June 27, 2019

Mr. Tadd Henry
Alternate Designated Representative
Associated Electric Cooperative
2814 S. Golden, P.O. Box 754
Springfield, Missouri 65801-0754

Re: Petition for approval of an alternative data substitution methodology for unit 2 at the New Madrid Power Plant (facility ID (ORISPL 2167))

Dear Mr. Henry:

The United States Environmental Protection Agency (EPA) has reviewed the March 16, 2018 petition submitted under 40 CFR 75.66 by Associated Electric Cooperative (Associated Electric) 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 November 14, 2017 through February 1, 2018 for unit 2 at the New Madrid Power Plant. EPA approves the petition, with conditions, as discussed below.

Background

Associated Electric owns and operates unit 2 at the New Madrid Power Plant (New Madrid) located in New Madrid County, Missouri. According to Associated Electric, unit 2 is a coal-fired boiler serving a generator with a capacity rating of 640 MW and is subject to the Acid Rain Program and the Cross-State Air Pollution Rule. New Madrid is therefore required to continuously monitor and report NO_X, SO_2, and CO_2 mass emissions; NO_X emission rate; and heat input data for unit 2 in accordance with 40 CFR part 75. To meet these requirements, New Madrid 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 2 stack is used to obtain the diluted flue gas samples sent to the SO_2, NO_X, and CO_2 concentration analyzers serving the unit.

According to Associated Electric, on November 14, 2017, the CO_2 continuous emission monitoring system installed on unit 2 began producing degraded data. Associated Electric discovered anomalies in the measured CO_2 data using a control chart methodology initially developed by EPA[1] and ultimately traced the cause of the anomalies to the internal components of the dilution probe. When the faulty probe was replaced with a like-kind probe, measured CO_2 data returned to the historical ranges. The SO_2, NO_X, and CO_2 concentration measurements obtained for the period from November 14, 2017 through February 1, 2018 were all identified as suspect because of the faulty probe.

Part 75 includes provisions for determining the substitute data to report when quality-assured CEMS data are missing.[2] However, in situations where a CEMS is operating properly in most respects but where a consistent, unidirectional measurement bias is detected, correction of the measured data through the use of appropriate bias correction factors may be a reasonable alternative to 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 New Madrid during the period in question, Associated Electric believes that the dilution probe problems can be addressed through the use of an appropriate bias correction factor. Accordingly, on March 16, 2018 Associated Electric 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.

Discussion

To analyze the potential bias in New Madrid unit 2's measured SO_2, NO_X, and CO_2 concentration data, Associated Electric applied the control chart methodology referenced above. Associated Electric appropriately chose to analyze CO_2 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 that are affected by fuel variability or other factors of the combustion process. When a consistent, unidirectional 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

[1] 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.

[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.

concentration data, the same factor can generally also be used to correct for bias in simultaneously measured SO_2 and NO_X concentration data.

Associated Electric'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 audit (RATA) performed on June 29, 2017. To screen out data variability attributable to operational variation, the analysis focused on the load bin at which the unit operated most frequently during the quarters in which the leak occurred (load bin 10). Based on the analysis, Associated Electric 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. Associated Electric also noted in the petition that all of the routine part 75 quality assurance tests were passed throughout the leak event, demonstrating the accuracy of the analyzers.[3]

In conjunction with use of the control chart methodology, EPA has recommended use of the equation below to determine appropriate correction factors. 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]

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

Where:

CF = Correction factor for the event;
x = Average of the $\%CO_2$ values during the baseline period (baseline CO_2);
y = Average of the $\%CO_2$ values during the leak event (biased CO_2);
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.

To compute a correction factor for the CEMS leak at New Madrid unit 2, Associated Electric used an equation similar to the equation above, with a small additional uncertainty adjustment. Associated Electric requests permission to use the correction factor of 1.06 determined from its modified equation to adjust the suspect data as an alternative to using the standard part 75 missing data substitution procedures.

[3] Routine quality assurance tests (i.e., daily calibration error tests and quarterly linearity checks) used to calibrate and confirm the accuracy of the analyzers may not detect a consistent bias caused by a leak in a dilution probe or umbilical line.

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

EPA's Determination

EPA approves Associated Electric's petition to make upward adjustments to the SO_2, NO_X, and CO_2 concentration values recorded at New Madrid unit 2 during the period of a dilution probe leak from November 14, 2017, hour 16 through February 1, 2018, hour 13, using a bias correction factor of 1.06 instead of using standard part 75 missing data substitution procedures. The use of a single bias correction factor in this instance is supported by Associated Electric's investigation showing a consistent bias throughout the leak period attributable to a probe leak and by the successful performance of routine quality assurance tests during the leak event, showing that other components of the monitoring systems were operating properly. Associated Electric's analysis of the measured data provides a basis for computation of the appropriate correction factor. Finally, the requested correction factor of 1.06 is no less conservative than the correction factor of 1.05 calculated by EPA for the period of the leak using the recommended equation described above.

Conditions of Approval

As conditions of this approval, Associated Electric must:

1. Adjust the hourly SO_2, NO_X, and CO_2 concentration data recorded at New Madrid unit 2 during the probe leak incident from November 14, 2017 through February 1, 2018.
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, NO_X, and CO_2 concentration and NO_X emission rate value using a method of determination code (MODC) of "55", which means "other substitute data approved through petition by EPA." These hours are not included in missing data lookbacks and are treated as unavailable hours for percent monitor availability (PMA) calculations.[5]

[5] In some previous responses to petitions concerning CEMS leaks where EPA approved the use of a bias correction factor as an alternative to standard missing data substitution procedures, EPA also authorized the sources to use an MODC code of "53", which allowed the adjusted data to be treated as quality-assured data available for percent monitor availability (PMA) calculations. This historical practice originated before EPA developed the control chart methodology discussed above and encouraged sources to use it regularly to check their CEMS measurements for indications of possible CEMS leaks. As a result of EPA's efforts, the control chart methodology is now built into many CEMS data acquisition and handling system (DAHS) software packages and its use is widespread among sources. Because regular use of the control chart methodology should enable CEMS leaks to be identified promptly, thereby making it possible for sources to avoid leaks that go undetected for long periods of time, EPA has determined that the use of MODC code 53 should no longer be routinely authorized in responses to petitions of this nature.

4. Revise and resubmit the fourth quarter 2017 and all 2018 electronic data reports (EDRs). Coordinate the resubmission of the data with 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 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 Associated Electric's March 16, 2018 petition and email communications dated August 31, 2018, September 5, 2018, October 11, 2018, November 16, 2018, and November 21, 2018, and is appealable under 40 CFR part 78. If you have any questions regarding this determination, please contact Jenny Jachim at (202) 343-9590. Thank you for your continued cooperation.

Sincerely,

/s/

Reid P. Harvey, Director
Clean Air Markets Division

cc: Nicole Weidenbenner, Air Pollution Control Program, MO
Josh Vander Veen, Air Pollution Control Program, MO
Jon Knodel, EPA Region 7
Ron Sobocinski, EPA CAMD
Charles Frushour, EPA CAMD
Craig Hillock, EPA CAMD
Kenon Smith, EPA CAMD