

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

P079756719

FACILITY: Upper Michigan Energy Resources -F.D. Kuester G.S.		SRN / ID: P0797
LOCATION: 80 Eagle Mills Road, NEGAUNEE		DISTRICT: Marquette
CITY: NEGAUNEE		COUNTY: MARQUETTE
CONTACT: Justin Kowalski , Senior Environmental Consultant		ACTIVITY DATE: 01/20/2021
STAFF: Sydney Hewson	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MAJOR
SUBJECT: Onsite Inspection to verify compliance with MI-ROP-P0797-2020 and all other applicable state and federal air quality regulations.		
RESOLVED COMPLAINTS:		

On January 20, 2021 I (Sydney Hewson) performed an onsite inspection of Upper Michigan Energy Resources Corporation F.D. Kuester Generating Station, located at 80 Eagle Mills Road, Negaunee MI 49866. While onsite I met with Scott Johnson and Eugene Soumis, Facility Manager. Mr. Johnson and Mr. Soumis were able to give me a tour of the facility and share the operation parameters of the engines.

Facility Description:

The F.D. Kuester Generating Station is an electric utility plant. The facility is owned and operated by the Upper Michigan Energy Resources Corporation (UMERC). UMEREC is a subsidiary of WEC Energy Group that provides electrical power to customers of Michigan's Upper Peninsula. The F.D. Kuester Generating Station is one of two new electrical generation stations that are a part of a long-term solution to the shutdown of the coal-fired Presque Isle Power Plant located in Marquette, MI.

The F.D. Kuester Generating Station generates electrical power through the operation of seven (7) 25,828 HP natural gas-fueled, 4-stroke spark ignition lean burn, reciprocating internal combustion engines (RICE) that are each coupled to a 19,260-kW electric generator. The facility also operates a 1,000-kW natural gas-fueled emergency generator and one 1.23 MMBtu per hour natural gas-fueled natural gas conditioning heater. 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 natural gas undergoes adiabatic cooling when the pressure is dropped coming from the natural gas transmission lines.

Pollutants emitted from the combustion process of the natural gas-fired RICE units include nitrogen oxides (NO_x), 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 NO_x 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, volatilized lubricating oil, and engine wear. Emissions vary according to the air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors.

The seven (7) RICE are equipped with air quality control systems including selective catalytic reduction (SCR) for NO_x control and oxidation catalyst systems for CO, VOC, and HAP control. The SCR system reduces NO_x into N₂ and H₂O. The SCR at F.D. Kuester Generating Station is

equipped with a urea storage tank, feeding unit, dosing unit, reactor with catalyst, along with a NO_x 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 NO_x 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, NO_x, and VOC emissions may be elevated during periods of startup and shutdown as compared to normal operation. Each RICE unit at F.D. Kuester Generating Station is limited to 1,095 startup and shutdown events a year. All seven engines exhaust out one common stack.

Current winter hours of operation are typically from 6am-1pm or 5pm-10 pm, Summer hours of operation are longer, 15-16 hours/day 7days/week, 4am-10pm

Compliance Evaluation:

Emission Unit: EUEMERGEN

Description:

A nominally rated 1,470 HP (1,000 kW) natural gas-fueled emergency RICE generator manufactured in 2011 or later.

Material Limit (SC. II. 1): This unit only operates on pipeline quality natural gas.

Process/Operational Restrictions (SC. III. 1-7):

The facility submitted a PM/MAP within 60 days of starting EUEMERGEN. The unit does not operate more than 500 hours per 12 month rolling period, records for hours of operate are attached to the hard file of this report. 12 month rolling period records for total hours of operation through December 2020 show 9 hours of total operation. The facility is also in compliance with the 100 hours per calendar year (included in the 500 hr/12-month period limit) allowed for maintenance and the 50 hours per calendar year allowed for non-emergency situations. The facility purchased a certified engine, records of certification are attached to the filed report.

Design/Equipment Parameters (SC. IV. 1-2):

The emergency generator has a non-resettable hour meter, and the name plate capacity is 1000 kW.

Testing/Sampling (SC. V. 1):

EUEMERGEN is a certified engine, it is maintained according to the manufacturer's recommendations.

Monitoring/Recordkeeping (SC. VI. 1-4):

The facility as maintained records as a certified engine. 2020 Maintenance records for EUEMERGEN are attached to the hard file of this report.

Reporting (SC. VII 1-5):

The facility has promptly reported deviations and submitted semi annual and annual ROP certifications on time.

Emission Unit: EUHEATER1

Description:

A nominally rated 1.23 MMBtu/hr natural gas-fueled natural gas conditioning heater.

Material Limit (SC. II.1): the facility burns only pipeline quality natural gas in EUHEATER1.

Design/Equipment Parameters (SC. IV. 1): EUHEATER1 is limited to a heat input capacity of 1.23 MMBtu/hr, this is less than the permit limit of 2 MMBtu/hr. Records of the heat input capacity are attached to the hard copy of this report.

2020 Maintenance records for EUHEATER1 are attached to the hard file of this report. This includes heater a tune up.

Reporting (SC. VII 1-3):

The facility has promptly reported deviations and submitted semiannual and annual ROP certifications on time.

Flexible Group: FGENGINES

Emission Units: EURICE1, EURICE2, EURICE3, EURICE4, EURICE5, EURICE6, EURICE7

Description:

Seven (7) non-emergency natural gas-fueled RICE generators equipped with oxidation catalysts and SCR. The engines are used to provide electric generation and are subject to 40 CFR Part 60, Subpart JJJJ.

Pollution Control Equipment:

Oxidation catalysts to control CO and VOC emissions, and SCR to control NOx.

Material Limits (SC. II. 1):

The seven engines only operate on pipeline quality natural gas.

Process/Operational Restrictions (SC. III. 1-6):

The facility submitted a Preventative Maintenance and Malfunction Abatement Plan April 8, 2019 for district approval. This was within 60 days of the engine start up. The engines are not considered certified engines, the facility maintains maintenance records for FGENGINES, Maintenance records for 2020 have been reviewed, the maintenance records for each engine are attached to the hard file of this report.

Engine ID	12 Month Rolling period shutdown for each engine through December 2020 (permit limit 1,095/ each engine)	12 Month Rolling period Start events for each engine through December 2020 (permit limit 1,095/ each engine)
KE11	342	352
KE12	359	364
KE13	349	357
KE14	334	340
KE25	415	422
KE26	346	351
KE27	346	354

Calendar year 2020 start up and shut down records for FGENGINES are attached to the hard file of this report.

Testing/Sampling (SC. V. 1-3):

Pollutant/Limit	EURICE1	EURICE2	EURICE3	EURICE4	EURICE5	EURICE6	EURICE7
	<i>Last tested</i> 3/19/19- 3/29/19	<i>Last tested</i> 3/19/19- 3/29/19	<i>Last tested</i>	<i>Last tested</i>	<i>Last tested</i>	<i>Last tested</i>	<i>Last tested</i>

			3/19/19- 3/29/19	3/19/19- 3/29/19	3/19/19- 3/29/19	3/19/19- 3/29/19	3/19/19- 3/29/19
NOx/3.0 lb/hr	2.8 lb/hr	1.1 lb/hr	2.8 lb/hr	0.8 lb/hr	2.6 lb/hr	1.9 lb/hr	3.0 lb/hr
NOx/ 82 ppmvd@15% O2	4.7 ppmvd @15% O2	1.8 ppmvd @15% O2	4.7 ppmvd @15% O2	1.2 ppmvd @15 % O2	4.7 ppmvd@ 15% O2	3.2 ppmvd @ 15% O2	82 ppmvd @15% O2
CO/ 5.5 lb/hr	2.3 lb/hr	1.2 lb/hr	2.7 lb/hr	1.0 lb/hr	2.3 b/hr	1.2 lb/hr	5.5 lb/hr
CO/ 270 ppmvd @15% O2	6.3 ppmvd @ 15% O2	3.3 ppmvd @15% O2	7.3 ppmvd @15% O2	2.7 ppmvd @15% O2	6.8 ppmvd@ 15% O2	3.2 ppmvd @15% O2	270 ppmvd@ 15% O2
VOC/5.5 lb/hr	3.6 lb/hr	1.0 lb/hr	3.9 lb/hr	1.2 lb/hr	0.8 lb/hr	1.2 lb/hr	5.5 lb/hr
VOC/ 60 ppmvd@ 15% O2	6.4 ppmvd @15% O2	1.8 ppmvd @15% O2	6.9 ppmvd @15% O2	2.0 ppmvd @15% O2	1.7 ppmvd @ 15% O2	2.2 ppmvd @15% O2	60 ppmvd @15 % O2
Total PM/ 3.72 lb/hr	0.358 lb/hr	0.605 lb/hr	0.586 lb/hr	0.602 lb/hr	0.660 lb/hr	0.493 lb/hr	3.72 lb/hr

Testing to verify NOx, CO, VOC, PM10 and PM2.5 emission rates is done every 5 years. The next tests to satisfy this condition are to be done before March 29, 2024.

Testing to verify compliance with 40 CFR Part 60 Subpart JJJJ is to be done every 3 years or every 8760 hours of engine operation, whichever comes first. The most recent performance testing for this standard is outlines below:

Pollutant/Limit	<i>EURICE1 Results Last tested May 12, 2020</i>	<i>EURICE2 Results Last tested May 12, 2020</i>	<i>EURICE3 Results Last tested May 13, 2020</i>	<i>EURICE4 Results Last tested May 13, 2020</i>	<i>EURICE5 Results Last tested May 14, 2020</i>	<i>EURICE6 Results Last tested May 14, 2020</i>	<i>EURICE7 Results Last tested May 15, 2020</i>
NOx/ 82 ppmvd @15% O2	4.1 ppmvd @15% O2	2.1 ppmvd @15% O2	4.3 ppmvd @ 15% O2	5.0 ppmvd @15% O2	3.3 ppmvd @15% O2	1.8 ppmvd @15% O2	3.3 ppmvd @15% O2

CO/ 270 ppmvd @ 15% O2	12.8 ppmvd @15% O2	8.5 ppmvd @15% O2	10.8 ppmvd @15% O2	5.7 ppmvd @15% O2	11.2 ppmvd@ 15% O2	6.1 ppmvd @15% O2	13.1 ppmvd@ 15% O2
VOC (as C3H8)/ 60 ppmvd @15% O2	2.6 ppmvd @15% O2	0.6 ppmvd @15% O2	4.0 ppmvd @15% O2	3.1 ppmvd @15% O2	1.1 ppmvd @15% O2	1.3 ppmvd @15% O2	1.1 ppmvd @15% O2

Reporting (SC. VII 1-6):

The facility has promptly reported deviations and submitted semiannual and annual ROP certifications on time.

Flexible Group: FGENGMACT4Z

Emission Units: EURICE1, EURICE2, EURICE3, EURICE4, EURICE5, EURICE6, EURICE7

Description: New spark ignition RICE located at a Major Source of HAPs greater than 500 HP, non-emergency

Pollution Control Equipment:

Oxidation catalyst to control CO.

Process/Operational Restrictions (SC. III. 1-5) Design/Equipment Parameters (SC. IV. 1-4):

Each engine is equipped with a catalytic oxidation system to control CO emissions and a Continuous Parameter Monitoring System (CPMS). These are outlined in the facility’s site-specific monitoring plan.

Testing/Sampling (SC.V. 1-3):

The facility verified formaldehyde emission rates from each engine with stack testing performed in October 2019 and May 12-15, 2020, the results are summarized below:

<u>Engine ID</u>	<u>Formaldehyde Emission Limit</u>	<u>Actual Emissions/Test date</u>	<u>Actual Emissions/Test date</u>
EURICE1	14 ppmvd@ 15% O2	0.66 ppmvd @15% O2 (10/1/2019)	1.22 ppmvd @15% O2 (5/12/2020)
EURICE2		0.23 ppmvd @15% O2 (10/1/2019)	1.43 ppmvd @15% O2 (5/12/2020)

EURICE3	0.59 ppmvd @15% O2 (10/1/2019)	1.56 ppmvd @15% O2 (5/13/2020)
EURICE4	0.08 ppmvd @15% O2 (10/1/2019)	1.92 ppmvd @15% O2 (5/13/2020)
EURICE5	0.68 ppmvd @15% O2 (10/2/2019)	1.08 ppmvd @15% O2 (5/14/2020)
EURICE6	0.19 ppmvd @15% O2 (10/2/2019)	0.75 ppmvd @15% O2 (5/14/2020)
EURICE7	0.70 ppmvd @15% O2 (10/2/2019)	1.37 ppmvd @15% O2 (5/15/2020)

The facility is required to test formaldehyde emission rates semiannually until two consecutive tests are passed, then testing is to be done annually. The facility tested October 2019 and May 2020, they passed both tests, the next test is to be done by May 2021.

Monitoring/Record Keeping (SC. VI. 1-5):

The facility maintains the following records to demonstrate continuous compliance with emission limits:

- Catalyst inlet temp
- Pressure Drop across the catalyst

During the onsite inspection, the facility was only operating engine 1, 4, 5, and 7. Operation Parameters observed during the site visit are summarized below:

Parameter	EURICE1	EURICE4	EURICE5	EURICE7
Engine Load	12 MW	12 MW	18.9 MW	13 MW
Urea Injection Rate	3.7 gal/hr	4.2 gal/hr	4.4 gal/hr	5.4 gal/hr
Catalyst Inlet Temp	777 Degrees F	783 Degrees F	727 Degrees F	774 Degrees F

Pressure Drop Across Catalyst	0.22 psi	0.19 psi	0.3 psi	0.23 psi
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Records of the catalyst pressure drops recorded during the performance test in May 2020 are attached to the hard file of this report. Average operating parameters (Including catalyst pressure drops) recorded for each engine for the month of June 2020 are also attached. Averages are shown below:

Do Not Change Formulas

				1	pressure/sq.in.	
				27.708	Inch water	
Permit Ranges at Full Load (100% load +/- 10%, > 16.92 MW)						
Engine	Average PSI	PSI Minimum	PSI Maximum	Average inch Water	Minimum Inch Water	Maximum Inch Water
Kuester 11	0.15	0.08	0.22	4.16	2.16	6.16
Kuester 12	0.13	0.06	0.20	3.60	1.60	5.60
Kuester 13	0.13	0.06	0.20	3.60	1.60	5.60
Kuester 14	0.11	0.04	0.18	3.05	1.05	5.05
Kuester 25	0.13	0.06	0.20	3.60	1.60	5.60
Kuester 26	0.12	0.05	0.19	3.32	1.32	5.32
Kuester 27	0.12	0.05	0.19	3.32	1.32	5.32

Exhaust temperatures recorded for June 2020 and December 2020 are attached to the hard file of this report.

Reporting (SC. VII 1-8):

The facility has promptly reported deviations and submitted semiannual and annual ROP certifications on time. They have also submitted compliance reports for 40 CFR Part 63 Subpart ZZZZ.

Flexible Group: FGNEHAP5D

Emission Unit: EUHEATER1

Description: Gas 1 Fuel Subcategory requirements for new Boilers/Process Heaters at major sources of Hazardous Air Pollutants per 40 CFR Part 63, Subpart DDDDD. These new boilers or process heaters will burn natural gas only and must comply with this subpart upon startup.

Process/Operational Restrictions (SC. III. 1-5) Monitoring/Record Keeping (SC. VI. 1-4):

The facility's most recent tune up for EUHEATER1 record is attached the hard copy of this report, this was performed on 11/12/2020. This unit only burns natural gas and has a heat input rating of less than 5 MMBtu/hr.

The facility maintains records of compliance and performance tests. Maintenance records for EUHEATER1 are attached to the hard copy of this report.

Reporting (SC. VII 1-11):

The facility has promptly reported deviations and submitted semiannual and annual ROP certifications on time. They have also submitted compliance reports for 40 CFR Part 63 Subpart DDDDD.

Compliance Determination:

At the time of my inspection and records review it appears UMERC F.D. Kuester Generating station is following MI-ROP-P0797-2020 and all other applicable state and federal air quality regulations.

NAME Sally Hewson

DATE 2/23/21

SUPERVISOR ELH