7/13/2011

Ms. Patricia West
Designated Representative
Progress Energy Florida, Inc.
P.O. Box 14042
St. Petersburg, FL 33733

Re: Petition for Approval of an Alternative Data Substitution Methodology for Unit 4 at the Crystal River Power Plant (Facility ID (ORISPL) 628)

Dear Ms. West:

The United States Environmental Protection Agency (EPA) has reviewed the January 31, 2010 petition submitted under § 75.66(a) by Progress Energy, in which Progress Energy requested approval of an alternative data substitution methodology to replace certain hourly sulfur dioxide (SO_2), nitrogen oxides (NO_x), and carbon dioxide (CO_2) concentration data recorded in October 2010, for Unit 4 at the Crystal River Power Plant. EPA approves the petition, with conditions, as discussed below.

Background

Progress Energy owns and operates the Crystal River Power Plant (Crystal River), which is located near Crystal River, Florida. Crystal River Unit 4 is a 760-megawatt coal-burning, dry bottom wall-fired boiler, which, according to Progress Energy, is subject to the Acid Rain Program and the Clean Air Interstate Rule (CAIR). Therefore, Progress Energy is required to continuously monitor and report SO_2, NO_x, and 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, Progress Energy uses in-stack dilution extractive continuous emission monitoring systems (CEMS).

In October 2010, plant personnel at Crystal River observed that the CO_2 concentration readings at Unit 4 were unusually low compared to the expected values for a given load level. The CO_2 monitoring system was inspected while in service and daily and quarterly quality assurance tests were reviewed. According to the Progress Energy, no problems with the quality assurance activities or sampling system were observed during their initial review. At the beginning of November 2010, the dilution probe was removed from the stack and an inspection was performed. It was found that the probe had become plugged. After the probe was cleaned and returned to service, the CO_2 readings returned to normal. Crystal River has since taken steps

to prevent this event from recurring. First, the CEMS sampling probes are checked monthly and cleaned out if necessary. Second, software that implements EPA's "Control Chart Methodology for Detecting Underreported Emissions" has been added to the data acquisition and handling system (DAHS). Third, the probe blowback frequency has been increased.

On January 31, 2011, Progress Energy submitted a petition to EPA, requesting permission to use a correction factor to adjust the SO_2, NO_x, and CO_2 data recorded during the time period when the dilution probe was plugged, rather than invalidating the data and using the Part 75 missing data routines. As described in detail below, Progress Energy performed a CEMS data analysis to derive the correction factor, using an approach similar to the one presented in the aforementioned EPA Control Chart Methodology. Based on the results of that analysis, Progress Energy proposed to apply a correction factor of 1.25 to the hourly SO_2, NO_x, and CO_2 data recorded on several days on which the CO_2 readings were abnormally low, i.e., on October 8, 2010 and October 10 through 28, 2010.

Consistent with EPA's Control Chart Methodology, Progress Energy analyzed the CO_2 concentration data at representative load levels for Unit 4. The CO_2 data were selected for the analysis because of the relatively low variability of CO_2 concentration within a given load range, as compared to other parameters such as SO_2 or NO_x, which are less predictable 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 data analysis compared the low-biased CO_2 data recorded during the time periods in question 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 baseline period included only data from load range ("load bin") 10, which was the most frequently used bin during the plugged probe incident. The baseline period (from June 23 through July 22, 2010) consisted of 30 days of CO_2 data where at least six hours of quality-assured data per day were collected in load bin 10. For each day on which this criterion was met, the average CO_2 concentration was calculated. The mean daily average CO_2 concentration and the standard deviation of this 30-day data set were 10.5% CO_2 and 0.295% CO_2, respectively. Based on these results, the lower control limit required by the Control Chart Methodology (i.e., three standard deviations from the mean) was determined to be 9.6% CO_2.

Next, the daily average CO_2 concentration in load bins 9 and 10 for each day in the fourth quarter of 2010 was compared to the baseline data. Two distinct periods of unusually low bias in the CO_2 data were observed. The first period, which extended from October 8 through 28, 2010, showed an average daily CO_2 concentration of 8.7%, which is well below the lower control limit of 9.6% CO_2. According to Progress Energy, the data during this first period were consistent except for one day (October 9, 2010), and application of a single correction factor to correct for the low bias on all of the other days appeared to be reasonable. The average CO_2 concentration for the second period, extending from October 29 through November 4, 2010 also fell below the

lower control limit, but the daily averages were too widely scattered for a single correction factor to be applied.

Progress Energy calculated a bias correction factor for the first time period (excluding October 9, 2010) by dividing the baseline daily average CO_2 value by the 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 plugged probe, the standard deviation of the daily averages during the biased period was used in combination with the standard deviation for the baseline data to calculate an overall uncertainty for the correction factor. This uncertainty was then added to the base correction factor to derive a conservatively high, yet reasonable final correction factor. The following formula demonstrates how this calculation was performed.

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

Where:

CF = Correction factor for the low bias during the partially plugged probe event;
x = Average baseline CO_2 concentration value (10.5% CO_2);
dx = Standard deviation of the baseline CO_2 concentration values (0.295% 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.

Table 1 below summarizes the results of the analysis performed using the above described methodology:

Table 1: Derivation of Correction Factors	
0.295	Standard deviation of baseline, *dx*
10.50	Average baseline CO_2, *x*
27.0	Days of data used in baseline period
9.60	Lower control limit, *x – 3dx*
11.40	Upper control limit, *x + 3dx*
0.218	Standard deviation of biased data, *dy*
8.70	Average biased CO_2, *y*
1.205	**Base correction factor**
±0.045	**Uncertainty**
1.25	**Final correction factor**

EPA's Determination

EPA reviewed Progress Energy's data analysis for Crystal River Unit 4 and found it to be consistent with the Control Chart Methodology, which the Agency has used to address similar issues in response to petitions from other sources. Therefore, EPA approves the use of the correction factor of 1.25 proposed by Progress Energy. However, as a condition of approval, the correction factor must be applied to all three gas concentrations (NO_X, SO_2, and CO_2) for each unit operating hour on October 8 2010 and in the time period extending from October 10 through 28, 2010. This is because the partially plugged dilution probe lowered the concentrations of all components of the stack gas samples by an equal percentage[1].

Ordinarily, for any unit operating hour(s) in which valid, quality-assured data are not obtained with a certified monitor, the applicable missing data provisions in §§ 75.30 through 75.37 are used to determine the appropriate substitute data values that must be reported. Substitute data tends to overstate emissions, particularly when the period of missing data consists of a large number of consecutive operating hours. The two main purposes of missing data substitution are to provide a conservative estimate of the actual emissions, so that emissions are not underreported, and to provide an incentive for affected sources to use good operation and maintenance practices to minimize CEMS downtime.

However, EPA finds that in the case of Crystal River Unit 4, using standard substitute data during the time periods in question 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 of about 114% of EPA's estimate of Unit 4's likely[2] SO_2 mass emissions and 117% of the likely[2] NO_X mass emissions during those time periods. 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 on October 8, 2010 and in the time period from October 10 through 28, 2010. Applying a correction factor of 1.25 to reflect this uniform bias results in reasonable, yet conservatively high emissions estimates.

EPA therefore approves Progress Energy's petition to make an upward adjustment of the SO_2, NO_X, and CO_2 emissions data for time periods in question, in lieu of using the standard Part 75 missing data routines. During those time periods the concentration data shall be reported using a special Method of Determination Code (MODC) of "53", which means "other quality

1. The assumption of equal dilution of the three gases is based on the fact the plugging of the probe caused a change in the effective dilution ratio such that less stack sample was collected per unit volume of dilution air. This error in the true dilution ratio affects the measurement of all three parameters sampled by the CEMS equally.

2. 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.

assured methodology approved through petition." These hours are to be included in the missing data lookbacks and are to be treated as available hours for percent monitor data availability calculations. However, for October 9, 2010 and for the time period extending from October 29, 2010 through November 4, 2010, Progress Energy must use standard Part 75 missing data substitution.

Progress Energy must also recalculate the hourly values of all parameters derived from the adjusted gas concentrations and substitute data values (including SO_2, NO_x, and CO_2 emission rates and mass emissions, and heat input rate values) and must recalculate both the fourth quarter 2010 emissions and the 2010 cumulative annual emissions for Unit 4.

Table 2a: Impact of Standard and Alternative Missing Data on Reported SO_2 Mass Emissions for Crystal River Unit 4 (October 8 and 10-28, 2010)

SO_2 Calculation Method	Total SO_2 Emissions (tons)
Unadjusted Data, as originally recorded	98
Adjusted Data (estimate of likely actual emissions)	118
Standard Part 75 Missing Data Substitution	135
Progress Energy's Requested Correction	122
Adjusted Data (using EPA-approved correction factor)	122

Table 2b: Impact of Standard and Alternative Missing Data on Reported NO_X Mass Emissions for Crystal River Unit 4 (October 8 and 10-28, 2010)

NO_X Calculation Method	Total NO_X Emissions (tons)
Unadjusted Data, as originally recorded	40
Adjusted Data (estimate of likely actual emissions)	48
Standard Part 75 Missing Data Substitution	56
Progress Energy's Requested Correction	50
Adjusted Data (using EPA-approved correction factor)	50

Correcting the emissions data will require a resubmission of the fourth quarter 2010 electronic data report (EDR) for Crystal River Unit 4. Progress Energy shall 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. To resolve the 2010 SO_2 and NO_x allowance accounting issues for Unit 4, Progress Energy shall coordinate 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 Progress Energy's January 31, 2010 petition and the associated electronic data reports and is appealable under Part 78. If you have any questions regarding this correspondence, please contact Carlos R. Martinez at (202) 343-9747 or by e-mail at artinez.carlos@epa.gov.

Sincerely,

/s/
Sam Napolitano, Director
Clean Air Markets Division

cc: David McNeal, USEPA Region IV
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