LEGAL AND POLICY BASIS FOR USE OF WEST ASSOCIATES PROPOSED MERCURY MACT FLOORS

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Legal and Policy Basis
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A. Introduction and Summary

The U. S. Environmental Protection Agency ("EPA") is currently considering how to use the information contained in two mercury Information Collection Request datasets ("ICR II" and "ICR III") to develop MACT floors for mercury emissions from coal-fired utility units. On March 4, 2003, WEST Associates presented to the Utility MACT Working Group the WEST Associates Multivariable Study,[1] setting forth proposed MACT floors for bituminous, subbituminous and lignite coal-fired units. This white paper provides a legal and policy basis for use of these proposed MACT floors by the EPA.

Pursuant to the Clean Air Act ("CAA"), MACT floors are to be set at levels no less stringent than the average emission limitation achieved by the best-performing sources.[2] To account for the variability of mercury emissions over time, both the EPA and the courts have determined that MACT floors must be set at levels achievable by the best performing units under the most adverse circumstances reasonably expected to recur.[3] The U.S. Court of Appeals for the D.C. Circuit has provided additional guidance on the development of MACT floors in *Cement Kiln Recycling Coalition v. EPA*,[4] stating that the methodology the EPA uses to set MACT floors must provide a reasonable estimate of the actual performance of the relevant best controlled source or sources.

In accordance with the above legal standards, WEST Associates engaged ENSR Corporation to develop a methodology and perform a study (the "WEST methodology or study") that utilizes, to the maximum degree possible, the information contained in the ICR II and ICR III datasets to estimate mercury emissions from the best-performing units under the most adverse circumstances reasonably expected to recur. More specifically, WEST's methodology utilizes the data in the ICR III dataset to determine relationships between coal composition (*i.e.*, differences in mercury content, chlorine content and heat content of coal) and mercury emissions so that the extensive ICR II fuel composition data can be employed to assess the variation in mercury emissions over the full range of coal compositions. In this manner, the proposed MACT floors, developed in accordance with WEST's methodology, account for the known and quantifiable chemical and physical processes that dictate the variability of mercury emissions from coal-fired utility units, providing robust estimates of actual mercury emissions from the best-performing units. Accordingly, the MACT floors calculated pursuant to WEST's methodology, based on the available data in the ICR database, provide the most accurate available estimates of mercury emission levels achieved in practice by the best performing units in each of the coal rank subcategories and should, as a practical and policy matter, be used by the EPA to set mercury MACT floors for coal-fired utility units.

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1 *Multivariable Method To Estimate The Mercury Emissions of The Best-Performing Coal-Fired Utility Units Under The Most Adverse Circumstances Which Can Reasonably Be Expected To Recur*, Document No. 6200-029-171 (March 4, 2003) ("WEST Associates Multivariable Study").

2 CAA § 112(d)(3), 42 U.S.C. § 7412(d)(3).

3 64 Fed. Reg. 31898, 31915 (June 14, 1999) (National Emission Standards for Hazardous Air Pollutants for Source Categories; Portland Cement Manufacturing Industry) (final rule). *See also Sierra Club v. EPA*, 167 F.3d 658, 665 (D.C. Cir. 1999); *National Lime Ass'n v. EPA*, 627 F.2d 416, 431 n. 46 (D.C. Cir. 1980).

4 *Cement Kiln Recycling Coalition v. EPA*, 255 F.3d 855 (D.C. Cir. 2001) ("*Cement Kiln*").

B. Overview of Applicable Legal Standards

1. Section 112 of the Clean Air Act

Section 112 of the CAA establishes a framework under which the EPA regulates emissions of "hazardous air pollutants" or "HAPs." Section 112(n)(1)(A) of the CAA provides for the regulation of HAP emissions from utility boilers if the EPA determines that regulation is "appropriate and necessary" following a study of the health impacts of HAP emissions from electric utility steam generating units.[5] The EPA has determined that it is appropriate and necessary to regulate mercury emissions from such units.[6] The EPA chose to list these units under section 112(c) and to establish technology-based emissions standards – called "maximum achievable control technology" or "MACT" standards – under section 112(d).[7]

The EPA implements these statutory requirements through a two-step process. The EPA first determines the specific minimum stringency requirements which the EPA may not go below (*i.e.*, MACT floors). MACT floors are to be set at levels reflecting the average emission limitation achieved by the best-performing source or sources in the relevant source category.[8] After determining the appropriate MACT floor for each pollutant and source category, the EPA then determines whether stricter standards, known as "beyond-the-floor" standards, are achievable in light of costs and other factors listed in Section 112(d)(2).

2. Legal guidelines for setting MACT floors

As noted above, MACT floors for existing sources are to be set at a level reflecting the average emission limitation achieved by the best-performing sources. To account for the variability of mercury emissions over time, both the EPA and the courts have determined that MACT floors must be set at levels "achievable [by the best performing units] under the most adverse circumstances which can reasonably be expected to recur."[9]

In *Cement Kiln*, the U.S. Court of Appeals for the D.C. Circuit provided additional guidance on the development of MACT floors by vacating the MACT standard for hazardous waste combustors, concluding that the EPA's method of establishing MACT floors was inconsistent with Section 112 of the CAA. In short, the standard was set aside because the Court believed the EPA had not demonstrated that the performance of sources outside the top 12% provided a reasonable indication of the

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5 CAA § 112(n)(1)(A), 42 U.S.C. § 7412(n)(1)(A).

6 *See* 65 Fed. Reg. 79825 (Dec. 20, 2000).

7 CAA §§ 112(d)(1) – (3), 42 U.S.C. §§ 7412(d)(1) – (3).

8 *Id.* at §§ 112(d)(3)(A) and (B), 42 U.S.C. §§ 7412(d)(3)(A) and (B). The CAA mandates the number of sources that are to be considered in determining MACT floors in two places. First, for larger source categories, Section 112(d)(3)(A) specifies that MACT floors should be based on performance data of 12% of the total number of sources in the category. Second, Section 112(d)(3)(B), acting as a backstop, mandates that a minimum of 5 data points be considered for smaller categories. The statutory design was intended to ensure that, as the number of sources in a category declines, the number of "best-performers" that sets the MACT floor declines as well, but never drops below 5.

9 64 Fed. Reg. 31898, 31915 (June 14, 1999) (National Emission Standards for Hazardous Air Pollutants for Source Categories; Portland Cement Manufacturing Industry) (final rule). *See also Sierra Club v. EPA*, 167 F.3d 658, 665 (D.C. Cir. 1999); *National Lime Ass'n v. EPA*, 627 F.2d 416, 431 n. 46 (D.C. Cir. 1980).

emissions performance of the best controlled sources. In relevant part, the Court's decision in *Cement Kiln* boils down to one essential point – MACT floors must be based on a reasonable estimate of the actual performance of the relevant best controlled sources. A more detailed description of the Court's ruling in *Cement Kiln* is set forth below.

EPA selected the MACT floors at issue in *Cement Kiln* by using a four step approach. First, the EPA identified the best controlled sources in the category (the "MACT pool"). Next, the EPA identified the primary control technology or technique employed by sources in the MACT pool with emissions levels equal to or lower than the MACT pool's median. Third, the Agency identified all sources in the category that properly use the designated control technology, which included sources that were not among the best-performing in the source category (the "expanded MACT pool"). Finally, the EPA established the MACT floor at the emissions level achieved by the worst performing source in the expanded MACT pool.

In the hazardous waste combustor MACT, the EPA interpreted the CAA such that the MACT floor should be set at a level that is "achievable" by any affected source that properly employs the designated control technology. Thus, for example, the EPA identified the MACT floor technology for existing sources based on the performance of the median facility among the best-performing sources. However, the EPA then based the floor determination (*i.e.*, the level of control that represents the MACT floor) on the performance achieved by the worst performing source in the expanded MACT pool of sources that properly employed the selected technology. The expanded MACT pool included sources that were not among the best-performing in the source category.

The Sierra Club asserted that the CAA requires MACT floors to be no less stringent than the emission levels actually achieved in practice by the best-performing source or sources; and that the EPA violated the CAA by setting MACT floors at levels the EPA considered achievable by all sources using the MACT technology.[10] The Court agreed with the Sierra Club: "While standards achievable by all sources using the MACT control might also ultimately reflect what the statutorily relevant sources achieve in practice, EPA may not deviate from section 7412(d)(3)'s requirement that floors reflect what the best performers actually achieve by claiming that floors must be achievable by all sources using MACT technology."[11] As a result, the Court determined that it was improper for the EPA to set MACT floors at levels achievable by any source properly using the designated control technology. Instead, "EPA's method of setting emission floors must reasonably estimate the performance of the relevant best-performing plants."[12]

The EPA also argued that, as a practical matter, its methodology for determining the applicable MACT floors did result in floor determinations reflecting the actual performance of the best controlled sources. The EPA asserted that "considering data from all sources using a common control approach is a reasonable means of estimating the performance of the best sources under the worst foreseeable circumstances."[13] The Court disagreed, commenting that the performance of all units with the same technology might be relevant if the type of technology is the only factor that determines emission levels of HAPs; however, evidence in the rulemaking record showed that the EPA had identified several

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10 *Cement Kiln* at 861.

11 *Id.*

12 *Id.*, citing 233 F. 3d at 632.

13 *Id.* at 862.

additional factors that were potentially relevant to the performance of hazardous waste combustors.[14] In sum, the Court concluded that, "the very fact that the EPA recognizes both design differences in MACT technology and non-MACT factors as causes of wide-ranging variations in performance suggests that the emissions achieved by the worst-performing MACT source do not, as the CAA requires, represent a reasonable estimate of emissions achieved by the best-performing sources."[15]

Lastly, the EPA argued that "to account for the best-performing sources' operational variability, it had to base the floors on the worst performers' emissions."[16] Again, the Court disagreed: "[T]he relevant questions here is ... whether the variability experienced by the best-performing sources can be estimated by relying on emissions data from the worst-performing sources using the MACT control."[17] The Court concluded that "*in this case*," the evidence in the record "fails to demonstrate the relevant relationship."[18]

In sum, the Court concluded that the "EPA has not demonstrated ... that floors based on the worst-performing MACT sources' emissions represent a reasonable estimate of the performance of the best-performing units."[19]

C. WEST's Methodology for Calculating MACT Floors for Mercury Emissions from Coal-Fired Utility Units[20]

In accordance with the above legal standards, ENSR developed for WEST Associates, a multivariable methodology to estimate mercury emissions from the best-performing coal-fired utility units. WEST's methodology utilizes the data in the ICR III stack test dataset to determine relationships between coal composition and mercury emissions so that the ICR II fuel composition data can be employed to assess the variation in mercury emissions over the full range of coal compositions. In this manner, WEST's methodology accounts for the known and quantifiable chemical and physical processes that drive variability of mercury emissions – providing robust estimates of the actual performance of the best-performing units in each coal rank subcategory.

1. Basic mercury chemistry in coal-fired boiler units

Coal-fired utility units are subject to a range of operating conditions that cause mercury emissions to vary considerably over time. This variability is primarily caused by differences in the composition of coal over time (*i.e.*, differences in mercury content, chlorine content and heat content of coal). In particular, coal chlorine concentration plays a key role in the variability of mercury emissions. Coal chlorine content is one of the primary determinants of which mercury-containing compounds will be present – and in what amounts – in the flue gas of an individual utility unit.[21] The differing physical and

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14 *Id.*

15 *Id.* at 862-865.

16 *Id.* at 865.

17 *Id.*

18 *Id.* (emphasis added).

19 *Id.* at 866 (internal punctuation omitted).

20 A detailed description of WEST's methodology is set forth in the WEST Associates Multivariable Study.

21 There are three primary mercury-containing chemicals that are emitted from power plants: Hg^{o} (or "elemental mercury"); Hg^{2+} ("divalent oxidized" mercury); and Hg^{p} (mercury containing compounds that

chemical properties of mercury-containing compounds in the flue gas result in significant differences in the feasibility and effectiveness of controls for removing the compounds from flue gas.[22]

Accordingly, when combined with other relevant data, such as coal mercury content, the chlorine content of coal can be used as a key indicator of mercury emissions. As described below, WEST's methodology utilizes the relationship between coal composition, including coal chlorine content where appropriate, and mercury emissions to estimate mercury emission levels actually achieved in practice by the best-performing sources.

2. **Overview of WEST's methodology for calculating MACT floors**

The WEST study extracted data from the ICR III and ICR II datasets to help determine the relationship between coal composition and mercury emissions. The ICR III dataset consists of stack testing results for 80 coal-fired utility units (3 tests per unit) and related coal mercury and chlorine data. With only 3 stack tests per unit conducted under essentially identical conditions, the ICR III data alone provides only a limited number of short-term observations, failing to account for variability of emissions over the full range of operating conditions. The ICR II dataset, on the other hand, contains extensive data on coal composition for over 1000 coal-fired units collected over the course of a year, but does not contain mercury stack emission data.

WEST's methodology utilizes the data in the ICR III stack test dataset to determine relationships between coal composition and mercury emissions so that the extensive ICR II fuel composition data can be employed to assess the variation in mercury emissions over the full range of coal compositions. This methodology allows for the maximum amount of information contained in the ICR III and ICR II datasets to be utilized to account for the variability of emissions, providing robust estimates of mercury emission levels experienced in practice by the best-performing units in each coal rank subcategory.

To estimate mercury emission levels, the WEST study first took the 80 units subject to stack testing and sorted them by coal rank, excluding certain units, such as fluidized bed combustors ("FBCs") that were not representative of the larger population of tested units.[23] The best-performing units for each coal rank subcategory were then selected as those having the lowest mercury emissions observed

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are bound to fly-ash, commonly referred to as "particulate-bound mercury"). The chlorine content of coal and the final temperature of the flue gas are the two primary factors impacting the chemical structure of mercury in the flue gas. Other factors, however, such as the sulfur and iron content, ash characteristics and amount unburned carbon (also known as "LOI") can also have a significant impact on mercury speciation. As a general matter, higher concentrations of chlorine in coal will result in lower concentrations of elemental mercury in the flue gas, and by implication, lower concentrations of chlorine will result in higher concentrations of elemental mercury.

22 While all three compounds contain mercury, it is important to recognize that that they are different chemicals and as such, display different chemical properties that in turn affect the ability of existing control technologies to remove them from flue gas. As a general matter, particulate-bound mercury and divalent oxidized mercury can be more easily removed from flue gas using conventional emission control technologies, such as fabric filters and scrubbers, relative to elemental mercury, which has proven difficult to remove.

23 This left 29 bituminous units, 26 subbituminous units and 10 lignite units among the ICR III stack test dataset. On March 27, 2003, WEST sent to EPA a legal analysis demonstrating that FBC units should not be included among these coal rank subcategories.

in the ICR III stack testing results.[24] The different control configurations used by the best-performing units were then identified and an analysis performed on each such control configuration to determine the relationship between mercury removal and coal chlorine concentration. This relationship, represented as a correlation equation, provides a numerical means of predicting the fraction of mercury removed for each control configuration used by the best-performing units.[25]

Next, for each of the best-performing units, a range of mercury emission levels were calculated using the test data for coal deliveries throughout a one-year period from the ICR II dataset. If the correlation equation derived for a particular unit's control configuration was determined to have sufficient explanatory power (*i.e.*, was a good fit to the data),[26] then the correlation equation was applied to the coal composition data from the ICR II dataset to determine a range of mercury emissions for that particular unit over the course of a year. This approach accounted for variations in the mercury, chlorine and heat content of fuel.

In those instances where the data did not support such a correlation of mercury removal with chlorine content, a secondary approach was used that applies the ICR III tested mercury removal fractions to the full range of ICR II coal mercury and heat content.[27] Under this approach, the measured impact of fuel variability was limited to the effect of variations in mercury and heat content, while variations in chlorine concentration were not explicitly considered.

For each of the best-performing sources, this process was repeated for each set of measured coal composition values, yielding a range of mercury emission levels for each unit over time. The estimated mercury emission levels for each best-performing unit were then sorted from smallest to largest to obtain a cumulative frequency distribution. The 95th percentile value of this distribution was

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24 In accordance with the Section 112(d)(3) of the CAA, the WEST study selected the top performing 5 bituminous units, 5 subbituminous units and 5 lignite units. On March 27, 2003 WEST sent to EPA a legal analysis demonstrating that the minimum number of units that must be included in each of these bituminous, subbituminous and lignite sugcategories is 5 units.

25 To calculate the correlation equations for each control configuration used by the best-performing units, the mercury removal fraction and test coal chlorine concentrations were obtained from the ICR III dataset for each of the 65 non-excluded units in the ICR III dataset that have one of the identified control configurations. This analysis used test data from the ICR III dataset for all units employing one of the identified control configurations (not only the best-performing units). Using the following mathematical expression, a correlation equation was derived for each identified control configuration used by the top performing units, establishing the relationship between coal chlorine concentration and the fraction of mercury removed:

$$F_r = 1 - \beta \exp(-\alpha C_{Cl})$$

where

F_r = fraction of mercury removed during the test

C_{Cl} = chlorine concentration in the test coal (ppm).

26 To determine whether the explanatory power of each correlation equation warranted its use on a larger range of ICR II coal composition data, the WEST study compared each correlation equation against ICR III stack test data. For each of the test chlorine concentrations in the ICR III stack test dataset, the mercury removal fraction was calculated by use of the correlation equation with parameters selected to give the best fit to the data. A correlation coefficient was then calculated to evaluate the accuracy of the fit.

27 This latter approach yielded a constant removal fraction based upon the source test, and had the effect of reducing (under-predicting) the variability of predicted mercury emissions.

then determined to represent the operation of the unit under the most adverse circumstances reasonably expected to recur. The 95th percentile distribution reflects an emission level that is expected to be exceeded 5% of the time and, therefore, appropriately reflects emissions under the most adverse circumstances reasonably expected to recur.

Finally, because the ICR III stack test units represent only a small portion of the true population of coal-fired utility units, WEST Associates considered it appropriate to account also for inter-unit variability among the top performers. The ICR II dataset indicates that the population of coal-fired units exceeds 1000. Yet, due to the limited size of the ICR III dataset, the analysis of within-unit variability considered only the top 5 units in each of the three coal-rank subcategories. With respect to bituminous and subbituminous units, however, the actual number of units in the top 12% of each subcategory is significantly larger than the number of units used in the analysis.[28] Further, the number of bituminous and subbituminous units tested represented only a small fraction of the total number of units actually burning each coal type.[29] Under these circumstances, a focus on within-unit variability alone is not expected to capture the full range of emissions-variability among the best performing sources. The WEST study accounted for this variability by calculating a 95% upper-confidence limit for the average 95th percentile emission levels of the top performers from each coal rank subcategory.[30] This 95% upper confidence limit, expressed as an emission rate, was reported as the MACT floor.

Although WEST's methodology accounts for the primary drivers of emissions variability (*i.e.*, differences in the mercury, chlorine and heat content of coal), certain additional factors that may affect variability were not able to be incorporated into the analysis, including: measurement error, intermittent maintenance events and load variation. Testing was performed with plants operating at full and constant load, and without on-going maintenance activities. Actual operation requires load-following in addition to intermittent maintenance activities, both of which may adversely impact mercury removal.[31] In addition, certain coal composition factors not incorporated into WEST's analysis, such as the impact of unburned carbon in fly-ash and the sulfur content and calcium content of coal, may impact mercury emissions. These factors were not able to be incorporated because available data currently are insufficient to quantify these effects. Insofar as the methodology discussed herein does not incorporate these effects, its results are likely to underestimate the reasonable worst-case emissions of the best-performing units.

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28 Excluding FBC units and blended units, there are 661 bituminous units and 228 subbituminous units. *See An Assessment of Mercury Emissions from U.S. Coal-fired Power Plants*, Electric Power Research Institute (2000). Thus, the total number of units actually in the top 12% of bituminous units is 79 and the top 12% of subbituminous units is 27. Merely looking at 5 bituminous units and 5 subbituminous units does not sufficiently capture the inter-unit variability among the full population of best-performing units.

29 Only 4.39% (29 out of 661) of the bituminous units were tested and only 11.40% (26 out of 228) of the subbituminous units were tested.

30 This adjustment reflects the fact that the top performing sources for which test data is contained in the ICR II and ICR III datasets do not represent the *full* population of the best-performing 12% of coal-fired utility boiler units.

31 Indeed, stack test results for Cinergy's Gibson plant – the only unit in the ICR III dataset with two sets of stack tests – demonstrate that daily maintenance activities, such as operation of the air heater soot blowers, can cause significant increases in mercury emissions.

D. **MACT Floor Results Using WEST's Methodology**

The mercury MACT floors for bituminous, subbituminous and lignite coal units derived using WEST's methodology are set forth in Table 1 below. A more detailed presentation of the results are set forth in Exhibit 1 hereto.

Table 1. Determined MACT Floor By Coal Rank

Coal Rank	MACT Floor (lb Hg/TBtu)
Bituminous	2.26
Subbituminous	5.75
Lignite	10.15

In addition, because of certain anomalies in the ICR III data and certain statistical reasons, alternative MACT floors have been calculated for subbituminous and lignite MACT floors as set forth in Table 2 below.

Table 2. Alternative MACT Floor for Subbituminous and Lignite Coal

Coal Rank	MACT Floor (lb Hg/TBtu)
Bituminous	2.26
Subbituminous	4.15
Lignite	8.20

With respect to the MACT floor for subbituminous units, a number of factors, described in more detail in the WEST Associates Multivariable Study, suggest that it may be appropriate to replace Coronado with Comanche in the list of 5 top performing subbituminous coal plants. If Coronado was replaced with Comanche the 95 percent upper confidence level of the mean of the worst-case mercury emission factors drops from 5.75 to 4.15 lb/Tbtu. In the results presented in Table 1, MACT floors for all 3 coal rank subcategories were calculated using a 95% upper confidence limit to account for the fact that the units tested for a particular coal were only a small fraction of the total number of units actually burning that type of coal. With respect to lignite, however, a straight average of the worst-case emission factors would be appropriate because almost half (10 out of 23) of the units were actually tested. Using a straight average for lignite would drop the MACT floor from 10.15 to 8.20 lb/TBtu.

E. **WEST's Methodology is Consistent with Applicable Legal Standards**

WEST's methodology is fully consistent with all applicable legal standards, including the Court's ruling in *Cement Kiln*. WEST's methodology accounts for the variability in emissions of the best-performing units to determine appropriate mercury MACT floors for bituminous, subbituminous and lignite coal-fired utility units. Unlike the methodology at issue in *Cement Kiln*, WEST's methodology does reasonably estimate the actual performance of the best-performing units. The WEST study uses data from sources outside the top 12% for the limited purpose of determining the relationship between mercury removal and coal chlorine concentration for the selected control configurations. This is fully consistent with the Court's ruling in *Cement Kiln*. Indeed, WEST's methodology utilizes the maximum possible amount of information contained in the ICR III and ICR II datasets to provide robust estimates of the actual performance of the best-performing units in each coal rank subcategory.

Cement Kiln does not forbid the use of data from sources outside the top 12%. In *Cement Kiln*, the EPA proposed that MACT floors should be set at levels that are "achievable" by any affected source that properly employs the designated MACT technology, including units that were not in the top 12%. The Court rejected the EPA's proposed MACT floor, noting that the CAA requires MACT floors to reflect emission levels actually achieved by the best-performing sources, *not* at levels the EPA considers achievable by all sources using the MACT technology. Thus, the methodology at issue in *Cement Kiln* was invalidated, not because it reached outside the top 12%, but because the EPA failed to demonstrate that MACT floors based on the worst-performing sources using the MACT technology represented a reasonable estimate of the performance of the best-performing units under the most adverse circumstances reasonably expected to recur. Indeed, the Court explicitly stated that "*[i]n this case*," the evidence in the record "fails to demonstrate the relevant relationship."[32]

WEST's approach is entirely different and clearly distinguishable from the approach rejected in *Cement Kiln*. In *Cement Kiln*, the EPA failed to demonstrate the required relationship between the performance of the worst performing sources using the designated control technology (including units outside the top 12%) and the actual performance of the top performing units. In this case, there is a clear nexus between WEST's methodology and actual performance of the top units. Indeed, as described above, WEST's methodology is specifically designed to account for the known and quantifiable chemical and physical processes that cause variability of unit emissions, providing robust estimates of mercury emissions experienced in practice by the best-performing units.

Thus, unlike the methodology at issue in *Cement Kiln*, WEST's methodology does not set MACT floors at levels achievable by all units (including those outside the top 12%) that use the designated control technology. Instead, the WEST study developed statistical equations, using the maximum amount of available data from the ICR III dataset, to express the relationship between coal chlorine content and mercury removal in a mathematical format. Where appropriate, this relationship was applied to actual coal composition data for the top performing units – providing robust estimates of unit performance. In this manner, WEST's methodology accounts for the known and quantifiable chemical and physical processes that dictate the variability of mercury emission from coal-fired utility units, providing reasonable estimates of mercury emissions from the best-performing units in each of the three coal rank subcategories.

F. The EPA Should Use WEST Associates/WEST's Proposed MACT Floors

WEST's methodology and proposed MACT floors derived pursuant thereto, based on available data in the ICR database, provide the most accurate available estimate of mercury emission levels actually achieved in practice by the relevant best-performing units. Unlike the approach developed by Research Triangle Institute ("RTI"), WEST's methodology accounts for the known and quantifiable chemical and physical processes that cause emissions variability. Accordingly, as a practical and policy matter, the MACT floors developed using WEST's methodology should be used by the EPA to set MACT floors for mercury emissions from coal-fired utility units.

RTI's approach sought to ascertain the variability of mercury emissions by applying statistical techniques to the ICR III stack test data alone ("Cole 2002 Study"). To do so, RTI used an Analysis of Variance ("ANOVA") technique to identify the intra and inter-unit variances to calculate the 95th percent upper confidence limit of the mean mercury emission factor of the best 5 performing units for each of the 3 coal types. RTI characterized the intra-unit variance solely in terms of the variance of the 3 mercury emission measurements set forth in the ICR III dataset. To do so, RTI had to assume a mathematical relationship between the mean and variance of the 3 test values at each unit.

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32 *Cement Kiln* at 865 (emphasis added).

From Figure A-1 of the Cole 2002 Study, however, it is clear that that there is at best only a weak correlation between the mean and variance of the measured emission factors. As previously noted, the ICR III stack test data provides only a limited number of short-term observations, failing to account for variability of emissions over the full range of operating conditions over an extended period of time. Furthermore, the derived intra-unit variance by RTI did not account for the key factors that drive the variability of mercury emissions – the mercury, chlorine and heat content of coal. As a result, the Cole 2002 Study approach, which simply develops confidence intervals around the ICR III stack test results, is not grounded in the physical and chemical processes that drive emission variability and fails to account for significant elements of variability.

WEST's methodology, on the other hand, utilizes the data in the ICR III stack test dataset to determine relationships between coal composition and mercury emissions so that the extensive ICR II fuel composition data can be employed to assess the variation in mercury emissions over the full range of coal utilized by the best performing units.[33] In this manner, WEST's methodology accounts for the known and quantifiable chemical and physical processes that drive variability of mercury emissions – providing robust estimates of the actual performance of the best-performing units. Because WEST's methodology provides, based on available data in the ICR database, the most accurate available estimates of mercury emission levels actually achieved in practice by the best-performing units, as a practical and policy matter, the EPA should use WEST's methodology to determine MACT floors for mercury emissions from coal-fired utility units.

G. Conclusion

WEST's methodology for establishing MACT floors for mercury emissions from coal-fired utility units fully comports with all legal standards, including the Court's ruling in *Cement Kiln*. By utilizing the established relationship between coal composition (*i.e.*, differences in mercury content, chlorine content and heat content of coal) and mercury emissions, the WEST study derived a reasonable estimate of emission levels actually achieved in practice by the best-performing sources. In this manner, the proposed MACT floors account for the known and quantifiable chemical and physical processes that dictate the variability of mercury emissions from coal-fired utility units, providing robust estimates of actual mercury emissions from the best-performing units in each of the three coal rank subcategories. Accordingly, the proposed MACT floors provide the most accurate available estimate of actual mercury emissions from the best performing units and should, as a practical and policy matter, be used by the EPA to set mercury MACT floors for coal-fired utility units.

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[33] Another study, performed by the Utility Air Regulatory Group ("UARG") also used the information contained in the ICR II and ICR III databases to account for the effects of fuel variability on mercury emissions ("UARG 2002 Study"). The results of the UARG 2002 Study are comparable to the results derived using WEST's methodology and further support the conclusion that this approach can be used to accurately capture the impact of the variability of coal composition on mercury emissions.

From Figure A-1 of the Cole 2002 Study, however, it is clear that that there is at best only a weak correlation between the mean and variance of the measured emission factors. As previously noted, the ICR III stack test data provides only a limited number of short-term observations, failing to account for variability of emissions over the full range of operating conditions over an extended period of time. Furthermore, the derived intra-unit variance by RTI did not account for the key factors that drive the variability of mercury emissions – the mercury, chlorine and heat content of coal. As a result, the Cole 2002 Study approach, which simply develops confidence intervals around the ICR III stack test results, is not grounded in the physical and chemical processes that drive emission variability and fails to account for significant elements of variability.

WEST's methodology, on the other hand, utilizes the data in the ICR III stack test dataset to determine relationships between coal composition and mercury emissions so that the extensive ICR II fuel composition data can be employed to assess the variation in mercury emissions over the full range of coal utilized by the best performing units.[33] In this manner, WEST's methodology accounts for the known and quantifiable chemical and physical processes that drive variability of mercury emissions – providing robust estimates of the actual performance of the best-performing units. Because WEST's methodology provides, based on available data in the ICR database, the most accurate available estimates of mercury emission levels actually achieved in practice by the best-performing units, as a practical and policy matter, the EPA should use WEST's methodology to determine MACT floors for mercury emissions from coal-fired utility units.

G. Conclusion

WEST's methodology for establishing MACT floors for mercury emissions from coal-fired utility units fully comports with all legal standards, including the Court's ruling in *Cement Kiln*. By utilizing the established relationship between coal composition (*i.e.*, differences in mercury content, chlorine content and heat content of coal) and mercury emissions, the WEST study derived a reasonable estimate of emission levels actually achieved in practice by the best-performing sources. In this manner, the proposed MACT floors account for the known and quantifiable chemical and physical processes that dictate the variability of mercury emissions from coal-fired utility units, providing robust estimates of actual mercury emissions from the best-performing units in each of the three coal rank subcategories. Accordingly, the proposed MACT floors provide the most accurate available estimate of actual mercury emissions from the best performing units and should, as a practical and policy matter, be used by the EPA to set mercury MACT floors for coal-fired utility units.

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33 Another study, performed by the Utility Air Regulatory Group ("UARG") also used the information contained in the ICR II and ICR III databases to account for the effects of fuel variability on mercury emissions ("UARG 2002 Study"). The results of the UARG 2002 Study are comparable to the results derived using WEST's methodology and further support the conclusion that this approach can be used to accurately capture the impact of the variability of coal composition on mercury emissions.

Exhibit 1. Results of the Mercury Emission Factor Variability Analysis

Coal Type	Unit	Chlorine Removal Correlation Used?	Comments	Particulate Control	Sulfur Dioxide Control	95th Percentile lb Hg/TBtu from Hg/Cl Variability
Bituminous	Mecklenburg Cogeneration Facility GEN 1	Yes	Used Removal-Chlorine Correlation for FF/SDA.	FF	SDA	1.870
	Dwayne Collier Battle Cogeneration Facility 2B	Yes	Used Removal-Chlorine Correlation for FF/SDA.	FF	SDA	0.413
	Valmont 5	No	Used Fraction Removal for Control Device for all samples because of poor Removal-Chlorine Correlation for FF.	FF	None	0.882
	SEI - Birchwood Power Facility 1	Yes	Used Removal-Chlorine Correlation for FF/SDA.	FF	SDA	2.927
	Intermountain 2SGA	No	Used Fraction Removal (Coal-Stack) for all samples due to lack of data (only 2 points) available to establish a Removal-Chlorine relationship for FF/WetScrubber.	FF	WS	0.833
	95th Percent Confidence Limit of Mean					2.247
Subbituminous	Clay Boswell 2	No	Used Fraction Removal for Control Device for all samples because the Removal-Chlorine Correlation was poor for FF.	FF	None	1.890
	Craig C3	No	Used Fraction Removal for Control Device for all samples because of the low chlorine concentrations and low chlorine variability for the samples.	FF	SDA	2.189
	Cholla 3	No	Used Fraction Removal for (Coal-Stack) for all samples because of low chlorine content and no variability in chlorine content of the samples.	HS	None	4.867
	Craig C1	No	Used Fraction Removal (Coal-Stack) for all samples because of the low chlorine concentrations and low chlorine variability in the samples.	HS	WS	2.616
	Coronado U1B	Yes	Used Removal-Chlorine Correlation for HS/WetScrubber.	HS	WS	0.958
	95th Percent Confidence Limit of Mean					5.754
Lignite	Antelope Valley Station B1	Yes	Used Removal-Chlorine Correlation for FF/SDA.	FF	SDA	6.620
	Leland Olds Station 2	No	Used Fraction Removal for Control Device for all samples due to the poor Removal-Chlorine Correlation for Cold Side Precipitators and the low chlorine concentrations in the samples.	CS	None	5.798
	Stanton Station 10	Yes	Used Removal-Chlorine Correlation for FF/SDA.	FF	SDA	7.896
	Stanton Station 1	No	Used Fraction Removal for Coal-Stack for all samples due to low chlorine concentrations in samples and the poor Removal-Chlorine Correlation for Cold Side Precipitators.	CS	None	6.309
	Coyote 1	Yes	Used Removal-Chlorine Correlation for FF/SDA.	FF	SDA	11.380
	95th Percent Confidence Limit of Mean					10.189

Notes:
FF - fabric filter
SDA - spray dryer absorber
WS - wet scrubber
HS - hot-side electrostatic precipitator
CS - cold-side electrostatic precipitator