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Continuous Emissions Monitoring Systems Certification Test Report

40 CFR Part 60, 40 CFR Part 75, & Michigan Department of Environmental Quality Rule 1158, Sub rule 5

Prepared for:
DTE Electric Company
Monroe Power Plant
Unit 1
Monroe, Michigan
ORIS: 1733

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1.0 Introduction

The DTE Electric Company Monroe Power Plant's Unit 1 is a coal-fired steam power boiler that supplies a dedicated steam turbine-generator. Unit 1 incorporates a flue gas desulfurization (FGD) scrubber for SO_2 control, selective catalytic reduction (SCR) for NO_X minimization, and an electrostatic precipitator (ESP) for particulate control. Both Unit 1 and Unit 2 exhaust into a common 580 foot 8 inch-high stack with separate 475 foot, 8 inch-high flues for each unit.

Unit 1 has a maximum design heat input rate of 8500 MMBtu per hour. The turbine generator that is associated with Unit 1 turbine-generator is rated at a nominal output of 835 MW.

To meet the requirements of the Environmental Protection Agency (EPA) and the Michigan Department of Environmental Quality (MDEQ), the Detroit Edison Company has purchased and installed a Continuous Emission Monitoring System (CEMS) from Babcock and Wilcox Power Generation Group (B&W PGG). The CEMS is a dilution-extractive system with analyzers to measure SO_2, NO_x, and CO_2. Unit 1 also has a stack mounted flow monitor and a continuous sorbent trap monitoring system (CSTMS) to monitor the flow rate and concentrations of mercury (Hg) in the exhaust stream.

A B&W 90/30 iNET Programmable Logic Controller (PLC) controls the CEMS. The PLC transmits data to a B&W PGG NetDAHS Data Acquisition and Handling System (DAHS).

This Certification Test Report outlines the procedures used to certify the SO_2, NO_X, and CO_2, CO, flow, and Hg analyzers. All testing was done is accordance with the requirements set forth in the Code of Federal Regulations, Title 40, Part 60, (40 CFR 60) Appendix B and 40 CFR 75, Subpart C, Paragraph 75.20, and Appendix A. The SO_2, NO_x, CO, stack flow, and CO_2 analyzers were certified in accordance with procedures as outlined in 40 CFR 75, Appendix A. While the CO analyzers are only subject to 40 CFR Part 60, DTE is choosing to follow the procedures set forth in 40 CFR 75, where allowed. The sorbent trap monitoring system was certified in accordance with 40 CFR 60, Appendix B, Performance specification 12b procedures.

The performance tests completed on the CEMS are listed below:

1. 7-Day Calibration Error Zero and Span Drift (NO_X, SO_2, CO_2, CO, and Stack Flow)
2. Cycle Time Test (NO_X, SO_2, CO_2, and CO)
3. Linearity Test – (NO_X, SO_2, CO_2, and CO)
4. Relative Accuracy Test Audit (RATA) – (NO_X, SO_2, CO_2, CO, Stack Flow, and Hg)
5. Bias Test (NO_X and SO_2)

1.1 Analyzer Information

Testing was performed on the following analyzers.

Unit 1

Analyzer	Manufacturer/Model	Analyzer Range	Serial Number
SO_2	TECO 43i	0-30 ppm Span 0-100 ppm Span*	1218153566
NO_x	TECO 42i	0-100 ppm Span* 0-500 ppm Span/Range	1218153564
CO_2	CAI 601	0-20% Span/Range	Z06028-M
CO	TECO 48i	0 – 100 ppm Span* 0 – 500 ppm Span	1218153568
Stack Flow	Teledyne Ultraflow 150	0 – 3000kscfm	1501279
Hg	Clean Air Met80	NA	1080MF-082212-B

2.0 Summary of Results

The results for the Seven Day Drift, Cycle Time, Linearity, RATA, and B ias tests are summarized in the following results tables. The supporting data is contained in several appendices to this report.

The linearity, cycle time, and 7 day drift testing was performed by a B&W Field Service engineer and all relative accuracy testing, except for Hg, was performed by Alliance Source Testing. T he testing to determine the relative accuracy of the sorbent trap system was performed by Clean Air Engineering. The body of this report will summarize the RATA testing, however full test reports from Alliance and Clear Air are contained in Appendices to this report.

Results Table 1: Unit 1 7-Day Drift Test Results

Parameter	Highest 24 Hour Drift Reading	Criteria	Status	Test Dates
CO_2	zero = 0.10% CO_2 Difference span = 0.06% CO_2 Difference	≤ 0.5% CO_2 difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14
CO – High Range	zero = 0.04% span = 2.06%	≤ 2.5% of span or 5ppm absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14
CO – Low Range	zero = 0.20% span = 3.42 ppm absolute difference	≤ 2.5% of span or 5ppm absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14
$FLOW_a$	zero = 0.10% span = 0.23%	≤ 3.0% of span or 0.01" of H_2O absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/4-10/14
$FLOW_b$	zero = 0.10% span = 0.40%	≤ 3.0% of span or 0.01" of H_2O absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/4-10/14
NO_X – High Range	zero = 0.00% span = 1.26%	≤ 2.5% of span or 5ppm absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14
NO_X – Low Range	zero = 0.40% span = 1.05%	≤ 2.5% of span or 5ppm absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14
SO_2 – High Range	zero = 0.00% span = 0.61%	≤ 2.5% of span or 5ppm absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14
SO_2 – Low Range	zero = 0.00% span = 2.33%	≤ 2.5% of span or 5ppm absolute difference (40 CFR Part 75, Appendix A, Section 3.1)	Pass	02/1-7/14

Results Table 2: Unit 1 Cycle Time Test Results

Test Type	Mean Cycle Time	Criteria	Status	Test Date
CO_2 Cycle Time	Downscale:3 minutes Upscale: 4 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
CO_2 Analyzer Cycle Time: 4 minutes				
CO Cycle Time – Low Range	Downscale: 4 minutes Upscale: 4 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
CO Cycle Time – High Range	Downscale:4 minutes Upscale: 4 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
CO Analyzer Cycle Time: 4 minutes				
NO_X Cycle Time – Low Range	Downscale: 4 minutes Upscale: 4 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
NO_X Cycle Time – High Range	Downscale: 4 minutes Upscale: 4 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
NO_X Analyzer Cycle Time: 4 minutes				
SO_2 Cycle Time – Low Range	Downscale: 4 minutes Upscale: 5 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
SO_2 Cycle Time – High Range	Downscale: 4 minutes Upscale: 5 minutes	≤ 15 minutes (40 CFR Part 75, Appendix A, Section 3.5)	Pass	02/12/14
SO_2 Analyzer Cycle Time: 5 minutes				
System Cycle Time: 5 minutes				

Results Table 3: Unit 1 Linearity Test Results

Test Type	Results	Criteria	Status	Test Date
CO_2 Linearity	Low = 4.0% / 0.20 % CO_2 abs. diff.	5 % of reference gas or 0.5 %CO_2 absolute difference	Pass	02/11/14
	Mid = 0.36% / 0.04 % CO_2 abs. diff.			
	High = 2.38% / 0.43 % CO_2 abs. diff.			
CO Low Range Linearity	Low = 1.06% / 0.26 ppm abs. diff.	5 % of reference gas or 5 ppm absolute difference	Pass	02/11/14
	Mid = 0.94% / 0.52 ppm abs. diff.			
	High = 0.99% / 0.91 ppm abs. diff.			
CO High Range Linearity	Low = 1.86%	5 % of reference gas[1]	Pass	02/11/14
	Mid = 0.23%			
	High = 1.36%			
NO_X Low Range Linearity	Low = 0.50% / 0.13 ppm abs. diff.	5 % of reference gas or 0.5 %CO_2 absolute difference	Pass	02/11/14
	Mid = 0.45% / 0.25 ppm abs. diff.			
	High = 0.57% / 0.49 ppm abs. diff.			
NO_X High Range Linearity	Low = 0.42 %	5 % of reference gas[1]	Pass	02/11/14
	Mid = 1.06 %			
	High = 1.64 %			
SO_2 High Range Linearity[2]	Low = 1.77% / 0.43 ppm abs. diff.	5 % of reference gas or 5 ppm absolute difference	Pass	02/11/14
	Mid = 0.68% / 0.38 ppm abs. diff.			
	High = 1.05% / 0.93 ppm abs. diff.			

[1] Due to the analyzer range being higher than 200ppm, the alternate pass fail criteria is not applicable
[2] In accordance with 40 CFR 75, Appendix A, Section 6.2 linearity tests are not required for analyzer ranges ≤ 30ppm.

Results Table 4: Unit 1 NO_X Rate Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
NO_X lb/MMBtu – Relative Accuracy (RA)	Relative accuracy of 5.5%	Relative Accuracy ≤ 10% or if the emissions are less then 0.2 lb/MMBtu then an absolute difference ≤ 0.02 (40 CFR Part 75, Appendix A, Section 3.3.2 (a)(b) Annual Incentive: Relative Accuracy ≤ 7.5% or absolute difference ≤ 0.015 (40 CFR Part 75, Appendix B, Section 2.3.1.2(a)(f)	Passes criteria for yearly RATA testing	02/13/14
NO_X Bias Adjustment Factor (BAF)	1.000	mean difference between the CEMS and Reference Method data (during the RATA) is ≤ absolute value of the confidence coefficient	Pass	02/13/14
CO2 % - RATA	Relative Accuracy of 1.8%	Relative Accuracy < 10% Annual Incentive: Relative accuracy < 7.5 %	Passes criteria for yearly RATA testing	02/13/14

Results Table 5: Unit 1 SO_2 Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
SO2 ppmvw Relative Accuracy	Absolute Difference = 1.2 ppm	For units with an average reference method value ≤ 250.0 ppm, the mean difference between the CEMS and Reference Method data shall not exceed ± 12.0 ppm for annual testing (40 CFR Part 75, Appendix B, Section 2)	Passes criteria for yearly RATA testing	02/13/14
SO_2Bias Adjustment Factor (BAF)	1.000	mean difference between the CEMS and Reference Method data (during the RATA) is ≤ absolute value of the confidence coefficient	Pass	02/13/14

Results Table 6: Unit 1 CO Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
CO ppmvw – RATA	Difference plus confidence coefficient 0.37 ppm.	The mean difference of between the reference method and CEMS plus the confidence coefficient must be ≤ 5ppm (40 CFR Part 60 Appendix B, PS4a)	Pass	02/13/14
CO lb/MMBtu – RATA	Relative Accuracy of 0.4%	Relative Accuracy ≤ 10% or if the emissions are less then 0.2 lb/MMBtu then an absolute difference ≤ 0.02 (40 CFR Part 75, Appendix A, Section 3.3.2 (a)(b) Annual Incentive: Relative Accuracy ≤ 7.5% or absolute difference ≤ 0.015 (40 CFR Part 75, Appendix B, Section 2.3.1.2(a)(f)	Pass	02/13/14

Results Table 7: Unit 1 High Load Flow Rate Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
Path AB kscfh	Relative accuracy of 3.0%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/13/14
Path A kscfh	Relative accuracy of 5.7%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/13/14
Path B kscfh	Relative accuracy of 0.9%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/13/14
BAF– Path AB	1.000	mean difference between the CEMS and Reference Method data (during the RATA) is ≤ absolute value of the confidence coefficient	Pass	02/13/14
BAF – Path A	1.000		Pass	02/13/14
BAF – Path B	1.000		Pass	02/13/14

Results Table 8: Unit 1 Mid Load Flow Rate Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
Path AB kscfh	Relative accuracy of 3.6%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/12/14 and 02/13/14
Path A kscfh	Relative accuracy of 0.6%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/12/14 and 02/13/14
Path B kscfh	Relative accuracy of 6.4%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/12/14 and 02/13/14
BAF– Path AB	1.029	mean difference between the CEMS and Reference Method data (during the RATA) is ≤ absolute value of the confidence coefficient	Fail See BAF in Results Column	02/12/14 and 02/13/14
BAF – Path A	1.000		Pass	02/12/14 and 02/13/14
BAF – Path B	1.059		Fail See BAF in Results Column	02/12/14 and 02/13/14

Results Table 9: Unit 1 Low Load Flow Rate Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
Path AB kscfh	Relative accuracy of 0.3%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/12/14
Path A kscfh	Relative accuracy of 1.1%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/12/14
Path B kscfh	Relative accuracy of 1.2%	Relative Accuracy ≤ 10% Annual Incentive: Relative accuracy ≤ 7.5 % at each operating level tested	Passes criteria for yearly RATA testing	02/12/14
BAF– Path AB	1.000	mean difference between the CEMS and Reference Method data (during the RATA) is ≤ absolute value of the confidence coefficient	Pass	02/12/14
BAF – Path A	1.000		Pass	02/12/14
BAF – Path B	1.006		Fail See BAF in Results Column	02/12/14

Results Table 10: Unit 1 Hg Relative Accuracy Test Results

Parameter	Results	Specification	Status	Test Date
Hg	10.2%	Relative Accuracy ≤ 20% of mean reference method value in terms of units of µg/dscm, or if mean reference method test data is less than 5.0 µg/dscm, then an absolute difference < 1.0 µg/dscm.	Pass	02/11/14 and 2/12/14

Note: all non flow RATA testing was performed at normal load, as described in 40 CFR Part 75, Appendix A, Section 6.5.2.1. This criterion also meets the part 60 criteria of ≥ 50% of maximum load. The flow RATA was performed at three operating loads, as described in 40 CFR 75 Appendix A, Section 6.5.2.1.

3.0 Test Procedures

The test procedures used for this program were in accordance with the methods as outlined in the Code of Federal Regulations (CFR), Title 40, Parts 60 and 75.

3.1 Calibration Error Test

An on-site calibration error test (7-day drift test) was performed for all ranges of the Unit 1 NO_X, SO_2, CO_2, CO, and stack flow analyzers in accordance with 40 CFR Part 75, Appendix A, Section 6.3. Theses tests were performed while the units were combusting fuel at typical stack temperature and pressure conditions.

The calibration error tests consisted of measuring the calibration error of each monitor scale once each day for seven (7) consecutive operating (on line) days. DTE has elected to follow the alternate method of using the mid level calibration gases to perform the calibration error testing. This option has been chosen in an effort to calibrate the analyzers at a value that is representative of actual emissions during normal operation. The calibration error tests were conducted at two EPA Protocol calibration gas concentrations: zero-level (0-20% of span) and mid level (50-60% of span) as specified in 40 CFR Part 75, Appendix A, Section 6.3.1.

In accordance with 40 CFR Part 75, Appendix A, Section 3.1, results of the 7-day calibration error test are acceptable if the daily calibration error does not exceed: 2.5% for the NO_x, and SO_2 analyzers, 0.5% for the CO_2, and 3.0% for the stack flow. Alternatively, if the pollutant monitor's span value is equal to or less than 200 ppm, then calibration error shall not exceed 5.0 ppm difference. Since DTE has elected to certify the CO analyzers in accordance with 40 CFR Part 75, the allowable calibration error criteria of 2.5% or 5 ppm difference where applicable, will be applied. This pass fail criteria is more stringent than the 40 CFR Part 60 required drift test criteria.

Calibration checks were performed automatically at approximately 24-hour intervals by the iNET during the drift test period. The readings for each analyzer were taken from the DAHS at the completion of the calibration routine. Copies of the DAHS reports are contained in Appendix A of this test report. No adjustments were made to the analyzers during the 7 day drift test.

The percent calibration error was determined using the following equation:

Percent Calibration Error (40CFR Part75, Appendix A, Equation A-5)	
Equation:	**Where:**
Pollutant Monitor $CE = \frac{\lvert R - A \rvert}{S} \times 100$ Diluent Analyzer $CE = \lvert R - A \rvert$	CE = Calibration error as a percentage of instrument span. R = Zero or high level calibration gas value in ppm or %; or reference signal for flow. A = Actual monitor response to calibration gas in ppm or %; or reference signal for flow. S = Span of the instrument.

3.2 Cycle Time Test

The cycle time test measures the monitor's reaction time to a change in gas concentration. Zero and span (80-100% of full scale range) gases were utilized to perform this testing for all analyzers. The test was performed on all ranges of the NO_X, SO_2, CO_2, and CO analyzers. Certified EPA Protocol gases, obtained from a PGVP participating vendor, were used to complete the testing in accordance with 40 CFR Part 75 Appendix A, Section 6.4.

To conduct the downscale portion of the Cycle Time test, a stable flue gas emission level was determined. The stable value was recorded and then a zero-level concentration gas was injected into the system. The time of the zero gas injection was recorded using the DAHS. The monitor was allowed to measure the zero-level gas concentration until the response stabilized. The stabilized ending gas calibration value and time were then recorded. The response time is the time interval from the stable cal gas value reading to 95% of the stable flue gas reading.

The procedure was then repeated for the upscale portion of the Cycle Time test by returning the system to read stack flue gases. After the stack flue gas readings stabilized, a high-level calibration gas was injected until the monitor measured a stable high-level gas concentration. The stabilized start and end values and times were recorded. The time for the system to record 95% of the stable ending value was then determined.

The upscale and the downscale cycle times were compared for all ranges of the NO_X, SO_2, CO_2, and CO analyzers. The longer (slowest) of these times was recorded as the cycle time for the analyzer. For the dual range analyzers, the cycle time for that analyzer was reported based on the range with the longest response time. The Cycle Time is considered acceptable if the cycle time does not exceed 15 minutes.

The following criteria were used to assess when a stable reading of stack emissions or calibration gas concentration was attained. A stable value is defined as a reading with a change of less than 2.0 percent of the span value for 2 minutes, or a reading with a change of less than 6.0 percent from the measured average concentration over 6 minutes. Alternatively, the reading can also be considered stable if it changes by no more than 0.5 ppm or 0.2% for CO_2 for two minutes. For monitors or monitoring systems that perform a series of operations (such as purge, sample, and analyze), timing of the injections of the calibration gases will be done so that they will produce the longest possible cycle times.

The Cycle Time data sheets and supporting CEM data can be found in Appendix B.

3.3 Linearity Test

On-site linearity tests were conducted in accordance with the 40 CFR 75, Appendix A, for the Unit 1 NO_X, SO_2, CO_2, and CO analyzers. CEMS. The tests were performed while the unit was combusting primary fuel at typical stack temperature and pressure conditions. It was not necessary for the unit to be generating electricity during the test.

EPA Protocol gases were used to conduct the linearity checks for the analyzers. Three concentrations of calibration gases, low (20-30% of analyzer span), mid (50-60% of analyzer span) and high (80-100% of analyzer span) were introduced at the probe (40 CFR 75, Appendix A, Section 5.2).

Each monitor was challenged three times with the appropriate EPA Protocol reference gas, without using the same gas twice in succession. The monitors' response for each concentration was then recorded. The average of the three responses was used to calculate the linearity error (40 CFR 75, Appendix A, Section 6.2).

Linearity tests were performed on the SO_2 and CO_2 analyzer and both ranges of the NO_X and CO analyzers.

Linearity error was calculated using the following equation:

Linearity Error (40 CFR 75, Appendix A, Section 7.1, Equation A-4):	
Equation:	**Where:**
Primary pass/fail equation $LE = \frac{\lvert R - A \rvert}{R} \times 100$ Alternate pass/fail equation $LE = \lvert R - A \rvert$	LE = Linearity Error, percent accuracy of the CEM. R = Calibration gas reference value. A = Average of monitor response.

Linearity checks are acceptable for monitor certification if the test results do not exceed the applicable performance specification of 40 CFR 75, Appendix A, Section 3.2. The results, for all applicable ranges, of the pollutant analyzers shall be less than 5.0% as calculated by the above equation or the alternative criteria of ≤ 0.5% CO_2 or ≤ 5 ppm difference for the pollutant analyzers.

3.4 Protocol Gas Verification Program (PGVP)

EPA Protocol One gas cylinders were used for the above mentioned cycle response time and linearity tests. In accordance with 40 CFR 75.21(g) and 40 C FR 75, Appendix A, Section 6.5.10 these gases were also obtained from a gas vendor that is actively participating in the protocol gas verification program. The above mentioned tests were not be performed with any gases that were lab certified after May 27, 2011 by a gas production facility that is not a participant in the PGVP program.

The calibration gas cylinders used to calibrate the reference method analyzers used for the RATA testing, mentioned in Section 7 also followed the above criteria.

3.5 DAHS Verification Tests

The DAHS formulae listed in the Monitoring Plan data type "Monitoring Formula Data" were tested shortly after the completion of the certification test program. Missing data substitution routines will also be verified through the DVAC routine of the DAHS software. Hard copies of both of these tests can be found in Appendix E of this report.

3.6 Air Emission Testing Body (AETB) Requirements

As required in 40 CFR 75, Appendix A, Section 6.1.2, the RATA testing was performed by an Air Emission Testing Body (AETB) that was in compliance with ASTM D7306-04. The AETB did have at least one Qualified Individual (QI), qualified for the test methods performed, on site during the testing.

All of Alliance's AETB and QI information is included in the full RATA test report contained in Appendix F of this document.

3.7 NO_X Emission Rate System Relative Accuracy Test Audit

EPA Test Methods 3A and 7E were used as the Reference Methods for certification of the NO_x emission rate monitoring system. A sample was continuously extracted from the effluent gas stream. A portion of the sample stream was then conveyed to an instrumental chemiluminescent analyzer for the determination of NO_x concentration. Another portion of the sample was conveyed to an Non Dispersive Infrared (NDIR) analyzer for the determination of the CO_2 concentration. When using Method 7E in appendix A–4 to 40 CFR Part 60 for measuring NO_x concentration, total NO_X, both NO and NO_2, must be measured. The NO_x RATA was conducted simultaneously with the SO_2, CO_2 and CO relative accuracy testing. Ten sample runs, 21 minutes in duration, were performed to determine relative accuracy for Unit 1 NO_X emission rate monitoring system.

Prior to sampling it was determined that the stack was not stratified, based on the criteria in 40 CFR Part 60, Appendix A, Method 7E, Section 8.1.2, and that single point sampling was appropriate for this project. The difference between the Reference Method sample and the NO_X monitor's reading was evaluated from the paired monitor and Reference Method test data (40 CFR Part 75, Appendix A, Section 6.5.9). From these differences, the 95% confidence coefficient was calculated, and the relative accuracy determined (40 CFR Part 75, Appendix A, Section 7.3). All sample runs, including those not used in the RA calculation are contained in Appendix F of this test report.

The NO_x relative accuracy was established on-site. In accordance with 40 CFR 75, Appendix A, Section 3.3.2, the NO_x RATA results are acceptable if the NO_x relative accuracy does not exceed 10.0% (semiannual). Alternatively, if during the RATA the average NO_x emission rate is less than or equal to 0.20 lb/MMBtu, the mean value of the NO_x CEMS must not exceed ±0.02 lb/MMBtu of the Reference Method mean value. The alternative criteria will only be utilized if the 10% relative accuracy requirement is not achieved. Under the incentive program if the RATA results are ≤7.5% then the next RATA can be performed on an annual basis rather than semiannual. Alternately, if the average NO_x emission rate is less than or equal to 0.20 lb/MMBtu, the mean difference must not exceed ±0.015 lb/MMBtu for annual pass/fail criteria.

It was determined that the NO_X analyzer met the alternative criteria of PART 75 and will only require annual testing.

3.8 SO2 Relative Accuracy Test Audit

EPA Test Method 6C was used as the Reference Method for certification of the SO_2 monitoring system. This method is an instrumental analyzer procedure. A sample is continuously extracted from the effluent gas stream. A portion of the sample stream is conveyed to an ultraviolet (UV), nondispersive (NDIR), or fluorescence analyzer for the determination of SO_2 concentration. Ten

sample runs, 21 minutes in duration, were performed to determine relative accuracy for Unit 1 SO_2 analyzer.

Prior to sampling it was determined that the stack was not stratified, based on the criteria in 40 CFR Part 60, Appendix A, Method 7E, Section 8.1.2, and that single point sampling was appropriate for this project. The difference between the Reference Method sample and the SO_2 monitor's reading was evaluated from the paired monitor and Reference Method test data (40 CFR 75, Appendix A, Section 6.5.9). From these differences, the 95% confidence coefficient was calculated, and the relative accuracy determined (40 CFR 75, Appendix A, Section 7.3). All sample runs, including those not used in the RA calculation are contained in Appendix F of this test report.

The SO_2 relative accuracy was established on-site. In accordance with 40 CFR 75, Appendix A, Section 3.3.1, the SO_2 RATA results are acceptable if the SO_2 relative accuracy does not exceed 10.0% (semiannual). Alternatively, if during the RATA the average SO_2 emission rate is less than or equal to 250.0 ppm, the difference between the mean value of the SO_2 CEMS must not exceed ±15.0 ppm of the Reference Method mean value, whenever the RA specification of 10% is not met. The alternative criteria will only be utilized if the 10% relative accuracy requirement is not achieved. Under the incentive program if the RATA results are ≤7.5% then the next RATA can be performed on an annual basis rather than semiannual. Additionally, testing frequency may be reduced to annually if the test results are ±12 ppm.

It was determined that the SO_2 analyzer met the alternative criteria of PART 75 and will only require annual testing.

3.9 CO2 Relative Accuracy Test Audit

Relative accuracy of the CO_2 monitor (diluent gas) was conducted concurrently with the pollutant gas tests. EPA Test Method 3A, an instrumental test method was the reference method for this recertification program. A portion of the sample stream is conveyed to a Non Dispersive Infrared (NDIR) analyzer for the determination of CO_2 concentration Ten sample runs, 21 minutes in duration, were performed to determine relative accuracy for Unit 1 CO_2 analyzer.

Prior to sampling it was determined that the stack was not stratified, based on the criteria in 40 CFR Part 60, Appendix A, Method 7E, Section 8.1.2, and that single point sampling was appropriate for this project. The differences between the Reference Method sample and the CO_2 monitor's readings were evaluated from the paired monitor and Reference Method test data (40 CFR 75, Appendix A, Section 6.5.9). From these differences, the 95% confidence coefficient is calculated, and the relative accuracy determined (40 CFR 75, Appendix A, Section 7.3). All sample runs, including those not used in the RA calculation are contained in Appendix F of this test report.

The CO_2 relative accuracy was established on-site. In accordance with 40 CFR 75, Appendix A, Section 3.3.3, the CO_2 RATA results are acceptable if the CO_2 relative accuracy does not exceed 10.0% (semiannual). Alternately, results are acceptable if the mean difference of the CO_2 monitor measurements and the corresponding Reference Method measurements, calculated using Equation A-7 of 40 CFR 75, Appendix A, are within ±1.0% CO_2. Under the incentive program if the RATA results are ≤7.5% or the mean difference does not exceed ±0.7% CO_2 then the next RATA can be performed on an annual basis rather than semiannual.

It was determined that the CO_2 analyzer met the alternative criteria of PART 75 and will only require annual testing.

3.10 CO Relative Accuracy Test Audit

EPA Test Method 10 was used as the Reference Method for certification of the CO monitoring system. A sample is continuously extracted from the effluent gas stream. A portion of the sample stream is conveyed to a gas filter correlation analyzer for the determination of CO concentration. The CO RATA was conducted separately from the NO_X, SO_2, and CO_2 RATAs. Ten sample runs, 21 minutes in duration, were performed to determine relative accuracy for Unit 1 CO analyzer.

Prior to sampling it was determined that the stack was not stratified, based on the criteria in 40 CFR Part 60, Appendix A, Method 7E, Section 8.1.2, and that single point sampling was appropriate for this project. The difference between the Reference Method sample and the CO monitor's reading was evaluated from the paired monitor and Reference Method test data (40 CFR 60, Appendix B, PS2, Section 8.4.4). From these differences, the 95% confidence coefficient was calculated, and the relative accuracy determined (40 CFR 60, Appendix B, PS2, Section 8.4.5.1). All sample runs, including those not used in the RA calculation are contained in Appendix F of this test report.

The CO relative accuracy was established on-site. In accordance with 40 CFR 60, Appendix B, PS4, Section 13.2, the CO RATA results are acceptable if the relative accuracy does not exceed 10%, when the average reference method value is used to calculate the RA, and 5% when using the applicable standard in the denominator of the equation.

It was determined that the CO analyzer met the criteria of PART 60 and will require annual testing.

3.11 Mercury Relative Accuracy Test Audit

EPA Test Method 30B was used as the Reference Method for certification of the Hg monitoring system.

Method 30B is a procedure for measuring total vapor phase mercury (Hg) emissions from coal-fired combustion sources using sorbent trap sampling and an extractive or thermal analytical technique. This method is only intended for use only under relatively low particulate conditions (e.g., sampling after all pollution control devices). Method 30B requires a minimum run time of 30 minutes.

The difference between the Reference Method sample and the Hg monitor's reading was evaluated from 12 sets of paired monitor and Reference Method test data. From these differences, the 95% confidence coefficient was calculated and the relative accuracy determined. Any tests not included in the calculations for the determination of relative accuracy (maximum of three) are included in the final test report.

The Hg relative accuracy was established on-site. CleanAir Engineering performed the analytical thermal desorption analysis on both the STMMS samples and the reference method samples. In accordance with 40 CFR 60, Appendix B, Specification 12B and R 336.2158, the Hg relative accuracy test results are acceptable if the relative accuracy of the sorbent trap

monitoring system is no greater than 20 percent of the mean value of the RM test data in terms of units of µg/dscm . Alternatively, if the mean RM is less than 5.0 µg/dscm, the results are acceptable if the absolute value of the difference between the mean RM and STMMS values does not exceed 1.0 µg/dscm.

3.12 Bias Test

A bias test was performed on the NO_x, SO_2,and stack flow monitoring in accordance with 40 CFR Part 75, Appendix A, Section 6.5 and 7.6. The bias test was performed using the same data sets as those used to calculate the relative accuracy at the normal operating level.

According to 40 CFR Part 75, Appendix A, Section 7.6.4, If the mean difference is greater than the absolute value of the confidence coefficient, the monitor fails the bias test requirements, and the values shall be adjusted for bias from the time of the test failure until the next relative accuracy test shows no bias (40 CFR Part 75, Appendix A, Sections 3.4.1 and 3.4.2).

The results of the Bias tests are summarized in the tables located in Section 2 of this report.

Bias Adjustment (A-11, 40 CFR Part 75, Appendix A, Section 7.6.5):	
Equation:	**Where:**
$CEM_i^{Adjusted} = CEM_i^{Monitor} \times BAF$	$CEM^{Adjusted}$ = Data value, adjusted for bias, at time i $CEM^{Monitor}$ = Data (measurements) provided by the monitor at time i BAF = Bias adjustment factor

Bias Adjustment (A-12, 40 CFR Part 75, Appendix A, Section 7.6.5):	
Equation:	**Where:**
$BAF = 1 + \frac{\lvert\bar{d}\rvert}{\overline{CEM}_{avg}}$	BAF = Bias adjustment factor $\bar{d}$ = Arithmetic mean of the difference obtained during the failed bias test from the arithmetic mean calculation of the relative accuracy test audit $\overline{CEM}_{avg}$ = Mean of the data values provided by the monitor during the failed bias test