DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: On-site Inspection

P079667083

FACILITY: Upper Michigan Energy Resources -A.J. Mihm G.S.		**SRN / ID:** P0796
LOCATION: 16017 Sarya Road, PELKIE		**DISTRICT:** Marquette
CITY: PELKIE		**COUNTY:** BARAGA
CONTACT: Justin Kowalski , Senior Environmental Consultant		**ACTIVITY DATE:** 03/02/2023
STAFF: Joe Scanlan	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** MAJOR
SUBJECT: Inspection to determine compliance with MI-ROP-P0796-2020 and PTI No. 34-17B.		
RESOLVED COMPLAINTS:		

REGULATORY AUTHORITY

Under the Authority of Section 5526 of Part 55 of NREPA, the Department of Environment, Great Lakes, and Energy may upon the presentation of their card, and stating the authority and purpose of the investigation, enter and inspect any property at reasonable times for the purpose of investigating either an actual or suspected source of air pollution or ascertaining compliance or noncompliance with NREPA, Rules promulgated thereunder, and the federal Clean Air Act.

FACILITY DESCRIPTION

The A.J. Mihm Generating Station is an electrical generation station that is owned and operated by the Upper Michigan Energy Resources Corporation (UMERC). UMERC is a subsidiary of WEC Energy Group that provides electrical power to customers of Michigan's Upper Peninsula.

The A.J. Mihm Generating Station is located at 16017 Sarya Road, Pelkie, Michigan, a rural area in Baraga County that is currently in attainment for all criteria pollutants. Construction of the facility began in 2017 under Permit to Install (PTI) No. 34-17, and initial operation of the generating units occurred in March 2019. All major functions of the A.J. Mihm Generating Station are monitored and controlled remotely by operators from Green Bay and Milwaukee, Wisconsin. The facility utilizes total remote start, stop, and load functionality on the reciprocating internal combustion engine (RICE) units. On-site personnel provide maintenance and support activities, along with continuously monitoring and reporting engine operating parameters.

PROCESS DESCRIPTION

The A.J. Mihm Generating Station generates electrical power through the operation of three (3) Wärtsilä 18V50SG natural gas-fired, 4-stroke, spark ignition lean burn, RICE units that are shaft coupled to electric generators. Each engine is rated at 25,828 HP and provides 19,260 KW of gross electrical output. The RICE units fire only pipeline quality natural gas with a fuel consumption rate of up to 152 MMBtu/hr at full load. The engines are housed inside the reciprocating engine hall designed with a 50-decibel sound limit. The exhaust systems are routed outside of the building with silencers, air quality control systems, and stacks. Each of the three RICE units at the A.J. Mihm Generating Station has its own 65-foot stack.

The RICE units at A.J. Mihm Generating Station are equipped with selective catalytic reduction (SCR) for NOx control, and oxidation catalysts for CO, VOC, and HAP control. An SCR system reduces NOx into N2 and H2O. The SCR at A.J. Mihm Generating Station is equipped with a 20,000 gallon urea storage tank, feeding unit, dosing unit, reactor with catalyst, along with a NOx monitor and SCR control system. The reducing agent, urea, is injected downstream of the engine

and upstream of the reactor to mix with flue gas before entering the reactor containing the catalyst. Inside the reactor, the urea selectively reacts with NOx in the presence of the catalyst and oxygen within a specific temperature range. The SCR system includes an automated process control that automatically adjusts the amount of urea injected into the flue gas stream. The oxidation catalyst is also fitted into the same housing as the SCR. In a catalytic oxidation system, CO and VOCs in the flue gas are oxidized as they pass over the catalyst. During periods of startup and shutdown, however, the exhaust gas temperatures are too low for the SCR and oxidation catalyst to function as designed. As a result, CO, NOx, and VOC emissions may be elevated during periods of startup and shutdown as compared to normal operation. Each RICE unit at A.J. Mihm Generating Station is limited to 1,095 startup and shutdown events a year.

Additional emission units at the source include a 1,470 HP natural gas-fired emergency RICE, a 0.83 MMBtu/hr natural gas-fired conditioning heater, space heaters, and storage tanks. The emergency engine will be used as back-up utility power in the event of a power outage at the facility. The emergency engine has an operational limit of 500 hours per year based on a 12-month rolling time period. The conditioning heater will be used to raise the temperature of the natural gas for proper operation of the RICE units. The emergency engine and natural gas conditioning heater are permitted under PTI No. 34-17.

EMISSIONS

Pollutants emitted from the combustion process of natural gas-fired RICE units include nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (PM). Sulfur oxides emissions are very low since sulfur compounds are removed from natural gas at processing plants. The formation of nitrogen oxides is related to the combustion temperature in the engine cylinder, and CO and VOC emissions are primarily a result of incomplete combustion. PM emissions can include trace amounts of metals and condensable, semi-volatile organics which result from incomplete combustion, volatized lubricating oil, and engine wear. Emissions vary according to the air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors.

EMISSIONS REPORTING

The facility is required to report its annual emissions to Michigan Air Emissions Reporting System (MAERS). The following table lists the source total emissions for the reporting year 2022:

Pollutant	Emissions (TPY)
CO	18.7
NOx	21.9
PM10, PRIMARY	5.5
PM2.5, PRIMARY	5.5

SO2	**0.6**
VOC	**21.2**
Formaldehyde	**2.4**

REGULATORY ANALYSIS

The A.J. Mihm Generating Station is subject to Permit to Install (PTI) No. 34-17B and MI-ROP-P0796-2020. The facility is considered major for hazardous air pollutants (HAPs). EURICE1, EURICE2, EURICE3, and EUEMERGEN are subject to NSPS Subpart JJJJ and MACT ZZZZ. EUHEATER1 is subject to MACT DDDDD.

COMPLIANCE HISTORY

The facility was last inspected in April of 2021 and found to be in compliance with all applicable air quality rules and federal regulations at that time. No violation notices have been issued since the last inspection date.

INSPECTION

A targeted inspection was scheduled for 03/02/2023 at the A.J. Mihm Generating Station to determine compliance with MI-ROP-P0796-2020 and PTI No. 34-17B. The contact for the facility is Justin Kowalski, Senior Environmental Consultant for UMERC. The on-site contact for the facility is Scott Johnson.

<u>EUEMERGEN</u>

This emission unit (EU) is a CAT G3512 natural gas-fired emergency engine rated at 1000 eKW. The purpose of this EU is to provide power during emergency power outages.

SC I, V.1, VI.1-2: The EU is an EPA certified engine that meets the emission limits in SC I.

SC II.1: The engine only fires natural gas. Piped natural gas into the unit was observed on-site. For 2021, EUEMERGEN burned 0.12326 MMCF of natural gas. For 2022, EUEMERGEN burned 0.09328 MMCF of natural gas.

SC III.1-7, IV.1-2: The engine is operated in a certified manner and is only used for emergency purposes or for maintenance and readiness testing. Records provided showed a total of 11.1 hours of use in 2021, and 8.4 hours of use in 2022. During the inspection, an hour meter was seen through the control screen and listed 64.5 hours of total use. The nameplate of the engine states CAT G3512 with a rated power output of 1000 eKW and engine displacement of 3173 in^3. Records provided show preventative maintenance is done monthly, every 6 months, and annually.

SC VII.1-2: EUEMERGEN has not been contractually obligated to be available for more than 15 hours per calendar year for the purposes specified in 40 CFR 60.4243(d)(3)(i). The permittee submitted a notification specifying the engine will be operated in a certified manner.

SC VIII.1: SVEMERGEN is vertical and verified to be 20 feet above the ground using a 3-point measurement on a Range Finder, measured from the building grade to the top of the stack. Diameter appeared to be no more than 12 inches.

SC IX.1-2: EUEMERGEN appears to be in compliance with all provisions of NSPS Subpart JJJJ and MACT ZZZZ.

EUHEATER1

This EU is a 0.83 MMBtu/hr natural gas-fired conditioning heater used to raise the temperature of the natural gas for proper operation of the RICE units. The natural gas undergoes adiabatic cooling when the pressure is dropped coming from the natural gas transmission lines. This equipment is maintained by SEMCO.

SC II.1, III.1, IV.1: Piped natural gas was observed into EUHEATER1. EUHEATER1 appeared to be well maintained and operating in a satisfactory manner. No visible emissions were observed from the two stacks above the heater.

SC VI.1-3: The facility maintains the manufacturer specification sheet on file. The ETI Indirect Gas Fired Water Bath Heater has a listed nominal heat input capacity of 0.75 MMBtu/hr. The heater is inspected and maintained by SEMCO and has a contractual operation agreement with UMERC. Records were provided showing the heater was inspected/maintained on 8/25/20 and again on 3/09/22.

SC VII.1: SVHEATER1 is vertical and verified to be 20 feet above the ground using a 3-point measurement on a Range Finder, measured from the building grade to the top of the stack. Diameter appeared to be no more than 10 inches.

FGENGINES

This flexible group consists of three (3) Wärtsilä 18V50SG natural gas-fired, 4-stroke, spark ignition lean burn, RICE units that are shaft coupled to electric generators. Each engine is rated at 25,828 HP and provides 19,260 KW of gross electrical output. The RICE units fire only pipeline quality natural gas with a fuel consumption rate of up to 152 MMBtu/hr at full load. These engines are each equipped with SCR and oxidation catalysts. Each engine emits out its own vertical stack.

SC I, V: The three engines underwent MACT JJJJ performance testing in May 2022 for compliance with the NOx, CO, & VOC emission limits set forth in SC I. The three engines passed all emission limits.

SC II.1: Piped natural gas was observed as the only fuel for FGENGINES.

SC III.1-6, VI.3-6: UMERC maintains a malfunction abatement plan for EURICE1, ERICE2, and EURICE3. The MAP provides the equipment operating parameters, ranges, and frequency, along with a list of inspection items, frequency of maintenance, major parts replacement list, and responsible personnel. The four monitoring parameters for FGENGINES representative of air quality performance are SCR inlet temperature, urea injection rate, SCR pressure drop, and oxidation catalyst pressure drop. The normal operating ranges for these parameters in the MAP are 600-780 F for SCR inlet temperature, 4-10 gallons/hour for urea injection rate, 0.20-0.65 psi

for SCR pressure drop, and 0.05-0.35 psi for oxidation catalyst pressure drop. During the inspection, all three engines were operating and were reporting the following performance parameters through the DEMAXX control software at 2:28 PM EST on 3/02/22:

Engine	1	2	3
Power Output (KW)	11748	15042	18753
Outlet NOx (ppm)	6.1	6.7	5.7
Urea (gal/hr)	3.8	5.0	10.5
Reactor Inlet Temp (F)	784 F	747 F	730 F
Ox Cat dp (psi)	0.09	0.12	0.15
SCR dp (psi)	0.25	0.23	0.28

At the time of the inspection, all three engines were operating and appeared to be running properly. The air pollution control equipment appeared to be operating within the normal operating ranges and no malfunctioning equipment was observed. All duct work appeared in good shape with no leaks.

Examples of continuous monitoring data records were provided for a day during each quarter of 2021 and 2022. The monitoring data records provide natural gas usage (lb/hr), power output (MW), urea flow rate to SCR (gal/hr), SCR inlet temperature (f), and differential pressure across oxidation catalyst (inches of water). The data for these parameters are recorded on an hourly basis for each engine. From records reviewed, performance parameter for urea flow rates routinely exceeds the normal operating range during full operation on all three engines. Additionally, performance parameters for SCR inlet temperature routinely exceed the normal operating range during reduced loads on all three engines.

FGENGINES are limited to 1,095 startup and shutdown events per 12-month rolling time period for each engine. The facility is required to keep records of the 12-month rolling startup and shutdown events for each engine in FGENGINES. For the period 2/21 through 02/23, the 12-month rolling total stays between 350-370 startup and shutdown events.

FGENGINES were purchased as non-certified EPA engines. For non-certified engines, the facility is required to conduct performance tests, create a maintenance plan, and keep records of conducted maintenance performed. The maintenance plan is included in the MAP. Records were provided on all three engines for calendar years 2021 and 2022. Maintenance conducted throughout the year occurred on both the engines and the SCR/oxidation catalyst system.

A gas component analysis report was provided from a sample collected on 05/24/22. The report states the weight percent of total sulfur in the gas is 0.0002.

Records were provided of the monthly fuel consumption and gross energy output from FGENGINES. For the period 01/21 through 12/22, the average monthly fuel consumption per engine was 2,516,068 lbs of natural gas and the average monthly gross energy output per engine was 7,081 MW.

SC VII.5-6: A notification on the completion of installation of FGENGINES was submitted on February 26, 2019. The notification also lists the manner of operation, which is non-certified per 40 CFR Part 60, Subpart JJJJ for all three engines.

SC VII.1-3: All three stacks for FGENGINES were verified to be 65' in height using a 3-point measure with a Range Finder, from the base to the top of the stacks. The diameter appeared to be no more than 63 inches in diameter. No visible emissions were observed.

FGENGMACT4Z

Flexible group for MACT ZZZZ requirements on EURICE1, EURICE2, and EURICE3.

SC I, V: Compliance testing for CO and formaldehyde emission limits last occurred on 5/24/2022. All three engines tested well below the 14 ppmvd @ 15% O2 formaldehyde limit. During the test, the average pressure drop across the oxidation catalyst for EURICE1 was 0.12 PSI, EURICE2 was 0.12 PSI, and EURICE3 was 0.12 PSI. The facility has conducted two consecutive passing tests and is now only required to test annually for compliance with the CO or formaldehyde limit set forth by MACT ZZZZ.

SC III, IV: The facility operates with a site-specific monitoring plan that provides normal operating ranges for performance parameters. All three engines are equipped with oxidation catalysts and SCR(s) with urea injection. As provided above, at the time of the inspection the pressure drop across the oxidation catalyst for EURICE1 was reading 0.09 PSI, EURICE2 was reading 0.12 PSI, and EURICE3 was reading 0.15 PSI. This shows compliance with the requirement to maintain the catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water from when the pressure drop across the catalysts were measured during the last performance test. Also, the inlet temperature to the reactor for each engine was reading between 730 F – 784 F. This shows compliance with the requirement of maintaining the exhaust for the catalyst inlet temperature to be greater than or equal to 450 F and less than or equal to 1350 F.

SC VI: The control software for the engines monitors the performance parameters, including the catalyst inlet temperature, live. At the time of the inspection, the inlet temperature to the reactor for EURICE1 was 784 F, EURICE2 was 747 F, and EURICE3 was 730 F.

A notification on the completion of installation of FGENGINES was submitted on February 26, 2019. The notification also lists the manner of operation, which is non-certified per 40 CFR Part 60, Subpart JJJJ for all three engines.

Records of malfunctions and maintenance performed on the air pollution control equipment is maintained on file. Preventative maintenance work on the SCR and oxidation system is documented multiple times throughout 2021, 2022, and into 2023.

Review of excess emissions reports show UMERC has not had any periods during which the CMS was out-of-control. Example records of hourly average catalyst inlet temperature recordings were provided for a day from each quarter of 2021 and 2022. The records provided show the catalyst inlet temperature being maintained between 450 F and 1350 F. The facility also maintains records of the raw data that provides the average exhaust gas SCR inlet temperature every five minutes along with the gross MW. Example records of the raw data were provided for the same days of the hourly average record examples for the days in 2021 and 2022. The raw data records show during standby power generation, the catalyst inlet temperature is between 450 F and 1350 F. Thermocouple calibration checks were performed for each engine in October of 2021 and December of 2022. There has not been a need for adjustments or maintenance on the CMS.

Records were provided showing compliance with the pressure drop across the catalyst measured monthly and demonstrating the pressure drop across the catalyst was within the operating limitation established during the most recent performance test.

FGNEHSAP5D

This process heater is less than 5 MMbtu/hr and is subject to the Gas 1 Fuel subcategory requirements for new boilers/process heaters.

EUHEATER1 only burns natural gas and the facility keeps on record the most recent fuel analysis collected during the most recent stack test on 5/24/22 shows the weight percent of sulfur being 0.0002. UMERC also submitted a notice on 10/30/2018 for the startup of EUHEATER1, as required in 40 CFR 63.7545(c).

FGTANKS

This flexible group consists of a 20,000 gallon urea tank, 4,000 gallon propylene glycol tank, 7,000 gallon lube oil tank, and a 7,000 used lube oil tank. The facility keeps records of all material deliveries to each tank, including the date and the amount of material delivered.

FGHEATERS

The space heaters at the facility only burn natural gas. UMERC maintains monthly records of the amount of natural gas burned. The facility also maintains the manufacturer documentation showing the maximum heat input for each space heater, water heater, and air handling units.

CONCLUSION

Based on the inspection performed and the records reviewed, UMERC A.J. Mihm Generating Station is currently in compliance with MI-ROP-P0796-2020 and PTI No. 34-17B.

NAME Joseph Sandusky DATE 4/28/2023 SUPERVISOR Michael Kaplan