

**CUSTOM INSTRUMENTATION
SERVICES CORPORATION**



RECEIVED

JUL 17 2017

AIR QUALITY DIV.

**HOLLAND ENERGY PARK
HOLLAND, MICHIGAN
ORIS CODE: 59093
UNIT 10 & UNIT 11**

CEMS INITIAL CERTIFICATION REPORTS

PREPARED FOR: BARTON MALOW COMPANY

PREPARED BY: CUSTOM INSTRUMENTATION SERVICES, CORP. (CISCO)

Date: July 12, 2017

Revision: 0

COPY NO:

1. INTRODUCTION

The Holland Energy Park located in Ottawa County, Michigan consists of two nominally rated 554 MMBtu/hr combined cycle natural gas-fired combustion turbine generators (CTG) coupled with a heat recovery steam generator (HRSG) with a steam turbine generator (STG). The HRSG is not capable of operating independently from the CTG. The CTG/HRSGs are equipped with dry low NO_x burners (DLNB), selective catalytic reduction (SCR) and oxidation catalysts. The gas turbines are fired exclusively with pipeline quality natural gas. The maximum design heat capacity is 593 mmBtu/hr for each CTG/HRSG train. The net heat rate for the CTG/HRSG pairs combined, will not exceed 8,361 btu/kW-hr (HHV-net) at the following reference conditions: ambient temperature of 84°F, 56% relative humidity, ambient pressure at the mean site elevation, baseload operation without duct firing, and not accounting for transformer losses. Exhaust gases from the turbine are discharged into the atmosphere through a stack approximately 160 feet above grade. A dedicated CEMS monitors NO_x, CO and O₂ emissions and gas fuel flow from each unit. This report represents the certification testing performed on Unit 10 and Unit 11.

Custom Instrumentation Services Corporation of Englewood, Colorado built the Continuous Emission Monitoring System. Data from the CEMS is recorded and stored on a Data Acquisition and Handling System designed by Environmental Services Corporation (ESC).

The CEMS on combustion turbines Unit 10 and Unit 11 were designed to meet the monitoring and reporting requirements of Michigan Department of Environmental Quality (MDEQ) Permit No. 107-13E; and regulatory requirements 40 CFR 60 and 40 CFR 75. This report presents the results of testing on the NO_x, CO and O₂ analyzers. The testing was performed to meet the requirements of 40 CFR 60, Appendix B, Performance Specifications 2, 3, 4/4a and 40 CFR 75, Appendix A. The certification requirements of 40 CFR 75 are applied to the NO_x and O₂ analyzers.

Field certification testing on the Unit 10 and Unit 11 CEMS occurred between March 31 and May 18, 2017; and March 30 and May 18, 2017, respectively for 40 CFR 60 and 40 CFR 75 requirements. The tests conducted on the CEMS included Relative Accuracy, Bias Check, Calibration Error, Linearity, and Response Time/Cycle Time. A printout of the test results from EPA's Emissions Collection and Monitoring Plan System Software is provided in Appendix 1. Tests were also conducted on the Data Acquisition and Handling System (DAHS).

McHale & Associates, Inc. (McHale) of Knoxville, TN conducted Relative Accuracy (RA) testing for NO_x, CO and O₂. On April 3 and April 4, 2017, ten (10) 21-minute runs were completed. The results of the RA tests are summarized in Tables 1 and 2. As shown, the Relative Accuracy calculations on the analyzers were within the EPA and MDEQ requirements for all parameters. A detailed description of the RA testing is provided in Section 2.1 and the Mchale test reports are in Appendix 6.

Bias check evaluations were made on the NO_x lb/mmBtu relative accuracy results as required in 40 CFR 75. The bias adjustment factors for the NO_x monitoring systems (NO_x lb/mmBtu) are provided in Tables 1 and 2. The bias test results are discussed in Section 2.2. Supporting data is provided in the relative accuracy tables in the McHale RA report in Appendix 6.

The Calibration Drift tests for Unit 10 and Unit 11 occurred from March 31 through April 6, 2017; and March 30 through April 4, 2017, respectively during seven consecutive operating days for 40 CFR 75 and 40 CFR 60 requirements. The results of the analyzer drift tests are summarized in Tables 1 and 2. As shown, the analyzers operated well within the applicable requirements. An explanation of the drift tests are provided in Section 2.3 and supporting documentation is provided in Appendix 2 of this report.

Linearity and Cycle Time / CO Response Time tests on the NO_x and O₂ (and CO) analyzers are requirements of 40 CFR 75 (40 CFR 60 for the CO Response Time Test). The Linearity tests for Unit 10 and Unit 11 took place on April 5, 2017, and the Cycle Time / CO Response Time tests for Unit 10 and Unit 11 took place on May 18, 2017. The results of the tests are summarized in Tables 1 and 2. As shown, the analyzers operated well within EPA requirements for all parameters. An explanation of the linearity test is provided in Section 2.4. Explanations of the cycle and response time tests are provided in Section 2.5. Audit reports for the linearity test and supporting documents for the cycle/response time tests are also provided in Appendices 3 and 4, respectively.

The DAHS verification tests and formula verification took place on April 3, 2017. The DAHS passed all the tests required by EPA. The DAHS tests are described in Section 3 and supporting documents are provided in Appendix 5.

In summary, the CEMS at Holland Energy Park provides reliable data and operates within the requirements of the EPA as outlined in 40 CFR 60, Appendix B, Performance Specifications 2, 3, 4a, and 40 CFR 75, Appendix A and meets the requirements of the Michigan Department of Environmental Quality for CEMS.

TABLE 1.
SUMMARY OF UNIT 10 CEMS CERTIFICATION RESULTS

UNIT 10	RESULTS	STANDARD	PASS / FAIL
RELATIVE ACCURACY			
NO _x lb/mmBtu-75	2.61% RA ¹	7.5% RA	PASS
NO _x ppm @ 15% O ₂	2.17% RA RM	20% RA RM or 10% RA AS	PASS
NO _x lb/hr	2.44% RA RM	20% RA RM or 10% RA AS	PASS
CO ppm @ 15% O ₂	0.03 ppm MD ²	5 ppm MD (abs d +cc)	PASS
O ₂	0.2% MD	1% MD	PASS
BIAS TEST			
Adjustment Factor	1.000	NOT REQUIRED	PASS
7-DAY ZERO DRIFT			
NO _x -LOW	2.0% of span	2.5 % of span or 5 ppm	PASS
NO _x -HIGH	0.1% of span	2.5 % of span or 5 ppm	PASS
CO-LOW	2.0% of span	5 % of span	PASS
CO-HIGH	0.0% of span	5 % of span	PASS
O ₂ %	0.0% O ₂	0.5% O ₂	PASS
7-DAY CALIBRATION DRIFT			
NO _x -LOW	1.0% of span	2.5 % of span or 5 ppm	PASS
NO _x -HIGH	0.5% of span	2.5 % of span or 5 ppm	PASS
CO-LOW	3.0% of span	5 % of span	PASS
CO-HIGH	1.2% of span	5 % of span	PASS
O ₂ %	0.3% O ₂	0.5% O ₂	PASS
LINEARITY			
NO _x	2.7% LE	5% LE or 5 ppm	PASS
O ₂ %	2.0% LE	5% LE	PASS
CYCLE/RESPONSE TIME			
NO _x -LOW	2 Minutes	15 Minutes	PASS
NO _x -HIGH	3 Minutes	15 Minutes	PASS
O ₂ %	2 Minutes	15 Minutes	PASS
CO-Low	2 Minutes	4 Minutes	PASS
ANALYZER SERIAL NUMBERS			
NO _x	1152020016		
CO	JC1515901569		
O ₂	1152020016		

WHERE: RA = RELATIVE ACCURACY RESULTS BASED ON REFERENCE METHOD MEAN VALUE

MD = MEAN DIFFERENCE

1 = RATA RESULTS REQUIRED FOR ANNUAL RATA FREQUENCY FOR 40 CFR 75

2 =RELATIVE ACCURACY RESULTS BASED MEAN DIFFERENCE PLUS CONFIDENCE COEFFICIENT

DRIFT LIMITS MEET BOTH 40CFR60, APPENDIX B AND 40 CFR 75, APPENDIX A

DRIFT AND LINEARITY/CGA RESULTS ARE THE HIGHEST ENCOUNTERED DURING ALL TESTS

TABLE 2.
SUMMARY OF UNIT 11 CEMS CERTIFICATION RESULTS

UNIT 11	RESULTS	STANDARD	PASS / FAIL
RELATIVE ACCURACY			
NO _x lb/mmBtu-75	2.30% RA ¹	7.5% RA	PASS
NO _x ppm @ 15% O ₂	4.35% RA RM	20% RA RM or 10% RA AS	PASS
NO _x lb/hr	2.38% RA RM	20% RA RM or 10% RA AS	PASS
CO ppm @ 15% O ₂	0.0 ppm MD ²	5 ppm MD (abs d +cc)	PASS
O ₂	0.6% RA	1% RA	PASS
BIAS TEST			
Adjustment Factor	1.000	NOT REQUIRED	PASS
7-DAY ZERO DRIFT			
NO _x -LOW	1.0% of span	2.5 % of span or 5 ppm	PASS
NO _x -HIGH	0.1% of span	2.5 % of span or 5 ppm	PASS
CO-LOW	3.0% of span	5 % of span	PASS
CO-HIGH	0.1% of span	5 % of span	PASS
O ₂ %	0.0% O ₂	0.5% O ₂	PASS
7-DAY CALIBRATION DRIFT			
NO _x -LOW	1.0% of span	2.5 % of span or 5 ppm	PASS
NO _x -HIGH	0.5% of span	2.5 % of span or 5 ppm	PASS
CO-LOW	3.0% of span	5 % of span	PASS
CO-HIGH	1.0% of span	5 % of span	PASS
O ₂ %	0.3% O ₂	0.5% O ₂	PASS
LINEARITY/CGA			
NO _x	3.0% LE	5% LE or 5 ppm	PASS
O ₂ %	2.0% LE	5% LE	PASS
CYCLE/RESPONSE TIME			
NO _x -LOW	2 Minutes	15 Minutes	PASS
NO _x -HIGH	3 Minutes	15 Minutes	PASS
O ₂ %	3 Minutes	15 Minutes	PASS
CO-Low	3 Minutes	4 Minutes	PASS
ANALYZER SERIAL NUMBERS			
NO _x		1151970010	
CO		JC1515901575	
O ₂		1151970010	

WHERE: RA = RELATIVE ACCURACY RESULTS BASED ON REFERENCE METHOD MEAN VALUE

MD = MEAN DIFFERENCE

1 = RATA RESULTS REQUIRED FOR ANNUAL RATA FREQUENCY FOR 40 CFR 75

2 =RELATIVE ACCURACY RESULTS BASED MEAN DIFFERENCE PLUS CONFIDENCE COEFFICIENT

DRIFT LIMITS MEET BOTH 40CFR60, APPENDIX B AND 40 CFR 75, APPENDIX A

DRIFT AND LINEARITY/CGA RESULTS ARE THE HIGHEST ENCOUNTERED DURING ALL TESTS

2. CEMS CERTIFICATION

Field tests and DAHS tests were performed for CEMS certification in accordance with the criteria in 40 CFR 60, Appendix B and 40 CFR Part 75, Appendix A. The results for all tests were determined from the data collected by the DAHS. The computer printouts for each field test are included in the Appendices.

2.1 RELATIVE ACCURACY

Relative accuracy testing was performed on April 3 and April 4, 2017 by McHale meets the EPA Air Emissions Testing Body (AETB) requirements. Each test run was a minimum of 21 minutes in duration and consisted of sampling for NO_x, CO and O₂. The times during which the tests were performed are shown in the McHale report.

The reference methods used by McHale are outlined below:

CONSTITUENT	METHOD
O ₂	EPA METHOD 3A
NO _x	EPA METHOD 7E
CO	EPA METHOD 10

As shown in the Relative Accuracy tables in the McHale report in Appendix 6, relative accuracy is reported as an error and is the sum of the absolute mean value of the differences between the reference method tests and the instrument readings, plus the 95 percent confidence interval of the differences, expressed as a percentage of the mean reference method value or the emission standard. As an alternative, 40 CFR 75 allows low NO_x emitters (less than 0.20 lb/mmBtu) to express relative accuracy as the difference between the average reference method value and the average CEMS value. Performance Specification 4a in 40 CFR 60, Appendix B also allows for CO relative accuracy results to be expressed as a mean difference between the reference method average value and CEMS average value.

The analyzer response was determined from the average of readings taken every minute for the duration of the time the relative accuracy tests were performed. The 1-Minute Data Reports from the CEMS are included in the McHale report.

The NO_x, CO and O₂ analyzers passed the relative accuracy requirements (as stated in 40 CRF 60, Appendix B 2, 3, and 4/4a). In addition, the NO_x and O₂ analyzers passed the relative accuracy requirements as stated in 40 CRF 75, Appendix A and the NO_x systems (NO_x and O₂ analyzer) qualify for annual RATA frequency under 40 CFR 75. The NO_x system had a relative accuracy and a mean difference significantly less than 7.5% and 0.015 lb/mmBtu, respectively.

2.2 BIAS CHECK

The relative accuracy result for NO_x lb/mmBtu was checked for low bias by determining if the mean difference between the test team's values and the CEMS values is greater than the absolute value of the confidence coefficient. The CEMS Units 10 and 11 did not exhibit bias. The bias adjustment factors (BAF) for each unit was determined to be 1.000 (see McHale report). In general, the BAF is determined after each RATA test.

2.3 CALIBRATION ERROR TEST

In general, the 7-day calibration error test required by 40 CFR 60 and 75 on the NO_x, CO, and O₂ analyzers for Unit 10 and Unit 11 occurred between March 31 and April 6, 2017; and between March 30 and April 5, 2017, respectively. All drift tests occurred on seven consecutive unit-operating days when the units were combusting fuel. The NO_x and O₂ calibration gases used for the calibration error test meet the requirements of the EPA 40 CFR 75, Appendix A Protocol Gas Verification Program (PGVP). The certificates of analysis for the cylinders are included in Appendix 8 of this report.

As shown, the calibration error for all analyzers were well within EPA requirements as stated in 40 CFR 60, Appendix B and 40 CFR 75, Appendix A. The calibration summary reports are provided in Appendix 2.

2.4 LINEARITY

The Unit 10 and Unit 11 NO_x and O₂ linearity tests were performed on April 5, 2017. To perform the linearity test, the high ranges of the NO_x analyzer and the O₂ analyzer were challenged three times with each of three levels of calibration gas (low, mid and high). The mean difference between the analyzer response and the calibration gas value, as a percentage of the calibration gas value, must be within 5%. Results are also acceptable if the difference between the mean response and the calibration gas is within 0.5% O₂. The result was well within the requirements of 40 CFR 75, Appendix A.

A summary of the linearity test results and the certificates of analysis for the cylinders are provided in Appendix 3. The calibration gases used for the linearity error tests meet the US EPA PGVP requirements of 40 CFR 75, Appendix A and are provided in Appendix 6.

2.5 CYCLE TIME/RESPONSE TIME

The Unit 10 and Unit 11 cycle time tests were performed on May 18, 2017. To perform the test, the NO_x and O₂ analyzers were challenged with a zero gas and high level (80 to 100% of span) calibration gas. Both the upscale and down scale response times were determined. As stated in 40 CFR 75, Appendix A, the response time to reach 95% of the gas value must be less than 15 minutes. For the NO_x system (NO_x and O₂ analyzer), the longer of the two analyzers response times is the response time for the system. The system response time met this requirement.

The Unit 10 and Unit 11 CO response time test were performed on May 18, 2017 to meet the requirements of 40 CFR 60. To perform this test, the CO analyzer was challenged with a zero gas and high level (50 to 100% of range) calibration gas. Both the upscale and down scale response time averages were determined. As stated in 40 CFR 60, Appendix B, Performance Specification 4A the response time to reach 95% of the gas value must be less than 4 minutes. For the upscale and downscale readings the longer of the two analyzers response times is the response time for the analyzer. The system response time met this requirement.

Audit reports that show the analyzers response in ten second increments are located in Appendix 4. The gas cylinders used to perform the NO_x/O₂ cycle time test meet the US EPA PGVP requirements of 40 CFR 75, Appendix A and are provided in Appendix 8.

3. DAHS VERIFICATION

A letter from the EDR software vendor Environmental Systems Corporation (ESC) stating that each of the missing data routines and calculations performed by the DAHS was verified is included in Appendix 5. A formula verification is also included. All variables included in the calculations (bias adjustment factor, fuel inputs) were used. The formula verification spreadsheet and associated printouts are also included in Appendix 5.

4. FUEL FLOWMETER DOCUMENTATION

Documents demonstrating fuel flowmeter calibrations as per 40 CFR 75 Appendix D are provided in Appendix 7.

5. DISCUSSION OF RESULTS

The CEMS and DAHS on the Unit 10 and Unit 11 combustion turbine generators at Holland Energy Park successfully met all the requirements of the EPA as outlined in 40 CFR 60 and 40 CFR 75. A certification file in the format specified by EPA for 40 CFR 75 has been prepared for analysis.