February 2, 2009

John O. Larsen
Designated Representative
Alliant Energy
200 First Street SE
P.O. Box 351
Cedar Rapids, IA 52406-0351

Re: Petition to Use an Alternative to Standard Missing Data Substitution for Unit 4 at the Lansing Generating Station (Facility ID (ORISPL) 1047)

Dear Mr. Larsen:

The United States Environmental Protection Agency (EPA) has reviewed the November 17, 2008 petition under 40 CFR 75.66, in which Alliant Energy (Alliant) requested to use an alternative to the standard missing data substitution routines under 40 CFR 75.33 for Unit 4 at the Lansing, Iowa facility (Lansing). EPA approves the petition in part, with conditions, as discussed below.

Background

Alliant owns and operates a coal-fired boiler, Unit 4, at its Lansing Generating Station in Iowa. Unit 4 is subject to the Acid Rain Program and to the Clean Air Interstate Regulation (CAIR). Therefore, Alliant is required to continuously monitor and report sulfur dioxide (SO_2), nitrogen oxides (NO_x) and carbon dioxide (CO_2) emissions and unit heat input for Lansing Unit 4, in accordance with 40 CFR Part 75. To meet these monitoring requirements, Alliant has installed and certified dilution extractive continuous emission monitoring systems (CEMS) for SO_2, NO_x, and CO_2, and a flow monitor.

On October 27, 2008, an EPA audit of emissions data from Unit 4 indicated that the CO_2 concentrations recorded by the CEMS were lower than expected in the time period extending from January 1 to May 1, 2008. When abnormally low CO_2 readings are observed for an extended period of time, it is often indicative that there is a leak in the dilution probe, causing ambient air to be drawn into the gas sampling system.

When EPA informed Alliant of the results of the electronic audit, Alliant initiated an investigation to determine the reason for the low CO_2 readings. However, a thorough review of the historical plant operations, fuel usage, fuel type, and CEMS quality-assurance and quality control (QA/QC) procedures during the time period in question failed to identify a likely cause. During this time period, the gas monitors consistently

passed their required daily calibration error tests and linearity checks. During these tests, the probe is flooded with calibration gas under positive pressure, and there can be no air in-leakage, but when the stack gas is sampled, the system is under a vacuum (negative pressure), and ambient air will enter the probe if a leak is present. Generally, this type of leak is only detectable during a relative accuracy test audit (RATA) of the CEMS.

According to Alliant, CEMS maintenance activities were performed on May 1, 2008, just prior to the annual RATA. The CO_2 readings after maintenance were 10 to 15 percent higher than the pre-maintenance values, at similar load levels. During the maintenance, the plant CEMS technicians were not aware of any visible leaks in the system. However, it is possible that ambient air may have been leaking in through loose compression fittings. These fittings were tightened as part of the maintenance procedure. As part of its response to EPA's audit findings, Alliant performed leak checks of the gas sampling system, under pressure and vacuum, and found no leaks present.

In the November 17, 2008 petition, Alliant proposed to apply an adjustment factor of 1.10 to all of the data recorded by Unit 4's gas monitors between January 1, 2008 and May 1, 2008, rather than using standard Part 75 missing data substitution. The proposed adjustment factor is based on the percentage difference between the CO_2 concentration at the time of the 2007 RATA and the mean CO_2 concentration observed at normal load levels during the time period in question.

EPA's Determination

EPA conditionally approves Alliant's petition to use an alternative to standard Part 75 missing data substitution to adjust Lansing Unit 4's reported emissions data in the time period extending from January 1, 2008, hour 00 through May 1, 2008, hour 23. However, the approved data adjustment factor differs from the correction factor proposed by Alliant. The basis for this approval and the conditions of approval are presented below.

To assess the appropriateness of Alliant's proposed correction factor, EPA performed an analysis of Unit 4's CEMS data, focusing on the CO_2 concentration at a representative load. 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 due to 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. EPA's analysis compared the low-biased CO_2 data recorded from January 1 through May 1, 2008 to a baseline period of quality-assured CO_2 concentration data collected following the most recent CO_2 RATA. To eliminate operational variation, EPA focused its analysis on the load bin for which the unit was most often operated during the evaluated period (i.e., load bin "8"). The baseline period (June 29 through August 16, 2007) 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 12.02 % CO_2 with a standard deviation of 0.208 % CO_2.

Next, EPA calculated daily average CO_2 concentrations in load bin 8, for each day in the period from January 1 through May 1, 2008. A base 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, EPA 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]

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

Where;

CF = Correction factor to correct for the low bias during the in-leakage
x = Average baseline CO_2 concentration value
dx = Standard deviation of the baseline CO_2 concentration values
y = Average CO_2 concentration value during the biased period
dy = Standard deviation of the CO_2 concentration value during the biased period

The correction factor was determined to be 1.137 for the leak period (see Table 1, below). This correction factor is higher than the correction factors that Alliant proposed. EPA could not identify two clearly distinct periods within the time period from January 1 through May 1, 2008 where different stable biases clearly existed and therefore is adopting a single correction factor in this instance. The same correction factors should be used for all three gases, 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]

[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 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.

Table 1 – Derivation of Correction Factor

Probe Leak Period	Average %CO_2 During Leak Period	Standard Deviation (uncertainty)	Base Correction Needed	Base Correction Uncertainty	Final Correction Factor
1/1/08 through 5/1/08	10.94	0.235	1.106	0.031	1.137

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 §75.33 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 period identified grossly overstates the unit's emissions. As discussed in detail below, use of standard substitute data in this case would result in reported SO_2 emissions approximately 350 tons higher than EPA's estimate of Unit 4's likely SO_2 emissions[3].

Furthermore, the data analysis described above has demonstrated that there was a consistent, uni-directional bias in the data recorded by Unit 4's CEMS in the period extending from January 1 through May 1, 2008. As discussed in detail below, applying an adjustment factor of 1.137 to account for this uniform bias results in more reasonable emissions estimates. Correcting the emissions data in this manner will cause the previously-reported SO_2, NO_x, and CO_2 mass emissions for 2008 to increase. The increase in the reported SO_2 emissions affects compliance with the requirement to hold allowances covering SO_2 emissions for 2008 under the Acid Rain Program. The increase in NO_x mass emissions does not affect the requirement to hold allowances under the CAIR regulations, because that requirement does not become effective until 2009. The increase in CO_2 mass emissions will have no significant effect since CO_2 has no emission limit at the present time.

Table 2 below compares the unadjusted SO_2 mass emissions during the probe leak period, as originally reported, to: (a) the estimated likely actual emissions; (b) the SO_2 mass emissions that would be reported using standard Part 75 missing data substitution; (c) the emissions that would be reported using Alliant's proposed data adjustment factor; and (d) the emissions that would be reported using the approved data adjustment factor of 1.137.

[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.

Table 2: 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 reported	2,150
Adjusted data (estimate of likely actual emissions)	2,414
Standard Part 75 missing data substitution	2,762
Adjusted data using Ameren's proposed factor	2,374
Adjusted data using EPA-approved factor	2,480

The second line in Table 2 shows that EPA's estimate of Unit 4's likely actual SO_2 emissions during the probe leak period is 2,414 tons[4]. From this it is clear that using standard Part 75 missing data substitution would grossly overstate the emissions, i.e., overstate SO_2 mass emissions by nearly 350 tons (15%). The fifth line in Table 2 shows that applying the approved 1.137 data adjustment factor gives a much more reasonable, yet conservatively high, estimate of the emissions, and is estimated to require Alliant to surrender an additional 330 SO_2 allowances[5]. This is consistent with the purposes of the Part 75 standard missing data substitution procedures, which are to ensure that emissions are not underreported and to provide strong incentive for owners and operators to ensure that monitoring systems are properly operated and maintained.

For the reasons discussed above, EPA approves Alliant=s petition to make an upward adjustment of the SO_2, NO_x, and CO_2 emissions data recorded during the suspected probe leak incident, in lieu of using the standard Part 75 missing data routines.

Conditions of Approval

The conditions of this approval are as follows:

(1) Alliant shall resubmit the first, second, third and fourth quarter 2008 electronic data reports (EDRs) for Lansing Unit 4, no later than February 15, 2009.

[4] This estimate was obtained by applying a data correction factor of 1.106 to each hour of the originally-reported emissions data. This correction factor, which approximates the amount by which air in-leakage lowered the gas concentrations, was determined by dividing the average baseline CO_2 concentration by the average CO_2 concentration during the probe leak period. The approved (more conservative) data correction factor of 1.137 takes into consideration the uncertainty of those two average CO_2 concentrations.

[5] The SO_2 mass emissions total in the fifth line of Table 2 is only an estimate. The actual number of allowances that must be surrendered may be slightly different, due to adjustment of previously-reported substitute data values during the probe leak incident (see "Conditions of Approval").

(2) For the time period extending from January 1, 2008, hour 00 through May 1, 2008, hour 23, Alliant shall report alternative quality-assured values for SO_2 concentration, NO_x concentration, and CO_2 concentration, as follows:

(a) Each value of SO_2 concentration originally reported as quality-assured in column 29 of EDR record type (RT) 200 shall be adjusted upward by the approved data correction factor of 1.137;

(b) Each NO_x concentration value originally reported as quality-assured in column 24 of RT 201 shall be multiplied by 1.137;

(c) Each CO_2 concentration value originally reported as quality-assured in column 24 of RT 202 and in column 24 of RT 210 shall be multiplied by 1.137; and

(d) Alliant shall report a Method of Determination Code (MODC) of "53" in the appropriate columns of RTs 200, 201, 202, and 210, and 320 for each hourly SO_2, NO_x, and CO_2 concentration originally reported with a MODC of "01", to which the approved data correction factor is applied, and for each NO_x emission rate calculated from the adjusted NO_x and CO_2 concentrations. Manual entry of MODC code "53" is permitted.

(e) For hours originally reported with missing data MODC codes (e.g., "06", "09", "10", or "11"), these codes shall be retained. However, the substitute data values for these hours shall be recalculated by the DAHS (see Condition (4), below).

(3) The adjusted hourly SO_2, NO_x, and CO_2 concentrations and NO_x emission rates reported with a MODC of 53 shall:

(a) Be treated as quality-assured data;

(b) Be used in missing data lookbacks; and

(c) Not lower the percent monitor data availability (PMA) of the CEM systems.

(4) The data acquisition and handling system shall recalculate the substitute data values for all missing data hours during the probe leak period. Unadjusted, quality-assured data with MODC code "01" and adjusted, quality-assured data with MODC code "53" shall be used, as appropriate, to determine the substitute data values.

(5) Alliant shall include EDR record type 910 in each of the resubmitted EDRs for Lansing Unit 4. Each RT 910 shall indicate the period(s) of

time for which the emissions data have been adjusted in accordance with this approval.

(6) Alliant shall coordinate resubmission of the EDRs with Mr. Craig Hillock, who may be reached at (202) 343-9105, or by e-mail at hillock.craig@epa.gov

(7) Alliant shall address the SO_2 allowance accounting issues for Lansing Unit 4 with Mr. Kenon Smith, who may be reached at (202) 343-9164, or by e-mail at smith.kenon@epa.gov

EPA's determination relies on the accuracy and completeness of the information provided by Alliant in the November 17, 2008 petition and is appealable under Part 78. If you have any questions or concerns about this determination, please contact Robert Vollaro at (202) 343-9116, or by e-mail at vollaro.robert@epa.gov. Thank you for your continued cooperation.

Sincerely,

/s/
Sam Napolitano, Director
Clean Air Markets Division

cc: Jon Knodel, EPA Region VII
Mark Stone, Iowa DNR
Robert Vollaro, CAMD
Craig Hillock, CAMD
Kenon Smith, CAMD