb/TBtu mercury MACT limit only reflects 90% mercury removal or greater for those coals with uncontrolled mercury content of 12.0 lb/TBtu or higher. Based on a review of background data for EPA's IPM, one can determine that the 1.2 lb/MMBtu limit would only reflect 90% control or more for those plants that burn certain medium to high sulfur coals from the Appalachian coal regions, specifically including Alabama Southern Appalachian coal, eastern Kentucky and Pennsylvania Central Appalachian

coal, and Maryland and Ohio Northern Appalachian coals.[35] For the >8300 Btu/lb subcategory, coal from these states accounts for only about 25% on a heat input basis of all the bituminous and subbituminous coals utilized at EGUs in the United States.[36] An even smaller amount of these states' coal constitute the higher mercury coals for which EPA's proposed 1.2 lb/TBtu mercury limit would equate to 90% control or more.[37]

Although EPA modeled 90% mercury control for its policy case in the IPM, its proposed mercury MACT floor limit will not require that 90% mercury removal be achieved at a majority of the coal-fired EGUs in the >8300 Btu/lb subcategory. EPA's IPM modeling and its Regulatory Impact Analysis based on the IPM modeling suggest the availability of 90% mercury removal, which should be assessed within EPA's beyond the floor analysis for the >8300 Btu/lb subcategory.

Ninety percent mercury control or greater from the level of mercury in the coal is achievable. Several EGUs achieve such levels of mercury control as a co-benefit of criteria pollutant controls. In its 1998 Information Collection Request in which EPA collected mercury emissions data for several coal-fired EGUs, EPA found that bituminous coal-fired units with baghouses averaged

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[35] *See* Table 9-5 of EPA's March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule (Docket no. EPA-HQ-OAR-2009-0234-3048).

[36] This is based on the U.S. Energy and Information Administration's 2010 Cost and Quality of Fuels for Electric Plants, Table 16 Origin and Destination of Coal to Electric Plants by State: Total (All Sectors), 2009, available at http://www.eia.gov/cneaf/electricity/cq/cq_sum.html. Ex. 9-12 includes a copy of that table and calculations of the coal from each used by electric plants compared to the total of all bituminous and subbituminous coals (i.e., coals that would fall into the >8300 Btu/lb subcategory).

[37] As previously stated, only the medium to high sulfur coals in the states of AL, KY, MD, OH and PA have uncontrolled mercury contents of 12.0 lb/TBtu or higher, and for Kentucky, only medium to high sulfur coals from the eastern portion of that state have uncontrolled mercury content of 12.0 lb/TBtu or higher. *See* Table 9-5 of EPA's March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule (Docket no. EPA-HQ-OAR-2009-0234-3048).

90% mercury removal and those bituminous coal-fired units with wet scrubbers and baghouses averaged 98% removal.[38] The 1998 ICR data also showed that CFB boilers with baghouses achieved high levels of mercury control, well in excess of 90%.[39] EPA has found the same for fluidized bed boilers in the mercury data it collected under its recent ICR.[40]

For those EGUs that don't already achieve 90% or greater mercury removal based on a co-benefit of existing design and controls, there are many options available to achieve 90% or greater mercury removal. Activated carbon injection is the most widely tested control technology that is specifically designed for mercury removal. There have been numerous studies showing that high levels of mercury removal can be achieved with this technology. For example, testing of mercury removal at the Holcomb Station Unit in Kansas showed significant increases in mercury removal with the addition of activated carbon and other sorbent injection. This pulverized coal boiler burns subbituminous coal from the Powder River Basin and is equipped with a spray dry absorber and a baghouse. Without ACI, these controls removed less than 25% of the mercury, but with ACI overall mercury removal improved with each type of sorbent tested and even at low sorbent injection concentrations. The mercury removal efficiencies with the existing controls and the different sorbents and injection concentrations tested achieved 28 – 99% mercury removal. Ex. 9-15.[41]

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[38] *See* EPA, Performance and Cost of Mercury and Multi-Pollutant Emission Control Technology Applications on Electric Utility Boilers, EPA-600/R-03/110, October 2003, at 7. Ex. 9-13.
[39] *See* 1998 ICR Summary Spreadsheet entitled "Hg Data.xls" at Column S "Fr Remove Coal-Stack." Ex. 9-14.
[40] *See* EPA Spreadsheet with Filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at "Hg_>8300 Butlb" tab.
[41] *See* Sharon Sjostrom et al., *Full-Scale Evaluation of Mercury Control by Injecting Activated Carbon Upstream of a Spray Dryer and Fabric Filter*, presented at US EPA/DOE/EPRI Combined Power Plant Air Pollutant Control Symposium: The Mega Symposium, Washington, D.C., August 30 – September 2, 2004, at 7, 10. Ex 9-15.

In addition, over a year of continuous mercury CEMS data is available for the WE Energies Presque Isle facility in Michigan, which burns subbituminous coal, and these data demonstrate that over 90% mercury control has been achieved on a continuous basis. This site is a Department of Energy test site, and the data is thus publicly available. Some of this data has been summarized in presentations and published articles. Exs. 9-6,[42] 9-7,[43] 9-8,[44] 9-9,[45] and 9-10.[46] Furthermore, at least two other full-scale, long-term mercury control demonstrations have been reported to continuously achieve 90%+ mercury control – at Rocky Mountain Power (Hardin) in Montana, Ex. 9-4, and at Comanche Station in Colorado, Ex. 9-16, both of which burn PRB coal.

For bituminous coal-fired units with ESPs, the TOXECON configuration has been used with great success. This technology uses activated carbon injection and a downstream polishing baghouse. The E.C. Gaston Unit 3 facility is an example of an EGU that achieved high levels of mercury control with activated carbon in the TOXECON configuration. This unit is a pulverized coal boiler burning bituminous coal that is equipped with a hot-side electrostatic precipitator and a downstream compact hybrid particulate collector (COHPAC) fabric filter. It measured little to no mercury removal across the ESP or across the COHPAC before injection of activated carbon, but with ACI, mercury removal ranged from approximately 30 to

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[42] *TOXECON™ Retrofit for Mercury and Multi-Pollutant Control, NETL Mercury Control Technology*, December 13, 2006, Pittsburgh, PA.
[43] *TOXECON™ Clean Coal Demonstration for Mercury and Multi-Pollutant Control*, DOE/NETL Mercury Control Conference 2007, Pittsburgh, PA.
[44] *TOXECON™ Clean Coal Demonstration for Mercury and Multi-Pollutant Control*, EUEC 2008, Tucson, AZ.
[45] Derenne, Steven et. al., *TOXECON™ Demonstration for Mercury and MultiPollutant Control at We Energies*, Paper #08-A-79-MEGA-AWMA.
[46] *TOXECON™ Tests at PIPP Continue Successfully*, PRECIP Newsletter No. 397, February 2009.

90%+ depending on the sorbent used and the injection concentration. Ex. 9-17,[47] Ex. 9-18.[48]

The use of halogenated sorbents has similarly been shown to be effective at removing mercury at both subbituminous as well as lignite-fired power plants. Testing of halogenated sorbents was conducted at the subbituminous coal-burning Holcomb Station Unit 1 in Garden City, Kansas. The halogenated sorbent injected upstream of the dry scrubbers achieved greater than 90% removal at an injection rate of 4.0 lb/MMacf.[49]

As previously stated, EPA assumed brominated activated carbon would be used in its cost analysis for mercury MACT. Brominated Powdered Activated Carbon (B-PAC™) is a halogenated sorbent that has been tested at least at seven different power plants, including four full-scale tests.[50] Mercury removal rates ranged from 70% to 98% across a wide variety of coals and configurations and at low sorbent injection rates.

Full-scale tests with brominated activated carbon were conducted at Detroit Edison's St. Clair Power Plant, which typically burns 85% subbituminous coal blended with 15% bituminous coal and is currently equipped with a cold-side ESP. Greater than 90% mercury removal overall

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[47] *See* C. Jean Bustard et al., Full-Scale Evaluation of Mercury Control with Sorbent Injection and COHPAC at Alabama Power E.C. Gaston, published in *J. Air & Waste Manag. Assoc.*, 2002 Aug: 52(8): 918-26.

[48] Michael D. Durham, Update on Full-Scale Activated Carbon Injection for Control of Mercury Emissions, Presentation to Utility MACT Working Group, August 8, 2002, Washington, D.C., at Slide 13.

[49] Sjostrom *et al.,* "Full-Scale Evaluation of Mercury Control by Injecting Activated Carbon Upstream of a Spray Dryer and Fabric Filter on PRB Coal," presented at PowerGen, Orlando, FL, November 29-December 2, 2004, ADA-ES Pub. No. 04008 at 11-12. Ex. 9-19.

[50] Nelson *et al.*, "Accumulated Power-Plant Mercury-Removal Experience with Brominated PAC Injection," presented at the Combined Power Plant Air Pollutant Control Mega Symposium, Washington, D.C., August 30 – September 2, 2004. Ex. 9-20.

was achieved at a B-PAC injection rate of 3.0 lb/MMacf.[51] The results were even better when 100% subbituminous coal was fired. Even more impressive were the results from a longer term test at this facility. An average of 94% mercury removal was achieved over 30 days of B-PAC injection at an injection rate of 3.0 lb/MMacf.[52]

The level of mercury removal achievable with ACI is generally based on two factors: the carbon injection rate and the particulate control device(s). With respect to the activated carbon injection rate, the amount of mercury removed typically increases with an increase in the amount of activated carbon injected, up to a point. The primary impediment to higher amounts of sorbent injection are simply the costs of the sorbent. Regarding the particulate control device, mercury emissions testing experience has shown that fabric filters are more effective in removing mercury than ESPs , because the buildup of sorbent on the bags provides more avenues for mercury adsorption as the flue gas passes through the baghouse and also because baghouses provide longer gas residence times in comparison to an ESP.[53] A lower cost option to installation of a full-scale baghouse is to install a compact hybrid particulate air collector (COHPAC), which is a polishing baghouse added downstream of an existing ESP.

In projecting costs for ACI to achieve 90% control in its IPM policy case run, EPA assumed a higher carbon injection rate for units with ESPs as

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[51] McCoy *et al.*, "Full-Scale Mercury Sorbent Injection Testing at DTE Energy's St. Clair Station," presented at the Combined Power Plant Air Pollutant Control Mega Symposium, Washington, D.C., August 30 – September 2, 2004, at 8. Ex. 9-21.

[52] Discussed in ex. 9-54, December 30, 2004 letter to Bill Maxwell, U.S. EPA, from Sid Nelson Jr., President, Sorbent Technologies, Corporation, Part I of comments submitted on EPA's Notice of Data Availability for the Proposed National Emission Standards for Hazardous Air Pollutants.

[53] *See* discussion at Institute of Clean Air Companies, Mercury Control with Fabric Filters from Coal-Fired Boilers, at 1 (Ex. 9-22).

compared to baghouses.[54] Further, EPA assumed installation of a fabric filter was required for EGUs in three scenarios: 1) EGUs with ESPs that cannot handle the increased particulate loading from the ACI, 2) when flue gas conditioning is needed with the ESP, and 3) when Powder River Basin coals are burned.[55]

The pollution controls needed to achieve a 90% reduction in mercury at each EGU will provide numerous benefits to public health and the environment, not only in reduced mercury and in reductions in the myriad of health and environmental impacts that mercury poses, but also in reductions of fine particulates, which adversely impact public health and cause regional haze, the reductions of metal HAPs, among other pollutant reductions that a stringent MACT rule will result in. EPA's analysis shows these extensive environmental improvements, with EPA's projections of the net benefit of the MACT rule estimated to be $48 to $130 billion based on 2007 dollars.[56] Those benefits strongly suggest that a beyond the floor MACT level of mercury control representing 90% removal would be appropriate, under the governing legal standard.

b. EPA's Proposed MACT Limits for Mercury at Coal-fired EGUs With Design Coal Less than 8300 Btu/lb

EPA has not justified its decision to subcategorize the mercury MACT determinations for the group of coal-fired EGUs designed for coal with heat value less than 8300 Btu/lb.[57] The boundaries of the category are themselves

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[54] *See* Appendix 5-3 to EPA's March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule: Sargent & Lundy, IPM Model – Revisions to Cost and Performance for APC Technologies, Mercury Control Cost Development Methodology, Final, March 11, 2011, at 6, available online at http://www.epa.gov/airmarkt/progsregs/epa-ipm/docs/append5_3.pdf.
[55] *Id.* at 7.
[56] *Id.*
[57] All of the units in this subcategory burn lignite coal; a subcategory based on lignite (or any other particularly high-HAP fuel) would not, however, be

poorly defined; EPA provides no design characteristics to separate these plants from others merely capable (but not designed for) burning such low-heat-value coals. Even if such a subcategory were justified, however, EPA has not properly supported its proposed standard for such units.

i. Proposed New Source MACT Standards for Units Designed for Coal with Heat Value Less than 8300 Btu/lb

(1) EPA's Proposed New Source MACT Floor for Mercury Fails to Reflect Emissions of the Best Controlled Similar Source

EPA has proposed a mercury MACT standard reflective of the MACT floor for new coal-fired EGUs in the <8,300 Btu/lb category of 0.04 lb/GW-hr.[58] EPA also determined the MACT floor emission rate in terms of lb/MMBtu to be 1.0232 x 10^{-6} lb/MMBtu or 1.02 lb/TBtu.[59] The standard is set at the rate EPA determined to be the floor.[60]

(a) EPA Failed to Take Into Account the Fact that the Best Controlled Source in the <8300 Btu/lb Subcategory Had Test Results That Measured Below Detection Limits

EPA found that the best controlled source in the <8300 Btu/lb subcategory was the Sandow Station Unit 5B. According to EPA's mercury MACT floor spreadsheet, this unit's three mercury test results were below the detection level of the test method used.[61] When a unit's emissions are at

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appropriate; the statute requires that EPA include substitution of cleaner fuels among the methods of reducing hazardous pollution, and the Agency may not use its authority to create subcategories to sidestep that obligation. *See Natural Resources Defense Council v. Environmental Protection Agency,* 489 F.3d 1364, 1372-73 (D.C. Cir. 2007) (EPA may not create subcategories in manner that violates statutory requirements).

[58] *See* EPA's spreadsheet entitled "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at Summary tab.

[59] *Id.*

[60] *See* 76 Fed.Reg. 25046 (May 3, 2011).

[61] *See* EPA's spreadsheet entitled "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at "Hg_Avg_<8300Btulb_MMBtu" tab.

or below the detection level, its emissions could be at the detection level or lower. To account for such test results in developing emission factors, EPA has typically assumed emissions were at half the detection level when there are other test results for the unit that measured above detection limits.[62] Had EPA followed the same approach here, the average of the test results at Sandow Station Unit 5B would have been lower. Instead, EPA has assumed that actual mercury emissions were equal to the detection limit of the test at that unit. By doing so, EPA may have overestimated the average mercury emission rate being achieved at this unit.

(b) EPA's Proposed New Source MACT Floor Limit Goes Well Beyond Accounting for Variability in Emissions at the Best Controlled Source and Also Fails to Reflect the Thermal Efficiency of a New EGU

After EPA determined the MACT floor in terms of lb/MMBtu, EPA accounted for variability in the top ranked EGU in the <8300 Btu/lb subcategory by determining the 99th percentile UPL value. EPA then did the same analysis for mercury emissions in terms of lb/MW-hr. Elsewhere in this comment letter, we provide a critique of using that metric to reflect variability in emissions. However, not only did EPA determine the 99th percentile UPL emission rate in terms of lb/MW-hr, EPA then 'rounded' up that value in coming up with a new source MACT floor emission limit EPA has provided for absolutely no justification for that increase. Further, a comparison of the proposed mercury MACT floor limit in terms of lb/GW-hr to the 99th percentile UPL mercury emission rate in terms of lb/MMBtu reflects an unreasonably high thermal efficiency that does not reflect the design and operation of a new EGU. The end result is that EPA's proposed 0.04 lb/GW-hr

[62] *See* US EPA, Procedures for Preparing Emissions Factor Documents, EPA 454/R-95-015, November 1997, at 4-21, available at http://www.epa.gov/ttn/chief/efdocs/procedur.pdf.

falls well short of the mercury emissions achieved at the best controlled source in the <8300 Btu/lb subcategory.

Specifically, EPA determined the average lb/MW-hr emission rate of Sandow Station Unit 5B to be 1.0726 x 10^{-5} lb/MW-hr, and determined the 99th percentile UPL of that source's data to be 3.4543 x 10^{-5} lb/MW-hr.[63] EPA then increased this value to arrive at a floor value of 4 x 10^{-5} lb/MW-hr or 0.04 lb/GW-hr. EPA has not provided adequate justification for going beyond the 99th percentile UPL in its determination of the MACT floor emission rate for mercury.

New coal-fired EGUs are typically designed to be more efficient with lower heat rates than typical existing coal-fired EGUs. For this subcategory of coal with heat value <8300 Btu/lb, circulating fluidized bed boilers are typically used in new source applications for such lower grade of coals. Supercritical circulating fluidized bed boilers are available today with net thermal efficiencies exceeding 41%.[64] Even with use of lignite coal, the thermal efficiency of a new EGU should be at least 38% (or a heat rate of 9000 Btu/kW-hr). The lb/GW-hr limit equivalent to EPA's 99th percentile UPL mercury emissions rate of 3.295 x 10^{-6} lb/MMBtu assuming a heat rate of 9,000 Btu/kW-hr would be 0.0297 lb/GW-hr. At the very minimum, EPA should not assume a heat rate of any higher than that achieved at the Sandow Station Unit 5B given that the Sandow Station Unit 5B is a recently built unit.

(c) EPA Should Consider Other Approaches to Accounting for Variability in Setting a Mercury MACT Floor Emission

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[63] *See* EPA spreadsheet with filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at the worksheet entitled "Summary."

[64] *See* Utt, James et al., Utility CFB Goes "Supercritical" – Foster Wheelers' Lagisza 460 MWe Operating Experience and 400-600 MWe Designs, presented at Coal-Gen 2009, Charlotte, NC, August 19-21, 2009, at 1 (Ex. 9-23).

Limit to More Accurately Reflect the Mercury Emissions Achieved by the Best Performing EGU.

In our comments on EPA's MACT floor determination for existing EGUs in the >8300 Btu/lb subcategory, we provide comments on the use of a long term averaging time limit with compliance determined by mercury CEMs to account for variability in emissions at the best controlled source, rather than apply a 99th percentile UPL analysis to reflect variability (which we contend goes well beyond predicting the worst reasonably foreseeable conditions). We incorporate those comments by reference here. Such an approach will adequately account for the worst reasonably foreseeable circumstances while at the same time more accurately reflecting the average mercury emission rate of the lowest emitting EGU in the <8300 Btu/lb subcategory. In addition, by requiring use of mercury CEMs and imposing a long averaging time, EGU owners will be more vigilant about the EGU's mercury emissions on a day in-day out basis to make sure the mercury controls are being operated in a manner to ensure continuous compliance with the MACT limits.

(2) EPA Did Not Adequately Justify Why It Did Not Evaluate a Beyond the Floor Mercury MACT Limit for New Sources in the <8300 Btu/lb Subcategory

EPA did not evaluate whether mercury emission rates lower than its determination of MACT floor could be met at coal-fired EGUs in the <8,300 Btu/lb subcategory. EPA suggests that it could not identify any control technologies that could achieve greater emission reductions of HAP than the control technologies they expected to be used to meet the MACT floor level of control.[65] That is not the appropriate test to follow in determining whether to evaluate beyond the floor MACT requirements.

[65] *See* 76 Fed.Reg. 25046 (May 3, 2011).

Various control methods are available to reduce the amount of mercury emitted by a coal-fired EGU. Activated carbon injection systems can be operated to achieve varying levels of mercury control, based on the amount of sorbent injected. EPA has noted this in its justification to require a beyond the floor analysis for existing sources in the <8300 Btu/lb subcategory.[66] And heat rate, as described above, affects mercury output. Emissions may be reduced without additional controls, by altering these operational parameters.

Further, because of the factors that EPA applied to reflect variability of the best performing unit in the <8300 Btu/lb subcategory, EPA's proposed MACT floor limit fails to reflect the emissions that have been demonstrated to be achievable at the best controlled similar source in this subcategory. EPA's determination of best performing similar source is Sandow Station Unit 5B which is a fluidized bed boiler with SCR, dry scrubber, ACI, and a fabric filter.[67] This EGU is achieving greater than 95% mercury removal, but EPA's proposed MACT floor emission limit for new sources reflects 87% or less removal efficiency.

As discussed above in our comments on beyond the MACT floor requirements for existing EGUs in the >8300 Btu/lb subcategory, EPA's Regulatory Impact Analysis suggests that 90% mercury removal is achievable and cost effective.[68] Ninety percent control should be readily achievable at

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[66] *Id.* Specifically, EPA states: "EPA has learned that the units of this design that were using ACI during the testing were using ACI to meet their permitted Hg emission levels. However, EPA believes that the control level being achieved is still not that which could be achieved if ACI were used to its fullest extent."

[67] *See* EPA spreadsheet with filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at the worksheet entitled "Hg_New_>8300 Btulb_MMBtu."

[68] *See* EPA's March 2011 Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report at 1-1 (Docket no. EPA-HQ-OAR-2009-0234-3051). EPA assumed 90% mercury removal in its IPM, *see* Table 9-5 of EPA's March 2011

new coal-fired EGU designed for fuel with heat value less than 8300 Btu/lb. As previously stated, circulating fluidized bed boilers are typically used for burning lower grade coals in new source applications. At the minimum, such a new coal-fired EGU would also be equipped with at least a dry scrubber and a baghouse, and possibly an SCR system – all to meet best available control technology and NSPS requirements. This combination of controls should achieve a fairly high level of mercury removal as a cobenefit, especially with an SCR to assist in oxidizing the mercury. With the addition of an ACI system using halogenated sorbents, 90% mercury removal from the mercury in the coal should be readily achievable. Indeed, this is the set of controls used at both Sandow Station Units 5A and 5B and these units are achieving 95-96% mercury removal based on the data collected by EPA.

For all of these reasons, EPA has not justified its decision to forego a beyond the floor MACT analysis for new sources in the <8300 Btu/lb subcategory.

ii) Proposed Existing Source MACT Standards for Coal-Fired Units in the <8300 Btu/lb Subcategory

1) EPA's Proposed Existing Source MACT Floor for Mercury Fails to Reflect the Mercury Emissions Rate Actually Achieved by the Best Performing 12% of EGUs in the <8300 Btu/lb Subcategory

As it did to set its parallel standard in the broader coal-fired category, EPA set its mercury standard for existing units in the <8300 Btu/lb subcategory EPA: (a) assumed that emissions below the detection limit were at the detection limit; (b) applied a 99% UPL to its data, and (c) 'rounded' that figure further upwards, despite any plausible imprecision in its results. As set forth elsewhere in these comments, each of those decisions departs from the statutory requirements.

Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule (Docket no. EPA-HQ-OAR-2009-0234-3048).

(3) EPA's Proposed Existing Source MACT Emission Limit Fails to Reflect the Maximum Degree of Mercury Emission Reductions that is Achievable For the <8300 Btu/lb Subcategory

EPA has proposed a beyond the floor mercury MACT limit for the <8300 Btu/lb subcategory of coal-fired EGUs of 4.0 lb/TBtu or 0.04 lb/GW-hr.[69] These emission limits do not reflect the maximum degree of mercury emission reductions achievable at coal-fired EGUs in the <8300 Btu/lb subcategory.

In EPA's IPM used to evaluate costs and benefits for the proposed MACT rule, EPA assumed a mercury emission reduction level of 90% with the use of brominated activated carbon injection required at most coal-fired EGUs.[70] However, EPA's proposed MACT floor emission limit of 4.0 lb/TBtu for the <8300 Btu/lb subcategory does not reflect 90% mercury removal for the coals that would fall into the <8300 Btu/lb category (primarily lignite). In Table 5-11 of Chapter 5 of EPA's August 2010 Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model (at page 5-17), EPA identified various coal types by sulfur grade and uncontrolled mercury emission factors based on mercury concentration in the coal. In the table below, we have reprinted that information for the lignite coals, and we have also included calculations of the % removal that the 4.0 lb/TBtu MACT emission limit reflects from mercury in these various coals.

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[69] *See* 85 Fed.Reg. 25127 (May 3, 2011).

[70] *See* March 2011 Documentation Supplement for EPA Base Case v.4.10_PTox-Updates for the Proposed Toxics Rule at pages 76-82 (Docket no. EPA-HQ-OAR-2009-0234-3048). The only EGUs that EPA did not model with ACI to meet a 90% mercury removal rate were those units that were already likely achieving 90% or greater mercury removal as a cobenefit of SO2, NOx and PM control technologies. *See* Section 5.4.3 and Table 5-16 of March 2011 Documentation Supplement (Docket no. EPA-HQ-OAR-2009-0234-3048).

Uncontrolled Mercury in the Coal For Coals <8300 Btu/lb[71] and Percent Removal Required to Comply with EPA's Proposed 4.0 lb/TBtu Existing Source Mercury MACT Limit.

Coal Type by Sulfur Grade	**Cluster #1**		**Cluster #2**	
	Hg lb/TBtu	**% Removal to Comply with 4.0 lb/TBtu**	**Hg lb/TBtu**	**% Removal to Comply with 4.0 lb/TBtu**
Low Medium Sulfur Lignite (LD)	7.51	46.7%	12.00	66.7%
Med Sulfur Lignite (LE)	13.55	70.5%	7.81	48.8%
High Sulfur Lignite (LE)	14.88	73.1%	----	

As can be seen from this table, the proposed 4.0 lb/TBtu mercury emission limit would not even 75%, mercury control for any of the various types and clusters of lignite.

Ninety percent mercury control been demonstrated to be achievable, even at EGUs burning coal with heat value <8300 Btu/lb. Many EGUs including those that burn lignite coal achieve some level of mercury control as a co-benefit of criteria pollutant controls. For example, of the EGUs in the <8300 Btu/lb subcategory for which EPA has data, three fluidized bed boilers burning lignite and equipped with baghouses but no mercury-specific controls achieved mercury removal rates of 54% to 75%.[72]

There are several options available to raise these levels of mercury removal to 90% or more, including the addition of activated carbon injection.

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[71] Data on uncontrolled mercury and coal types is from Table 5-11 of Chapter 5 of EPA's August 2010 Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model (at page 5-17) (Docket no. EPA-HQ-OAR-2009-0234-3049).

[72] *See* EPA spreadsheet with filename "floor_analysis_coal_hg_051811.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-10041) at the worksheet entitled "Hg_New_>8300 Btulb_MMBtu" – specifically, Twin Oaks Power One Unit 2 and Red Hills Generating Facility Units 2 and 1.

EPA has data for three such units with ACI that burn lignite. Two are CFB boilers with SCR, dry scrubbers and baghouses (Sandow Station Units 5A and 5B) and one is a pulverized coal boiler with SCR, a baghouse, and a wet scrubber (Oak Grove Unit 1).[73] These three units all achieved well in excess of 90% mercury control with this pollution control equipment.

The mercury emissions from lignite burning EGUs can be more difficult to capture in comparison to the mercury control achieved at EGUs burning other types of coals (especially those that burn bituminous coal). Lignite coals are typically much higher in mercury content than other coals. A high percentage of the mercury in the flue gas of lignite boilers is in elemental mercury form, which is more difficult to capture in downstream sulfur dioxide and particulate controls. One key approach to improving mercury reduction at lignite-fired power plants is to increase the oxidation of the mercury so that it is more reactive to be more readily captured in downstream pollution controls. Another important factor to improve mercury removal is the addition of a baghouse, either full-scale or via a downstream polishing baghouse such as a COHPAC™ configuration.

The use of halogenated sorbents greatly enhances the oxidation of elemental mercury and also provide particles for the oxidized mercury to react with and adhere to. For example, iodine-impregnated carbon was utilized at the lignite burning Stanton Station Unit 10, a pulverized coal-fired boiler with an ACI system, spray dryer, and baghouse; the system achieved 96% mercury removal.[74] Brominated activated carbon was also tested at Stanton Unit 10, and 95% mercury removal was achieved with this sorbent.[75]

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[73] *Id.*

[74] *See* Sjostrom, Sharon et al., Full-Scale Evaluation of Mercury Control at Great River Energy's Stanton Station using Injected Sorbents and a Spray Dryer/Baghouse, 2002, at 11, 13. (Ex. 9-24).

[75] *See* Machalek, Tom et al., Full-Scale Activated Carbon Injection for Mercury Control in Flue Gas Derived from North Dakota Lignite, at 6 (Ex. 9-25).

At the NRG Limestone power plant, which burns a blend of 30% subbituminous and 70% lignite coal, the addition of calcium bromide in conduction with sorbent provided for greatly increased mercury removal. The two units tested at this plant each are equipped with cold-side ESPs, wet scrubbers, and activated carbon injection systems. With the activated carbon injection and the addition of calcium bromide, 75-85% mercury removal was achieved.[76] However a portion of these units' flue gas bypasses the wet scrubbers; the elimination of the bypass should improve mercury removal efficiency.[77] Similar results were observed with the injection of calcium chlorine at the Limestone units.[78] Again, if the scrubber bypass were eliminated, this level of mercury control would presumably increase.

The Big Brown power plant burns Texas lignite blended with subbituminous Powder River Basin coal (typically 70% lignite/30% Powder River Basin coal), and is equipped with a COHPAC™ system (i.e., a cold side ESPs followed by a polishing baghouse). The plant achieved 90% mercury removal with activated carbon, and at a much lower carbon injection rate with enhanced activated carbon.[79]

The Mer-Cure™ process, a proprietary, carbon-based sorbent, similarly accelerates mercury oxidation as well as capture mercury.[80] Ninety percent removal of mercury was achieved at Leland Olds which burns North Dakota lignite and is equipped with an ESP.[81]

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[76] *See* Dombrowski, Katherine, Mercury Control for Plants Firing Texas Lignite and Equipped with ESP-Wet FGD, March 2010 at ES-1 (Ex. 9-26).
[77] *Id.*
[78] *See* Mercury Reduction Technology Shows Promise for Texas Lignite, March 1, 2005, Power-Gen Worldwide. Ex. 9-27.
[79] *See* Pavlish, John, Field Testing of Activated Carbon Injection Options for Mercury Control at TXU's Big Brown Station, presented at DOE NETL Mercury Control Technology Conference, December 11-13, 2007, at Slides 7 and 24 (Ex. 9-28).
[80] *See* Mer-Cure™ Demonstrated at Leland Olds, McIlvaine Company Precip Newsletter, January 2008. Ex. 9-29.
[81] *Id.*

All of the above options can achieve mercury emissions below those proposed by EPA. Lignite-fired EGUs can also choose the option of blending lower mercury subbituminous coal in combination with ACI and the addition of a baghouse.[82] EPA's proposed beyond the floor mercury limit for the <8300 Btu/lb subcategory does not reflect even 70% mercury removal from uncontrolled mercury levels in most lignite coals; better rates have been demonstrated, as set forth above.

B. EPA's Proposed Acid Gas MACT Emission Limits

As discussed above, EPA has not justified its use of HCl as a surrogate for all or any of the acid gases but itself. Nor has EPA justified the use of SO_2 as a surrogate for all or any of the acid gases. EPA should therefore impose separate MACT limits for HCl, HF, HCN, Cl_2 and SeO_3. That flaw to one side, below we provide our review and comments on EPA's proposed numerical MACT limits for HCl and SO2.

1. EPA's Proposed Acid Gas Limits for Coal-Fired Units

a. Determination of HCl MACT Floor for Existing Sources

According to EPA, there are 1091 coal-fired EGUs nationwide; accordingly, the best performing 12% of those sources should include 131 EGUs.[83] We understand that EPA determined the existing source MACT floor for HCl as follows: Through its 2009 Information Collection Request (ICR), EPA obtained and/or required emission testing at approximately 256 EGUs (based on the HCl data provided in EPA's HCl MACT Floor Spreadsheet). EPA then ranked those units' emissions from lowest HCl emission rates to highest emission rates. EPA determined the average HCl emission rate of the top performing 131 units (which is 12% of the universe of

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[82] *See* EPA's Emission Reduction Costs for the Beyond-the-Floor Mercury Rate in the Toxics Rule (Docket no. EPA-HQ-OAR-2009-0234-2925).
[83] *See* May 18, 2011 Revised MACT Floor Memo at 3 (Docket no. EPA-HQ-OAR-2009-0234-9858).

such units, not the 256 for which data were available and summarized) to be 2.19 x 10^{-4} lb/MMBtu.[84] Next, EPA accounted for variability in emissions at these 131 units by determining the 99th percentile Upper Prediction Limit (UPL) of the HCl emissions data. According to EPA, "a 99 percent level of confidence means that a facility whose emissions are in line with the best performers has one chance in 100 of exceeding the floor limit."[85] The 99th percentile UPL HCl emission rate was determined by EPA to be 1.250 x 10^{-3} lb/MMBtu.[86] Then, to derive a floor value, EPA rounded the 99th percentile UPL up to 0.0020 lb/MMBtu.[87]

This proposed emission limit of 0.0020 lb/MMBtu is higher than the minimum HCl emission rate measured at any of the 131 lowest HCl emitting EGUs and, in fact, is higher than all but three of the maximum HCl emission rates measured at the 131 "best-performing" HCl emitting EGUs. This proposed HCl emission rate can hardly be portrayed as representative of the average HCl emission rate of the top performing 12% of coal-fired EGUs. Further, of the full HCl dataset of 256 EGU HCl test data, 177 units have HCl emissions below EPA's proposed MACT floor limit – including several units with no SO2 or acid gas controls at all. The Clean Air Act instructs EPA to set a MACT floor reflecting the emissions averaged by the top 12% of EGUs; EPA's MACT standard of 0.0020 lb/MMBtu (purportedly based on 131 units of the 256 tested, or 51% of the total HCl dataset) can be met by a full 69% of the EGUs tested. EPA's standard-setting– ostensibly intended to determining the average emission rate achieved by the best performing 12% of coal-fired EGUs under the worst reasonably foreseeable conditions – has

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[84] *See* Spreadsheet entitled "floor analysis coal HCl 31611" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "Summary" worksheet.
[85] *See* May 18, 2011 Revised MACT Floor Memo at 4 (Docket no. EPA-HQ-OAR-2009-0234-9858).
[86] *See* Spreadsheet entitled "floor analysis coal HCl 31611" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "Summary" worksheet.
[87] *Id.*

resulted in a HCl MACT standard well out of sync with the statutory standard. Below we provide a more detailed explanation of the flaws in the agency's justification of its 0.0020 lb/MMBtu HCl emission limit.

i. EPA Did Not Include HCl Emissions Data for All of the Lowest Emitting Coal-Fired EGUs

EPA has HCl emissions data for 256 EGUs, which only reflect the emissions of 23% of the total number of coal-fired EGUs in the U.S. EPA assumed that this data captured all of the lowest emitting units, and on that bases selected data from the lowest emitting 131 units (51% of the units for which EPA collected emissions data) to represent the best performing 12% of all coal-fired EGUs in the United States.[88]

The statute requires EPA to establish existing source standards no higher than the "average emission limitation achieved by the best performing 12 percent of the existing sources (*for which the Administrator has emissions information*)." 42 U.S.C. § 7412(d)(3)(A) (emphasis added). The Agency has, instead, based its standard on the assumed emissions of sources for which it has no information.

And the record does not support EPA's reliance on that assumption. Prior to proposing EGU MACT standards, EPA collected emissions data on numerous coal-fired EGUs via an Information Collection Request.[89] EPA selected EGUs to be tested that it believed were the "best performing sources

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[88] In contrast, EPA collected mercury emissions data for 328 EGUs in the>8300 Btu/lb subcategory, but treated that data as representative of the fleet as a whole. Accordingly, it based its mercury standard on 12% of its dataset - or 40 EGUs. Similarly, For the <8300 Btu/lb subcategory, EPA assumed that 12% of that dataset of 11 EGUs - or 2 EGUs - reflected the top 12% of the EGUs in the nation in the <8300 Btu/lb subcategory.

[89] *See* Information Collection Effort for New and Existing Coal- and Oil-Fired Electric Utility Steam Generating Units, December 2009 (Docket no. EPA-HQ-OAR-2009-0234-0102).

for the HAP groups for which they will be required to test."[90] EPA targeted 15% of all EGUs and assumed that would ensure the agency had the emissions data for the top 12% of all EGUs.[91]

In particular, EPA assumed that EGUs with the most recently installed SO2 controls would achieve the lowest acid gas HAP emission rates. Consequently, EPA required acid gas HAP testing at the "175 units with the newest FGD controls installed."[92] EPA selected EGUs for testing with SO2 controls installed in 1991 or later. [93] EPA assumed that these units would have to comply with the most stringent SO2 emission limits and would achieve the lowest emission rates of acid gas HAPs (although EPA had not yet determined that SO2 could serve as a surrogate for acid gas HAPs).[94] EPA also randomly selected 50 other units for acid gas and other HAP testing that did not necessarily have SO2 controls.[95] Further, EPA collected other HCl testing that had been done in the past at EGUs.

EPA assumed that those units with the most recently installed SO2 scrubbers would have to comply with most stringent SO2 emission limits, and achieve the greatest SO2 removal efficiency.[96] EPA has not, however, presented data on the SO2 emission limits, or on SO2 removal efficiencies of the EGUs tested to verify that the SO2 controls at these units are operated to achieve the most stringent SO2 emission rates.

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[90] *See* Part B to the Supporting Statement for the Information Collection Request for the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coal- And Oil-fired Electric Utility Steam Generating Units at 2 (Docket no. EPA-HQ-OAR-2009-0234-0103).
[91] *Id.*
[92] *Id.* at 4.
[93] *See* Information Collection Request for National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coal- and Oil-Fired Electric Utility Steam Generating Units, Part B of Supporting Statement, December 2009, at 4; *see also* Attachment 8 (both located at (Docket no. EPA-HQ-OAR-2009-0234-0103).
[94] *Id.*
[95] *Id.*, Attachment 13.
[96] *Id.* at 4.

EPA's assumption that only the more recently installed scrubbers would have the highest removal efficiency was a flawed assumption. There are several examples of scrubbers installed in the 1980's that either were designed and always operated to achieve high levels of SO2 control, or that have been upgraded (e.g., bypass eliminated) to greatly improve SO2 removal. Despite the superior SO_2 (and acid gas) removal demonstrably achieved by such facilities, EPA excluded them from those selected for additional testing. For example, the following units burn lower chlorine coal and have scrubbers that achieve high levels of SO2 control, but they were not tested for HCl testing: Intermountain Power Units 1 and 2, Hunter Unit 3, Huntington Unit 2, and Craig Units 1 and 2.[97] There are also several EGUs that have recently had highly effective scrubbers installed, yet EPA did not require testing of those units either. For example, EW Brown Units 1-3 have recently installed scrubbers designed to achieve 98.5% SO2 removal, Jeffrey Energy Center had scrubbers installed in 2009 designed to achieve 98% SO2 removal, Paradise Unit 3 had a scrubber installed recently that was also designed to achieve 98% SO2 removal as did all six units at the WH Sammis plant.[98]

Most importantly, the data in the record does not support EPA's claimed relationship between SO_2 emissions and acid gas emissions. Aside from chlorine content of the coal and SO2 removal efficiency of the SO2 controls, HCl removal is affected by process conditions and by competing reactions between the slurry and the acid gases (including SO2). A

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[97] The following of these units have annual average SO2 emission rates of 0.06 lb/MMBtu or lower: Craig Units 1 and 2, Hunter Unit 3, and Huntington Unit 2. Intermountain Power Units 1 and 2 achieved 0.08 lb/MMBtu on an annual average basis. See Ex. 9-31, spreadsheet of 2008 and 2009 annual average emissions data for these units from EPA's Clean Air Markets Database.

[98] These and other examples of recently installed/upgraded high performance scrubbers can be found in the Burns & McDonnell paper entitled "Utility FGD Design Trends," which is attached as Ex. 9-32 to this letter.

comparison of the lowest 131 HCl-emitting EGUs to the lowest 131 HF-emitting EGUs seems to indicate such competing reactions. Based on all of the acid gas data presented in EPA's HCl MACT floor spreadsheet, we sorted the EGUs based on HF emission rates. The table below shows that the lowest 131 HCl-emitting EGUs have an average HF emission rate than is five times higher than the average HF emission rate of the lowest 131 HF-emitting EGUs.

Comparison of the Average HCl and HF Emission Rates of the Lowest HCl-Emitting Units and the Lowest HF-Emitting Units

	Avg HCl Emission Rate	**Avg HF Emission Rate**
Lowest 131 HCl-Emitting EGUS	2.19 E-04 lb/MMBtu	4.28 E-04 lb/MMBtu
Lowest 131 HF-Emitting EGUs	2.76 E-03 lb/MMBtu	8.58 E-05 lb/MMBtu

Similarly, the lowest 131 HF-emitting EGUs have an average HCl emission rate that is an order of magnitude higher than the average HCl emission rate of the lowest 131 HCl-emitting EGUs. EPA has indicated that HCl and HF would be absorbed more readily than SO2 in a scrubber[99], but such acid gas removal does not appear to occur at the same levels for each acid gas emitted by an EGU – as set forth above, and this suggests the need for separate HF limits.[100]

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[99] *See* Information Collection Request for National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coal- and Oil-Fired Electric Utility Steam Generating Units, Part B of Supporting Statement, December 2009, at 3 (Docket no. EPA-HQ-OAR-2009-0234-0103).

[100] The record suggests that SO2 control efficiencies correlates with HCl control efficiencies. Nonetheless, EPA should not use SO2 limits as a surrogate for direct limits on HCl and other acid gas HAPs. Actual HCl emissions remain significantly dependent on the chlorine level in the fuel. Net SO2 emissions, similarly, depend on the sulfur content of the burned coal. The uncontrolled SO2 emissions based on sulfur in the coal can vary from 0.6 lb/MMBtu to in excess of 6 lb/MMBtu. *See* August 2010

In addition, the low chlorine dataset also included some EGUs with pulverized coal boilers that had absolutely no SO2 controls. Chlorine in the coal accounts for some of these low HCl values, but there is data to show some level of HCl removal is occurring at these units. For example, Joliet 9 Unit 5 is a cyclone boiler, burns subbituminous coal, and is equipped with activated carbon injection and an ESP; it is achieving approximately 55% HCl reduction.[101] As the data for this unit shows, there can be other factors that come into play that affect HCl removal. That EPA's 131 lowest HCl-emitting EGU dataset includes EGUs with no SO2 controls also suggests that EPA's dataset does not capture all of the lowest HCl-emitting EGUs in the U.S.

The SO2 removal efficiency of the SO2 controls is not the only factor impacting HCl emissions. Chlorine content of the coal has an impact. EPA's ICR did not seek out EGUs with the most effective SO2 controls that also were burning lower chlorine coal, and we have identified several such units that EPA should have included in its dataset but did not. In addition, there likely are other factors that affect the removal of HCl that go beyond the SO2 removal efficiency of the scrubber, such as competing reactions between the slurry, HCl and other acid gases. Further, there could be other factors in the design and/or operation of the scrubber that optimize a scrubber for HCl

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Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model, Table 9-5 (at 108-109) (Docket no. EPA-HQ-OAR-2009-0234-3049). Thus, a unit burning coal with an uncontrolled SO2 rate of 6 lb/MMBtu would be achieving 95% SO2 removal if its SO2 emission rate was 0.30 lb/MMBtu. However, if a unit was burning coal with an uncontrolled SO2 rate of 1 lb/MMBtu, an SO2 emission rate of 0.3 lb/MMBtu would only reflect 70% control. Accordingly, a unit with a low-performing scrubber (but low sulfur coal) could have low SO_2 emissions. The record suggests no correlation between sulfur content and chlorine content in coal; that same unit would, therefore, have high HCl emissions.

[101] *See* EPA spreadsheet with filename "floor_analysis_coal_HCl_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "AcidGas_Coal" worksheet, Row 130.

removal. For all of these reasons, it is unlikely that EPA's target data set includes the 131 lowest HCl-emitting EGUs out of all the 1,091 coal-fired EGUs in the U.S. We suggest that EPA truncate the dataset it uses to determine MACT floor to better ensure that it only reflects the HCl emissions of the top 12% performing units, to reflect the fact that some of the best-performers lie outside its data set.

ii) EPA's Determination of the Average HCl Emission Rate of the 131 Lowest Emitting Units Tested Fails to Take into Account Emission Rates that Were Below Detection Limits

In determining the average HCl emission rate of the 131 lowest emitting units, EPA is using some test data that was measured below the detection level of the monitoring method. EPA improperly accounted for data below detection limits in determining variability (as we have discussed elsewhere in these comments, Chapter VIII.B). We also question EPA's assumption the units with test results below detection limits to be emitting at the detection level in determining an average HCl emission rate of the best performing units.

In calculating the average emission rate for each unit, EPA assumed detection limit values were equal to the detection limit. When a unit's emissions are at or below the detection level, its emissions could be just below the detection level or lower. To account for such test results in developing emission factors, EPA has typically assumed emissions were at half the detection level when there are other test results for the unit that measured above detection limits.[102] Had EPA followed the same approach here, the average of the test results of EPA's 131 lowest HCl emitting units would have been lower. The flaws associated with substituting the detection limit (or

[102] *See* US EPA, Procedures for Preparing Emissions Factor Documents, EPA 454/R-95-015, November 1997, at 4-21, available at http://www.epa.gov/ttn/chief/efdocs/procedur.pdf.

even half the detection limit) in censored data are well known.[103] EPA should use better methods such as maximum likelihood estimation (MLE) methods, imputation methods, or the Kaplan-Meier method to conduct data substitution before initiating its floor analysis.[104] As it stands, instead, EPA has assumed that HCl emissions are equal to the detection limit of the test at that unit. By doing so, EPA has overestimated the average HCl emission rate of the lowest 131 HCl-emitting EGUs for which EPA had test data.

EPA should account for the likelihood that HCl emissions are lower than the detection limit in determining the average HCl emission rate. At the minimum, EPA should take into account the likelihood that its average HCl emission rate is likely an overestimate when determining an appropriate HCl emission limit to propose as reflective of the MACT floor for HCl.

The data used in the floor analysis for HCl for Logan Unit 1 provides an example of the manner in which EPA has distorted its standards. On the basis of the minimum data for HCl, this unit was picked as the best performing unit and is the basis for the new source floor. However, for the analysis of variability of the existing source, six sets of data were used for this unit – one collected as part of the ICR and 5 older tests for the years 2005, 2006, 2007, 2008, and 2009. From EPA's Part I and Part II Access database, the following information was obtained regarding the older (non-ERT) tests.

Test Date/Run	Result	Result (Alt Units)
5/19/05/Run 1	<0.1 lb/hr	<0.04 ppm
5/19/05/Run 2	<0.3 lb/hr	<0.08 ppm
5/19/05/Run 3	0.0002 lb/MMBtu	
6/15/06/Run 1	<1.47 lb/hr	<0.06 ppm

[103] *See* Helsel, D.R., "Fabricating Data: How Substituting Values for Non-Detects Can Ruin Results and What Can Be Done About It," Chemosphere Vol. 65, 2006. Ex. 9-33.

[104] See Helsel, D.R., "More Than Obvious: Better Methods for Interpreting Non-Detect Data," Environmental Science and Technology, October 15, 2005, p. 419. Ex. 9-34.

6/15/06/Run 2	<1.67 lb/hr	<0.06 ppm
6/16/06/Run 3	<1.35 lb/hr	<0.05 ppm
7/12/07/Run 1	<0.46 lb/hr	<0.15 ppm
7/12/07/Run 2	<0.43 lb/hr	<0.15 ppm
7/12/07/Run 3	<0.41 lb/hr	<0.14 ppm
6/27/08/Run 1	<1.01 lb/hr	<0.32 ppm
6/27/08/Run 2	<0.99 lb/hr	<0.32 ppm
6/27/08/Run 3	<1.02 lb/hr	<0.33 ppm
6/24/09/Run 1	<0.17 lb/hr	<0.06 ppm
6/24/09/Run 2	<0.17 lb/hr	<0.06 ppm
6/24/09/Run 3	<0.17 lb/hr	<0.06 ppm

As seen in the table above, except for one data point (i.e., 5/19/05 Run 3), all of the runs were non-detect. Yet, the detection limits (all MDLs, per the database) show wide and inexplicable variability. Since actual test reports are not available for these older tests (or could not be located), it was not possible to determine exactly why the detection limits (in units of ppm and lb/hr) varied so significantly. It is not certain if all of the data were analyzed by the same or different labs. For example, in ppm units, the MDL ranged from 0.05 ppm to 0.33 ppm. This is more than a six-fold variability in detection limits, which, based on EPA's methodology (i.e., assuming that actual emissions are equal to the detection limit in the case of non-detect data), significantly (and likely spuriously) affects the variability analysis, since, in all of these runs, the actual emissions of the unit were non-detect. In other words, the variability analysis factors in the effects of analytical test variability more than the actual variability in the emissions of the source itself. Further, considering the data shown above, it is not readily apparent why the 2006 runs had relatively low detection limits in ppm terms but high detection limits in lb/hr units. Compare the lb/hr numbers for 2006 and 2009. In both years, the runs had MDLs in the range of 0.05-0.06 ppm. Yet the calculated lb//hr values are almost an order of magnitude greater in 2006 than 2009. Without the underlying test data and reports, the cause of this could not be ascertained. But, it is important to note that EPA included all of this data in its variability analysis, assuming that these reflect proper "intra-

unit" variability over the years. The range in this data do not properly reflect likely intra-unit variability for an emissions unit whose emissions were always likely low.

EPA should also examine the range of data for various other units included in its floor variability analysis. These include TS Power and Montrose Units 2 and 3. In each of these cases, the ratio of the maximum to the minimum averages of various tests exceeds 10. EPA should not simply assumes that these large variations reflect unit emissions variability; test variability, or other factors unrelated to actual emissions, may be responsible. If so, those results should be excluded from EPA's calculations.

iii. EPA Has No Justification to Round Up the HCl MACT Floor from the 99th Percentile UPL

After taking the average of the HCl emissions of the 131 lowest emitting EGUs (including the flawed assumption that those units tested below detection limits were emitting HCl at the detection limit) and after determining the 99th percentile UPL value, EPA 'rounded' that number up to the nearest third decimal place in coming up with a proposed HCl MACT floor limit. Specifically, the 99th percentile UPL HCl value was 0.001250 lb/MMBtu and EPA "rounded" that up to a proposed MACT floor limit of 0.0020 lb/MMBtu.[105] The proposed MACT floor is 1.6 times higher than the 99th percentile UPL HCl value. A review of the HCl data collected by EPA shows twelve of the 256 units with minimum HCl values falling between 0.001250 and 0.0020 lb/MMBtu.[106] So just in EPA's dataset of 256 units tested, 4.6% of the tests results fall in this range at EGUs that would have

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[105] *See* EPA spreadsheet with filename "floor_analysis_coal_HCl_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "Summary" worksheet. *See also* 76 Fed.Reg. 25045 (Table 10); proposed Table 2 to Subpart UUUUU of 40 C.F.R. Part 63 (76 Fed.Reg. 25126).
[106] *Id.* at AcidGas_coal worksheet.

had to reduce HCl emissions had EPA not rounded up the 99th percentile UPL from 0.001250 and 0.0020 lb/MMBtu.

EPA offers no justification for that inflation. EPA has not suggested that its calculation of HCl emissions at .001250 lb/MMbtu is so imprecise as to require the chosen inflation. EPA consequently has no basis to conclude that the average *actual* emissions of the floor plants are any higher (or lower) than .001250 lb/MMbtu, or that measurement inaccuracies make a limit at that level infeasible. By inflating the standard from 0.001250 to 0.0020 lb/MMBtu, EPA has provided a limit which exceeds (even the 99th percentile UPL-adjusted) emissions of the best performing sources. EPA has provided no justification that departure from statutory standard.

iv. Conclusion

EPA's proposed HCl limits for existing units are in excess of the statutory floor. EPA has made an unsupported assumption that it captured the 131 lowest HCl emitting units in its ICR for HCl emissions. EPA has also improperly assumed those units with HCl test results below test method detection limits were actually emitting at the detection limit. And EPA has impermissible rounded up its UPL-adjusted rate such that it is now 1.6 times the 99th percentile UPL of the plants' actual emissions. Finally, compounding all of this, EPA has set the floor based on 3 times the MDL – without proper justification. EPA should, for these reasons, revise the HCl MACT floor to realistically reflect the actual emissions of the best performers.

2. Determination of a Surrogate SO2 MACT Floor Limit for Existing Sources.

EPA has proposed the use of SO2 as a de facto surrogate for HCl and other acid gases at EGUs with some sort of flue gas desulfurization system. As discussed elsewhere in these comments, EPA has not provided adequate legal or technical justification for its decision to use SO2 as a surrogate for HCl, HF, HCN, or SeO_2. SO2 emissions do not correlate with that of HCl, HF

or HCN emissions. Those issues aside, below we provide our comments on EPA's assessment of the MACT floor for SO_2.

In determining the SO2 MACT floor, EPA re-ranked the data collected for the 256 EGUs not by HCl emissions but by SO2 emissions. *See* EPA spreadsheet titled "floor_analysis_coal_HCl_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3036). The top ranked units in the HCl ranking is the Logan Generating Plant Unit 1, whereas the top ranked unit in the SO2 ranking is Stanton Unit 10 – a unit which does not even show up in EPA's lowest 131 HCl emitters. The 2nd ranked unit for SO2 is Stockton Unit 1, which is also not included in EPA's lowest 131 HCl emitters. In fact, eleven of the top 20 units ranked by lowest SO2 emissions are not in EPA's lowest 131 HCl emitters (this, of itself, should cast doubt on the notion of using SO_2 as a surrogate for HCl or any other acid gas). The average SO2 rate of the 131 lowest HCl emitting units with a flue gas desulfurization system (i.e., wet or dry scrubber) is 0.14 lb/MMBtu[107], as compared to the average SO2 rate of the 131 lowest SO2 emitting units which EPA has calculated to be 0.0740 lb/MMBtu.[108]

a) EPA Should Not Apply a 99th Percentile UPL in Setting an SO2 Limit

For its proposed SO2 MACT floor limit, EPA took the average of its new ranking of the lowest SO2 emitting 131 units and determined the 99th percentile UPL of that SO2 data. Specifically, EPA calculated the average SO2 emission rate of the lowest SO2 emitting units to be 0.0740 lb/MMBtu and then determined that the 99th percentile UPL of that data was more than

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[107] Note that EPA's spreadsheet does not have SO2 emission rates for all units. This info is readily available in EPA's Clean Air Markets Database based on continuous emission monitoring data. For the units with missing SO2 emissions data in EPA's spreadsheet, we used quarterly average SO2 emission rates from 2010.

[108] *See* EPA spreadsheet with filename "floor_analysis_coal_HCl_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "Summary" worksheet.

double the average emission rate at 0.1699 lb/MMBtu.[109] EPA provided no justification for application of the 99th percentile UPL; there is none.

First, EPA's proposed rule would evaluate compliance with the surrogate SO2 limit based on a 30-day rolling average.[110] Such a long term average adequately accounts for variability in SO2 emissions. The SO2 data used by EPA in ranking the SO2 emission rates of the coal-fired EGUs was based on short term average data. Long term averages are typically at the same level or lower than that measured on a short term basis. And they are less variable; had EPA run its UPL formula with 30-day average emissions, it would have inflated the limit by far less. If EPA is setting the SO2 MACT limit based on short term average testing, the 30-day average compliance time provides all of the flexibility needed to reflect the best performing sources under the worst reasonably foreseeable conditions. Given that all coal-fired EGUs are required to measure SO2 with continuous emission monitoring systems (CEMS) under requirements of the New Source Performance Standards as well as Acid Rain Program requirements, a 30-day average SO2 limit will be readily achievable by these sources.

Operators of EGUs routinely use SO2 CEMS data to guide adjustments to the SO2 control equipment. This is especially so when the unit has a strict SO2 limit to meet. For example, if a unit operator sees SO2 emissions spiking, the concentration of lime or limestone in the scrubber slurry can be increased which in turn increases the removal efficacy of the scrubber. Plant operators use such methods on a daily basis.

EPA's analysis suggests that the SO2 removal efficiency of the SO2 controls has an impact on HCl emission rates. Yet, EPA, in applying the 99th percentile UPL to the average SO2 emissions rate, has come up with an SO2 emission rate that will not encourage the best operation of the scrubber, and thus will not ensure removal of HCl (or other acid gases).

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[109] *Id.*.
[110] *See* 76 Fed.Reg 25029 (May 3, 2011).

A long term averaging time provides sufficient flexibility to EGU owners/operators to deal with spikes in SO2 emissions, and thus no adjustments to the SO2 emission rate considered to be reflective of the lowest HCl emitting units is warranted. Further, an SO2 MACT limit that is based on an appropriate subset of the lowest HCl emitting units will ensure that the SO2 controls at each EGU are operated to maximize SO2 removal and also maximize removal of HCl.

b) EPA Has No Justification for Rounding Up the 99th Percentile UPL SO2 Emission Rate in Setting an SO2 Limit

Not only did EPA fail to justify its determination of the 99th percentile UPL SO2 emission rate, EPA then rounded up the UPL emission rate from 0.1699 lb/MMBtu to 0.20 lb/MMBtu in setting an SO2 MACT emission limit.[111] This limit is almost 20% higher than the SO2 emissions rate that EPA determined to reflect the 99th percentile UPL and is 270% higher than the 0.0740 lb/MMBtu SO2 emission rate that EPA determined to reflect the uninflated MACT floor. EPA has provided no justification for rounding up to 0.2 lb/MMBtu; the lower rate was precisely measured when EPA collected its data, and can be precisely measured by subject facilities.

c) If EPA Could Justify Using SO2 as a Surrogate for HF, HCN, or SeO2, It Must Do a Separate Analysis for Each HAP

Sulfur dioxide's relationship to HCl differs (if if exists at all) from its relationship to other acid gases. In order to justify using SO_2 as a surrogate for all acid gases, therefore, EPA would first have to determine the MACT floor dataset for the particular HAP and then determine the appropriate SO2 limit to impose. As we have stated elsewhere in these comments, EPA has provided absolutely no justification to use SO2 as a surrogate for HCN or SeO_2. An initial review of the data collected by EPA indicates some relationship between SO_2 removal and HF removal; however, in order to

[111] *See* EPA spreadsheet with filename "floor_analysis_coal_HCl_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "Summary" worksheet.

properly establish an SO_2-based HF limit, EPA would need to truncate its dataset to reflect the lowest HF emitting units (a dataset much smaller than 131 units).

3. Determination of HCl MACT Floor for New Sources

The MACT floor for new sources must be based on the emissions achieved in practice by the best controlled similar source. Accordingly, EPA based its HCl MACT floor determination for new sources on the EGU with the lowest HCl emissions – the Logan Generating Plant Unit 1. The average HCl emission rate at this unit was 1.3×10^{-5} lb/MMBtu.[112] EPA then determined the 99th percentile UPL emission rate to be 3.0×10^{-5} lb/MMBtu.[113] EPA converted the HCl test data at Logan to lb/MW-hr, and came up with an average emission rate to be 0.000113 lb/MW-hr. EPA determined the 99th percentile UPL of the three test runs to be 0.000262 lb/MW-hr. Then EPA converted this value to lb/GW-hr and 'rounded' up the value to the nearest tenth to come up with a proposed MACT floor limit of 0.30 lb/GW-hr.[114]

At least some of the three test results at the Logan Generating Plant were measured below the detection limit of the testing method.[115] Yet, EPA assumed that the test results were measured at the detection limit. While the precise emissions are not known when a test does not detect a pollutant, it is known that the emissions are less than the detection limit. See previous discussion on better approaches for data substitution when non-detect data are present. So EPA overestimated the average HCl emission rate being achieved at the best performing source. EPA compounded this issue by

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[112] *Id.*
[113] *Id.*
[114] *See* 76 Fed.Reg. 25125 (May 3, 2011).
[115] *See* EPA spreadsheet with filename "floor_analysis_coal_HCl_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3036) at "HCl_New_MMBtu" worksheet.

applying a 99th percentile UPL factor and then rounding up to the nearest tenth of a lb/GW-hr.

Further, by rounding up to 0.3 lb/GW-hr, EPA's proposed new source MACT standard assumes a very poor heat rate and thermal efficiency for new units. Specifically, the proposed 0.3 lb/GW-hr limit includes an assumption that the heat rate is 10,000 Btu/kW-hr and that the unit thermal efficiency is 34% when converted from EPA's 99th percentile MACT floor value of 0.000030 lb/MMBtu. A heat rate of 10,000 Btu/kW-hr is higher than the annual average heat rate of 9,854 Btu/kW-hr of the existing coal-fired EGU fleet.[116] New coal-fired EGUs are typically supercritical or ultra-supercritical boilers that are designed to be more efficient with lower heat rates than typical existing coal-fired EGUs. EPA should not assume a heat rate of new coal-fired EGUs higher than 9,000 Btu/kW-hr (or approximately 38% thermal efficiency) in setting its new source MACT floor limit. Based on EPA's floor emission rate of 0.000030 lb/MMBtu, that means EPA's proposed new source MACT floor limit should not be any higher than 0.27 lb/GW-hr.

For all of these reasons, EPA's proposed HCl MACT floor limit for new units is too high and does not reflect the emissions achieved at the best controlled similar source under the worst reasonably foreseeable circumstances.

a) EPA Failed to Fully Evaluate Beyond the Floor Methodologies to Achieve Lower HCl Emission Rates at Existing Coal-Fired EGUs

EPA did not evaluate in any meaningful way control technologies or methodologies that would enable units to achieve HCl emission reductions beyond EPA's proposed HCl floor emissions rates. EPA's justification apparently was that they could not identify any control technologies that could achieve greater emission reductions of HAP than the control

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[116] *See* Sargent & Lundy Report, Coal-Fired Power Plant Heat Rate Reductions, SL-009597, January 22, 2009, at 1-1 (Ex. 9-1).

technologies they expected to be used to meet MACT.[117] However, EPA has not adequately demonstrated that there are no beyond the floor control techniques or methodologies that could be implemented to further reduce HCl to the maximum achievable level. This is especially true for EPA's proposed existing source MACT floor.

The Clean Air Act defines how the floor of the MACT emission standard is to be set, but (as set forth above) the statute requires EPA to establish lower emission standards, where further reductions are achievable, "taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements" under the statutory standard. 42 U.S.C. § 7412(d)(2).

In EPA's determination of the existing source MACT floor, EPA took the average emission rate of the 131 lowest HCl emitting EGUs for which it had HCl emission data. As we have discussed above, EPA has not likely captured the HCl emissions of the lowest emitting 131 (12%) coal-fired EGUs in the U.S. This is evident in the fact that not all of the units in EPA's MACT floor dataset of 131 EGUs have SO2 controls. While many units have wet or dry scrubbers, several have only DSI and others have only particulate matter controls. In part due to this dataset, EPA's calculation of the HCl MACT floor emission rate is high. In fact, the 0.0020 lb/MMBtu MACT floor emissions rate which EPA has proposed to meet existing source MACT is higher than the HCl rates actually emitted by any of the 131 EGUs in EPA's dataset.

That data suggests that the control technologies in use by those sources can achieve greater emission reductions than the MACT floor. EPA has suggested that that would be required to meet the MACT floor for HCl.[118] EPA's HCl emission dataset strongly implies that EGUs may not have to install scrubbers to meet EPA's HCl MACT floor for existing sources, and some EGUs may not have to install any SO2 controls. There are beyond the

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[117] *See* 76 Fed.Reg. 25046 (May 3, 2011).
[118] *Id.*

floor techniques and methodologies that must be at least considered by EPA in setting the existing source MACT standard for HCl.

i) EPA Has Acknowledged that Lower HCl Emission Rates than Its Proposed MACT Floor Are Achievable at Coal-Fired EGUs

EPA assumed a much lower HCl emission rate than its proposed HCl MACT floor in its Integrated Planning Model (IPM). Specifically, EPA assumed a floor HCl emission rate of 0.0001 lb/MMBtu, an emissions rate that is 20 times lower than EPA's proposed MACT floor limit of 0.0020 lb HCl/MMBtu.[119] In the modeling for the IPM, EPA assumed that this floor HCl emission rate would be achieved through limestone forced oxidation scrubbers (wet scrubbers), dry flue gas desulfurization (dry scrubbers), dry sorbent injection (DSI), or upgrades to existing scrubbers.[120] With respect to upgrades, EPA assumed that scrubbers would have to be upgraded to achieve 92-96% SO2 removal which should in turn achieve 99% HCl removal.[121]

An HCl emission rate of 0.0001 lb/MMBtu is achievable with these control technologies. Fifty four of the EGUs tested in the ICR already have actual HCl emission rates that would be in compliance with a MACT standard of 0.0001 lb/MMBtu. More than half of the 131 EGUs considered by EPA as the lowest HCl emitting units are achieving greater than 99% HCl emission control.

Both of these findings fit with our analyses of subsets of the dataset used by EPA to determine HCl MACT floor. Specifically, by first dividing up the 131 EGU dataset that EPA relied on for MACT floor by low chlorine coal and higher chlorine coal and then analyzing the lowest emitting half of each of those datasets, we found a significant decrease in HCl emission rate with SO2 emission rates of 0.15 to 0.08 lb/MMBtu or lower, indicative of at least

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[119] *See* March 2011 Document Supplement for EPA Base Case v.4.10_PTox – Updates for Proposed Toxics Rule at 89-90 (Docket no. EPA-HQ-OAR-2009-0234-3048).
[120] *Id.* at 90.
[121] *Id.*

90% SO2 control or greater.[122] As previously discussed in these comments, EPA has failed to capture HCl emissions data on numerous other coal-fired EGUs with SO2 scrubber upgrades and/or high efficiency scrubbers. Had EPA done so, it is very likely that the HCl MACT floor would be much lower, in line with the HCl emissions achieved with state-of-the-art SO2 controls (including retrofits and upgrades) today.

In any event, EPA's analyses for the IPM provides EPA's view that technologies and methodologies are available that would result in lower HCl emission rates than the 0.0020 lb/MMBtu MACT floor proposed by EPA. There are thus, according to EPA itself, beyond-the-floor technologies and methodologies that can achieve greater HCl reductions than the prescribed MACT standard.

ii) EPA Has Determined that the Technologies and Methodologies Available to Achieve Lower Emission Rates of HCl Are Cost Effective, Considering Non-Air Quality Health and Environmental Benefits and Energy Impacts

In its base case and policy case runs for the Integrated Planning Model (IPM), EPA estimated the costs of new scrubbers, scrubber upgrades, and DSI to meet an HCl emission rate of 0.0001 lb/MMBtu.[123] The control technologies for HCl include wet and dry SO2 scrubbers and dry sorbent injection. To achieve the highest levels of HCl control, baghouses will likely be needed at fluidized bed combustors or pulverized coal-fired units with dry

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[122] *See* Ex. 9-30, which is a table that compared the lowest emitting subsets of HCl and SO2 emission rates at low and higher chlorine coal-fired EGUs.
[123] *See* March 2011 Document Supplement for EPA Base Case v.4.10_PTox – Updates for Proposed Toxics Rule at 89-90, 91-98 (Costs of DSI and Baghouse) (Docket no. EPA-HQ-OAR-2009-0234-3048). *See also* August 2010 Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model, Chapter 5 at 5-2 to 5-6 (Docket no. EPA-HQ-OAR-2009-0234-3049).

scrubbers.[124] For units using dry sorbent injection (DSI), baghouses will also most likely be required to achieve the highest levels of HCl control.[125] For EGUs with existing SO2 scrubbers, upgrades to existing scrubbers to improve collection efficiency may be required, such as elimination of scrubber bypass.

EPA found that the costs of complying with a 0.0001 lb/MMBtu HCl MACT limit, which would be achieved through installation of scrubbers or scrubber upgrades, installation of baghouses at fluidized bed boilers, and/or DSI with baghouses to achieve SO2 removal efficiencies of 92% to 96%, would be cost effective. According to EPA's documentation on the base case IPM modeling, EPA did not account for the fact that numerous units will likely have to achieve this level of control through SO2 controls that will soon be required under BART, CAIR, or state regulations to meet ambient air quality standards.[126]

EPA estimated the costs of compliance with the proposed MACT rule using the IPM.[127] Although EPA's Regulatory Impact Analysis implies that its cost-benefit modeling was based on its proposed HCl MACT limit of 0.002 lb/MMBtu, the analysis was based on the IPM and the March 2011 update to the IPM included the modeling of an HCl emission rate of 0.0001 lb/MMBtu.[128] The analysis was also based on an assumed SO2 rate of 0.06 to 0.065 lb/MMBtu for those EGUs with wet or dry scrubbers and an SO2

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[124] *See* March 2011 Document Supplement for EPA Base Case v.4.10_PTox – Updates for Proposed Toxics Rule at 88 (Docket no. EPA-HQ-OAR-2009-0234-3048).
[125] *Id.* at 91.
[126] *See* August 2010 Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model at 1-1 to 1-2 (Docket no. EPA-HQ-OAR-2009-0234-3049).
[127] *See* March 2011 Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report, at 1-11, 2-11 (Docket no. EPA-HQ-OAR-2009-0234-3051).
[128] *See* March 2011 Document Supplement for EPA Base Case v.4.10_PTox – Updates for Proposed Toxics Rule at 89-90 (Docket no. EPA-HQ-OAR-2009-0234-3048).

removal efficiency of 70% for those EGUs assumed by EPA to use DSI with a baghouse.[129]

In the base case 2005 emissions analysis, EPA determined the EGU sector emitted 10.4 million tons per year of SO2 and 352,000 tons per year of HCl.[130] In 2016, as a result of the EGU MACT rule, EPA determined the SO2 emissions from coal-fired EGUs would decrease to 3.6 million tons per year.[131] In Table 3-12 of the Regulatory Impact Analysis, EPA provides a summary of the emission changes due to the toxics rule in the lower 48 states, projecting a 66% decrease in SO2 emissions by 2016.[132]

EPA determined that the social costs to implement the proposed MACT rule was $10.9 billion in 2007 dollars, and also determined that the benefits of the rule far outweigh the costs[133]. The numerous non-air quality and environmental benefits of the HCl MACT requirement of the rule include decreased mercury emissions due to wet scrubbers and/or baghouses added with dry scrubbers or DSI, decreased SO2 emissions, and decreased fine particulates. This rule will mean less mercury deposited in our nation's water bodies, less sulfate deposition (which may decrease mercury methylization in the environment), a decrease in fish consumption advisories, and lower numbers of people with diminished IQs due to mercury consumption. The HCl requirements of the rule will also help to improve regional haze and sulfate deposition, lessen acidification of lakes and streams, and decrease concentrations of lung damaging HCl and also fine particulate in the air. Thus, a strong MACT rule and HCl reduction requirements will provide important benefits to public health and the environment. EPA estimates the

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[129] *Id.* at 90.
[130] *See* March 2011 Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report, at 3-9 (Table 3-2 under Sector abbreviation "ptipm") (Docket no. EPA-HQ-OAR-2009-0234-3051).
[131] *Id.* at 3-20.
[132] *Id.* at 3-25.
[133] *Id.* at 11-1.

net benefit of the MACT rule at $48 to $130 billion based on 2007 dollars.[134] EPA has shown that it is quite cost effective to meet a beyond the floor MACT level of HCl control of 0.0001 lb/MMBtu along with all of the other proposed MACT requirements. These aggregate numbers strongly suggest that superior HCl reductions are achievable as MACT, under the statutory standard.

iii) HCl Emission Limits Well Below EPA's Proposed MACT Floor of 0.0020 lb/MMBtu Are Achievable at Existing EGUs

EPA has determined that an HCl emission rate of 0.0001 lb/MMBtu is cost effective, and we know that numerous EGUs that were tested for the ICR have achieved HCl emissions at or below 0.0001 lb/MMBtu. Though they are likely to claim otherwise now, EGU owners/operators around the country have repeatedly asserted that, HCl emission rates less than EPA's proposed MACT standard of 0.0020 lb/MMBtu (down to as low as 0.0001 lb/MMBtu) can be met on a continuous basis.

Several owners of coal-fired EGUs have in fact claimed that such low HCl emission rates can be met on a continuous basis. For example, Longleaf Energy Associates has obtained a permit with emissions limitations that the Georgia Environmental Protection Division has found are sufficient to keep the proposed 2 unit 1200 MW power plant to less than major source emission thresholds. This plant will burn primarily subbituminous coal, although their permit also allows up to 100% Central Appalachian coal, and each unit will be equipped with dry scrubbers and baghouses. Based on its review of the average HCl emission rate being achieved at subbituminous coal fired units with dry scrubbers, the company proposed that it would emit HCl at a rate of 9.56×10^{-5} lb/MMBtu.[135] This HCl emission rate is just under the 0.0001 lb/MMBtu HCl rate that EPA assumed would apply in its IPM.

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[134] *Id.*

[135] *See* Ex. 9-35, December 22, 2009 submittal from Longleaf Energy Associates to Georgia Division of Environmental Protection, Attachment at 3.

While Georgia did not impose 9.56 x 10^{-5} lb/MMBtu as a limit in the Longleaf permit, Georgia did impose a limit on emissions of any single HAP of 10 tons per year.[136] Since HCl and HF are the HAPs that coal-fired EGUs emit in the greatest quantities, the 10 ton per year (tpy) limit applies to Longleaf's emissions of each of these HAPs.[137] In order to comply with the 10 tpy limit on emissions of HCl, the Longleaf boilers cannot emit HCl at a rate any higher than 0.00019 to 0.00022 lb/MMBtu. This range of limits reflects operation at 100% capacity factor, which is not likely to occur, down to 85% capacity factor. These are effectively the Longleaf plant's HCl limits in order to stay a minor source of HAPs. Further, Longleaf Energy Associates claimed they could continue to comply with the 10 tpy limit even when burning Central Appalachian coal which is much higher in chlorine content than subbituminous coal.[138]

The Longleaf plant is not alone. There have been numerous "synthetic minor" permits issued to coal-fired EGUs which claim they will keep HCl emissions below 10 tpy with planned SO2 scrubbers. While Sierra Club does not agree that any of these synthetic minor permits properly limit potential to emit of all HAPs to less than major source emission thresholds[139], we are

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[136] *See* Ex. 9-36, November 8, 2010 Permit Amendment for Longleaf Energy Associates, Condition 2.25. While the permit also has specific lb/MMBtu emission limits for HCl in Condition 2.15o. of 0.0006 lb/MMBtu when burning subbituminous coal and 0.0024 lb/MMBtu when burning bituminous coal, those emission limits are superseded by the 10 tpy limit on the emissions of any one HAP.

[137] There is also a 25 tpy limit on all HAPs including HCl and HF with which Longleaf must comply to be considered a minor source of HAPs which will likely require HCl emissions to be even less than 10 tpy, but for the purposes of this comment letter, we are focusing only on the impacts of the 10 tpy limit.

[138] The Longleaf permit requires compliance with the 10 tpy single HAP limit and also allows up to 100% Central Appalachian coal to be burned.

[139] In several instances, Sierra Club and /or other environmental organizations have challenged these permits on grounds that the 10 tpy single HAP and 25 tpy total HAPs emission limits are not practically

raising these permits to EPA's attention because they essentially reflect company's and state permitting agencies' determinations of HCl emission rates that they claim can be met on a continuous basis.

For example, the synthetic minor HAP permit for the Big Stone II power plant, a proposed 600 MW unit that would have burned subbituminous coal and be equipped with a wet scrubber, required the unit to not emit any more than 9.5 tpy HCl.[140] To comply with the 9.5 tpy limit, the unit could not emit HCl at emission rates any higher than 0.00036 lb/MMBtu (at 100% capacity factor) to as high as 0.00043 lb/MMBtu (at 85% capacity factor). While the company has decided not to build this unit, nonetheless the company proposed these emission limits, the state of South Dakota issued the permit with these limits, and the Board of Minerals and Environment upheld these permit limits.

Eastern Kentucky Power Cooperative's Spurlock Unit 4 also has a permit with synthetic minor HAP limits. This 268 MW (net) unit began operation in 2009.[141] It is a circulating fluidized bed boiler with a dry scrubber that burns eastern bituminous coal, and the unit is subject to a 9 tpy limit on emissions of a single HAP such as HCl.[142] To comply with the 9 tpy emission limit, the unit cannot emit HCl at rates higher than 0.00073 lb/MMBtu (at 100% capacity factor) to 0.00086 lb/MMBtu (at 85% capacity factor).

The lb/MMBtu HCl emission rates reflective of compliance with the HCl limits of these permits are all less than EPA's proposed HCl MACT limit of 0.0020 lb/MMBtu. Thus, this indicates that emission limitations that go

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enforceable, both for HCl and HF as well as all of the other numerous HAPs emitted by coal-fired EGUs.

[140] Ex. 9-37, Big Stone Permit at 30 (Condition 11.5).

[141] *See* East Kentucky Power Cooperative Spurlock Power Station Fact Sheet. Ex. 9-38.

[142] *See* Ex. 9-39, Hugh L. Spurlock Generating Station, Permit Number V06-007 Revision 3 at 25 and at 27 (Condition 2.o).

beyond the floor (i.e., are lower) proposed by EPA are considered feasible and achievable by the utility companies and state agencies.

The fact that these permits were issued for new EGUs should not be a factor in determining whether these emission rates reflect achievable beyond the floor HCl emission limits for existing EGUs. The technologies used (i.e., SO2 control technologies with the cobenefit of HCl control) are the same whether the EGUs are existing or new. Wet and dry scrubbers have been retrofitted at existing EGUs to achieve very high levels of SO2 removal, and thus these SO2 controls would also then provide for very high levels of HCl removal. A prime example is the Chiyoda CT-121 FGD. Vendor information for this technology indicates that this scrubber has achieved 98-99% SO_2 removal even with low sulfur coal.[143] For example, the Chiyoda's bubbling jet reactor has consistently achieved >99% SO_2 removal during long-term operation at the Shinko-Kobe power plant in Japan. This facility consists of two 700-MW coal-fired utility boilers. The wet FGD was designed to achieve 0.014 lb SO2/MMBtu (9 ppmv at 3% oxygen) on an instantaneous basis and has consistently exceeded this level of control while treating gases with inlet SO_2 concentrations of 1.78 lb/MMBtu.[144] This technology has been guaranteed by Chiyoda to achieve 99% SO_2 removal on three coal-fired boilers in Japan.[145] It also has been demonstrated in the U.S. at the University of Illinois's Abbott power plant, Georgia Power's Plant Yates[146],

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[143] *See* Black & Veatch vendor brochure on CT-121, ex. 9-40.

[144] Yasuhiko Shimogama, Hirokazu Yasuda, Naohiro Kaji, Fumiaki Tanaka, and David K. Harris, Commercial Experience of the CT-121 FGD Plant for 700 MW Shinko-Kobe Electric Power Plant, Paper No. 27, presented at MEGA Symposium, Air & Waste Management Association, May 19-22, 2003, ex. 9-41.

[145] CT-121 FGD Process – Jet Bubbling Reactor, http://www.netl.doe.gov/technologies/coalpower/cctc/resources/pdfs/ct121/PPACT121_1.pdf, Ex. 9-42.

[146] Emission-control Technologies Continue to Clear the Air, Power, May/June 2002. Ex. 9-43.

Dayton Power & Light's Killen Unit 2,[147] and Plant Bowen Unit 3.[148] It has also been licensed for installation on several additional units in the US, including the other three units at Plant Bowen in Georgia, the other units at Dayton Power & Light's Killen plant, Dayton Power & Light's Stuart plant, and AEP's Big Sandy Unit 2, Conesville Unit 4, Cardinal Units 1 and 2, and Kyger Creek, among others.[149] Many of these EGUs were tested for HCl emissions in EPA's ICR and are in fact among the lowest HCl emitters for which EPA has data.

For those EGUs with existing wet scrubbers, options abound for upgrades to the scrubbers to improve HCl removal. For example, a new improved magnesium-enhanced lime scrubber process can achieve up to 99% SO2 removal.[150] In the year 2000, 4,300 MW of older magnesium-enhanced lime wet scrubbers were converted to this improved version.[151] According to vendor literature on this technology, the pre-existing magnesium-enhanced lime scrubbers were also capable of very high SO2 removal efficiencies in excess of 95%.[152] Elimination of scrubber bypass is a common scrubber upgrade that can greatly improve HCl emission rates. Other changes that could be made to existing scrubbers include improving gas flow distribution

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[147] *See* Black & Veatch, First Black & Veatch/Chiyoda Wet Flue Gas Desulfurization System in North America Successfully Goes Operational, 2008. Ex. 9-44.

[148] Blankinship, Steve, Go Take a Bath, Power Engineering, October 2008. Ex. 9-45.

[149] Chiyoda Licenses Its Flue Gas Desulfurization Technology in USA Newly for 5 Coal-Fired Generation Units, Press Release, May 2, 2005; Chiyoda Licenses its Flue Gas Desulfurization Process in USA for Georgia Power Owned 4 FGD Units, January 26, 2005. Ex. 9-46.

[150] *See* Roden, Bob et al., New Magnesium-Enhanced Lime FGD Process, Carmeuse-North America Technology Center, Pittsburgh, PA, at 1. Ex. 9-47.

[151] *Id.*

[152] *Id. See also* Nolan, Paul S., Babcock & Wilcox Co., Flue Gas Desulfurization Technologies for Coal-Fired Power Plants, presented at Coal-Tech 2000 International Conference, November 13-14, 2000, Jakarta, Indonesia, at 3. Ex. 9-48.

through ductwork changes, improving spray level coverage, adding frothing trays, increasing liquid to gas ratio (increasing recycle flow), and injecting dibasic acid.[153] Modifications such as these have been done or are planned at numerous EGUs to meet BART or CAIR, and have proven cost-effective under those rules. For example, scrubber upgrades were considered cost effective to meet BART at the Jim Bridger Power Plant Units 1-4, Coal Creek Units 1 and 2, King Unit 1, Laramie River Units 1 and 2, Milton R. Young Units 1 and 2, Naughton Unit 3, and Sherburne County Units 1 and 2.[154]

Dry scrubbers can also be upgraded to improve SO2 and thus HCl removal. For example, use of performance additives or more reactive sorbent could improve HCl removal, as could an increase in the pulverization of the sorbent and/or a redesign of the slurry injection system or atomizer. The Colorado Department of Public Health and Environment required evaluation of these dry scrubber upgrades as part of its BART analysis for the Hayden Station units.[155] At the Laramie River Station Unit 3, scrubber upgrades have included operation of all scrubber modules (no spare), increasing the gas residence time, changes to the turbo diffusers, use of additives, etc.[156]

There are also examples of coal-fired EGUs finding it cost effective to install new wet or dry scrubbers to meet BART – a standard which imposes a similar (and often less generous) statutory standard.[157]

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[153] *See* Carstens, Andrew J. et al., Performance Upgrades for Low-Sulfur Wet Scrubbers, Sargent & Lundy and CPS Energy, Paper # 134, at 6-12 (Ex. 9-49).

[154] *See* National Park Service Spreadsheet "EGUs with proposed BART SO2 controls Mar 2011." Ex. 9-50.

[155] *See* Colorado Department of Public Health and Environment - Air Pollution Control Division, Best Available Retrofit Technology (BART) Analysis of Control Options for Public Service Company – Hayden Station. Ex. 9-51.

[156] *See* Doyle, John B. and Dan Hagel, Dry Scrubber 20 Years Later, Babcock & Wilcox publication BR-1692, 1999. Ex. 9-52.

[157] *See* National Park Service Spreadsheet "EGUs with proposed BART SO2 controls Mar 2011." Ex. 9-50.

For all of these reasons, HCl emission limits below EPA's proposed HCl emission limit of 0.0020 lb/MMBtu are achievable at existing EGUs through available technology and/or technology upgrades.

iv) Summary: EPA Is Obligated to Impose Lower HCl Emission Limits than EPA's Proposed MACT Floor to Ensure the Maximum Degree of HCl Emission Reduction is Required as MACT Because Such Lower Limits Are Achievable and Cost Effective

For all of the reasons discussed above, EPA is obligated to impose lower HCl emission limits to meet MACT for HCl. First, EPA has already determined that an HCl emission limit of 0.0001 lb/MMBtu would be cost effective, because the public health and environmental benefits of the scrubbers required to meet an HCl limit of 0.0001 lb/MMBtu would reduce mercury, SO2, and fine particulate which will in turn benefit public health and the environment. EPA projected benefits to improved public health and environment of $48 to $130 billion at a cost of $10.9 billion.[158] The benefits outweigh the costs at a ratio of 5 – 13 to 1. While the monetary value of the benefits takes into account the mercury MACT and metal HAP MACT proposals as well as the HCl MACT requirements, it is difficult to separate these costs and benefits since the SO2 scrubbers and potentially baghouses required for HCl and metal HAP compliance will result in reduced mercury as well as reduced HCl and other acid gas HAPs. Given that EPA did not quantify the improved reductions of other acid gases such as HF that should be achieved with HCl controls to meet MACT, EPA's cost-benefit analysis likely underestimates true benefits of a 0.0001 lb/MMBtu HCl MACT limit. Further, EPA also did not take into account that many of these units will be required to install or upgrade SO2 controls to meet BART or CAIR. Thus, EPA's cost benefit analysis likely overstated the cost of controls as due solely

[158] EPA's March 2011 Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report at 1-1 (Docket no. EPA-HQ-OAR-2009-0234-3051).

to MACT requirements and also likely understated the environmental benefits.

Second, HCl emission limits lower than EPA's proposed MACT floor limit of 0.0020 lb/MMBtu are achievable. EPA stated it did not consider any beyond the floor requirements because there were not additional control technologies that could be applied beyond those needed to meet the MACT floor. But EPA has no justification for not evaluating beyond the floor emission limits achievable through available technologies and methods – including further reductions that may be achieved through the use of the technologies used by (some) sources in the dataset used to establish the MACT floor. 42 U.S.C. § 7412(d)(2) (requiring consideration of all "measures, processes, and methods" of pollution reduction). And, in fact, EPA's proposed HCl MACT floor emission limit of 0.0020 lb/MMBtu, is being met by all of the units that EPA considered to be the lowest emitting 12% of coal-fired EGUs, which are equipped with a wide range of control technologies including scrubbers being operated at varying levels of SO2 removal as well as units without any SO2 controls. Thus, EPA's proposed MACT floor emission limit of 0.0020 lb/MMBtu is not based on any particular control technology.

EPA itself determined that an HCl emissions rate of 0.0001 lb/MMBtu was achievable. Indeed, that was the HCl emission limit, along with assumptions that units would operate wet or dry scrubbers achieving 92-96% SO2 removal or use DSI with a baghouse, evaluated by EPA in its Integrated Planning Model.[159] EPA's HCl emissions data also shows that an emission limit of 0.0001 lb/MMBtu is achievable, as 54 of the top performing units for which EPA has emissions data for emit HCl at or lower than 0.0001

[159] *See* March 2011 Document Supplement for EPA Base Case v.4.10_PTox – Updates for Proposed Toxics Rule at 90 (Docket no. EPA-HQ-OAR-2009-0234-3048).

lb/MMBtu.[160] As previously discussed, we think there are likely many other units that are already configured to achieve similar low emission rates of HCl but EPA does not currently have HCl emissions data on all of these units.

Further, EPA's proposed MACT limit does not ensure the maximum degree of HCl emission reduction is achieved on a continuous basis. The best way for EPA to ensure that its HCl MACT limit requires continuous emission reductions it to require compliance to be measured by HCl CEMs. Not only would the required use of HCl CEMs better ensure continuous HCl reductions, but EPA could account for variability via an HCl limit with a long term averaging time. The use of CEMs will allow an EGU operator to more readily adjust the operations of the SO2 controls to optimize HCl removal. With a long term average HCl limit truly reflective of the maximum degree of HCl emissions that can be achieved that is also measured by CEMs, EPA can account for expected variability in emissions while still motivating EGU operators to achieve the lowest HCl levels on a continuous basis.

In summary, EPA's proposed HCl MACT limit does not require the maximum degree of reduction in HCl that EPA has already determined is achievable and cost effective. Even an HCl emission limit of 0.00086 lb/MMBtu, which is among the highest HCl rates that coal-fired EGUs would be required to meet under a synthetic minor HAP permit, is less than half of EPA's proposed MACT floor emission limit. EPA should also require the use of HCl CEMs to ensure continuous compliance with the HCl MACT limit.

C. EPA's Proposed MACT Standards for Petroleum Coke Fired EGUs

EPA has proposed petroleum coke ("pet coke") burning EGUs to be covered under the solid oil-derived fuel-fired EGU category. This section of

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[160] *See* Spreadsheet entitled "floor analysis coal HCl 31611" (Docket no. EPA-HQ-OAR-2009-0234-3036 at "AcidGas_coal" worksheet.

our letter provides comments on EPA's proposed standards, as they apply to units burning pet coke.

1. Whether Petroleum Coke-Fired EGUs Should Be in a Separate Subcategory from Coal-Fired EGUs

EPA is taking comment on whether petroleum coke-fired EGUs should be in a separate subcategory for MACT. *See* 76 Fed.Reg. 25070 (May 3, 2011). It appears that EPA has proposed to include EGUs that burn other fuels with coal to be considered coal-fired EGUs. *See* 76 Fed.Reg. at 25122 (definition of "coal-fired electric utility steam generating unit" in proposed §63.10042).[161]This is consistent with the definition of "coal-fired electric utility steam generating units" in the New Source Performance Standards, Subpart Da (40 C.F.R. §60.41Da). We support such a determination by EPA. Coal-fired units that blend with pet coke do so in varying amounts throughout a year of operations. It would be administratively impracticable to set separate MACT limits for units that intermittently burn pet coke with coal.

Moreover, even for units that burn 100% pet coke, there is no justification for putting such units in a separate subcategory from those that burn coal or coal and pet coke. All of these units are "similar sources" to coal-fired EGUs. *See* 40 C.F.R. §63.41. Specifically, such coal-fired and coal/pet coke-fired EGUs have comparable HAP emissions, are structurally similar in design and capacity, and the HAP emissions can be controlled with the same control technology. For example, the RD Green Unit 2 burns bituminous coal and pet coke, is a conventional boiler with an ESP and wet scrubber, and it is in the coal-fired EGU MACT floor analysis for PM and HCl.[162] AES

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[161] EPA's proposed definition of "coal-fired electric utility steam generating unit" includes units that burn coal or coal refuse "in any combination with other fuels in any amount."

[162] *See* EPA's MACT Floor Spreadsheets for Coal HAP Metals and Coal Acid Gas, available at http://www.epa.gov/ttn/atw/utility/utilitypg.html.

Greenridge Unit 4 is a conventional boiler that burns bituminous coal and pet coke, is equipped with activated carbon injection along with SCR, a spray dry absorber and a fabric filter baghouse, and this unit was ranked the 6th lowest emitter for mercury emissions among coal-fired units.

EPA has not put forth any rationale for identifying a separate subcategory for pet coke-fired EGUs (i.e., EPA's "solid oil-derived fuel-fired EGU" category). Because the HAP emissions from pet coke-fired EGUs can be controlled with the same control technology and methods as can be applied at those EGUs that burn coal, there is no justification for a separate category for pet coke burning EGUs.

EPA should not, therefore, create separate standards for pet coke units. Though we believe that the subcategory lacks justification, we offer the following comments on EPA's MACT analysis for its "solid oil-derived fuel-fired EGU" category."

2. EPA's Proposed HCl MACT Standard for New Pet Coke-Fired EGUs

EPA has proposed an HCl standard for new pet coke-fired EGUs of 0.00030 lb/MW-hr.[163] EPA also determined the MACT floor emission rate in terms of lb/MMBtu to be 2.3618 x 10^{-5} lb/MMBtu based on the 99th percentile UPL.[164]

EPA's determination of the 99th percentile UPL HCl emission rate for the best performing source, AES Deepwater, is higher than the three HCl emissions results provided in EPA's MACT floor spreadsheet. Specifically, the highest HCl emission rate measured at AES Deepwater was 1.9592 x 10^{-5} lb/MMBtu, yet EPA's proposed 99th UPL value of 2.3618 x 10^{-5} lb/MMBtu is 20% higher than the highest HCl emission rate measured at this unit. Thus, EPA's proposed MACT floor value in units of lb/MMBtu fails to reflect the

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[163] *See* 76 Fed.Reg. 25027, 25126 (May 3, 2011).
[164] *See* EPA's spreadsheet with filename "floor_analysis_petcoke_031611.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-3041) at "Summary_Pet coke" tab.

HCl emissions of the best performing unit under the worst reasonably foreseeable circumstances.

In addition, EPA determined the HCl MACT floor in terms of lb/MW-hr to be 0.00027169 lb/MW-hr, based on EPA's determination of the 99th percentile UPL.[165] Yet, the limit EPA proposed as MACT is 0.00030 lb/MW-hr, which is 10% higher than EPA's 99th percentile UPL emission rate. EPA has not provided any justification for going beyond the 99th percentile value in its MACT floor determination for HCl.

EPA's proposed new source MACT standard for HCl reflects a very poor heat rate and thermal efficiency for new units. Specifically, the proposed 0.00030 lb/MW-hr limit reflects an assumed heat rate of 12,702 Btu/kW-hr and a thermal efficiency of 26.8% when compared to EPA's 99th percentile MACT floor value of 2.3618×10^{-5} lb/MMBtu. A heat rate of 12,702 Btu/kW-hr is higher than the annual average of the existing coal-fired EGU fleet.[166] New pet coke-fired EGUs should be able to operate at much lower heat rates, in line with coal-fired EGUs, i.e., closer to 9,000 Btu/kW-hr (approximately 38% thermal efficiency). Based on EPA's floor emission rate of 2.3618×10^{-5} lb/MMBtu, that means EPA's proposed new source MACT floor limit should not be any higher than 0.00021 lb/MW-hr assuming a heat rate of new pet coke-fired units of 9,000 Btu/kW-hr.

Based on the above comments, EPA's proposed HCl limit for new pet coke-fired units fails to be at least as stringent as the best controlled similar source.

3. EPA's Proposed HCl MACT Standard for Existing Pet Coke-Fired EGUs

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[165] *Id.*

[166] *See* Sargent & Lundy Report, Coal-Fired Power Plant Heat Rate Reductions, SL-009597, January 22, 2009, at 1-1 (Ex. 9-1).

EPA has proposed an HCl MACT limit for existing pet coke burning EGUs of 0.0050 lb/MMBtu or 0.080 lb/MW-hr.[167] Though EPA's proposed rule states the 0.080 limit in terms of lb/GW-hr, we assume the reference to "GW-hr" to be a mistake. EPA's pet coke MACT floor spreadsheet indicates a 99th percentile UPL emissions level in terms of lb/MW-hr. , We take EPA's proposed existing source HCl limit for pet coke is 0.080 lb/MW-hr. These emission limits fail to reflect the existing source MACT floor for pet coke-fired EGUs.

EPA has included EGUs that burn blends of coal and pet coke in the HCl MACT floor determination for existing pet coke burning EGUs. Specifically, the Northside Generating Station units[168] and the Manitowoc units burn coal in addition to pet coke.[169] Such units should be considered coal-fired EGUs under EPA's proposed definition of coal-fired electric utility steam generating unit in §63.10042. 76 Fed.Reg. at 25122. It is not clear why these units were included in the pet coke MACT floor analysis. Further, it is not known whether the units were burning any coal at the time of the tests but, regardless, it does not make sense to include these units that should be covered under the coal-fired EGU MACT requirements rather than under the pet coke (solid oil-derived fuel) EGU MACT requirements.

In addition to these significant issues, EPA rounded up its HCl MACT floor determination from the 99th percentile UPL emission rate. Specifically, EPA determined the 99th percentile UPL from the top 5 pet coke-fired EGUs with the lowest HCl emissions to be 4.0628×10^{-3} lb/MMBtu.[170] Yet, EPA has proposed an HCl limit for existing sources of 5.0×10^{-3} lb/MMBtu, a limit that

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[167] *See* 76 Fed.Reg. 25027, 25128 (May 3, 2011).
[168] A 2003 Babcock & Wilcox paper indicates the units were not yet capable of firing 100% pet coke at that time. *See* Goodrich, William et al., Summary of Air Emissions from the First Year of Operation of JEA's Northside Generating Station, presented at ICAC Forum 2003, ex. 9-53.
[169] EPA's spreadsheet with filename "floor_analysis_petcoke_031611.xlsx" (Docket no. EPA-HQ-OAR-2009-0234-3041) at "AcidGas_Petcoke_data" tab.
[170] *Id.* at "Summary" tab.

is 23% higher than EPA's 99th percentile UPL value. EPA has not provided any justification for going beyond the 99th percentile UPL in setting the HCl MACT floor for existing pet coke-fired EGUs.

Further, EPA determined the HCl MACT floor in terms of lb/MW-hr to be 0.078803 lb/MW-hr, based on EPA's determination of the 99th percentile UPL.[171] The limit EPA proposed as MACT is 0.080 lb/MW-hr, which is higher than EPA's 99th percentile UPL emission rate. EPA has not provided any justification for going beyond the 99th percentile value in its MACT floor determination for HCl.

4. Determination of a Surrogate SO2 MACT Floor Limit for Existing Pet Coke-Fired EGUs

EPA has proposed the use of SO2 as a de facto surrogate for HCl and other acid gases at pet coke burning EGUs with some sort of flue gas desulfurization system. As discussed elsewhere in these comments, EPA has not provided adequate legal or technical justification for its decision to use SO2 as a surrogate for HCl, HF, HCN, or SeO_2. Those issues aside, below we provide our comments on EPA's assessment of the MACT floor for SO_2.

In determining the SO2 MACT floor, EPA re-ranked the data collected for the ten pet coke-fired EGUs not by HCl emissions but by SO2 emissions. *See* EPA spreadsheet titled "floor_analysis_pet coke_031611.xls." The top ranked pet coke-fired unit in the HCl ranking is AES Deepwater, whereas the top ranked unit in the SO2 ranking is Hanford Unit 1A. AES Deepwater is not even in the top 5 SO2 emitters for the pet coke units that EPA used for its SO2 MACT floor determination. Further, Hanford Unit 1A is only ranked fourth for HCl emissions among pet coke burning units. This re-ranking of the top performing units and the fact that the top units change when ranked for SO2 emissions compared to the ranking for HCl emissions adds to the

[171] *Id.*

argument that SO2 is not likely a good surrogate pollutant for HCl or other acid gas HAPs at pet coke-fired EGUs.

a) EPA's SO2 MACT Floor Determination Does Not Reflect the Actual Emissions of the Top 12% of Pet Coke-Fired EGUs

i) EPA Should Not Apply a 99th Percentile UPL in Setting an SO2 Limit

For its proposed SO2 MACT floor limit pet coke-fired units, EPA took the average of its new ranking of the lowest SO2 emitting units and determined the 99th percentile UPL of that SO2 data. Specifically, EPA calculated the average SO2 emission rate of the lowest SO2 emitting units to be 0.2113 lb/MMBtu and then determined that the 99th percentile UPL of that data was close to double the average emission rate at 0.39862 lb/MMBtu.[172] EPA provided no justification for application of the 99th percentile UPL; there is none.

First, EPA's proposed rule would evaluate compliance with the surrogate SO2 limit based on a 30-day rolling average.[173] Such a long term average adequately accounts for variability in SO2 emissions. The SO2 data used by EPA in ranking the SO2 emission rates of the pet coke-fired EGUs was based on short term average data. Long term averages are typically at the same level or lower than that measured on a short term basis. And they are less variable; had EPA run its UPL formula with 30-day average emissions, it would have inflated the limit by far less (indeed, if EPA wishes to set a limit based on 30-day averages, it must calculate its UPL based on a similar duration of emissions). If EPA is setting the SO2 MACT limit based on short term average testing, the 30-day average compliance time provides all of the flexibility needed to reflect the best performing sources under the

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[172] *See* EPA spreadsheet with filename "floor_analysis_petcoke_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3041) at "Summary" worksheet.
[173] *See* 76 Fed.Reg 25029 (May 3, 2011).

worst reasonably foreseeable conditions. Given that all pet coke-fired EGUs are required to measure SO2 with continuous emission monitoring systems (CEMS) under requirements of the Acid Rain Program, a 30-day average SO2 limit will be readily achievable by these sources.

Operators of EGUs routinely use SO2 CEMS data to guide adjustments to the SO2 control equipment. This is especially so when the unit has a strict SO2 limit to meet. For example, if a unit operator sees SO2 emissions spiking, the concentration of lime or limestone in the scrubber slurry can be increased which in turn increases the removal efficacy of the scrubber. Plant operators use such methods on a daily basis.

A long term averaging time provides sufficient flexibility to EGU owners/operators to deal with spikes in SO2 emissions, and thus no adjustments to the SO2 emission rate considered to be reflective of the lowest HCl emitting units is warranted. Further, an SO2 MACT limit that is based on an appropriate subset of the lowest HCl emitting units will ensure that the SO2 controls at each EGU are operated to maximize SO2 removal and also maximize removal of HCl.

ii) EPA's SO2 Emission Rates in Terms of Pounds per Megawatt-Hour Fail to Reflect Energy Efficient EGUs

EPA's proposed existing source MACT standard for SO2 reflects a very poor heat rate and thermal efficiency for new units. Specifically, the proposed 5.0 lb/MW-hr limit reflects an assumed heat rate of 12,543 Btu/kW-hr and a thermal efficiency of 27.2% when compared to EPA's 99th percentile MACT floor value of 0.39862 lb/MMBtu. This is significantly higher than the annual average of the existing coal-fired EGU fleet average heat rate of the coal-fired EGU fleet of 10,400 Btu/kW-hr.[174] Existing pet coke-fired EGUs should be able to operate at much lower heat rates, in line with coal-fired EGUs, i.e.,

[174] *See* Sargent & Lundy Report, Coal-Fired Power Plant Heat Rate Reductions, SL-009597, January 22, 2009, at 1-1 (Ex. 9-1).

closer to 10,500 Btu/kW-hr (approximately 33% thermal efficiency). Based on EPA's floor emission rate of 0.39862 lb/MMBtu, that means EPA's proposed existing source MACT floor limit should not be any higher than 4.185 lb/MW-hr assuming a heat rate of existing pet coke-fired units of 10,500 Btu/kW-hr.

For all of the above reasons, EPA's proposed existing source SO2 surrogate MACT limits of 5.0 lb/MW-hr and 0.40 lb/MMBtu fail to reflect the MACT floor for pet coke-fired EGUs.

b) EPA's Proposed New Source SO2 MACT Surrogate Limit Also Fails to Reflect the MACT Floor

EPA has proposed a new source SO2 MACT limit of 0.40 lb/MW-hr as a surrogate limit for acid gas HAPs if the EGU has some sort of flue gas desulfurization system installed. Similar to the SO2 surrogate limit for existing pet coke-fired EGUs, the EPA's proposed new source SO2 limit fails to reflect the lowest HCl-emitting unit and it also fails to reflect the SO2 emissions of the lowest SO2-emitting pet coke-fired EGU.

The best controlled source for HCl was determined by EPA to be the AES Deepwater EGU, but the best controlled source for SO2 was determined by EPA to be the Hanford Unit 1A EGU.[175] These differing determinations of the best controlled similar source for HCl and SO2 emissions adds to the argument that SO2 is not likely a good surrogate pollutant for HCl or other acid gas HAPs at pet coke-fired EGUs.

The EPA's proposed SO2 MACT limit for new sources of 0.40 lb/MW-hr also has the same flaws described above regarding the existing source SO2 surrogate MACT limit. First, EPA's 99th percentile UPL SO2 rate of 0.36175 lb/MW-hr is higher than the highest SO2 rate measured at the Hanford Unit

[175] *See* EPA spreadsheet with filename "floor_analysis_petcoke_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3041) at "Acid_Gas_SO2_New_PC_MW" worksheet and at "Acid_Gas_New_PC_MW" worksheet.

1A EGU of 0.2678 lb/MW-hr.[176] Second, EPA's proposed MACT limit of 0.40 lb/MW-hr is 10% higher than EPA's 99th percentile UPL emission rate, and EPA has not provided any justification for going beyond the 99th percentile UPL emission rate in setting the MACT floor limit. Third, in comparing EPA's proposed SO2 limit of 0.40 lb/MW-hr to its 99th percentile UPL MACT floor emission rate in terms of lb/MMBtu of 0.03755 lb/MMBtu[177] shows that EPA's 0.40 lb/MW-hr limit reflects a poor heat rate for new sources of only 10,652 Btu/kW-hr. New sources should be able to achieve heat rates of 9,000 Btu/kW-hr, meaning a more appropriate new source SO2 emission limit that reflects the EPA's determination of SO2 MACT floor would be 0.0338 lb/MW-hr.

c) If EPA Could Justify Using SO2 as a Surrogate for HF, HCN, or SeO2, It Must Do a Separate Analysis for Each HAP

Sulfur dioxide's relationship to HCl differs (if if exists at all) from its relationship to other acid gases. In order to justify using SO_2 as a surrogate for all acid gases, therefore, EPA would first have to determine the MACT floor dataset for the particular HAP and then determine the appropriate SO2 limit to impose. As we have stated elsewhere in these comments, EPA has provided absolutely no justification to use SO2 as a surrogate for HCN or SeO_2. An initial review of the data collected by EPA indicates some relationship between SO_2 removal and HF removal; however, in order to properly establish an SO_2-based HF limit, EPA would need to truncate its dataset to reflect the lowest HF emitting units (a dataset much smaller than 131 units).

5. EPA Failed to Consider Any Beyond the Floor Technologies in Setting the HCl and SO2 MACT Limits

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[176] *See* EPA spreadsheet with filename "floor_analysis_petcoke_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3041) at "Acid_Gas_SO2_New_PC_MW" worksheet.
[177] *Id.* at "Summary" worksheet.

EPA did not evaluate in any meaningful way control technologies or methodologies that would enable units to achieve HCl emission reductions beyond EPA's proposed HCl and SO2 floor emissions rates for pet coke-fired EGUs. EPA's justification apparently was that they could not identify any control technologies that could achieve greater emission reductions of HAP than the control technologies they expected to be used to meet MACT.[178] However, EPA has not adequately demonstrated that there are no beyond the floor control techniques or methodologies that could be implemented to further reduce acid gases to the maximum achievable level.

The Clean Air Act defines how the floor of the MACT emission standard is to be set, but the statute requires EPA to establish lower emission standards, where further reductions are achievable, "taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements" under the statutory standard. 42 U.S.C. § 7412(d)(2).

The EPA's new source HCl MACT floor determination for pet coke-fired EGUs is based on the AES Deepwater unit's HCl emissions, and this unit is a conventional boiler with a wet scrubber. This unit also has among the lowest fuel chlorine content of any of the 7 pet coke-fired EGUs tested in EPA's ICR, in some cases two orders of magnitude lower than other pet coke-fired units.[179] While the unit has a wet scrubber that is typically among the most effective in removing HCl emissions, the pet coke chlorine content used at this unit also contributed to its HCl emission rate. This is especially clear given that the wet scrubber appears to only be removing 91% of the HCl emissions at best, based on the data provided regarding chlorine in the coal

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[178] *See* 76 Fed.Reg. 25046 (May 3, 2011).
[179] *See* EPA spreadsheet with filename "floor_analysis_petcoke_31611.xls" (Docket no. EPA-HQ-OAR-2009-0234-3041) at "Acid_Gas_Petcoke_Data" worksheet.

and the minimum HCl emission rate.[180] Yet, there are numerous coal-fired EGUs achieving over 99% HCl removal. Thus, the best performing pet coke-fired EGU determined by EPA does not reflect the maximum degree of HCl emission reduction that can be achieved at these units.

The existing source HCl MACT floor determination also includes units that don't have the top acid gas controls. For example, the Manitowoc and Hanford EGUs in the existing source MACT floor determination are fluidized bed boilers without any add-on SO2/acid gas controls, in comparison to the Northside units which are fluidized bed units and have dry scrubbers. Thus, the existing source MACT floor determination does not reflect the available acid gas controls for pet coke-fired units.

In Section IX.B.3. of these comments, we discuss beyond the floor technologies for acid gas HAPs at coal-fired EGUs. The same technologies and techniques can be applied to pet coke-fired EGUs. We also discuss how EPA already determined than an HCl emission limit of 0.0001 lb/MMBtu is cost effective. We incorporate all of those comments here.

EPA must evaluate beyond the floor technologies for acid gases at pet coke-fired EGUs and ensure that its proposed MACT standards truly reflect the maximum degree of acid gas HAPs emission reduction that is achievable at these units.

D. The Agency's Particulate Matter Standards Exceed the Statutory Standard

1. EPA's Floor Analysis Does Not Reflect the Performance of the Best Performing Sources

EPA has proposed limits on total particulate matter (filterable) in lieu of limits on non-mercury metallic HAP emissions: 0.03 lb/MMBtu for existing coal-fired units, and 0.050 lb/MWh for new coal-fired units. As discussed elsewhere, EPA has not justified use of particulate matter as a surrogate for

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[180] *Id.*

non-mercury metals. Further, the specified PM limits do not reflect the maximum achievable reductions in such pollution.

First, in setting the new floor limit, EPA did not use the unit with the lowest emissions (i.e., the best performing unit), which was the Bonanza Power Plant, Unit 1-1. Instead, citing unspecified data issues, EPA set the floor using the second lowest emitting unit, the Dunkirk Generating Plant, Unit 1. The total particulate emissions from Bonanza were 8.6E-06 lb/MMBtu while the emissions from Dunkirk were 2.82E-03 lb/MMBtu. Absent an explained technical basis for disregarding them, EPA should have been based the new source floor on the Bonanza plant. Further, the data questions which prevented EPA from selecting the Bonanza plant as its best performer did not prevent EPA from retaining the Bonanza emissions in the variability analysis used to set the existing source floor.

Second, in setting the existing source floor, EPA used the top 12% or 131 units based on the total number of plants and not the units for which EPA has data (approximately 245 units). EPA thereby assumed that it had captured, in its data, the entirety of the "best performing" units. Since the best performing set includes units that have both ESPs and fabric filters of various designs, with and without various scrubbers, it is difficult to see how EPA can justify this assumption.

Third, we note that even with the best performing set, the emissions of the 131st unit (Dale Station, Unit 3) is 2.58 E-02 lb/MMBtu, which is approximately 9.1 times the emissions of the second best source (i.e., Dunkirk Unit 1) or close to 3000 times the emissions of the best performing unit (i.e., Bonanza). EPA assumes – without support – that all of this variability is emissions variability. For example, a portion of this variability could be due to different test methods, and other factors unrelated to variability in the plants' actual emissions. Or (as discussed above) the Dale unit is not amongst the best performing sources.

2. EPA Has Not Justified Its Refusal to Set Limits Beyond the Floor

EPA has not justified its failure to require additional "beyond-the-floor" reductions in emissions. Available means of achieving lower particulate matter emissions exist. Baghouses vary in design – notably, as to the choice of fabric used for a filter. As a result, some filters (e.g., Daikin's AMIREX™, PTFE membrane filters,[181] and W.L. Gore's L3650[182]) achieve better control of smaller particles (and thus HAP) than others (e.g., filters using Ryton). *See* summary of U.S. EPA's ETV test results in Ex. 9-56.[183] A bag leak detection system can lower emissions for any filter.

Other technologies that control $PM_{2.5}$ emission are available. For example, a WESP placed after a fabric filter would eliminate significant amounts of $PM_{2.5}$ emissions. Ex. 9-57.[184] *See* Exs. 9-58[185] 9-59,[186] 9-60[187]

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[181] *McIlvaine Hot Topic Hour, Filter Media Selection for Coal-Fired Boilers*, September 13, 2007, Presentation by Todd Brown, Daikin America, Inc. Ex. 9-68. Voice recording available online to subscribers of McIlvaine Power Plant Knowledge System and available for purchase.

[182] USEPA, *ETV Joint Verification Statement, Baghouse Filtration Products*, W.L. Gore & Associates, L3650, Ex. 9-55.

[183] Fabric Filtration Media are certified by the U.S. EPA Environmental Technology Verification Program using the "Generic Verification Protocol for Baghouse Filtration Products" to Achieve 99.99% Removal of PM2.5.

[184] Report of Expert Witness Hal Taylor, *Feasibility of Conducting PM2.5 BACT Analysis for the Highwood Generating Station*, September 2007. *See also* Ex. 9-57 at 9 ("A wet ESP placed after the fabric filter would eliminate up to 99% of the 130 tons of filterable PM2.5 emissions projected in the Highwood facility air permit. In addition, it would eliminate a similar percentage of the 161 tons of condensable PM that this unit will emit"). Notably, the Wet ESP system "has been in successful commercial operation since 1986."

[185] Moretti et al., *Application of Wet Electrostatic Precipitators to Address Fine Particulate Emission Requirements from Fossil-Fueled Combustors*, ICAC 2005. Ex. 9-58.

[186] "*Evaluation of Potential PM2.5 Reductions by Improving Performance of Control Devices: Conclusions and Recommendations*," Prepared for: U.S. Environmental Protection Agency by E.H. Pechan & Associates, Inc., EPA Contract No. 68-D-00-265 at 23 (September 30, 2005) (describing Wet ESP as

EPA's Environmental Test Verification (ETV) program recently verified the performance of the "Advanced Hybrid Particulate Collector" (AHPC) system[188] "as providing the lowest filter outlet concentrations for both $PM_{2.5}$ and total mass concentration."[189] A 2005 report prepared for the EPA listed additional innovative control techniques that yield high $PM_{2.5}$ emissions reductions. Included in the list of controls are: (1) Compact Hybrid Particulate Collector, Ex. 9-59,[190] (2) Indigo Particle Agglomerator, Ex. 9-59,[191] 9-64,[192] 9-65,[193] (3) Wet ESP, Ex. 9-66,[194] and (4) Wet Membrane ESP, Ex. 9-59.[195]

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an "innovative control system" that "yield[s] higher PM2.5 emissions reductions than the methods identified to improve existing control device performance"). Ex. 9-59.

[187] *See also Candidate Stationary and Area Control Measures*, Chicago PM2.5 Workshop, June 21, 2007, Tim Smith, USEPA at slide 15 (recognizing Wet ESP's as "innovative PM2.5 controls"). Ex. 9-60. *See also* CIBO Industrial Emissions Control Technology II Conference, August 2 - 4, 2004 Portland, Maine at 6 (explaining that Wet ESP's are an effective control technology for PM2.5: "There are no moving parts in a wet ESP. The [fine] particles never really reach the electrode and are constantly washed away by the water flow"). Ex. 9-61.

[188] Since its original development, the name of this technology has been changed to "Advanced Hybrid™". The name was trademarked by W.L. Gore and Associates, Inc. "Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector Technology," U.S. Department of Energy (February 2007). Ex. 9-62.

[189] EPA Test Program Verifies Performance of GORE® Filter Laminate (October 2006). Ex. 9-63.

[190] The Compact Hybrid Particulate Collector (COHPAC) is "a pulse jet filter module operated at a very high filtration velocity (air-to-cloth ratio), installed downstream of an ESP. The function of a COHPAC is as a "polishing filter," collecting the particulate (especially fine particulate) that escapes an ESP. A full-scale COHPAC system has been installed at the Gaston power plant near Birmingham, AL (Southern Company, 2004)." Ex. 9-59 at 23.

[191]The Indigo Agglomerator was "developed in Australia to reduce visible emissions from coal fired boilers. The Indigo Agglomerator contains two sections, a bipolar charger followed by a mixing section. The bipolar charger has alternate passages with positive or negative charging. That is, the even passages may be positive and the odd passages negative, or vice versa. This can be contrasted with a conventional coal fired boiler precipitator, which has

Recently constructed units are, through these and other means, achieving substantially lower particulate emissions than those required by standards. The table below lists some of those units, all of which demonstrate that lower emissions are achievable. By failing to explain, in a manner consistent with the statutory standards, why EPA's proposed standards exceed those achievable, lower rates, the Agency has failed to adhere to the statutory standard.

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only negative charging electrodes. Following the charging sections, a mixing process takes place, where the negatively charged particles from a negative passage are mixed with the positively charged particles from a positive passage. The close proximity of particles with opposite charges causes them to electrostatically attaché to each other. These agglomerates enter the precipitator, where they are easily collected due to their larger size." Ex. 9-59 at 23.

[192] Rodney Truce and others, *Reducing PM2.5 Emissions Using the Indigo Agglomerator*, Mega 2006.

[193] *Indigo Agglomerator: Reducing Particulate Emissions & Reducing Opacity, McIlvaine Hot Topic Hour*, November 3, 2006.

[194] *Wheelabrator Air Pollution Control, Inc., PM2.5 Control with Wet Electrostatic Precipitators*, November 2, 2006.

[195] The wet membrane ESP "attempts to avoid problems of water channeling and resulting dry spots than can occur with wet ESPs, and avoiding the higher-cost metals that must be employed to avoid corrosion in a traditional wet ESP. The membranes are made from materials that transport flushing liquid by capillary action effectively removing collected material without spraying (Southern Environmental Corporation, 2004)." Ex. 9-59 at 25.

Permitted Filterable PM/PM10 Emission Limits

Facility	Permit Lb/MMBtu	Reference
Virginia City HEC	0.0090	RBLC VA-0311
Desert Rock[196]	0.010	Permit (7.31.08) Condition H.1.b
Karn Weadock	0.0110	RBLC MI-0389
American Municipal Power	0.0120	RBLC OH-0310
Basin Dry Fork	0.0120	RBLC WY-0064
Deseret Power	0.0120	RBLC UT-0070
Wygen 3	0.0120	RBLC WY-0063
Dallman Power Plant	0.0120	RBLC IL-0107
John W. Turk	0.012	RBLC AR-0094
Norbornne Power Plant	0.012	RBLC MO-0077
Spiritwood Station	0.0150	RBLC ND-0024
Hugo Generating Station	0.0150	RBLC OK-0118

All RBLC data are at www.epa.gov/ttn

E. The Agency Has Not Justified Its Refusal to Set MACT Limits for Organic Air Toxics and Dioxin/Furan

EPA has refused to set MACT limits for any organic hazardous air pollutants, or dioxin or furan, substituting a "work-practice standard" of an annual performance test intended to promote "good combustion."[197] 76 Fed. Reg. 25046. It bases that refusal on the assertion that "the significant majority of the measured emissions from EGUs of dioxin/furan and non-dioxin/furan organic HAP are at or below the MDL [(minimum detection level] of the EPA test methods even though we required 8 hour test runs." *Id.* EPA concludes that the "application of measurement technology to [EGUs] is not practicable due to technological and economic limitations." *Id.*

The Clean Air Act allows EPA to issue work practice standards in lieu of emission standards only where it is not feasible to prescribe or enforce and

[196] Ex. 9-67.

[197] Polycyclic aromatic compounds present particularly acute dangers to public health. *See* Exs. 9-69 through 9-75.

emission standard. 42 U.S.C. § 7412(h)(1). Further, it provides expressly that the term "not feasible to prescribe or enforce an emission standard" refers only to situations where: "(A) a hazardous air pollutant cannot be emitted through a conveyance designed and constructed to emit or capture such a pollutant, or that any requirement for, or use of, such a conveyance would be inconsistent with any Federal, State, or local law, or (B) the application of measurement methodology to a particular class of sources is not practicable due to technological and economic limitations." 42 U.S.C. § 7412(h)(2).

EPA's argument that some test results were below some MDLs does not even speak to the relevant statutory standard. EPA does not claim that it is not practicable to apply measurement technology to EGUs' emissions of dioxins or other organic HAPs, nor could the agency possibly make such a claim. As EPA admits, measurement technology has been applied to EGUs' emissions of dioxins and other organic HAPs, and it has generated significant quantities of emissions test data. For this reason alone, setting work practice standards in lieu of emission standards for dioxins and organic HAPs would be unlawful and arbitrary.

EPA claims that because some of the emission test results fell below the MDLs that happened to be used at some units, "EPA considers it impracticable to reliably measure emissions from these units." 76 Fed. Reg. at 25046. The test under § 112(h), however, is whether "the application of measurement methodology to a particular class of sources is not practicable." EPA does not identify any class of sources to which measurement methodology for dioxins and organic HAPs is not practicable. Nor does the mere fact that some units recorded test results below the particular MDL that a unit chose show that application of measurement methodologies is impracticable even for those same units. Rather, it merely reflects EPA's discretionary decisions not to specify a maximum MDL and to collect data in a way that allowed some sources to return test results with extremely high

MDLs. The measurement methodologies that allowed many other EGUs to use much lower MDLs are applicable to all EGUs.

Further, the record does not indicate that EGUs consistently emit all organic HAP at levels below any MDLs. EPA indicates only that in "several cases . . . all of the data for a given run were below the detection limit," and in "few cases were the data for a given run all above the detection level." *Id.* at 25040. Emissions of certain organic HAP were, however, significantly above detection limits. For example, in the case of formaldehyde, of the 150 tests available, 101 were detected above each test's detection limit. It cannot therefore be impracticable to set a floor limit for formaldehyde. And for a significant number of units – providing nearly a third of the test runs – *all* dioxin/furan congeners were above the minimum detection limit. *Id.* Significantly, § 112(d)(3) directs EPA to base floors on the emission limitation achieved by the best performing sources "for which the Administrator has emissions information." 42 U.S.C. § 7412(d)(3)(A). Assuming *arguendo* that test results that fall below a particular source's MDL are not usable for the purposes of standard-setting, EPA must base floors on the sources for which the Administrator does have usable emissions data. EPA does not and cannot dispute that it has significant quantities of emissions information for both dioxins and organic HAPs that do not reflect tests results below MDLs. As the Agency has acknowledged, where "emissions can be precisely measured for at least some units in [a] subcategory . . . the statutory test for establishment of work practice standards – i.e., that measurement of emissions is impracticable due to technological and economic limitations – is not met." 76 Fed. Reg. 15608, 15640 (March 21, 2011).[198]

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[198] EPA explains the inconsistency between its decision here and in previous decisions by noting previous standards shorter sampling times, and units emitting greater quantities of HAP. Neither affects the Agency's primary rationale: whether measurement can be described as impracticable, where some (but not all) units in the category have emissions below a minimum detection limit.

Moreover, even the possibility that some plants might always record emission levels below their particular MDLs is irrelevant. It does not show that application of the measurement methodology is impracticable, but rather, merely that they have low emission levels, high MDLs, or both. And emissions below the "method detection level" can be practicably measured. As the Agency has acknowledged, its tests are designed to provide "only about a 1 percent probability of an error in deciding that the pollutant measured at [or below] the MDL is present when in fact it is absent." 76 Fed. Reg. at 25044. While there may be some imprecision associated with monitoring emissions at levels near the detection level, *see* 76 Fed. Reg. at 25,046 ("the expected measurement imprecision for an emissions value at or near the MDL is about 40 to 50 percent")[199], that imprecision can be addressed by further statistical manipulations, *cf.,* 76 Fed. Reg. 25044 (seeking comment on statistical methods to address measurement imprecision), adjusting the limit (e.g., with a safety factor) that accommodates any uncertainty (e.g., 50% above the detection level), or establishing monitoring protocols that reduce the uncertainty to acceptable level. As we have discussed earlier, we cannot find any support for EPA's alternate triple-MDL floor in the ASME ReMAP report upon which EPA relies.

EPA also attempts to claim that setting emission standards would be economically infeasible by arguing that "[b]ecause the levels of organic HAP emissions from EGUs are so low (at or below the MDL of the available test methods), there is no indication that expending the additional cost (*i.e.*, extending the sampling time) would provide the regulated community the ability to test for these HAP that would provide reliable technically viable results." 76 Fed. Reg. at 25046. EPA provides no basis to believe that plants could not apply measurement methodologies without extending the sampling

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[199] As noted above, the record does not support this assertion. *See* pps. 8-15 and 8-16.

time – and thus without "additional cost." Sample times are only one component in the determination of method detection limits and, indeed, a minor one. But assuming that some additional cost might be incurred, EPA does provides no basis to assume that it would render measurement methodologies economically impracticable.

Finally, even if § 112(h) authorized EPA to set work practice standards in lieu of emission standards for EGUs' emissions of dioxins and organic HAPs – which it does not – the work practice standards EPA has proposed would contravene § 112(h)(1), which provides that such standards must be "consistent with the provisions of subsection (d) or (f) of this section." 42 U.S.C. § 7412(h)(1). To be consistent with subsection (d), any work practice standards for EGU would have to reflect measures that yield the maximum achievable degree of reduction in these pollutants and that at a minimum reflect the measures adopted by the EGUs with the lowest emission levels of dioxins and organic HAPs. EPA's proposal does not purport to satisfy this requirement and is untenable in light of record evidence that EGUs can and do achieve reductions in dioxins through the use of activated carbon injection and reductions in other organic HAPs through the use of selective catalytic reduction systems. If EPA were to set work practice standards, it would have to require the use of these technologies at a minimum.