7/30/2013

Mr. C. Richard Neff
Vice President - Environmental, Health, and Safety
Cogentrix Energy Power Management, LLC.
9405 Arrowpoint Boulevard
Charlotte, NC 28273-8110

Re: Petition for an Exemption from Flow-to-Load Ratio or Gross Heat Rate Testing for Six Coal-fired Boilers at the James River Plant (Facility ID (ORISPL) 10377)

Dear Mr. Neff:

The United States Environmental Protection Agency (EPA) has reviewed the October 23, 2012 petition submitted under 40 CFR 75.66 by Cogentrix Energy Power Management, LLC ("Cogentrix"), in which Cogentrix has requested an exemption from flow-to-load or gross heat rate testing requirements for six coal-fired units at the James River plant. EPA denies the petition, for the reasons given below.

Background

The James River plant, located in Hopewell City, Virginia, is managed by Cogentrix and operated by James River Genco, LLC, a Cogentrix affiliate. Units BLR01A, BLR01B, BLR01C, BLR02A, BLR02B, and BLR02C at the James River plant are coal-fired boilers that are configured in two "three-to-one" boiler-to-generator designs, in which three boilers provide steam to one 55-MWe electric generator and exhaust through a common stack. According to Cogentrix all six units are subject to the Acid Rain Program (as opt-in units) and to the Clean Air Interstate Rule (CAIR) ozone season and annual emissions trading programs. Therefore, Cogentrix is required to continuously monitor and report SO_2, NO_X, and CO_2 emissions and heat input for these units in accordance with 40 CFR Part 75. To meet these monitoring requirements, Cogentrix has installed and certified continuous emission monitoring systems (CEMS) for SO_2, NO_x, CO_2, and stack gas flow rate. The monitoring systems are installed on two common stacks, known as CS001 (which serves Units BLR01A, BLR01B, and BLR01C) and CS002 (which serves Units BLR02A, BLR02B, and BLR02C).

Part 75 requires periodic, on-going quality-assurance (QA) tests to be performed on all certified CEMS. For stack gas flow monitors, one of the required QA tests is a quarterly flow-to-load ratio or gross heat rate (GHR) test. Section 2.2.5 of Appendix B to Part 75 requires this test to be performed in every "QA operating quarter" (i.e., a calendar quarter in which there are at least 168 unit or stack operating hours). The quarterly flow-to-load ratio or GHR test is used to check the accuracy of a flow monitor between successive relative accuracy test audits (RATAs), which, for most affected units, are performed annually. If a flow monitor fails a

quarterly flow-to-load ratio or GHR test, this indicates that the monitor may not be working properly, and the owner or operator must either perform further testing or take corrective actions as prescribed in the regulations (see Part 75, Appendix B, sections 2.2.5(b) and (c)(8) and 2.2.5.1 through 2.2.5.3).

Section 7.8 of Appendix A to Part 75 allows exemptions from flow-to-load ratio or GHR testing requirements for certain units. Specifically, the section provides that "[f]or complex stack configurations (e.g., when the effluent from a unit is divided and discharges through multiple stacks in such a manner that the flow rate in the individual stacks cannot be correlated with unit load), the owner or operator may petition … for an exemption" from the otherwise applicable flow-to-load ratio or GHR testing requirements. The section further provides that to qualify for the exemption, the owner or operator must provide "sufficient information and data to demonstrate that a flow-to-load or gross heat rate evaluation is infeasible for the complex stack configuration."

According to Cogentrix, each of the "three-to-one" boiler-to-generator configurations at the James River plant has historically run at an annual capacity factor above 50%, exporting steam at an average rate of 220,000 lb/hr while cogenerating electricity. This operating scenario has required all three of the boilers in each configuration to be in operation, with normal steam flow in excess of 400,000 lb/hr. This mode of operation has maintained the stack gas flow rates and steam loads for each configuration at relatively constant levels, and the quarterly flow-to-load ratio or GHR tests have been consistently passed. However, in the October 23, 2012 petition, Cogentrix states that due to escalating coal prices and decreasing natural gas prices, the annual capacity factor at the James River plant is now less than 5%, with steam exports falling to 180,000 lb/hr on average and electricity generation occurring sporadically with demand. This reduction in plant load levels has been accompanied by significant variability in boiler operating scenarios. Cogentrix believes that due to the change in the way that the James River facility is operated, the stack gas flow rate in each common stack can no longer be correlated with load. According to Cogentrix, variations in the number of boilers in service and the load distribution among the individual boilers could result in distinctly different flow-to-load ratios being obtained at similar combined load levels. For example, two boilers operating at a steam load of 150,000 lb/hr and three boilers operating at 100,000 lb/hr would produce the same combined steam load of 300,000 lb/hr, but the exhaust gas flow rates for these two operating scenarios could be significantly different. Cogentrix believes that this variability in boiler operating scenarios and the consequent potential lack of correlation between hourly stack gas flow rate and hourly load could jeopardize compliance with the flow-to-load ratio or GHR test.

Therefore, in its October 23, 2012 petition, Cogentrix requests that CS001 and CS002 at the James River plant be treated as "complex stack configurations" qualifying under section 7.8 of Appendix A of Part 75 for an exemption from flow-to-load ratio and gross heat rate testing requirements based on the asserted infeasibility of compliance with those requirements. Cogentrix further asserts that there would be no adverse effects from the cessation of flow-to-load ratio and gross heat rate testing.

Discussion

As an initial matter, EPA observes that for purposes of the Part 75 provision under which Cogentrix is seeking an exemption, a "complex stack configuration" would generally be a configuration in which "the effluent from a unit is divided and discharges through multiple stacks…." Part 75, Appendix A, section 7.8. The configuration of the Cogentrix facility, where multiple units each discharge all their effluent to a common stack, is not ordinarily considered "complex" in the same way. However, assuming solely for purposes of this discussion that the plant's configuration could be considered "complex," the principal argument put forth by Cogentrix in the petition for an exemption from flow-to-load ratio or GHR testing at the James River plant is that flow and load cannot be correlated because the flow rate in each common stack will vary depending on the number of units that are operating and how the steam load is distributed among the individual units. Consequently, according to Cogentrix, a reference flow-to-load ratio or GHR derived from data recorded during the most recent normal-load flow RATA may not be suitable for evaluating subsequent hourly flow-to-load ratios or GHR values if the number of boilers in service or the load distribution among the units is not the same as it was at the time of the RATA.

In order to evaluate Cogentrix's claims, EPA performed flow-to-load ratio and gross heat rate analyses for common stacks CS001 and CS002 for each of the four calendar quarters of 2012. For each common stack, all four quarters of 2012 were QA operating quarters; therefore, according to Part 75, Appendix B, section 2.2.5(a), a flow-to-load ratio or GHR analysis was required for each stack in each quarter, subject to data availability as described below.

EPA began its data analysis by calculating reference flow-to-load ratios and reference GHRs for CS001 and CS002 in accordance with section 7.7 of Part 75, Appendix A, using data recorded during the 2011 and 2012 normal-load flow RATAs. The reference flow-to-load ratios and GHR values derived from the 2011 flow RATAs were used to analyze the first quarter 2012 emissions data. The reference flow-to-load ratios and GHRs derived from the 2012 flow RATAs were used to analyze the second, third, and fourth quarter 2012 emissions data.[1]

The 2011 and 2012 flow RATAs were two-load tests, performed at the "low" and "high" load levels in 2011 and at the "low" and "mid" load levels in 2012. The electronic monitoring plans for CS001 and CS002 indicate that at the time these RATAs were done, both of the tested load levels were designated as normal. When two normal load levels are designated in the monitoring plan, Part 75, Appendix B, section 2.2.5(a)(4) requires the quarterly flow-to-load ratio or GHR data analysis to be performed at the higher load level first. Then, if there is insufficient data to analyze at that load level,[2] the analysis must be done at the lower load level.

[1] The 2011 and 2012 flow RATAs were done in the second quarter of each year (May and June). Part 75 requires the flow-to-load ratio or GHR analysis for a particular calendar quarter to be performed using the reference flow-to-load ratio or GHR value from the most recent normal load flow RATA.

[2] To perform a flow-to-load or GHR evaluation, there must be at least 168 hours of quality-assured flow rate data (and diluent gas data for the GHR evaluation) within ± 10 percent of the RATA load. The rule allows some data to be excluded from the analysis (e.g., when the load changes by more than 15% from one hour to the next).

If there is insufficient data to analyze at both load levels, a flow-to-load ratio or GHR analysis is not required for that calendar quarter.[3] Notwithstanding these requirements, EPA performed the flow-to-load ratio and GHR analyses for both common stacks at both load levels in all four quarters of 2012, even where the analysis was not required by Part 75.

The applicable reference ratio or GHR was applied to each quarter's data. In each quarterly analysis, the flow-to-load ratio and the GHR were calculated for each hour in which: (1) quality-assured data flow rate data (and diluent gas data for the GHR) were obtained; and (2) the combined load for the operating units was within ± 10% of the average combined load during the previous flow RATA. Then, the percentage deviation of each hourly flow-to-load ratio and GHR from its reference value was calculated, and average percentage deviation values for each quarter were determined. Note that the flow rates used in the calculations were unadjusted rates, i.e., they were not corrected for bias.

The results of the data analyses are presented in Table 1, below. Table 1 shows that for most of the analyses performed by EPA, there were fewer than 168 hours of quality-assured data within ± 10 percent of the RATA load; these analyses are marked as "(NR)" to indicate that they are not required by Part 75. For CS001, sufficient data to analyze were found in the second, third, and fourth quarters of 2012; these analyses are the only ones required by Part 75 and are shaded in gray. Note that in the second and third quarters, there were sufficient data to analyze only at the lower load level, and in the fourth quarter, there were sufficient data to analyze at both load levels, but (according to Part 75), the analysis at the higher load level is the one that must be reported. For CS002, sufficient data to analyze was found only in the first quarter of 2012, at the lower load level (shaded in gray).

TABLE 1: FLOW-TO-LOAD RATIO AND GROSS HEAT RATE TEST RESULTS---COGENTRIX JAMES RIVER PLANT

Quarter and Year	Stack ID	Load Level	Number of Hours Evaluated	Average % Deviation from Reference Method Mean Value (E_f)	
				Flow-to-Load Ratio	Gross Heat Rate
1st Qtr 2012	CS001	High	123(NR)	3.9%	8.8%
		Low	59(NR)	8.7%	9.5%
	CS002	High	104(NR)	3.5%	6.4%
		Low	**192**	**18.4%**	**7.5%**
2nd Qtr 2012	CS001	Mid	38(NR)	5.5%	4.7%
		Low	**168**	**26.6% ***	**5.1%**
	CS002	Mid	23(NR)	10.6%	10.8%
		Low	8(NR)	18.6%	4.6%
3rd Qtr 2012	CS001	Mid	89(NR)	5.8%	5.2%
		Low	**324**	**22.2% ***	**8.4%**
	CS002	Mid	61(NR)	10.8%	12.3%
		Low	21(NR)	23.5%	9.2%

[3] Although the data analysis is not required in this situation, the results of the attempt to perform the flow-to-load ratio or GHR test must still be reported. In this case, a special results code must be reported to indicate that there were insufficient data to analyze.

4th Qtr 2012	CS001	**Mid**	**183**	**5.0%**	**2.3%**
		Low	218(NR)	23.6%	9.5%
	CS002	Mid	40(NR)	23.1%	9.0%
		Low	75(NR)	5.2%	6.9%
*	This flow-to-load ratio analysis did not meet the specification in Appendix B, section 2.2.5(b)(3), but the corresponding GHR analysis did meet the specification.				

The 2011 and 2012 flow RATAs at CS001 and CS002 were all performed at combined steam loads less than 500 klb/hr, and, as previously noted, EPA used unadjusted flow rates in the flow-to-load ratio and GHR calculations. Therefore, in accordance with section 2.2.5(b)(3) of Part 75, Appendix B, the acceptance criterion for E_f, the average percentage deviation of the hourly flow-to-load ratios or gross heat rates from the reference value, is 20.0%.

Table 1 shows that across all tests (including those where the data analysis was not required by Part 75), the values of E_f ranged from 3.5% to 26.6% for the flow-to-load ratio tests, and from 2.3% to 12.3% for the GHR tests. For the tests with sufficient data to analyze, E_f ranged from 5.0% to 26.6% for the flow-to-load ratio tests and from 2.3% to 8.4% for the GHR tests. The value of E_f exceeded 20.0% for two of the flow-to-load ratio tests with sufficient data to analyze (i.e., for CS001, in the second and third quarters of 2012); however, for the GHR test in these same calendar quarters, the values of E_f were 5.1% and 8.4%, respectively, well within the 20.0% acceptance criterion. For three of the twelve analyses that were not required by Part 75, the value of E_f for the flow-to-load ratio test exceeded 20.0%; however, the values of E_f for the corresponding GHR tests ranged from 9.0% to 9.5%. The highest value of E_f for any of the twelve "non-required" GHR analyses was 12.3%.

Thus, the results of EPA's data analysis show that for each quarter of 2012 in which a flow-to-load ratio or GHR test was required by Part 75, at least one of the tests easily met the 20.0% acceptance criterion. This same result was observed for the data analyses that were not required by Part 75. For this reason EPA believes that the available data do not support Cogentrix's claim that the emission discharge configuration of the James River units makes compliance with the testing requirements infeasible. Rather, EPA's results indicate that the flow-to-load ratio and gross heat rate test requirements provide sufficient safeguards (e.g., use of a quarterly average percentage deviation, consideration of unit size, exclusion of certain unrepresentative data, etc.) to account for hourly variations in the flow-to-load ratio or GHR.

The Agency notes that for CS002, the number of operating hours in the second, third, and fourth quarters of 2012 was substantially lower than in previous quarters and years, apparently reflecting the change in process operation described in the October 23, 2012 petition. For all three of these quarters, there were insufficient data (< 168 hours) in the proper load range and a flow-to-load ratio or GHR analysis was not required. Cogentrix (appropriately) reported the test results for these calendar quarters using the code "FEW168" to indicate this. However, Table 1 shows that despite the small number of hours in the correct load range, when flow-to-load ratio and GHR tests were performed on these data, the 20.0% acceptance criterion was safely met for at least one of the tests in all three calendar quarters.

EPA's Determination and Recommendation

In view of the findings, EPA disagrees with Cogentrix's assertion that an exemption from flow-to-load ratio or gross heat rate testing is merited for the coal-fired boilers at the James River plant because of concerns about potential infeasibility. Rather, the data analysis described above has shown that these tests can be consistently passed (one or the other or both). Further, if the reductions experienced recently in plant load and in the number of operating hours continue into the future, it is possible (even likely) that in some calendar quarters, a flow-to-load ratio or GHR test may not be required due to a lack of data in the proper load range. EPA therefore denies Cogentrix's petition for an exemption from flow-to-load ratio or GHR testing for common stacks CS001 and CS002 at the James River plant.

EPA also notes that section 2.2.5(c) of Appendix B to Part 75 allows certain unrepresentative flow rate data to be excluded from the flow-to-load ratio or GHR analysis. For instance, data for hours in which load is within the proper load range for analysis (i.e., within ± 10% of the RATA load) but in which the load changes by more than 15% from one hour to the next (i.e., when a unit is "ramping" up or down) may be excluded from the flow-to-load ratio or GHR analysis. Also, when a normal-load flow RATA is performed in a particular calendar quarter, all flow rate data recorded in that quarter prior to the RATA may be excluded. However, in the flow-to-load ratio and GHR test results reported by Cogentrix in recent years (2011 and 2012), not all of the allowable data exclusions were taken. In view of this, EPA recommends that Cogentrix take these data exclusions fully into account in future flow-to-load ratio or GHR analyses, to alleviate its concerns that "the wide variety of operating scenarios derived from steam host and electrical dispatch demands"[4] at the James River facility may result in flow-to-load ratio or GHR test failures.

EPA's determination relies on the accuracy and completeness of the information provided by Cogentrix in its October 23, 2012 petition, and is appealable under 40 CFR Part 78. If you have any questions regarding this determination, please contact Mr. Carlos R. Martinez at (202) 343-9747 or by e-mail at martinez.carlos@epa.gov. Thank you for your continued cooperation.

Sincerely,

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

[4] See Cogentrix's October 23, 2012 petition, page 6.

cc: Paul Arnold, USEPA Region III
Todd M. Alonzo, Virginia DEQ
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