JUN 2 6 2009

Mr. Phillip C. Grigsby
W.H. Zimmer Designated Representative
139 E. Main Street
EA605
Cincinnati, OH 45201

Re: Petition for Approval of Alternative Data Substitution Methodology for the W. H. Zimmer Station - Unit 1 (Facility ID (ORISPL) 006019)

Dear Mr. Grigsby:

The United States Environmental Protection Agency (EPA) has reviewed the petition submitted under § 75.66(a) by Duke Energy dated March 19, 2009, in which Duke Energy requested approval to use an alternative data substitution methodology to replace hourly SO_2, NO_x, and CO_2 concentration data from October 17, 2008 through January 21, 2009 for Unit 1 at the W. H. Zimmer Station, in order to correct the data for a low bias that was caused by two probe leak events which the company identified and corrected. EPA approves the petition, with conditions, as discussed below.

Background

Unit 1 at Duke Energy's W. H. Zimmer Station in Moscow, Ohio is a dry bottom wall-fired 1300 megawatt boiler. According to Duke Energy, Unit 1 is subject to the Acid Rain, NOx Budget, and Clean Air Interstate Rule (CAIR) Programs and is required to monitor and report sulfur dioxide (SO_2), nitrogen oxides (NO_x), and carbon dioxide (CO_2) emissions and heat input data for the unit in accordance with 40 CFR Part 75. To meet the SO_2, NO_x, and CO_2 monitoring requirements of Part 75, Duke Energy uses an in-stack dilution extractive continuous emissions monitoring system (CEMS).

The first event began on October 17, 2008 when it is suspected that a routine change of a daily calibration gas bottle introduced a leak into the unit one sampling system. This leak was identified by Duke as part of its routine data quality assurance (QA) procedures using tools developed by Duke Energy, which procedures are analogous to EPA's CO_2 audits. Once this leak was identified, personnel at Zimmer took corrective action to trouble shoot the problem, and the source of the leak was discovered and corrected on November 8, 2008.

The second event took place on December 25, 2008 when Zimmer personnel realized that the sampling probe for Unit 1's continuous emissions monitoring system (CEMS) was plugged. It is suspected that, during the maintenance conducted to remove the pluggage, a leak was

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introduced in the probe itself, possibly during the reassembly of the in-stack dilution probe. Again, the problem was identified by the routine data QA procedures. However, by the time this problem was discovered, the stack elevator was out of service for renovation so the probe was not accessible for re-inspection. Furthermore, in looking at other possible causes for the abnormally low CO_2 readings, Duke discovered significant amounts of in-leakage of ambient air into the ductwork for the unit and thought that the in-leakage was the cause. After patching the ductwork to reduce the in-leakage, Duke reevaluated the CO_2 data and found them still to be abnormally low. The CEMS was re-evaluated, and the problem with the probe was discovered.

Duke Energy proposes a correction factor for each of these two separate events. Duke performed an analysis of the CEMS data using the methodology outlined by EPA in a previous petition response issued in August of 2008 for a similar situation at Unit 6 of Duke's W. C. Beckjord Station (Facility ID (ORISPL) 002830). Specifically, an analysis of the CEMS data focusing on the CO_2 concentration at a representative load was performed at Unit 1. The CO_2 data were selected for the analysis because of the relatively low variability of CO_2 concentration in a given load range, as compared to other parameters that vary more due to fuel variability or other factors in the combustion process. Therefore, differences in CO_2 concentration may be used to derive an appropriate bias correction factor when a uniform bias can be detected. The analysis compared the low-biased CO_2 data recorded during each of the described periods to a baseline period of quality-assured CO_2 concentration data collected following the most recent CO_2 relative accuracy test audit (RATA). To eliminate operational variation, the analysis was focused on the load bin for which the unit was most often operated during the evaluated period (i.e., load bin "10"). The baseline period (July 24 through September 1, 2008) was selected to give 30 days worth of data where at least six hours of quality-assured data per day were collected when the unit was operated within the desired load bin for the analysis. For each day where these criteria were met, the average CO_2 concentration for that load bin was calculated. Then the average daily average CO_2 concentration and standard deviation of the daily averages was calculated resulting in a baseline expected CO_2 concentration of 10.77 %CO_2 with a standard deviation of 0.18 %CO_2.

Next, Duke calculated daily average CO_2 concentrations in load bin "10", for each day in the two periods of system leakage (October 17 through November 8, 2008 and December 26, 2008 through January 21, 2009). A bias correction factor was calculated for this time period by dividing the baseline daily average CO_2 value by the daily average CO_2 concentration calculated for the biased period. To account for the uncertainty of the calculated correction factor and any additional variability caused by the leak, Duke calculated the standard deviation of the daily averages during the biased period and used that value in combination with the standard deviation calculated for the baseline data to calculate an overall uncertainty for the calculated correction factor. This uncertainty was then added to the base correction factor to derive the final correction factor, which ensures that the corrections are conservative and that the corrected data will be reasonably overstated. The following formula demonstrates how this calculation was made.[1]

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[1]. Note that the uncertainty of a quotient is equal to the square root of the sum of squared fractional uncertainties for the individual input values times the quotient result. See, e.g., John R. Taylor, An Introduction to Error Analysis at

$$CF = \frac{x \pm dx}{y \pm dy} = \frac{x}{y}\left(1 \pm \sqrt{\left(\frac{dx}{x}\right)^2 + \left(\frac{dy}{y}\right)^2}\right)$$

Where:

CF = correction factor to correct for the low bias during the in-leakage;
x = average baseline CO_2 concentration value (11.04 %CO_2);
dx = standard deviation of the baseline CO_2 concentration values (0.04 %CO_2);
y = average CO_2 concentration value during the biased period; and
dy = standard deviation of the CO_2 concentration value during the biased period.

Duke submitted the following table showing the results of the analysis performed using the above described methodology:

Table 1 – Derivation of Correction Factors by Period

Time Period	Average CO_2	Standard Deviation (uncertainty)	Base Correction Needed	Base Correction Uncertainty	Final Correction Factor
10/17/08 - 11/08/08	9.59	±0.17	1.122	±0.027	1.149
01/17/07 - 03/03/07	8.12	±0.23	1.325	±0.043	1.368

EPA's Determination

EPA approves the use of the two correction factors requested by Duke Energy. Specifically, 1.149 for the period of October 17 through November 8, 2008 and 1.368 for the period of December 26, 2008 through January 21, 2009. The same correction factors should be used for all three gas concentrations, SO_2, NO_x, and CO_2, because air in-leakage at the probe of a dilution-extractive CEMS lowers the concentrations of all components of a stack gas sample by an equal percentage.[2] EPA has reviewed the analysis used by Duke Energy to determine these correction factors and has verified that they were determined using the approach outlined in previous petition responses. Also, EPA finds that the situations for which these correction factors are requested are comparable to those where the Agency has previously approved such.

56-57 (1982).
2. The assumption of equal dilution of the three gases is based on the fact that the concentrations of SO_2, NO_x, and CO_2 in the in-leaked gas are insignificant.

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Ordinarily, for any unit operating hour in which valid, quality-assured data are not obtained with a certified monitor, the standard missing data provisions in §§ 75.30 through 75.33 would be used to determine the appropriate substitute data values to be reported. Substitute data tends to overstate emissions, particularly when the period of missing data is composed of a large number of consecutive hours. It is designed to provide a conservative estimate of the actual emissions and at the same time encourage good maintenance practices that increases data capture.

However, EPA finds that using standard substitute data, in this case, during the time periods identified grossly overstates the unit's emissions. As reflected in Tables 2a and 2b below, use of standard substitute data in this case would result in reported emissions equaling about 161% of EPA's estimate of Unit 1's likely SO_2 mass emissions[3] and 681% of the likely NO_x mass emissions for the first quarter of 2009. Furthermore, the data analyses described above have demonstrated that there was a consistent, uni-directional bias in the data recorded by Unit 1's CEMS in the periods extending October 17 through November 8, 2008 and December 26, 2008 through January 21, 2009. In addition, the correction factor reflecting this uniform bias results in reasonable but conservatively high emissions data. EPA therefore approves Duke Energy's petition to make an upward adjustment of the SO_2, NO_x, and CO_2 emissions data for most of this time period, in lieu of using the standard Part 75 missing data routines. During this period the concentration data shall be using a special MODC code of "53", which is to mean "other quality assured methodology approved through petition." These hours are to be included in the missing data lookback and are to be treated as available hours for percent monitor availability calculations. Duke Energy also needs to recalculate all mass, emissions rate, and heat input values using the adjusted pollutant concentrations.

Table 2a: Impact of Standard and Alternative Missing Data on Reported SO_2 Emissions During Probe Leak

SO_2 Calculation Method	Total SO_2 Emissions (tons)
Unadjusted data, as originally recorded	1945
Adjusted data (estimate of likely actual emissions)	2370
Standard Part 75 missing data substitution	3826
Duke Energy's Requested correction	2480
Adjusted data (using EPA approved correction factor)	**2480**

3. This estimate of the "likely emissions" was obtained by applying the base correction factor in Table 1, which assumes that SO_2, NO_x and CO_2 were all underreported by the same percentage in each time period but does not take into account the uncertainty of the averages used to calculate the factors.
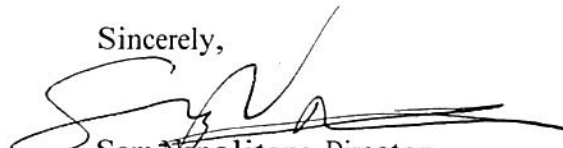
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Table 2b: Impact of Standard and Alternative Missing Data on Reported NO$_X$ Emissions During Probe Leak (2009 CAIR NO$_X$ Emissions Only)

NOx Calculation Method	Total NOx Emissions (tons)
Unadjusted data, as originally recorded	214
Adjusted data (estimate of likely actual emissions)	284
Standard Part 75 missing data substitution	1932
Duke Energy's Requested correction	293
Adjusted data (using EPA approved correction factor)	**293**

Correcting the data will require a resubmission of the fourth quarter 2008 and first quarter 2009 EDRs for Unit 1. Duke Energy should coordinate resubmission of the data with Mr. Craig Hillock, who may be reached at (202) 343-9105 or by e-mail at hillock.craig@epa.gov.

EPA's determination relies on the accuracy and completeness of Duke Energy's June 12, 2008 petition and the associated electronic data reports and is appealable under Part 78. If you have any questions regarding this correspondence, please contact Louis Nichols at (202) 343-9008.

Sincerely,

Sam Napolitano, Director
Clean Air Markets Division

cc: Constantine Blathras, USEPA Region 5
  Todd Brown, OEPA
  Louis Nichols, USEPA CAMD
  Craig Hillock, USEPA CAMD