

**Emissions Compliance Test  
General Electric, 7FA.05, Unit #EU-CTG1  
Wolverine Power Supply Cooperative, Inc.  
Alpine Power Plant  
Elmira, Otsego County, Michigan  
June 22, 2020**

## **1.0 INTRODUCTION**

Air Hygiene International, Inc. (Air Hygiene) has completed the Emissions Compliance Test for nitrogen oxides (NO<sub>x</sub>) and oxygen (O<sub>2</sub>) from the exhaust of the General Electric, 7FA.05, Unit #EU-CTG1 for Wolverine Power Supply Cooperative, Inc. at the Alpine Power Plant in Elmira, Otsego County, Michigan. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on June 22, 2020.

## **1.1 TEST PURPOSE AND OBJECTIVES**

The purpose of the test was to conduct a periodic compliance emission test to document levels of selected pollutants at four test loads (Low, Mid-Low, Mid-High, and High). The information will be used to confirm compliance with the operating permit issued by the Michigan Department of Environment, Great Lakes & Energy (EGLE). The specific objective was to determine the emission concentration of NO<sub>x</sub> and O<sub>2</sub> from the exhaust of Wolverine Power Supply Cooperative, Inc.'s General Electric, 7FA.05, Unit #EU-CTG1 at Low, Mid-Low, Mid-High, and High loads.

## **1.2 SUMMARY OF TEST PROGRAM**

The following list details pertinent information related to this specific project:

- 1.2.1 Participating Organizations
  - Michigan Department of Environment, Great Lakes & Energy (EGLE)
  - Wolverine Power Supply Cooperative, Inc. (WP)
  - Fishbeck
  - Air Hygiene
- 1.2.2 Industry
  - Electric Utility / Electric Services
- 1.2.3 Air Permit and Federal Requirements
  - Permit Number: MI-ROP-P0582-2019
  - 40 CFR 75, Appendix E
- 1.2.4 Plant Location
  - Alpine Power Plant in Elmira, Otsego County, Michigan
    - GPS Coordinates [Latitude 45.0639, Longitude -84.8271]
    - 7432 M-32, Elmira, Michigan 49730
    - Federal Registry System / Facility Registry Service (FRS) No. – 110069993184
    - Source Classification Code (SCC) – 20100209
- 1.2.5 Equipment Tested
  - General Electric, 7FA.05, Unit #EU-CTG1

- 1.2.6 Emission Points
  - Exhaust from the General Electric, 7FA.05, Unit #EU-CTG1
  - For all gases, twelve sample points in the exhaust duct from the General Electric, 7FA.05, Unit #EU-CTG1
- 1.2.7 Emission Parameters Measured
  - NO<sub>x</sub>
  - O<sub>2</sub>
- 1.2.8 Date of Emission Test
  - June 22, 2020
- 1.2.9 Federal Certifications
  - Stack Testing Accreditation Council AETB Certificate No. 3796.02
  - International Standard ISO/IEC 17025:2005 Certificate No. 3796.01

### 1.3 KEY PERSONNEL

WP:	Laura Hoisington (lhoisington@wpsci.com)	231-775-5700 x3369
WP:	Daniel Boulter (dboulter@wpsci.com)	989-619-4059
Fishbeck:	Stephanie A. Jarrett (sajarrett@ftch.com)	248-324-2146
Air Hygiene:	Michael Whisenhunt (mwhisenhunt@airhygiene.com)	918-307-8865
Air Hygiene:	Matt Jones	918-307-8865

### 2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Wolverine Power Supply Cooperative, Inc.'s General Electric, 7FA.05, Unit #EU-CTG1 located at the Alpine Power Plant on June 22, 2020 are summarized in the following table and relate only to the items tested.

The results of all measured pollutant emissions were below the required limits. All testing was performed without any real or apparent errors. All testing was conducted according to the approved testing protocol.

**TABLE 2.1  
SUMMARY OF GENERAL ELECTRIC, 7FA.05, UNIT #EU-CTG1 RESULTS**

Parameter	Low Load	Mid-Low Load	Mid-High Load	High Load	Permit Limits
Start Time (hh:mm:ss)	7:10:06	9:58:06	12:47:06	15:40:06	--
End Time (hh:mm:ss)	9:49:36	12:39:06	15:30:36	18:20:36	--
Run Duration (min / run)	50	50	51	49	--
Bar. Pressure (in. Hg)	28.49	28.49	28.49	28.45	--
Amb. Temp. (°F)	75	82	74	70	--
Rel. Humidity (%)	64	50	75	94	--
Spec. Humidity (lb water / lb air)	0.008227	0.012183	0.014021	0.015355	--
Load Designator	Low	Mid-Low	Mid-High	High	--
Comb. Discharge Pres. (psig)	170.0	190.3	211.2	235.5	--
Turbine Fuel Flow (lb/min)	1,074	1,180	1,294	1,440	--
Total Fuel Flow (SCFH)	1,455,003	1,598,606	1,753,048	1,950,841	--
Stack Flow (RM19) (SCFH)	35,760,567	39,727,066	43,884,707	48,210,363	--
Heat Input (MMBtu/hr)	1,486.6	1,633.3	1,791.1	1,993.2	--
Power Output (megawatts)	140.0	160.3	180.3	202.0	--
CD Temp. (°F)	95.09	95.58	95.76	97.22	--
NOx (ppmvd)	9.94	9.64	9.18	9.78	--
NOx (ppm@15%O <sub>2</sub> )	7.80	7.65	7.34	7.72	--
NOx (ppm@15%O <sub>2</sub> &ISO)	7.78	8.01	8.15	8.89	--
NOx (lb/hr)	42.44	45.75	48.13	56.34	66.8
NOx (lb/MMBtu)	0.029	0.028	0.027	0.028	0.0327
O <sub>2</sub> (%)	13.38	13.47	13.52	13.43	--

### 3.0 SOURCE OPERATION

#### 3.1 PROCESS DESCRIPTION

Wolverine Power Supply Cooperative, Inc. (WP) owns and operates the Alpine Power Plant located in Elmira, Otsego County, Michigan. The station consists of two General Electric (GE) Frame 7FA.05 simple cycle combustion turbines, designated as EU-CTG1 and EU-CTG2. Each CTG has a nominal rating of 203 MW, with a peak heat input of 2,045 MMBtu/hr, an exhaust flow rate of ~800,000 scfm (at 100% load), and an exhaust gas temperature of ~1,100 °F. The interest of this report is EU-CTG1.

#### 3.2 SAMPLING LOCATION

The EU-CTG1 is vertical, circular and measures 22 feet (ft) (264 inches) in diameter at the test ports which are approximately 110 ft above grade level with an exit elevation of approximately 130 ft above grade level. The test ports are located approximately 39.2 ft (470.5 inches) downstream and approximately 11 ft (132 inches) upstream from the nearest disturbances. The stacks were sampled from a minimum of twelve sampling points during each run with the sampling time at each point in compliance with Appendix E Section 2.1.2.3. Prior to the first run for Appendix E testing, the system response time was determined to ensure sufficient sampling time for each sample point.

## 4.0 SAMPLING AND ANALYTICAL PROCEDURES

### 4.1 TEST METHODS

The emission test on the General Electric, 7FA.05, Unit #EU-CTG1 at the Alpine Power Plant was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on June 22, 2020.

**TABLE 4.1  
SUMMARY OF SAMPLING METHODS**

Pollutant or Parameter	Sampling Method	Analysis Method
Sample Point Location	EPA Method 1	Equal Area Method
Oxygen	EPA Method 3A	Paramagnetic Cell
Nitrogen Oxides	EPA Method 7E	Chemiluminescent Analyzer
Stack Flow Rate	EPA Method 19	Dry Oxygen F Factor

### 4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR GAS ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 3A, 7E, and 19.

Figure 4.1 depicts the sample system used for the real-time gas analyzer tests. The gas sample was continuously pulled through the probe and transported, via heat-traced Teflon® tubing, to a stainless steel minimum-contact condenser designed to dry the sample. Transportation of the sample, through Teflon® tubing, continued into the sample manifold within the mobile laboratory via a stainless steel/Teflon® diaphragm pump. From the manifold, the sample was partitioned to the real-time analyzers through rotameters that controlled the flow rate of the sample.

Figure 4.1 shows that the sample system was also equipped with a separate path through which a calibration gas could be delivered to the probe and back through the entire sampling system. This allowed for convenient performance of system bias checks as required by the testing methods.

All instruments were housed in a climate controlled, trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with the concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e. NO<sub>x</sub> calibration gases).

Table 4.2 provides a description of the analyzers used for the instrument portion of the tests. All data from the continuous monitoring instruments were recorded on a Logic Beach Portable Data Logging System which retrieves calibrated electronic data from each instrument every one second and reports an average of the collected data every 30 seconds.

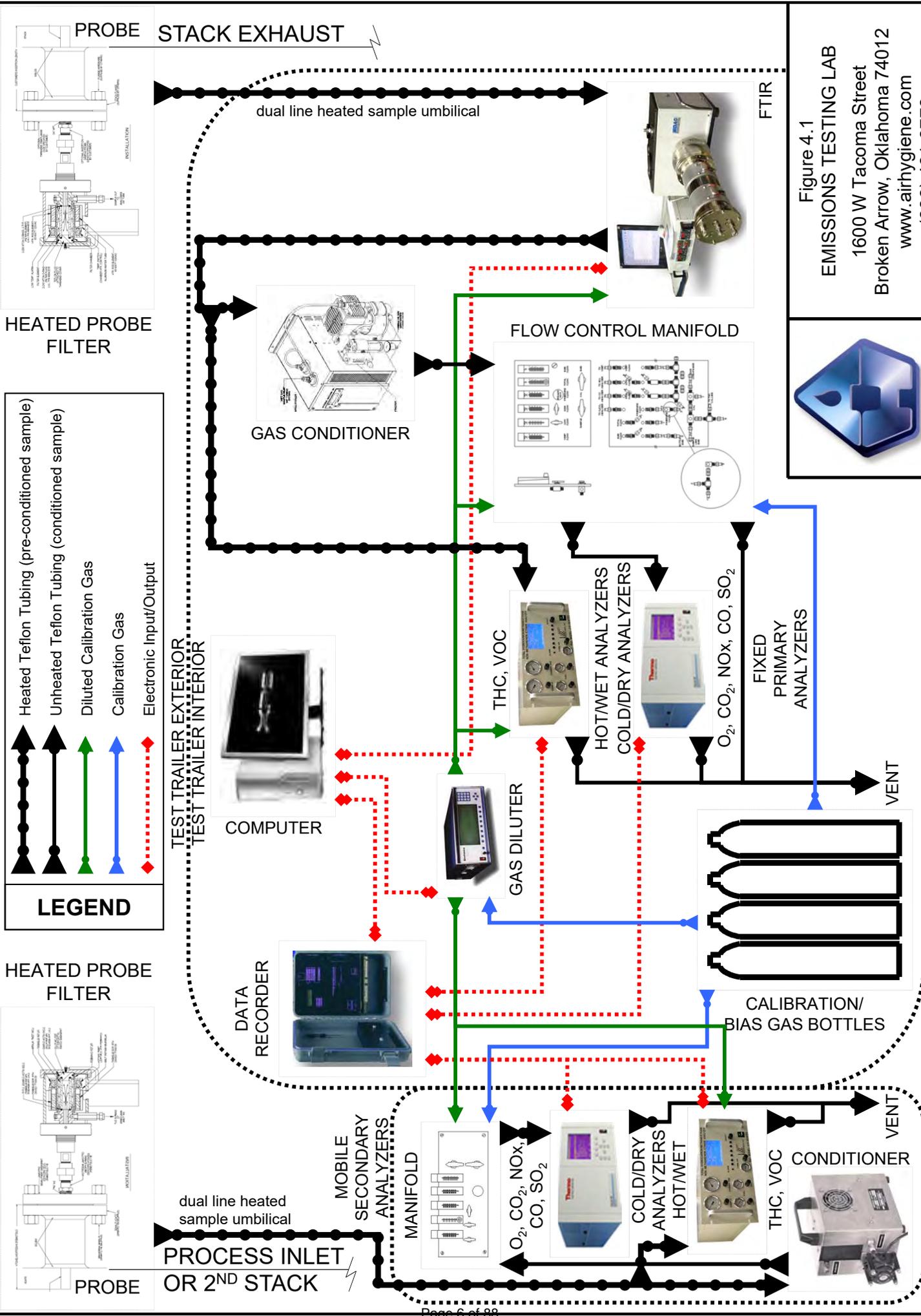
Three test runs of approximately 50 minutes each were conducted on the General Electric, 7FA.05, Unit #EU-CTG1 at each of the multiple test loads for NO<sub>x</sub> and O<sub>2</sub>.

The stack gas analysis for O<sub>2</sub> concentrations was performed in accordance with procedures set forth in EPA Method 3A. The O<sub>2</sub> analyzer uses a paramagnetic cell detector.

EPA Method 7E was used to determine concentrations of NO<sub>x</sub>. A chemiluminescent analyzer was used to determine the nitrogen oxides concentration in the gas stream. A NO<sub>2</sub> in nitrogen certified gas cylinder was used to verify at least a 90 percent NO<sub>2</sub> conversion on the day of the test.

**TABLE 4.2  
ANALYTICAL INSTRUMENTATION**

<b>Parameter</b>	<b>Manufacturer and Model</b>	<b>Range</b>	<b>Sensitivity</b>	<b>Detection Principle</b>
NO <sub>x</sub>	THERMO 42 series	User may select up to 5,000 ppm	0.1 ppm	Thermal reduction of NO <sub>2</sub> to NO. Chemiluminescence of reaction of NO with O <sub>3</sub> . Detection by PMT. Inherently linear for listed ranges.
O <sub>2</sub>	SERVOMEX 1440	0-25%	0.1%	Paramagnetic cell, inherently linear.



**Figure 4.1**  
**EMISSIONS TESTING LAB**  
 1600 W Tacoma Street  
 Broken Arrow, Oklahoma 74012  
 www.airhygiene.com  
 (888) 461-8778



Shown fully equipped. Some labs may not contain these features and others may contain additional features specific to certain scopes.