

**Emissions Compliance Test
General Electric, PG7121 (EA), Unit #3
Wolverine Power Supply Cooperative, Inc.
Sumpter Generation Plant
Belleville, Michigan
June 18, 2020**

1.0 INTRODUCTION

Air Hygiene International, Inc. (Air Hygiene) has completed the Emissions Compliance Test for carbon monoxide (CO) and formaldehyde (HCHO) from the exhaust of the General Electric, PG7121 (EA), Unit #3 for Wolverine Power Supply Cooperative, Inc. at the Sumpter Generation Plant near Belleville, Michigan. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on June 18, 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. 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 CO and HCHO from the exhaust of Wolverine Power Supply Cooperative, Inc.'s General Electric, PG7121 (EA), Unit #3.

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)
 - Air Hygiene
- 1.2.2 Industry
 - Electric Utility / Electric Services
- 1.2.3 Air Permit Requirements
 - Permit Number: MI-ROP-M4854-2014C
- 1.2.4 Plant Location
 - Sumpter Generation Plant near Belleville, Michigan
 - GPS Coordinates [Latitude 42.167, Longitude -83.532]
 - 8509 Rawsonville Road, Belleville, Wayne County, Michigan 48111-9371
 - Federal Registry System / Facility Registry Service (FRS) No. – 110017414172
 - Source Classification Code (SCC) – 20100201
- 1.2.5 Equipment Tested
 - General Electric, PG7121 (EA), Unit #3
- 1.2.6 Emission Points
 - Exhaust from the General Electric, PG7121 (EA), Unit #3
 - For all gases, one sample point in the exhaust duct from the General Electric, PG7121 (EA), Unit #3, determined after conducting a stratification test

- 1.2.7 Emission Parameters Measured
 - CO
 - HCHO
 - O₂
- 1.2.8 Date of Emission Test
 - June 18, 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 ext. 3369
WP:	Ken Sowards (ksowards@wpsci.com)	734-461-9287
Fishbeck:	Stephanie A. Jarrett (sajarrett@ftch.com)	248-324-2146
EGLE:	Mark Dziadosz (dziadoszm@michigan.gov)	586-854-1611
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, PG7121 (EA), Unit #3 located at the Sumpter Generation Plant on June 18, 2020 are summarized in the following tables and relate only to the items tested.

**TABLE 2.1
SUMMARY OF GENERAL ELECTRIC, PG7121 (EA), UNIT #3 RESULTS**

Parameter	Run 1	Run 2	Run 3	Permit Limits
Start Time (hh:mm:ss)	10:40:21	12:10:21	13:40:21	--
End Time (hh:mm:ss)	12:00:51	13:30:51	15:00:51	--
Bar. Pressure (in. Hg)	29.37	29.32	29.30	--
Amb. Temp. (°F)	84	90	93	--
Rel. Humidity (%)	45	35	29	--
Spec. Humidity (lb water / lb air)	0.011399	0.010850	0.009794	--
Turbine Fuel Flow (SCFH)	882,760	884,103	883,367	--
Stack Flow (RM19) (SCFH)	28,522,599	28,820,719	28,846,123	--
Power Output (megawatts)	73.0	73.0	73.0	--
CO (ppmvd)	2.44	2.49	2.49	--
CO (ppm@15%O ₂)	2.43	2.50	2.51	--
CO (lb/hr)	5.05	5.21	5.23	--
CO (ton/year) at 8760 hr/year	22.14	22.83	22.91	--
CO (lb/MMBtu)	0.005	0.006	0.006	0.057
O ₂ (%)	14.98	15.04	15.05	--

**TABLE 2.2
GENERAL ELECTRIC, PG7121 (EA), UNIT #3 NORMAL LOAD DATA SUMMARY**

Parameter	Normal Load, Run - 1-1	Normal Load, Run - 1-2	Normal Load, Run - 1-3	Average
Start Time (hh:mm:ss)	10:40:21	12:10:21	13:40:21	10:40:21
End Time (hh:mm:ss)	12:00:51	13:30:51	15:00:51	15:00:51
Bar. Pressure (in. Hg)	29.38	29.34	29.31	29.34
Amb. Temp. (°F)	82	89	93	88
Rel. Humidity (%)	48	36	32	39
Spec. Humidity (lb water / lb air)	0.011409	0.010705	0.010794	0.010969
Turbine Fuel Flow (SCFH)	882,760	884,103	883,367	883,410
Stack Flow (RM19) (SCFH)	28,519,341	28,819,852	28,854,306	28,731,166
Stack Moisture (% Method 320)	5.7	5.4	5.5	5.6
Power Output (megawatts)	73.0	73.0	73.0	73.0
HCHO (ppmvd)	0.04	0.04	0.04	0.04
HCHO (lb/hr)	0.09	0.09	0.10	0.09
HCHO (ton/year) at 8760 hr/year	0.39	0.38	0.43	0.40
HCHO (lb/MMBtu)	0.0001	0.0001	0.0001	0.0001
O ₂ (%)	14.98	15.04	15.05	15.02

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.

3.0 SOURCE OPERATION

3.1 PROCESS DESCRIPTION

Wolverine Power Supply Cooperative, Inc. (WP) owns and operates the Sumpter Generation Plant located in 8509 Rawsonville Road, Wayne County, Michigan. The station consists of four General Electric (GE) PG7121 (EA) simple cycle combustion turbines, designated as Unit 1, Unit 2, Unit 3 and Unit 4. Each unit has a nominal rating of 83 MW.

3.2 SAMPLING LOCATION

The stack is rectangular and measures 9 feet (ft) (108 inches) deep and 19 ft (228 inches) wide at the test ports which are approximately 45 ft above grade level with an exit elevation of approximately 60 ft above grade level. The test ports are located approximately 13 ft (156 inches) downstream and approximately 29 ft (344 inches) 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.. All exhaust samples for gaseous emissions were continuously drawn from the exhaust system at the sample ports from a single point determined after conducting a stratification test. During the stratification test two points were traversed from each of the seven ports. The probe was allowed to remain at a point for two times the system response time.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The emission test on the General Electric, PG7121 (EA), Unit #3 at the Sumpter Generation 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 18, 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
Carbon Monoxide	EPA Method 10	Nondispersive Infrared Analyzer
Stack Flow Rate	EPA Method 19	Dry Oxygen F Factor
Formaldehyde and H ₂ O	EPA Method 320	Fourier Transform Infrared

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, 10, 19; and 40 CFR 63, Appendix A, Method 320.

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 heated head pump and into the FTIR then 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_x 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. For target compounds measured with the Fourier transform infrared (FTIR) spectrometer,

interferograms consisting of 120 co-added scans were recorded continuously during the test periods, and provided approximately 30-second average concentrations. Spectral data was analyzed by the MKS MG2000 software.

Three test runs of at least 60 minutes each were conducted on the General Electric, PG7121 (EA), Unit #3 for CO and HCHO by combining data from every three RATA runs.

The stack gas analysis for O₂ concentrations was performed in accordance with procedures set forth in EPA Method 3A. The O₂ analyzer uses a paramagnetic cell detector.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous nondispersive infrared (NDIR) analyzer was used for this purpose.

An MKS Instruments - MultiGas™ Fourier Transform Infrared (FTIR) spectrometer, with MAX StarBoost, was used for HCHO, methane, acetaldehyde, and H₂O analysis per EPA Method 320. The FTIR spectrometer spectral resolution was 0.5 cm⁻¹. The system employed a silicon carbide infrared source at 1200°C, a helium neon reference laser, beam splitters, potassium bromide (KBr) cell window, front-surface optical transfer mirrors, and multi-pass absorption cells. MCT detectors were used and cooled with liquid nitrogen in order to maintain a constant temperature of 77 Kelvin. The approximately 5.11-meter multi-pass path cells incorporated aspheric, aberration-correcting mirrors to increase the optical throughput and the detection sensitivity. Transducers and thermocouples were connected directly to the insulated sample cells that provide the pressure and temperatures of the sample streams. During testing, the temperature of the absorption cells was set at 191°C. Elevated temperature prevented gas condensation within the cell and minimized compound adhesion to the cell walls and mirrors. The volume of the absorption cell was 0.5 liters, so at a sample gas flow rate of 4.0 liters per minute, the sample gas in the cell is refreshed approximately four times each minute. Interferograms consisting of 120 co-added scans were recorded continuously during the test periods, and provided approximately 30-second average concentrations.

**TABLE 4.2
ANALYTICAL INSTRUMENTATION**

Parameter	Manufacturer and Model	Range	Sensitivity	Detection Principle
CO	THERMO 48 series	User may select up to 10,000 ppm	0.1 ppm	Infrared absorption, gas filter correlation detector, microprocessor based linearization.
HCHO, methane, acetaldehyde, and H ₂ O	MKS 2030	User may select from multiple ranges	0.1 ppm	Fourier Transform Infrared – FTIR
O ₂	SERVOMEX 1440	0-25%	0.1%	Paramagnetic cell, inherently linear.

