MCV

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Limited Partnership

Midland Cogeneration Venture
Recertification Application
For
Units 3, 4, 5 and 6 NO_x Analyzers

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1.0 INTRODUCTION

Midland Cogeneration Venture (MCV), located in Midland, Michigan, includes twelve (12) pipeline natural gas-fired combined cycle combustion turbines (i.e., Units 3 – 14) manufactured by Asea Brown Boveri (ABB). In August 2014, MCV permanently replaced the Units 3 – 6 NO_x analyzers with like-kind analyzers. A probationary calibration error test was conducted on each of the four units after the new NO_x analyzers were installed. All required recertification tests were successfully completed on the first attempt.

This reccertification application includes the recertification tests results for the Units 3 - 6 NO_x analyzers. A copy of the Recertification Test History Reports and the QA/Certification Events Report are included in Appendix A of this recertification application. A copy of the EPA Monitoring Plans are provided in Appendix B to this recertification application.

In accordance with §75.20, MCV was required to perform the following quality assurance checks in order to recertify the Units 3 – 6 NO_x analyzers.

- Linearity check,
- Cycle time test,
- Seven (7) day calibration error check, and
- A minimum nine (9) run relative accuracy test audit (RATA).

2.0 RECERTIFICATION TESTS

MCV successfully completed each of the required certification tests for Units 3, 4, 5 and 6 NO_x analyzers. The linearity checks, 7-day calibration error tests and cycle time tests were completed by Spectrum Systems and MCV personnel. The RATAs were conducted by Spectrum Systems. All EPA Protocol Gases used for the recertification tests were obtained from vendors that are participating in EPA's Protocol Gas Verification Program.

2.1 Linearity Check

For the Units 3 – 6 NO_x analyzers, a linearity check was performed on the both ranges of the dual range NO_x analyzer in accordance with the procedures in Appendix A of 40 CFR Part 75. Linearity checks were performed using EPA Protocol Gases corresponding to 20.0-30.0%, 50.0-60.0% and 80.0-100.0% of each analyzer span. The analyzers were challenged three times with each of the three calibration gases, without using the same calibration gas twice in succession. Analyzer linearity error is determined using the following equations:

$$LE = \frac{|R - A|}{R} \times 100 \quad or \quad LE = |R - A|$$

Where:
- LE = Linearity error
- R = Calibration gas tag value
- A = Average CEMS response

Results of the linearity checks are acceptable if the linearity error is ≤ 5.0% of the audit gas concentration, or if the absolute value of the difference between the average of the monitor responses and the average of the audit gas concentrations is ≤ 5.0 ppm NO_x, whichever is least restrictive. Table 2-1 provides a summary of the linearity check results, and Appendix C of this document contains the complete linearity check results.

Table 2-1: Summary of Linearity Check Results

Unit(s)	Test Date	Test Parameter	Reference Value (L,M,H)	Average Response (L,M,H)	Percent Error (%)	Performance Specification
3	8/19/14	NO_x (low)	26.670	27.400	2.7	≤ 5.0 %
			54.170	54.157	0.0	≤ 5.0 %
			89.130	87.143	2.2	≤ 5.0 %
		NO_x (high)	122.500	125.000	2.0	≤ 5.0 %
			275.200	277.790	0.9	≤ 5.0 %
			452.900	453.490	0.1	≤ 5.0 %
4	8/19/14	NO_x (low)	26.670	27.383	2.7	≤ 5.0 %
			54.170	54.013	0.3	≤ 5.0 %
			89.130	87.173	2.2	≤ 5.0 %
		NO_x (high)	122.500	124.877	1.9	≤ 5.0 %
			275.200	278.033	1.0	≤ 5.0 %
			452.900	454.873	0.4	≤ 5.0 %
5	8/19/14	NO_x (low)	26.670	27.490	3.1	≤ 5.0 %
			54.170	54.563	0.7	≤ 5.0 %
			89.130	88.430	0.8	≤ 5.0 %
		NO_x (high)	122.500	124.470	1.6	≤ 5.0 %
			275.200	277.503	0.8	≤ 5.0 %
			452.900	452.027	0.2	≤ 5.0 %
6	8/19/14	NO_x (low)	26.670	27.630	3.6	≤ 5.0 %
			54.170	54.777	1.1	≤ 5.0 %
			89.130	88.130	1.1	≤ 5.0 %
		NO_x (high)	122.500	124.063	1.3	≤ 5.0 %
			275.200	274.823	0.1	≤ 5.0 %
			452.900	451.497	0.3	≤ 5.0 %

2.2 Seven (7) Day Calibration Error Test

Calibration error tests were performed on both ranges of the dual-range NO_x analyzer once per day for seven (7) consecutive unit operating days. Each analyzer was challenged with two EPA Protocol gas concentrations corresponding to 0.0-20.0% and 80.0-100.0% of each of the instrument's span. Calibration error is determined by one of the following equations:

$$CE = \left(\frac{|R - A|}{S} \right) \times 100 \quad or \quad CE = |R - A|$$

Where: CE = Calibration error
R = Reference value of calibration gas
A = Actual CEMS response to calibration gas
S = Span of instrument

Table 2-2 provides a summary of the 7-day calibration error test results for the NO_x analyzers, respectively. The results of the 7-day calibration error tests for each of the analyzers are presented in Appendix D of this certification application. The maximum drift specification for a NO_x analyzer is 2.5 % (or ± 5 ppm from the reference value) of the instrument's span.

Table 2-2: Summary of 7-Day Calibration Error Test

Unit(s)	Test Date	Test Parameter	Calibration Error[1]	Performance Specification
3	8/20 – 8/26/14	NO_x (low)	2.2	≤ 2.5% or ± 5 ppm
		NO_x (high)	0.7	
4	8/19 – 8/25/14	NO_x (low)	2.4	≤ 2.5% or ± 5 ppm
		NO_x (high)	1.0	
5	8/29 – 9/05/14	NO_x (low)	1.7	≤ 2.5% or ± 5 ppm
		NO_x (high)	1.8	
6	8/19 – 8/25/14	NO_x (low)	3.0[2]	≤ 2.5% or ± 5 ppm
		NO_x (high)	0.8	

[1] Highest calibration error during 7-day calibration error test.
[2] Passed using alternate performance specification of ± 5 ppm.

2.3 Cycle Time Check

A cycle time test was performed on both ranges of the dual-range NO_x analyzers using the zero and high-level span calibration gases. The maximum allowed cycle time is 15 minutes. Table 2-3 provides a summary of the cycle time results for Units 3 – 6. The supporting test data are provided in Appendix E of this report.

Table 2-3: Summary of Cycle Time Test Results

Unit(s)	Date	Parameter	Cycle Time (Minutes)	Performance Specification
3	8/19/14	NO_x	3	≤ 15 minutes
4	8/19/14	NO_x	4	
5	8/19/14	NO_x	3	
6	8/19/14	NO_x	3	

2.4 Relative Accuracy Test Audit

A RATA was performed on each of the Units 3 – 6 CEMS by Spectrum Systems. Spectrum Systems is an Air Emissions Testing Body (AETB) as required by 40 CFR Part 75. The RATA consisted of nine (9) 21-minute comparative test runs. Spectrum Systems used EPA Reference Methods 3A and 7E to make measurements of CO_2 and NO_x, respectively. In addition to determining relative accuracy, the data was used to conduct the bias test in accordance with Appendix A of 40 CFR Part 75. Table 2-4 provides a summary of the RATA and bias test results. The complete RATA report is included in Appendix F of this recertification application.

Table 2-4: Summary of RATA and Bias Test Results

Unit(s)	Test Date	Test Parameter	RATA Result	Performance Specification		Bias Adjustment Factor
				Annual	Semi-annual	
3	8/22/14	NO_x CEMS (lb/mmBtu)	2.65	≤ 7.5 %	≤ 10.0 %	1.000
4	8/22/14	NO_x CEMS (lb/mmBtu)	2.72	≤ 7.5 %	≤ 10.0 %	1.000
5	8/21/14	NO_x CEMS (lb/mmBtu)	3.64	≤ 7.5 %	≤ 10.0 %	1.000
6	8/21/14	NO_x CEMS (lb/mmBtu)	3.89	≤ 7.5 %	≤ 10.0 %	1.000

A RATA is conducted on a semi-annual basis if:

- The relative accuracy (RA) is less than or equal to 10.0%; or
- For units with low NO_x emission rates (average NO_x emission rate measured by the reference method during the RATA ≤ 0.200 lb/mmBtu), when a NO_x-diluent continuous emission monitoring system fails to achieve a relative accuracy of ≤ 10.0%, but the monitoring system mean value from the RATA, calculated using Equation A-7 in Appendix A to 40 CFR Part 75, is within ± 0.020 lb/mmBtu of the Reference Method mean value.

A RATA is conducted on an annual basis if:

- The relative accuracy (RA) is less than or equal to 7.5%; or
- For units with low NO_x emission rates (average NO_x emission rate measured by the reference method during the RATA ≤ 0.200 lb/mmBtu), when a NO_x-diluent continuous emission monitoring system fails to achieve a relative accuracy of ≤ 7.5%, but the monitoring system mean value from the RATA, calculated using Equation A-7 in Appendix A to 40 CFR Part 75, is within ± 0.015 lb/mmBtu of the Reference Method mean value.