January 12, 2017

Ms. Barbara A. Walz
Senior Vice President, Policy and Compliance and Designated Representative
Tri-State Generation and Transmission Association, Inc.
P.O. Box 33695
Denver, CO 80233-0695

Re: Petition for Approval of an Alternative Data Substitution Methodology for Unit C3 at the Craig Station (Facility ID (ORISPL 6021))

Dear Ms. Walz:

The United States Environmental Protection Agency (EPA) has reviewed the November 10, 2014 petition submitted under 40 CFR 75.66 by Tri-State Generation and Transmission Association, Inc. (Tri-State) requesting approval to use an alternative data substitution methodology to replace certain hourly sulfur dioxide (SO_2), nitrogen oxides (NO_X), and carbon dioxide (CO_2) concentration values recorded from January 28, 2013 to May 22, 2013 for Unit C3 at the Craig Station (Craig). EPA approves the petition, with conditions, as discussed below.

Background

Tri-State owns and operates Unit C3 at the Craig power plant located near Craig, Colorado. According to Tri-State, Unit C3 is a coal-fired boiler serving a generator with a capacity rating of 490 MW and is subject to the Acid Rain Program. Tri-State is therefore required to continuously monitor and report SO_2 and CO_2 mass emissions, NO_X emission rate, and heat input data for Unit C3 in accordance with 40 CFR part 75. To meet these requirements, Tri-State has installed and certified dilution-extractive continuous emission monitoring systems (CEMS) for SO_2, NO_X, and CO_2, as well as a stack gas flow rate monitor. In a dilution-extractive CEMS, flue gas samples are extracted from the stack through a sample probe, diluted with conditioned air in a known ratio, and sent through an umbilical line to gas concentration analyzers. A single dilution probe on the Unit C3 stack is used to obtain the diluted flue gas samples sent to the set of SO_2, NO_X, and CO_2 concentration analyzers serving the unit.

In the course of a data audit, EPA found anomalies in the CO_2 concentration data reported for Unit C3, suggesting the possibility of a leak in the unit's sample probe or umbilical line. EPA informed Tri-State of this finding, and upon examination Tri-State identified a cracked O-ring causing a leak in the probe bypass eductor, which would be expected to cause a

low bias in measured pollutant concentrations. Tri-State corrected the probe leak and conducted an investigation to determine the effect of the leak on the historical emissions and heat input data. Based on this investigation, Tri-State determined that the measured CO_2 concentration data were suspect for the period from January 28, 2013 through May 22, 2013. Under Tri-State's monitoring plan for Unit C3, CO_2 concentration data are used directly in the computation of both CO_2 emissions and heat input, making the previously computed values for CO_2 mass emissions and heat input for this time period suspect. Further, because the flue gas samples analyzed for SO_2 and NO_X concentrations were obtained through the same dilution probe, Tri-State recognized that the measured SO_2 and NO_X concentration data and the previously computed values for SO_2 mass emissions and NO_X emission rate[1] were also suspect for the same time period.

Part 75 includes provisions for determining substitute data to be reported when quality-assured CEMS data are missing.[2] However, in situations where a CEMS is operating properly in most respects but where a uniform measurement bias is detected, correction of the measured data through the use of appropriate bias correction factors may be a reasonable alternative to use of the otherwise applicable part 75 missing data substitution procedures. Based on its analysis of the measured CO_2 concentration data and other information related to operations at the Craig Station during the period in question, Tri-State believes that the dilution probe problems can be addressed through the use of an appropriate bias correction factor. Accordingly, on November 10, 2014, Tri-State submitted a petition to EPA describing its analysis and requesting approval to apply a bias correction factor to the pollutant concentration data instead of using the standard part 75 missing data substitution procedures. The petition also describes steps (i.e., control chart analysis) that Tri-State has since been taking at all the coal-fired units that it operates to prevent occurrences of extended probe leak incidents.

Discussion

To analyze the potential bias in Craig Unit C3's measured SO_2, NO_X, and CO_2 concentration data, Tri-State applied a control chart methodology that EPA uses to evaluate data in cases of suspected dilution probe leaks.[3] Tri-State appropriately chose to analyze CO_2

[1] The formula that Tri-State uses to determine the reported values for NO_X emission rate includes the measured NO_X concentration in the numerator and the measured CO_2 concentration in the denominator, such that equal biases in the two measured concentrations would offset one another and not cause a bias in the reported NO_X emission rate values. However, Tri-State also exercises the option provided under section 3.3.4.1 of appendix F to part 75 to substitute the CO_2 "diluent cap" value of 5% in hours when measured CO_2 concentrations are below that level. While use of the CO_2 diluent cap value in combination with low-biased NO_X concentration measurements would result in a downward bias in the reported NO_X emission rate values, during the time period at issue here Tri-State used the CO_2 diluent cap value in only 1.1% of the operating hours.

[2] Standard missing data substitution procedures for SO_2 and NO_X generally applicable to units without add-on emission controls are described in § 75.33, while § 75.34 describes alternative procedures for SO_2 and NO_X that are available in cases where an owner or operator can demonstrate that add-on emission controls (as defined in 40 CFR § 72.2) were operating during the period of missing data. Procedures for CO_2, heat input rate, and moisture are set out in §§ 75.35, 75.36, and 75.37, respectively.

[3] A paper describing EPA's "Control Chart Methodology," an approach for evaluating potential CEMS data quality issues by examining the relationship over time of CO_2 concentration data to unit load data, can be found at https://www.epa.gov/sites/production/files/2016-12/documents/control-chart-method_12-13-16.pdf

concentration rather than SO_2 or NO_X concentration data, because CO_2 concentration for a given unit generally has relatively low variability in a given load range compared with SO_2 and NO_X concentrations, which are affected by fuel variability or other factors of the combustion process. When uniform bias is detected in CO_2 concentration measurements over a given period relative to quality-assured reference measurements, the two sets of measurement data can be used in combination to derive an appropriate bias correction factor. In cases where gas samples analyzed for SO_2, NO_X, and CO_2 concentrations are obtained using a common dilution probe that is experiencing a leak, if an appropriate factor can be derived to correct the identified bias in the measured CO_2 concentration data, the same factor can generally also be used to correct for bias in simultaneously measured SO_2 and NO_X concentration data.

Tri-State's analysis compared the CO_2 data recorded during the probe leak event to quality-assured CO_2 data recorded during a 30-day baseline period immediately after the most recent CO_2 relative accuracy test (performed on June 6, 2012). To screen out data variability attributable to operational variation, the analysis focused on the load bin at which the unit most often operated during the quarters in which the leak was occurring (load bin 9). Based on the analysis, Tri-State concluded that the magnitude of the leak was relatively constant throughout the leak period, providing the opportunity to determine a single correction factor for the entire period. To compute a correction factor, Tri-State used the equation below. This correction factor equation includes an adjustment to account for uncertainty in the data measurements and has been approved by EPA for use in determining correction factors in other instances of probe leaks.[4]

$$CF = x/y\ [1 + [(sd_x/x)^2 + (sd_y/y)^2]^{1/2}]$$

Where:

CF = Correction factor for the event;
x = Average of the $\%CO_2$ values during the baseline period;
y = Average of the $\%CO_2$ values during the leak event;
sd_x = Standard deviation of the $\%CO_2$ values during the baseline period; and
sd_y = Standard deviation of the $\%CO_2$ values during the leak event.

Table 1 below shows the data inputs and results of Tri-State's correction factor calculations.

[4] *See, e.g.*, EPA response to petition for Sammis power plant (December 15, 2014).

Table 1: Correction factor calculation (see equation above)

Derivation of correction factor	Craig Unit C3, load bin 9
Average baseline CO_2, x	10.4597
Average biased CO_2, y	9.7495
Standard deviation of baseline data, sd_x	0.1383
Standard deviation of biased data, sd_y	0.1478
Correction factor including uncertainty adjustment	1.0944

Tri-State requests permission to use the correction factor of 1.0944 determined from the equation above to adjust the suspect data as an alternative to using the standard part 75 missing substitute data procedures. In support of this request, Tri-State provided the data in Tables 2 and 3 below comparing the SO_2 and CO_2 mass emissions data as originally reported to substitute mass emissions data computed under two possible approaches for replacing the invalid SO_2 and CO_2 concentration data.[5] In each of the tables, the data shown for the first possible approach reflect use of the applicable standard part 75 missing data substitution procedures as specified in § 75.34 for SO_2 for a unit with add-on SO_2 emission controls, § 75.35 for CO_2, and § 75.36 for heat input rate.[6] The data shown for the second possible approach reflect adjustment of the invalid concentration data using the calculated correction factor.

Table 2: Impact of standard and alternative missing data on reported SO_2 emissions

SO_2 calculation method	Total SO_2 emissions 1/28/2013-5/22/2013 (tons)	Total SO_2 emissions 1/1/2013-12/31/2013 (tons)
Data as originally reported	477	1,822
Standard part 75 missing data substitution (for unit with add-on SO_2 emission controls)[7]	1,875	3,235
Data adjusted using correction factor	522	1,867

[5] Tri-State also provided analogous data comparing NO_X mass emissions computed under several possible approaches. Tri-State is not currently required to report NO_X mass emissions data, and EPA has not relied on the comparisons of computed NO_X mass emissions data in addressing Tri-State's petition. As discussed in footnote 1 above, there is likely to be a downward bias in the original NO_X emission rate values reported by Tri-State during the 1.1% of operating hours in the probe leak period when Tri-State computed NO_X emission rate using the CO_2 diluent cap value instead of measured CO_2 concentrations. In the remaining 98.9% of operating hours in the probe leak period, the leak would not have been expected to cause a bias in the originally reported NO_X emission rate values because equal biases in measured NO_X concentration and measured CO_2 concentration would have offset one another in the computation of NO_X emission rate. Similarly, approval of a bias correction factor and use of that factor to adjust the measured concentration data for both NO_X and CO_2 should result in no material change to Tri-State's originally reported NO_X emission rate values for 98.9% of operating hours in the probe leak period.

[6] At EPA's request, after submitting the original petition Tri-State revised the data representing application of the standard part 75 missing data substitution procedures in order to more appropriately reflect application of the procedures in Tri-State's circumstances. For example, Unit C3 is equipped with an SO_2 scrubber, but as originally submitted, Tri-State's substitute data for SO_2 did not reflect the more favorable substitute data values available under § 75.34 to a unit operating add-on SO_2 emission controls. The data shown in Table 2 reflect the revisions made by Tri-State after the original submission.

Table 3: Impact of standard and alternative missing data on reported CO_2 emissions

CO_2 calculation method	Total CO_2 emissions 1/28/2013-5/22/2013 (tons)	Total CO_2 emissions 1/1/2013-12/31/2013 (tons)
Data as originally reported	1,010,690	3,319,794
Standard part 75 missing data substitution	1,269,141	3,579,850
Data adjusted using correction factor	1,106,113	3,415,402

EPA's Determination

EPA approves Tri-State's petition to make upward adjustments to the SO_2, NO_X, and CO_2 concentration values recorded at Craig Unit C3 during the period of a dilution probe leak from January 28, 2013, hour 00, through May 22, 2013, hour 23, using a bias correction factor of 1.094 instead of using standard part 75 missing data substitution procedures. Tri-State's investigation supports the use of a bias correction factor in this instance, and Tri-State's analysis of the measured data provides a basis for computation of the appropriate correction factor. Further, comparison of the SO_2 mass emission values computed using the correction factor with estimates of the emission values that would be reported under the standard part 75 missing data substitution provisions shows that the standard part 75 provisions are unnecessarily conservative in this instance. The standard missing data substitution provisions are intended to provide a conservative estimate of actual emissions and to provide sources with an incentive to follow good operating and maintenance practices that will ensure high CEMS availability. In this instance, use of the standard missing data substitution provisions would result in reported SO_2 emissions more than triple the SO_2 emissions that would be reported for the missing data period using the calculated correction factor.

Conditions of Approval

As conditions of this approval, Tri-State must:

(1) Adjust the hourly SO_2, NO_X, and CO_2 concentration data recorded at Craig Unit C3 during the probe leak incident from January 28, 2013, hour 00, through May 22, 2013, hour 23, using a bias correction factor of 1.094.

(2) Recalculate all hourly SO_2 and CO_2 mass emission rate (ton/hr), NO_X emission rate (lb/mmBtu), and heat input rate (mmBtu/hr) values for the probe leak period using the adjusted SO_2, NO_X, and CO_2 concentration data.

(3) Report each adjusted hourly SO_2 concentration, NO_X concentration, CO_2 concentration, and NO_X emission rate value using a method of determination code (MODC) of "53", which means "other quality assured methodologies approved through petition." These adjusted hourly values must be included in missing data lookbacks and are treated as available hours for percent monitor availability (PMA) calculations.

(4) Resubmit the quarterly electronic data reports (EDRs) for Craig Unit C3 for all quarters of 2013. Coordinate the resubmission of the data with Mr. Craig Hillock, who may be reached at (202) 343-9105 or by email at hillock.craig@epa.gov.

(5) Resolve any Acid Rain Program allowance accounting issues by contacting Mr. Kenon Smith, who may be reached at (202) 343-9164 or by email at smith.kenon@epa.gov.

EPA's determination relies on the accuracy and completeness of Tri-State's November 10, 2014 petition, as supplemented by certified mail dated May 28, 2015 and email communications submitted on July 2, 2015, August 5, 2015, September 22, 2015, October 23, 2015, and January 27, 2016, and is appealable under 40 CFR part 78. If you have any questions regarding this determination, please contact Mr. Charles Frushour at (202) 343-9847. Thank you for your continued cooperation.

Sincerely,

/s/
Reid P. Harvey, Director
Clean Air Markets Division

cc: Scott Patefield, EPA Region VIII
Paul Carr, Colorado DPH&E
Charles Frushour, CAMD
Craig Hillock, CAMD
Kenon Smith, CAMD