Testing Solutions for a Better World

EMISSION COMPLIANCE TEST
FOR THE
GENERAL ELECTRIC FRAME 7FA.05,
UNIT EU-CTG2
PREPARED FOR
WOLVERINE POWER SUPPLY
COOPERATIVE, INC.
AT THE
ALPINE POWER PLANT
ELMIRA, OTSEGO COUNTY, MICHIGAN
AUGUST 11, 2023

Permit No: MI-ROP-P0582-2019a
Report Date: October 3, 2023

Corporate Headquarters
1600 W. Tacoma Street
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Prepared and Reviewed by:

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Report Writer

I, _____
Rob White, QSTI
Project Manager
certify that this testing was conducted and this report was created in conformance with the requirements of ASTM D7036

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CERTIFICATION OF INFORMATION

I certify under penalty of law that I believe the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

Rob White, QSTI
Project Manager
Air Hygiene International, Inc.

August 17, 2023
Date

FACILITY CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attached documents and, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

I am the responsible official with direct knowledge and overall responsibility for the information contained in this report.

_____
Name

_____
Title

_____
Signature

_____
Date

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Emissions Compliance Test
General Electric Frame 7FA.05, Unit EU-CTG2
Wolverine Power Supply Cooperative, Inc.
Alpine Power Plant
Elmira, Otsego County, Michigan
August 11, 2023

1.0 INTRODUCTION

Air Hygiene International, Inc. (Air Hygiene) has completed the Emissions Compliance Test for nitrogen oxides (NOx) from the exhaust of the General Electric Frame 7FA.05, Unit EU-CTG2 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 August 11, 2023.

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 two operating loads. The information will be used to confirm compliance with the operating permit issued by the Michigan Department of Environment, Great Lakes and Energy (EGLE). The specific objective was to determine the emission concentration of NOx from the exhaust of the General Electric Frame 7FA.05, Unit EU-CTG2 for Wolverine Power Supply Cooperative, Inc. at the Alpine Power Plant in Elmira, Otsego County, Michigan.

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 and Energy (EGLE)
- Wolverine Power Supply Cooperative, Inc.
- Fishbeck
- Air Hygiene

1.2.2 Industry
- Electric Utility / Electric Services

1.2.3 Air Permit Requirements
- Permit Number: MI-ROP-P0582-2019a

1.2.4 Plant Location
- Alpine Power Plant in Elmira, Otsego County, Michigan
  - GPS Coordinates [Latitude 45.06175, Longitude -84.84466]
  - Physical Address: 7432 M-32, Elmira, Michigan 49730
  - Federal Registry System / Facility Registry Service (FRS) No. – 110067539293
  - Source Classification Code (SCC) – 20100209

1.2.5 Equipment Tested
- General Electric Frame 7FA.05, Unit EU-CTG2

1.2.6 Emission Points

- Exhaust from the General Electric Frame 7FA.05, Unit EU-CTG2
- For all gases, one sample point in the exhaust duct from the General Electric Frame 7FA.05, Unit EU-CTG2, determined after conducting a stratification test

1.2.7 Emission Parameters Measured

- NOx
- O_2

1.2.8 Date of Emission Test

- August 11, 2023

1.2.9 Federal and State Certifications

- Stack Testing Accreditation Council AETB Certificate No. 3796.02
- International Standard ISO/IEC 17025:2005 Certificate No. 3796.01

1.3 KEY PERSONNEL

Wolverine Power Supply Cooperative, Inc.:	Joe Hazewinkel (jhazewinkel@wpsci.com)	231-577-8721
Fishbeck:	Stephanie Jarrett (sajarrett@fishbeck.com)	248-324-2146
Air Hygiene:	Rob White (rwhite@airhygiene.com)	918-307-8865
Air Hygiene:	Tait Ngormia	918-307-8865

2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Wolverine Power Supply Cooperative, Inc.'s General Electric Frame 7FA.05, Unit EU-CTG2 located at the Alpine Power Plant on August 11, 2023 are summarized in the following table and relate only to the items tested.

TABLE 2.1
SUMMARY OF GENERAL ELECTRIC, 7FA.05,
UNIT #EU-CTG2 RESULTS

Parameter	Mid Load Emissions	High Load Emissions	Permit Limits
Turbine Fuel Flow (SCFH)	1,682,960	1,934,099	--
Stack Flow (RM19) (SCFH)	43,477,571	48,744,799	--
Power Output (megawatts)	175.1	203.3	--
NOx (ppmvd)	9.28	9.46	--
NOx (ppmvd@15%O_2)	7.56	7.51	--
NOx (lb/hr)	48.20	55.05	66.8
NOx (lb/MMBtu)	0.0277	0.0275	0.0327

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, except for the following updates, which were approved by EGLE Air Quality Division (AQD) during the testing:

- The testing protocol indicated that testing would be "conducted from a minimum of twelve sampling points for each run." Per discussion with AQD, a stratification test was conducted under Part 75

requirements (in conjunction with a simultaneous relative accuracy test audit), that determined a non-stratified stack and subsequent testing from a single test point.

- The testing protocol indicated testing would be completed at the load required by Part 75 (i.e., normal or secondary normal load) and two other loads corresponding to 50%, 75%, or 100% load. Per discussion with AQD, the Alpine turbines do not operate at 50% load during normal operation. The minimum safe load for the turbines is 139 MW. Therefore, testing was completed pursuant to mid, low, and high loads as determined by Part 75. Low load (RATA normal load) which corresponds to approximately 75% load; mid load which corresponds to approximately 85% load; and high load (secondary normal) which corresponds to approximately 100% load.

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 megawatts (MW), with a nominal design heat input of 2,045 million British thermal units per hour (MMBtu/hr), an exhaust flow rate of approximately 800,000 standard cubic feet per minute (scfm) [at 100 percent load], and an exhaust gas temperature of approximately 1,100 degrees Fahrenheit (°F).

3.2 SAMPLING LOCATION

The EU-CTG1 and EU-CTG2 stacks are vertical, circular and measure 25 feet (ft) (300 inches) in diameter at the test ports which are approximately 74 ft above grade level with an exit elevation of approximately 85 ft above grade level. The test ports are located approximately 39.2 ft (471 inches) [1.6 dia] downstream and approximately 11 ft (132 inches) [0.4 dia] upstream from the nearest disturbances. Air Hygiene has field verified the measurable dimensions. Non-field verified dimensions are provided by Wolverine Power Supply Cooperative, Inc. During the stratification test three points were traversed from each of the four ports. The probe was allowed to remain at a point for at least two times the system response time.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The emission test on the General Electric Frame 7FA.05, Unit EU-CTG2 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 August 11, 2023.

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 concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e., NOx 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.

The stack gas analysis for O_2 concentrations was performed in accordance with procedures set forth in EPA Method 3A. The O_2 analyzer uses a paramagnetic cell detector.

EPA Method 7E was used to determine concentrations of NOx. A chemiluminescent analyzer was used to determine the nitrogen oxides concentration in the gas stream. A NO_2 in air manufacturer-certified gas cylinder was used to verify at least a 90 percent NO_2 conversion on the day of the test.

TABLE 4.2
ANALYTICAL INSTRUMENTATION

Parameter	Manufacturer and Model	Range	Sensitivity	Detection Principle
NOx	THERMO 42 series	User may select up to 5,000 ppm	0.1 ppm	Thermal reduction of NO_2 to NO. Chemiluminescence of reaction of NO with O_3. Detection by PMT. Inherently linear for listed ranges.
O_2	SERVOMEX 1440	0-25%	0.1%	Paramagnetic cell, inherently linear.

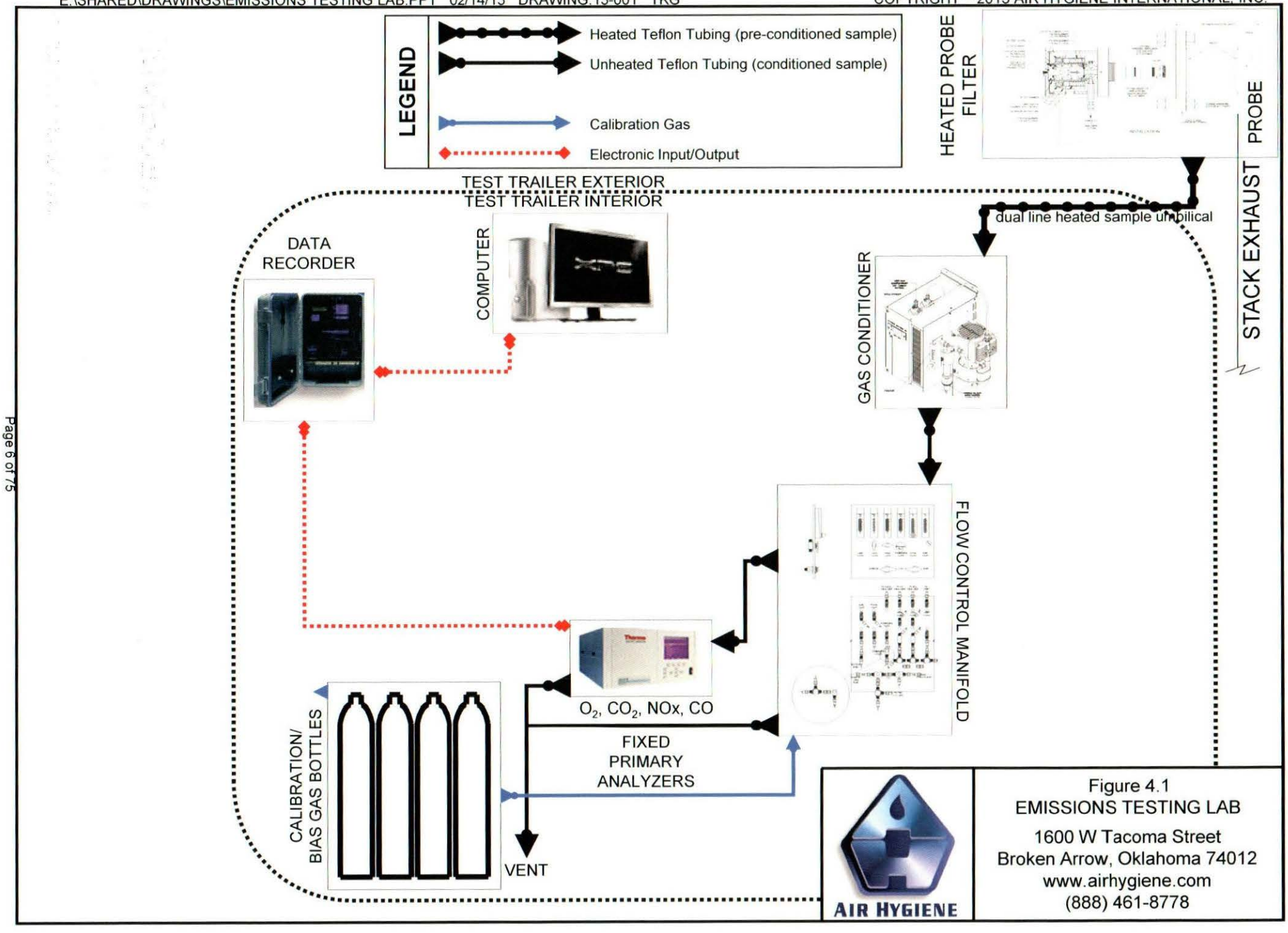

Figure 4.1
EMISSIONS TESTING LAB

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