

## 1.0 INTRODUCTION

### 1.1 SUMMARY OF TEST PROGRAM

CMS Generation-Kalamazoo River Generating Station (CMS) contracted Montrose Air Quality Services, LLC (Montrose) to perform a NO<sub>x</sub> compliance emissions test program on the EUCOMBTURB01 at the facility located in Comstock, Michigan. The tests were conducted to determine compliance with the 40 CFR Part 60 Subpart KKKK requirements listed in permit number MI-ROP-N6731-2015b issued by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

The specific objectives were to:

- Measure emissions of NO<sub>x</sub> and O<sub>2</sub> at the normal running load on the outlet of the EUCOMBTURB01
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

**TABLE 1-1  
 SUMMARY OF TEST PROGRAM**

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
9/2/2020	EUCOMBTURB01	O <sub>2</sub>	EPA 3A	3	24
9/2/2020	EUCOMBTURB01	NO <sub>x</sub>	EPA 7E	3	24

To simplify this report, a list of Units and Abbreviations is included in Appendix C.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling location, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated July 31, 2020 that was submitted to the EGLE.

**TABLE 1-2  
 SUMMARY OF AVERAGE COMPLIANCE RESULTS -  
 EUCOMBTURB01  
 SEPTEMBER 2, 2020**

Parameter/Units	Average Results	Emission Limits
<b>Nitrogen Oxides (NO<sub>x</sub> as NO<sub>2</sub>)</b>		
ppmvd @ 15% O <sub>2</sub>	7.68	15
lb/hr	24.0	72.9

## 1.2 KEY PERSONNEL

A list of project participants is included below:

### Facility Information

Source Location: CMS Generation  
 Kalamazoo River Generating Station  
 6900 East Michigan Avenue  
 Comstock, Michigan 49093

Project Contact: Tim Morrison  
 Role: Plant Manager  
 Company: CMS Generation  
 Telephone: 269-385-8950  
 Email: timothy.morrison@CMS.com

### Agency Information

Regulatory Agency: EGLE  
 Agency Contact: Karen Kajiya-Mills  
 Telephone: 517-256-0880  
 Email: kajiya-millsk@michigan.gov

### Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC	
Contact: Matthew Young	Todd Wessel
Title: Division Manager	Client Project Manager
Telephone: 586-744-9133	616-885-4013
Email: myoung@montrose-env.com	twessel@montrose-env.com

Test personnel and observers are summarized in Table 1-3.

**TABLE 1-3  
TEST PERSONNEL AND OBSERVERS**

<b>Name</b>	<b>Affiliation</b>	<b>Role/Responsibility</b>
Todd Wessel	Montrose	Project Manager/Field Team Leader/Qualified Individual (QI)/Trailer operator
Shane Rabideau	Montrose	Sample train operator
Laurie Snyder	Montrose	Calculations and report preparation
Monica Brothers	EGLE, Air Quality Division	Observer
David Patterson	EGLE, Technical Programs Unit Field Operations Section Air Quality Division	Observer

## 2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

### 2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The KRGS facility located in Comstock, Michigan operates one simple-cycle combustion turbine that fires natural gas (NG).

The turbine has a nominal output capacity of approximately 86 Megawatts (MW). The turbine exclusively uses natural gas as the fuel. The turbine generator consists of a compressor, combustion turbine, and generator. Energy is generated at the combustion turbine by drawing in ambient air by means of burning fuel and expanding the hot combustion gases in a three-stage turbine.

### 2.2 FLUE GAS SAMPLING LOCATION

Information regarding the sampling location is presented in Table 2-1.

**TABLE 2-1  
 SAMPLING LOCATION**

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUCOMBTURB01	138 x 174	600 / 3.9	300 / 1.9	Stratification Check: 12 Gaseous: 1

Sample location(s) were verified in the field to conform to EPA Method 1. See Appendix A.1 for more information.

### 2.3 OPERATING CONDITIONS AND PROCESS DATA

In accordance with 40 CFR Part 60, Subpart KKKK, the emission tests were performed while the turbine was at a single load point within plus or minus 25 percent of peak load, depending upon actual ambient conditions.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Natural gas flow, scfh
- Turbine load, MW
- Heating value, MMBtu/hr

Process data times are presented in Eastern Standard Time (EST). Montrose times are presented in Eastern Daylight Time (EDT), resulting in a one-hour difference.

### 3.0 SAMPLING AND ANALYTICAL PROCEDURES

#### 3.1 TEST METHODS

The test methods for this test program were presented previously in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

##### 3.1.1 EPA Methods 3A and 7E, Determination of Oxygen and Nitrogen Oxides Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedures)

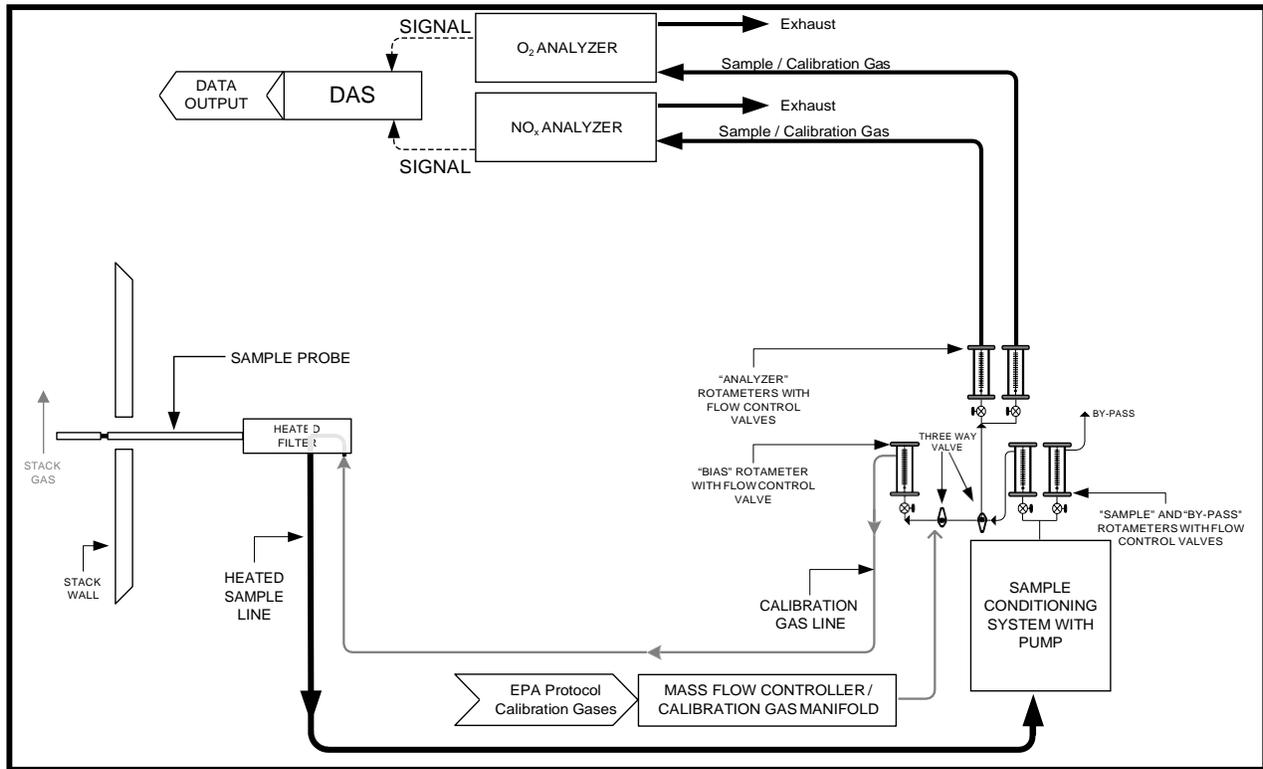
Concentrations of O<sub>2</sub> and NO<sub>x</sub>, and CO are measured simultaneously using EPA Methods 3A and 7E, which are instrumental test methods. Conditioned gas is sent to a series of analyzers to measure the gaseous emission concentrations. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - No filter is used since low PM is expected
  - A dry extractive sampling system is used to report emissions on a dry basis
  - A paramagnetic analyzer is used to measure O<sub>2</sub>
  - A chemiluminescent analyzer is used to measure NO<sub>x</sub>
  - Calibration span values are 19.96% O<sub>2</sub> and 90.83 ppmvd NO<sub>x</sub>
- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Target and/or Minimum Required Sample Duration: 24 minutes

The typical sampling system is detailed in Figure 3-1.

**FIGURE 3-1  
 EPA METHODS 3A (O<sub>2</sub>), 7E SAMPLING TRAIN**



### 3.2 PROCESS TEST METHODS

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

## **4.0 TEST DISCUSSION AND RESULTS**

### **4.1 FIELD TEST DEVIATIONS AND EXCEPTIONS**

No field deviations or exceptions from the test plan or test methods occurred during this test program.

In order to remain consistent with the test plan and obtain a twenty four-minute average test run, the values measured during the stratification traverse at the first point in each port are not included in the Run 1 average.

### **4.2 PRESENTATION OF RESULTS**

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Table 4-1. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

**TABLE 4-1  
 NO<sub>x</sub> EMISSIONS RESULTS -  
 EUCOMBTURB01**

<b>Run Number</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>Date</b>	9/2/2020	9/2/2020	9/2/2020	--
<b>Time</b>	0854-0946	1010-1034	1053-1117	--
<b>Process Data</b>				
heat input, MMBtu/hr	846.6	846.3	848.9	847.3
load, MW	74	74	74	74
% of peak load, %	86	86	86	86
<b>Flue Gas Parameters</b>				
O <sub>2</sub> , % volume dry	14.90	14.96	14.93	14.93
<b>Nitrogen Oxides (NO<sub>x</sub> as NO<sub>2</sub>)</b>				
ppmvd	8.35	7.66	7.32	7.78
ppmvd @ 15% O <sub>2</sub>	8.21	7.60	7.24	7.68
lb/hr	25.6	23.7	22.6	24.0
lb/MMBtu	0.030	0.028	0.027	0.028

## **5.0 INTERNAL QA/QC ACTIVITIES**

### **5.1 QA/QC AUDITS**

EPA Method 3A and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

The NO<sub>2</sub> to NO converter efficiency check of the analyzer was conducted per the procedures in EPA Method 7E, Section 8.2.4. The conversion efficiency met the criteria.

### **5.2 QA/QC DISCUSSION**

All QA/QC criteria were met during this test program.

### **5.3 QUALITY STATEMENT**

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).