February 26, 2020

Mr. Jeffrey Araujo
Primary Designated Representative
Plant Manager
Canal Generating LLC
Canal Station
9 Freezer Road
Sandwich, MA 02563

Re: Petition to use an alternative fuel flowmeter calibration procedure and to use hourly gross calorific value (GCV) data in calculations of hourly heat input rate for units 1, 2, and 3 at the Canal Station (facility ID (ORISPL 1599)

Dear Mr. Araujo,

The United States Environmental Protection Agency (EPA) has reviewed the September 25, 2019 petition submitted by Canal Generating LLC (Canal) under 40 CFR 75.66 requesting (1) approval of an alternative calibration procedure for initial certification, ongoing quality assurance, and recertification of fuel flowmeters that are being or may be used to measure fuel flow rates at units 1, 2, and 3 at the Canal Station and (2) approval to calculate hourly heat input rate from pipeline natural gas using hourly measurements, rather than monthly averages, of the gross calorific value (GCV) of that fuel. EPA approves this petition, with conditions, as discussed below.

Background

Canal owns the Canal Station in Sandwich, Massachusetts. Canal Station units 1 and 2 are wall-fired boilers serving electricity generators with nominal design ratings of 542.5 and 529.6 MW respectively. Unit 1 fires primarily residual oil (measured by Coriolis meters for supply and return) and No. 2 fuel oil (currently unmetered) for ignition purposes. Unit 2 primarily fires pipeline natural gas (measured by orifice-type flowmeter) and, as a secondary fuel, residual oil (measured by Coriolis meters for supply and return). Unit 3 is a simple cycle combustion turbine firing pipeline natural gas and No. 2 fuel oil (measured by Coriolis meters) serving an electricity generator with a nominal design rating of 330 MW. According to Canal, units 1, 2, and 3 are subject to the Acid Rain Program. Canal is therefore required to continuously monitor and report sulfur dioxide (SO_2) and carbon dioxide (CO_2) mass emissions, nitrogen oxides (NO_X) emission rate, and heat input for units 1, 2, and 3 in accordance with 40 CFR part 75.

To meet the SO_2 mass and heat input monitoring requirements, Canal has elected to use the monitoring methodology in appendix D to part 75. The appendix D methodology requires continuous monitoring of the fuel flow rate and periodic sampling of relevant characteristics of the fuel combusted, including sulfur content, GCV, and density (if needed). Canal's September 25, 2019 petition concerns two distinct issues related to Canal Station's use of the appendix D methodology.

The first issue raised by the petition concerns the certification and quality-assurance testing procedures for some of the fuel flowmeters used. Section 2.1 of appendix D requires continuous monitoring of the fuel flow rate to each affected unit using gas and/or oil fuel flowmeters that meet initial certification requirements set forth in section 2.1.5 and ongoing quality assurance requirements set forth in section 2.1.6. Section 2.1.5 specifies three acceptable methods to certify a fuel flowmeter: (1) by design (this option is available for orifice, nozzle, and venturi flowmeters only); (2) by measurement under laboratory conditions using an approved method; or (3) by in-line comparison against a reference meter that either meets the design criteria in (1) above or that within the previous 365 days has met the accuracy requirements of appendix D by measurement using an approved method under (2) above. Certain approved measurement methods are listed in section 2.1.5.1. However, the section provides that unlisted methods using equipment traceable to National Institute of Standards and Technology (NIST) standards may also be used, subject to EPA approval pursuant to a petition submitted under § 75.66(c). Section 2.1.6 generally allows ongoing quality assurance tests to be carried out using the same methods as section 2.1.5.

Canal Station unit 1 is equipped with Coriolis fuel flowmeters (model DS600S166MAUEAZZX and DS300S156SU, serial number 12036147 and 12040160, respectively) manufactured by Emerson Process Management – Micro Motion, Inc. (Emerson MMI) to measure residual oil fuel supply and return flow. Canal Station unit 2 is equipped with Coriolis fuel flowmeters (model DS600S166MAUEAZZX and DS300S156SU, serial number 12036849 and 12040124, respectively) manufactured by Emerson MMI to measure residual oil fuel supply and return flow. Canal Station unit 3 is equipped with Coriolis fuel flowmeters (model CMFHC2M811N2BAEZZX and F300H999CCAAZZZX, serial number 12150663 and 14654482, respectively) manufactured by Emerson MMI to measure natural gas and No. 2 fuel oil flow. Canal also anticipates the possibility of using additional like-kind fuel flowmeters at units 1, 2, and 3 in the future. Each individual flowmeter must meet the initial certification requirements set forth in section 2.1.5 of appendix D and the ongoing quality assurance requirements set forth in section 2.1.6.

Emerson MMI has developed a calibration procedure it calls the Transfer Standard Method (TSM). According to Emerson MMI, the TSM uses equipment that is traceable to NIST standards. According to Canal, each flowmeter identified above has been tested for initial certification using the Emerson MMI TSM and will be calibrated for ongoing quality assurance purposes using the same method.

Coriolis flowmeters are not orifice, nozzle, or venturi flowmeters and therefore do not qualify for certification based on their design. Further, the Emerson MMI TSM is not listed in section 2.1.5.1 of appendix D as an approved method. However, EPA has previously evaluated and approved the use of the Emerson MMI TSM as an alternative certification and quality assurance testing method for Coriolis flowmeters at other facilities. In view of these circumstances, Canal's

petition requests approval of the use of the Emerson MMI TSM as an alternative certification and quality assurance testing method for Coriolis flowmeters at the Canal Station. Canal requests approval to use the TSM process not only for the flowmeters identified by the serial numbers above but also for additional like-kind Coriolis fuel flowmeters that Canal may use at the facility in the future.

The second issue raised by the petition concerns the GCV data used in calculations of hourly heat input rate from pipeline natural gas. Under sections 2.3.4.1 and 2.3.4.2 of appendix D, the GCV of pipeline natural gas and natural gas must be determined at least once in every month in which the fuel is combusted for 48 hours or more (and at least once in each calendar quarter in which the unit operates). If multiple GCV samples are taken and analyzed in a particular month, sections 2.3.4.1 and 2.3.4.2 provide that "the GCV values from all samples shall be averaged arithmetically to obtain the monthly GCV." Furthermore, section 2.3.7(c)(1) of appendix D states that "[i]f multiple samples are taken and averaged, apply the monthly average GCV to the entire month."

Thus, for units such as Canal Station units 2 and 3 that combust pipeline natural gas, for each hour of unit operation in a given month, the measured hourly fuel flow rate and the average monthly GCV value are used to calculate the hourly heat input rate from that fuel. The hourly heat input rate is then multiplied by a default SO_2 emission rate of 0.0006 lb/mmBtu to calculate hourly SO_2 mass emission rate from that fuel. Units that use the appendix D methodology to determine heat input and that are required to report NO_X or CO_2 mass emissions according to part 75 also use the heat input values in calculations of those emissions.

Canal operates and maintains a continuous gas chromatograph which provides hour-by-hour measurements of the GCV of the pipeline natural gas burned at the facility. Canal believes the most accurate hourly heat input rates are obtained when hourly GCV values are coupled with hourly measurements of fuel flow rate. In view of this, Canal's petition requests permission to use hourly values for the GCV of pipeline natural gas, rather than monthly averages, in the hourly heat input rate calculations for units located at the Canal Station.

EPA's Determination

EPA has reviewed the information provided by Canal in the September 25, 2019 petition concerning both of the petition's requests. With respect to the first request, the petition describes the alternative calibration procedure that Canal requests approval to use to verify the accuracy of the pipeline natural gas, residual oil, and No. 2 fuel oil Coriolis fuel flowmeters installed at units 1, 2, and 3 and any other like-kind Coriolis fuel flowmeters to be installed at the Canal Station.

EPA approves use of the Emerson MMI TSM calibration procedure for initial certification of the Coriolis fuel flowmeters (serial numbers 12036147, 12040160, 12036849, 12040124, 12150663, and 14654482) installed on Canal Station units 1, 2, and 3. The basis for this approval is as follows:

A1. The alternative calibration methodology used equipment traceable to NIST standards. In Emerson MMI's TSM, the candidate fuel flowmeter to be tested for accuracy is calibrated against a reference meter that was calibrated against a "Global Reference

Meter" which, in turn, was calibrated using Micro Motion's "Primary Flow Stand." The Primary Flow Stand is an ISO 17025-accredited calibration system that uses equipment traceable to NIST standards. Thus, the reference meters used to test Canal Station's flowmeters had fully traceable calibrations through an accredited path back to NIST standards.[1]

A2. The calibration procedure followed for initial certification of Canal Station's flowmeters met the requirements of section 2.1.5.2(a) of appendix D to part 75 for in-line testing of candidate flowmeter by comparison against a reference flowmeter. Specifically:

a. The reference flowmeters and secondary elements (i.e. temperature transmitters and pressure transducers) used to test Canal Station's flowmeters had been calibrated within 365 days prior to the comparison testing;
b. The comparison testing was performed in a laboratory over a period of less than seven operating days; and
c. For the candidate flowmeter, three test runs were conducted at each of three flow rate levels with each test run lasting 20 minutes in duration.

A3. At each tested flow rate level, the fuel flowmeters demonstrated accuracy better than the accuracy requirement specified in section 2.1.5 of appendix D – 2.0 percent of the flowmeter's upper range value (URV). The test results are summarized in Tables 1, 2, and 3 below.

Table 1 – Unit 1 average three-run residual oil fuel flowmeter accuracy results

Flow rate level	**Flowmeter s/n 12036147 Accuracy (% of URV)**	**Flowmeter s/n 12040160 Accuracy (% of URV)**
Low – normal minimum unit operating load	0.000%	0.000%
Mid –a load point approximately equally spaced between normal minimum and full operating load	0.001%	0.000%
High – normal full unit operating load	0.000%	0.000%

[1] The Primary Flow Stand calibration system is equipment that has been accredited by NVLAP according to ISO/IEC 17025.

Table 2 – Unit 2 average three-run residual oil fuel flowmeter accuracy results

Flow rate level	Flowmeter s/n 12036849 Accuracy (% of URV)	Flowmeter s/n 12040124 Accuracy (% of URV)
Low – normal minimum unit operating load	0.001%	0.000%
Mid –a load point approximately equally spaced between normal minimum and full operating load	0.001%	0.000%
High – normal full unit operating load	0.001%	0.000%

Table 3 – Unit 3 average three-run pipeline natural gas and diesel oil fuel flowmeter accuracy results

Flow rate level	Flowmeter s/n 12150663 Accuracy (% of URV)	Flowmeter s/n 14654482 Accuracy (% of URV)
Low – normal minimum unit operating load	0.000%	0.000%
Mid –a load point approximately equally spaced between normal minimum and full operating load	0.000%	0.000%
High – normal full unit operating load	0.001%	0.000%

EPA also approves the use of the Emerson MMI TSM calibration procedure to meet the applicable on-going quality assurance requirements for the Canal Station units 1, 2, and 3 fuel flowmeters under section 2.1.6 of appendix D, subject to the following conditions:

B1. The application of the Emerson MMI TSM for each future accuracy test must meet the requirements of section 2.1.5.2(a) of appendix D as part of the basis for EPA's approval of use of the TSM for the initial certification of the fuel flowmeters; and

B2. The three flow rate levels tested in each future accuracy test must correspond to: (1) normal full unit operating load, (2) normal minimum unit operating load, and (3) a load point approximately equally spaced between the full and minimum unit operating loads.

EPA further approves the use of the Emerson MMI TSM calibration procedure to meet the applicable initial certification and on-going quality assurance requirements for like-kind Coriolis fuel flowmeters used in the future at the Canal Station subject to the satisfaction, for each such like-kind fuel flowmeter, of all approval conditions set forth in paragraphs A1, A2, A3, B1, and B2 of this approval for the fuel flowmeters identified by serial numbers above.

With respect to the petition's second request, EPA approves the use of hourly GCV measurements, instead of monthly average GCV values, in calculations of the hourly heat input rate from pipeline natural gas. EPA similarly approves the use of hourly GCV measurements in calculations of the hourly heat input rate from natural gas, in the event that the natural gas combusted at Canal Station does not qualify as pipeline natural gas. The Agency concurs that using hourly, rather than monthly, GCV values together with hourly fuel flow rates is likely to provide more accurate hourly heat input rate data. Furthermore, hour-by-hour measurement of the GCV far exceeds the minimum sampling frequency for pipeline natural gas and natural gas (i.e., once per month) specified in sections 2.3.4.1 and 2.3.4.2 of appendix D. EPA notes that approval of the requested authorization to use hourly GCV measurements does not preclude Canal from alternatively continuing to use monthly average GCV values in accordance with the regulations.

The approval to use hourly GCV measurements is subject to the following conditions:

C1. Provided that at least one valid GCV measurement is obtained in a given month, Canal must substitute, for each hour of the missing data period, the arithmetic average of the GCV values from the hour before and the hour after the missing data incident; or

C2. In accordance with section 2.4.1 of appendix D to part 75, if no valid GCV values are obtained in a given month, Canal must substitute, for each hour of the missing data period, the maximum potential GCV value of 110,000 Btu per 100 standard cubic foot (scf), from Table D-6 in appendix D.

EPA's determination relies on the accuracy and completeness of the information provided by Canal and is appealable under 40 CFR part 78. If you have any questions regarding this determination, please contact Charles Frushour at (202) 343-9847 or by e-mail at frushour.charles@epa.gov Thank you for your continued cooperation.

Sincerely,

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

cc: Charles Frushour, CAMD
Jenny Jachim, CAMD
Susan Lancey, EPA Region I
Todd Wheeler, MassDEP