

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

P026255428

FACILITY: BLUE WATER RENEWABLES		SRN / ID: P0262
LOCATION: 6797 SMITHS CREEK ROAD, SMITHS CREEK		DISTRICT: Warren
CITY: SMITHS CREEK		COUNTY: SAINT CLAIR
CONTACT: Nick Diedrich , Environmental Engineer		ACTIVITY DATE: 02/11/2020
STAFF: Iranna Konanahalli	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MAJOR
SUBJECT: FY2020 ROP CMS scheduled inspection of Blue Water Renewables, LLC ("Blue Water" or "BWR"),		
RESOLVED COMPLAINTS:		

Blue Water Renewables, LLC (P0262)– DTE Engines
6797 Smiths Creek Road
Smiths Creek (Kimball). Michigan 48074-3506

NAICS: 221119 & SCC: 2-01-008-02

ROP: MI-ROP-N6207-2018 Effective June 07, 2018, Expiring June 07, 2023
(consolidated two ROPs into SRN N6207: MI-ROP-P0262-2012a expired June 5, 2017 and MI-ROP-N6207-2012). The ROP incorporated PTI No. 163-09D.

ROP Application Nos.: 201600183 Smiths Creek Landfill (N6207) as two facilities (SCL & BWR) have been consolidated and 201700078 for BWR Minor Mod to incorporate PTI No. 163-09D.

PTI No. 163-09D (Melissa Byrnes) dated May 31, 2017. This modification increased the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 1,300 ppmv. i.e., Sulfur Dioxide(SO₂) emissions increase of 44.9 tons of SO₂ per year based on 1,300 ppm sulfur in the fuel. Correspondingly, SO₂ limits were raised to 6.21 pph and 54.4 tpy from 2.18 pph 9.54 tpy (Mod163-09C → 163-09D) based upon 1300 ppm sulfur content in the fuel. It is not expected the sulfur will ever reach this level; e.g., < 400 ppm S in LFG in CY 2019, monthly average. DTE – St. Clair and Belle River power plants (DTE-SC/BR) were included in the modeling analysis. LANDGEM predicts the maximum landfill gas (LFG) production to be no more than 2,220 scfm and the actual LFG available for combustion is 1,554 scfm (2,220 x 70% capture efficiency). The flare has a capacity of 2,000 scfm and each engine of two engines has a capacity of 480.48 scfm. In addition to annual RICE NSPS engine testing, BWR is required to perform LFG gas sampling on a weekly basis to determine the sulfur content in the fuel and stack testing once every five years for NO_x, CO, SO₂, and formaldehyde (based on ROP schedule). Practically all DTE-BWR operations of the engines (2) is governed by this permit which is incorporated into the ROP.

VN: September 23, 2014, Violation Notice for exceeding the Single Hazardous Air Pollutant (HAP) emission limit of 9 TPY (formaldehyde) and failing comply with NESHAP / MACT 4Z.

CO: Consent Order AQD No. 25-2015 (for exceeding single HAP limit of 9 tpy and failure to comply with NESHAP / MACT 4Z as cited in Sep 14, 2014, Violation Notice). The CO requires BWR to comply with the permit (most recent: PTI No. 163-09D), increase stack heights (25 feet to 38 feet), test for formaldehyde emissions rates from each engine (two Caterpillar G3520C SI RICE engines) by August 21, 2015. Settlement \$33,000.00. CO void request was approved before the ROP was issued.

PTI Mods: PTI No. 163-09 (approved for two Caterpillar G3520C SI RICE engines [G3520C, 2,233 bhp at 100% load] and one Caterpillar G3516 SI RICE engine [G3516, 1,148 bhp at 100% load], which was never installed) → PTI No. 163-09A (remove Sec. 112 HAP limits contained in FG-FACILITY because the Company was required to test their RICE for formaldehyde [HAP] and the emissions were greater than 10 tpy, a major source; also third engine, Caterpillar G3516, was removed as it was never installed) → PTI No. 163-09B (Denied: increase the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 800 ppmv) → PTI No. 163-09C (increase the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 228 ppmv) → PTI No. 163-09D (increase the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 1,300 ppmv).). In addition to annual RICE NSPS engine testing, BWR is required to perform LFG gas sampling on a weekly basis to determine the sulfur content in the fuel and stack testing once every five years for NO_x, CO, SO₂, and formaldehyde (based on ROP schedule). Practically all DTE-BWR operations of the engines (2) is governed by this permit which is incorporated into the ROP

PTI voids: PTI Nos. 163-09 (approved: 10/26/2009 & voided: 02/11/2015); 163-09A (approved: 02/11/2015 & voided: 08/18/2015); 163-09B (Denied: 03/10/2016); 163-09C (approved: 10/19/2016 & voided: 06/01/2017); 163-09D (approved: 06/01/2017 & voided: will be voided upon issuing ROP).

Rule 702 BACT: Compliance with NSPS 4J for VOC is deemed to satisfy this BACT.

Subject to NSPS 4J: Two (PTI No. 163-09D, FG-ICENGINES: EU- ICENGINE1 and EU- ICENGINE2) SI RICE engines are subject to New Source Performance Standard 40 CFR, Part 60, Subpart JJJJ. SI RICE NSPS 4J requires annual (every 8,760 hours based upon non-resettable hour meter) stack testing for CO, NO_x, NMOC (VOC excluding methane).

Subject to NESHAP / MACT 4Z: All SI RICE engines are subject to Major Source National Emissions Standards for Hazardous Air Pollutants, as specified in 40 CFR, Part 63, Subpart A and Subpart ZZZZ, for Stationary Reciprocating Internal Combustion Engines.

NSPS 4J & MACT Z: Page 3568 Federal Register / Vol. 73, No. 13 / Friday, January 18, 2008 / Rules and Regulations / Final rule. NSPS 4J Revision: Page 37954 Federal Register / Vol. 76, No. 124 / Tuesday, June 28, 2011 / Rules and Regulations / Final rule. Amendments to the NESHAP for RICE MACT 4Z and also NSPS 4J: Page 6674 Federal Register / Vol. 78, No. 20 / Wednesday, January 30, 2013 / Rules and Regulations / Final rule. Notice of final decision on reconsideration of January 30, 2013 Final Rule: Page 48072 Federal Register / Vol. 79, No. 158 / Friday, August 15, 2014 / Rules and Regulations. Notice of final decision on reconsideration of January

30, 2013 Final Rule: Page 48072 Federal Register / Vol. 79, No. 158 / Friday, August 15, 2014 / Rules and Regulations

Contacts: Mr. Robert B. Sanch (Phone: 734-302-5383; Cell: 734-834-4117; E-mail: Robert.Sanch@dteEnergy.com), P.E., Sr. Environmental Supervisor, DTE Energy Resources, LLC, 414 S. Main St., Suite 600, Ann Arbor, MI 48104. DTEPowerIndustrial.com and Mr. David M. Harris (Phone: 734-479-0707; Cell: 313-804-9116; E-mail: HarrisonD@dteEnergy.com), Biomass Operations.

Mr. Nick T. Diedrich (Phone: 734-302-5392; Cell: 734-276-8233; E-mail: Nicholas.Diedrich@dteEnergy.com), P.E., Sr. Environmental Engineer, and Mr. Daniel E. Morris (Phone: 734-389-5079; Cell: 810-434-4196; ; E-mail: Daniel.E.Morris@dteEnergy.com). Both Messrs. Diedrich and Morris moved to other areas of DTE.

Mr. Mark R. Hill, Jr. (Phone: 734-302-5359; E-mail: Mark.Hill@DTEEnergy.com), VP – Operations, Responsible Official.

Tester: Mr. Roger Mellars (Phone: 734-519-2936; Cell: 734-914-5645; E-mail: rMellars@LemosLabs.com), Emissions Analyst, Lemos Labs, LLC, 6017 Enterprise Dr., Suite B, Export, PA 15632.

On February 11, 2020, I conducted a level-2 **FY2020 ROP CMS scheduled** inspection of Blue Water Renewables, LLC (“Blue Water” or “BWR”), located at 6797 Smiths Creek Road, Smiths Creek (Kimball). Michigan 48074-3506. The inspection was conducted to determine compliance with the Federal Clean Air Act; Article II, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451; and Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) administrative rules.

During the FY 2020 inspection, Mr. Robert B. Sanch (Phone: 734-302-5383; Cell: 734-834-4117; E-mail: Robert.Sanch@dteEnergy.com), P.E., Sr. Environmental Supervisor, DTE Energy Resources, LLC, 414 S. Main St., Suite 600, Ann Arbor, MI 48104 and Mr. David M. Harris (Phone: 734-479-0707; Cell: 313-804-9116; E-mail: HarrisonD@dteEnergy.com), DTE Biomass Operations., assisted me.

Smiths Creek Landfill (owned by St. Clair County) is a municipal solid waste landfill, located at 6779 Smiths Creek Road, Smiths Creek, Michigan. Blue Water Renewables, Inc., (operated by DTE Biomass Energy) owns an electric generating facility that utilizes landfill gas as fuel; the address for this facility is also 6797 Smiths Creek Road, Smiths Creek, Michigan. Smiths Creek Landfill (SRN: N6207) is a Type II Sanitary Landfill, owned and operated by St. Clair County. Blue Water Renewables (operated by DTE Biomass, SRN: P0262) owns an electric generating facility located at the landfill that utilizes the landfill gas as fuel. An agreement was made between AQD management and the managements of Smiths Creek Landfill and Blue Water Renewables, Inc. This agreement allowed the two entities (SCL & BWR) to have separate ROPs; together these entities comprise one single stationary source. As result of this policy reversal, a consolidated ROP (Sec. 1: SCL & Sec. 2: BWR) was issued on June 7, 2018, under SRN N6207.

Blue Water Renewables, LLC, owns and operates two landfill gas fueled, Caterpillar, Model G3520C, spark ignition (SI) reciprocating internal combustion engines (RICE). The engines are permitted under MI-ROP-N6207-2018 (consolidated from MI-ROP-P0262-2012 and most recent PTI No. 163-09D dated May 31, 2017) and are subject to the National Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, 40 CFR Part 60 Subpart JJJJ, and the National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, 40 CFR Part 63 Subpart ZZZZ.

In addition, to the engines, Blue Water Renewables operated a landfill gas (LFG) treatment system which dewateres, filters, and compresses the LFG prior to combustion in the engines.

PTI No. 163-09D, EU-TREATMENTSYS is subject to the New Source Performance Standards for Municipal Solid Waste Landfills promulgated in 40 CFR, Part 60, Subparts A and WWW. Smiths Creek is primarily responsible for complying with landfill requirements. As I observed, the process is equipped with one in-line filter system and one moisture knock-out drum (reduce gas pressure such that moisture condenses).

Flexible Groups

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FG-ICENGINES-BWR2	Two (2) internal combustion, lean burn engines for combusting treated landfill gas to produce electricity.	EU-ICENGINE1-BWR2 EU-ICENGINE2-BWR2

Emission Units

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
EU-TREATMENTSYS-BWR2	This emission unit treats landfill gas before it is used for electrical generation. The treatment system removes particulate to at least the 10 micron level, compresses the landfill gas, and removes enough moisture to ensure good combustion during subsequent use. The treatment of the LFG ensures that a high percentage of NMOC will be destroyed in the internal combustion engines (spark ignition, lean burn, reciprocating internal combustion engine Caterpillar G3520C, 2,233 bhp at 100% load engines and associated generator producing 1.6 megawatt gross electrical output).	June 1, 2011	NA
EU-ICENGINE1-BWR2	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt or MW gross electrical output).	June 1, 2011	FG-ICENGINES-BWR2

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
	Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output) Serial No. GZJ00491		
EU-ICENGINE2-BWR2	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output) Serial No. GZJ00493	June 1, 2011	FG-ICENGINES-BWR2
Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1290.			

All NSPS Engines (Nos. 1 and 2): Caterpillar Model G3520C (mechanical engine work output 2,333 BHP > 500 BHP at 100% load, 1.6 MW [megawatt] gross electrical power output), Year 2011 (construction / reconstruction after December 19, 2002), lean burn SI RICE, landfill gas (LFG) only, non-emergency. Two engines are subject to SI RICE NSPS 4J (40 CFR, Part 60, Subpart JJJJ). All NSPS engines were installed about June 1, 2011 (construction / reconstruction after December 19, 2002). All engines are subject to Major Source RICE NESHAP / MACT 4Z. All engines fire only landfill gas (LFG) from Smith Creek Landfill. All engines are subject to annual (8,760 hours) testing per NSPS 4J.

September 23, 2014, Violation Notice and Consent Order

AQD issued September 23, 2014, Violation Notice to Blue Water Renewables (DTE Energy) for exceeding the Single Hazardous Air Pollutant (HAP) emission limit of 9 TPY (formaldehyde) and failing comply with NESHAP / MACT 4Z. AQD settled the issues with Consent Order AQD No. 25-2015. DTE Energy (DTE Biomass Energy) of Ann Arbor requested termination of AQD No. 25-2015 via the June 21, 2017 letter from Mark R. Hill, Jr. to Lynn Fiedler. AQD agreed to terminate the consent order.

Based upon FY 2017 thru FY 2020 inspection, the stack height has been increased. On October 19, 2015, AQD received formaldehyde test report. See below for stack test results.

Stack Tests

January 11-12, 2012, stack test (PTI No. 163-09)

1. Engine1 (all units in pounds per hour & g/bhp-hr, respectively): NA (HCl limit: 0.51 lb/hr); 2.5 & 0.5 (NO_x limit: 3.0 & 0.6); 12.5 & 2.5 (CO limit: 16.3 & 3.3) and ND (NMOC limit: 1.0 g/bhp-hr)

2. Engine2 (all units in pounds per hour & g/bhp-hr, respectively): 0.05 (HCl limit: 0.51 lb/hr); 2.5 & 0.5 (NO_x limit: 3.0 & 0.6); 12.0 & 2.4 (CO limit: 16.3 & 3.3) and 0.14 (NMOC limit: 1.0 g/bhp-hr)

August 18-19, 2015, formaldehyde test

On October 19, 2015, AQD received formaldehyde test report. Formaldehyde sampling for two SI RICE engines (Engine #1 [08/18/2015] & Engine #2 [08/19/2015]) was performed on August 18-19, 2015. BWR reported emission rates of 1.7 and 1.8 pounds per hour for Engine1 and Engine2, respectively (PTI No. 163-09D, FG-ICENGINES, 1.7 limit: 2.12 pounds per hour)

February 04,2020 testing – Formaldehyde, nitrogen oxides (NO_x), Carbon Monoxide (CO) Volatile Organic Compounds (VOC)

AQD received formaldehyde test report (LEMOS LABS LLC PROJECT 00913). Formaldehyde sampling for two SI RICE engines (Engine #1 [02/04/2020] & Engine #2 [02/04/2020]) was performed on February 04,2020. BWR reported emission rates of 1.245 and 1.805 pounds per hour for Engine1 and Engine2, respectively (MI-ROP-N6207-2018, PTI No. 163-09D, FG-ICENGINES, 1.7 limit: 2.12 pounds per hour)

The February 04,2020, sampling also included, in addition to formaldehyde, nitrogen oxides (NO_x), Carbon Monoxide (CO) Volatile Organic Compounds (VOC) per the ROP (MI-ROP-N6207-2018, FG-ICENGINES-BWR2, V.1: every five years from the date of completion of the most recent stack test, the permittee shall verify NO_x, HCl, CO, SO₂ emission rates). The test results are as follows:

FG-ICENGINES-BWR2 (may also be referred to as FG-ICENGINES), I.1-9 (1 in 5 yrs tests)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	February 04,2020, test
1. CO	16.3 ² pph (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	
2. CO	5.0 ² g/bhp-hr or 610 ² ppmvd corrected to 15% O ₂ (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	327 (Eng1) & 305 (Eng2) ppmvd @ 15% O ₂
3. NO _x	3.0 ² pph (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	
4. NO _x	2.0 ² g/bhp-hr	Hourly	EU-ICENGINE1-BWR2	49 (Eng1) & 52 (Eng2) ppmvd @ 15% O ₂

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	February 04,2020, test
	or 150 ² ppmvd corrected to 15% O ₂ (applies to each engine)		and EU-ICENGINE2- BWR2	
5. Hydrogen Chloride (HCl)	0.51 ² pph (applies to each engine)	Hourly	EU-ICENGINE1- BWR2 and EU-ICENGINE2- BWR2	Not a part of February 04,2020, test report.
6. VOC	1.0 ² g/bhp-hr or 80 ² ppmvd corrected to 15% O ₂ (applies to each engine)	Hourly	EU-ICENGINE1- BWR2 and EU-ICENGINE2- BWR2	2.0 (Eng1) & 1.5 (Eng2) ppmvd @ 15% O ₂
7. Formaldehyde	2.12 ² pph ¹ (applies to each engine)	Hourly	EU-ICENGINE1- BWR2 and EU-ICENGINE2- BWR2	1.245 (Eng1) & 1.805 (Eng2) pounds per hour
8. SO ₂	6.21 ² pph (applies to each engine)	Hourly	EU-ICENGINE1- BWR2 and EU-ICENGINE2- BWR2	Weekly sampling < 400 ppm S in LFG in 2019 Vs limit of 1300 pm
9. SO ₂	54.4 ² tpy ^A	12-month rolling time period, as determined at the end of each calendar month	FG-ICENGINES- BWR2	Weekly sampling < 400 ppm S in LFG in 2019 Vs limit of 1300 pm

^A This limit is based on the calculation in Appendix 7-2

Jan 25 & 31, 2017, NSPS 4J stack tests

Jan 25 & 31, 2017, annual, SI RICE NSPS 4J, Stack Test of DTE Engines (NSPS 4J Engines: EU- ICENGINE1 and EU- ICENGINE2) –

In all two (2) engines are present: ROP: MI-ROP--P0262-2012a and PTI No. 163-09D dated May 31, 2017. Two engines (FG-ICENGINES: EU- ICENGINE1 and EU- ICENGINE2) are required to be tested annually (every 8,760 hours based upon non-resettable hour meter) because these two engines, manufactured after June 12, 2006 (installed June 01, 2011), are subject to NSPS 4J. During the Jan 25 & 31, 2017, annual / 8,760-hour stack test pursuant to MI-ROP--P0262-2012a, FG-ICENGINES, V.2 TESTING/SAMPLING and PTI

No. 163-09D, FG-ICENGINES, V.2 TESTING/SAMPLING (stack test every 8,760 hours of operation using non-resettable hour meter), the engines are as follows:

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
EUIENGINE1	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output Serial No. GZJ00491	June 1, 2011	FGICENGINES
EUIENGINE2	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output Serial No. GZJ00493	June 1, 2011	FGICENGINES

All NSPS Engines (Nos 1 and 2): Caterpillar Model G3520C (mechanical engine work output 2,333 BHP > 500 BHP at 100% load, 1.6 MW [megawatt] gross electrical power output), Year 2011 (construction / reconstruction after December 19, 2002), lean burn SI RICE, landfill gas (LFG) only, non-emergency. Two engines are subject to SI RICE NSPS 4J (40 CFR, Part 60, Subpart JJJJ). All NSPS engines were installed about June 1, 2011 (construction / reconstruction after December 19, 2002). All engines are subject to Major Source RICE NESHAP / MACT 4Z. All engines fire only landfill gas (LFG) from Smith Creek Landfill.

Smiths Creek Landfill (N6207) is currently producing nearly 1000 scfm of LFG (800-920 scf). Unless either of the RICE engines are malfunctioning or shut down for scheduled maintenance, all of the LFG produced by the landfill is combusted by the DTE engines. Smiths Creek does have two flares (open flares with shrouds): a 10" diameter flare with a 2000 scfm capacity, a 3" diameter flare with a 30-200 scfm capacity. When in operation the flow and temperature are recorded every 15 minutes as required by the ROP. Blue Water Renewables keeps electronic copies of the data for the flares; Smiths Creek still maintains the flow/temp data chart at the flares.

Mechanical engine work output BHP is not measured but calculated using the following equation:

Engine work output

$$= (\text{generator output power (kW)}) * (\text{HP} / 0.7457 \text{ kW}) * (1 / \text{generator efficiency } 96\%)$$

Generator electrical output power 1, 600 kW ≈ engine work output 2,233 HP

Smiths Creek Landfill (N6207) supplies conditioned landfill gas (LFG ≈ 50% methane) to the DTE engines (2).

Mr. Mark Grigereit (Phone: 313-897-1324; Cell: 734-276-8233; E-mail: GrigereitM@dteEnergy.com), Principal Engineer, Field Services, DTE Energy, Environmental Management and Resources, submitted test plan via letter dated December 21, 3016. The test plan is for verification of carbon monoxide (CO), nitrogen oxides (NOx) and non-methane organic compounds (NMOC or VOC excluding methane) concentrations in exhaust gases and emission rates from NSPS 4I engines (FG-ICENGINES: EU-ICENGINE1 and EU- ICENGINE2). On January 05, 2017, Mr. Tom Gasloli of AQD-TPU approved the test plan. On January 25 & 31, 2017, Field Services, DTE Energy, Environmental Management and Resources DTE Corporate Services, LLC, of Detroit conducted sampling. On March 15, 2017, AQD received the test report dated March 15, 2017.

LFG RICE generator power output averaged 1,627 kW for Engine1 / Generator1 1,592 kW for Engine2 / Generator2 during the testing. RICE fuel consumption was 531 SCFM for Engine1 and 513 SCFM for Engine2. Lower Heating Value (LHV) of LFG are 435 BTU per SCF for Engine1 (Jan 25, 2017) and 455 BTU per SCF for Engine2 (Jan 31, 2017). US EPA Reference Methods 3A and 320 were used.

PTI No. 163-09D, FG-ICENGINES (EU- ICENGINE1 and EU- ICENGINE2), I. EMISSION LIMIT(S) and TESTED EMISSIONS with OPERATING PARAMETRS

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Pollutant	Limit	Average tested emission rate	Equipment		Underlying Applicable Requirements
1. CO	16.3 pph (applies to each engine)		EUICENGINE1, EUICENGINE2	SC V.1	R 336.1205, 40 CFR 52.21 (d)
2. CO	5.0 g/bhp-hr or 610 ppmvd corrected to 15% O ₂ (applies to each engine)	Engine1 = 264.6 Engine2 = 330.6 ppmv at 15% O ₂ dry	<u>EU-ICENGINE1 (Jan 25)</u> 1610-1650 kW Power 1201 rpm 113 °F inlet air temp 43 psi inlet air pressure 532 SCF LFG <u>EU-ICENGINE2 (Jan 31)</u> 1586-1597 kW Power 1201 rpm 130 °F inlet air temp 44 psi inlet air pressure	SC V.2	40 CFR Part 60 Subpart JJJJ, 40 CFR 60.4233(e) and Table 1

Pollutant	Limit	Average tested emission rate	Equipment		Underlying Applicable Requirements
			513 SCF LFG		
3. NO _x	3.0 pph (applies to each engine)	Hourly	EUICENGINE1, EUICENGINE2	SC V.1	40 CFR 52.21 (c) & (d)
4. NO _x	2.0 g/bhp-hr or 150 ppmvd corrected to 15% O ₂ (applies to each engine)	Engine1 = 45.7 Engine2 = 67.3 ppmv at 15% O ₂ dry	<u>EU-ICENGINE1 (Jan 25)</u> 1610-1650 kW Power 1201 rpm 113 °F inlet air temp 43 psi inlet air pressure 532 SCF LFG <u>EU-ICENGINE2 (Jan 31)</u> 1586-1597 kW Power 1201 rpm 130 °F inlet air temp 44 psi inlet air pressure 513 SCF LFG	SC V.2	40 CFR Part 60 Subpart JJJJ, 40 CFR 60.4233(e) and Table 1
5. Hydrogen Chloride (HCl)	0.51 pph (applies to each engine)	Engine1 = NA Engine2 = 0.05 Jan 11-12, 2012, stack test	EUICENGINE1, EUICENGINE2	SC V.1	R 336.1225
6. VOC or NMOC	1.0 g/bhp-hr or 80 ppmvd corrected to 15% O ₂ (applies to each engine)	Engine1 = 8 Engine2 = 7.5 ppmv at 15% O ₂ dry	<u>EU-ICENGINE1 (Jan 25)</u> 1610-1650 kW Power 1201 rpm 113 °F inlet air temp 43 psi inlet air pressure 532 SCF LFG <u>EU-ICENGINE2 (Jan 31)</u> 1586-1597 kW Power 1201 rpm 130 °F inlet air temp 44 psi inlet air pressure 513 SCF LFG	SC V.2	40 CFR Part 60 Subpart JJJJ, 40 CFR 60.4233(e) and Table 1
7. Formaldehyde	2.12 pph ¹ (applies to each engine)	Engine1 = 1.7 Engine2 = 1.8 Pounds per hour Aug 18-19, 2015 stack tests	EUICENGINE1, EUICENGINE2	SC V.3	R 336.1225(2)
8. SO ₂	6.21 pph (applies to each engine)	Weekly sampling and calculations	EUICENGINE1, EUICENGINE2	SC V.1	40 CFR 52.21 (c) & (d)
9. SO ₂	54.4 tpy ^A	Weekly sampling and calculations	FGICENGINES	SC V.4, VI.2, and	R 336.1205(3)

Pollutant	Limit	Average tested emission rate	Equipment		Underlying Applicable Requirements
				Appendix A	

^AThis limit is based on the calculation in Appendix A. Also, included in this table are results of formaldehyde (August 18-19, 2015) and hydrogen chloride (January 11-12, 2012) stack tests.

The January 25 and 31, 2017, tested emission rates show compliance with the limits. Although pounds per hour (pph) values are not reported, these pph values are deemed to be in compliance since the engines (2) operated at maximum capacity and ppmv values are well within the limits.

Other routine annual (8,760 hrs) NSPS 4J tests for Engine Nos. 1 & 2.

Nomenclature: NO_x = Oxides of Nitrogen (NO_x). CO = Carbon Monoxide (CO). NMOC = Non-Methane Organic Compounds (NMOC). HCl = Hydrogen Chloride (HCl). SO₂ = Sulfur Dioxide (SO₂).

1. January 21 & 25, 2016 (NO_x, CO, NMOC), Ening1 and Engine2, respectively: 35.6 & 36.7 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 237 & 239 ppm CO (limit: 610 ppmvd corrected to 15% O₂); ND & <2 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂). The test was conducted by Environmental Management & Resources, Environmental Field Services, DTE Energy.
2. January 25 & 31, 2017 (NO_x, CO, NMOC), Ening1 and Engine2, respectively: See above for detailed analysis. The test was conducted by Environmental Management & Resources, Environmental Field Services, DTE Energy.
3. January 23 & 24, 2018 (NO_x, CO, NMOC, HCl, SO₂), Ening1 and Engine2, respectively: 31 & 42 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 236 & 255 ppm CO (limit: 610 ppmvd corrected to 15% O₂); 9.6 & 12.3 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂); 0.02 & 0.02 pounds of HCl per hour (limit: 0.51 lbs/hr HCl); 1.0 & 1.0 pounds of SO₂ per hour (limit: 6.21 lbs/hr SO₂). The test was conducted by BT Environmental Consulting, Inc. of Royal Oak (BTEC Project No. 049AS-324444 dated March 16, 2018)
4. February 06, 2019 (NO_x, CO, NMOC), Ening1 and Engine2, respectively: 42.8 & 35.3 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 287.1 & 276.3 ppm CO (limit: 610 ppmvd corrected to 15% O₂); 3.3 & 1.2 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂); NA & NA pounds of HCl per hour (limit: 0.51 lbs/hr HCl); NA & NA pounds of SO₂ per hour (limit: 6.21 lbs/hr SO₂).

The test was conducted by Lemos Labs LLC of Butler, Pennsylvania 16001 (LEMOS LABS LLC PROJECT 0793). As landfill gas sampling and analysis is performed periodically (weekly by gas sampling (e.g., Draeger Tubes, Tedlar Sampling Bags, etc.) and semi-annually by gas sampling using an EPA approved method and laboratory analysis) per the permit (MI-ROP-N6207-2018, FG-ICENGINES-BWR2, V.4), stack sampling may be not necessary for SO₂ and HCl. Also, previous sampling has shown that SO₂ and HCl emission rates are well below the permit limits. H₂S (TRS equivalent) concentration of the landfill gas is well below 1,300 ppmv.

5. February 04, 2020 (NO_x, CO, NMOC, Formaldehyde), Ening1 and Engine2, respectively: 49 & 52 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 327.1 & 304 ppm CO (limit: 610 ppmvd corrected to 15% O₂); 2.0 & 1.5 ppm NMOC or Non-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂); NA & NA pounds of HCl per hour (limit: 0.51 lbs/hr HCl); NA & NA pounds of SO₂ per hour (limit: 6.21 lbs/hr SO₂); 1.245 & 1.085 pounds of formaldehyde per hour (limit: 2.12 pounds of formaldehyde per hour; pentennial or quinquennial or 1 in 5 years testing for formaldehyde per MI-ROP-N6207-2018, FG-ICENGINES-BWR2, V.3). The test was conducted by Lemos Labs LLC of Butler, Pennsylvania 16001 (LEMOS LABS LLC PROJECT 0913).

For example, Traverse City Laboratory (Phone 231-421-8202) of Traverse City, MI 49686, Certificate of Analysis # 8010-19090104-001A dated September 30, 2019, states that hydrogen sulfide (H₂S) concentration in LFG is 325 ppmv. Total Sulfur(TRS) is 332.5.

Sec. 2 ROP: ROP-N6207-2018, dated June 7, 2018, and PTI No. 163-09D dated May 31, 2017 – Compliance Determination

PTI No. 163-09D modified MI-ROP--P0262-2012a especially for sulfur dioxide and hydrogen sulfide limits.

Sec. 2 ROP: ROP-N6207-2018, SOURCE-WIDE

In CY 2019, DTE BWR emitted 86 tons carbon monoxide (CO) per year (ROP-N6207-2018, Source-Wide limit: 225 tons of carbon monoxide (CO), including Sec 1 landfill, which has hardly any CO emissions).

Sec. 2 ROP-N6207-2018 EU-TREATMENTSYS-BWR2

This emission unit treats landfill gas before it is used for electrical generation. The treatment system removes particulate to at least the 10 micron level, compresses the landfill gas, and removes enough moisture to ensure good combustion during subsequent use. The treatment of the LFG ensures that a high percentage of NMOC will be destroyed in the internal combustion engines (spark ignition, lean burn, reciprocating internal combustion engine Caterpillar G3520C, 2,233 bhp at 100% load engines and associated generator producing 1.6 megawatt gross electrical output).

I observed an in-line filter that removes particulate matter. Also, one knock drum is present to remove moisture by lowering pressure. Such LFG treatment is demanded by the proper operation of

the engines as well to improve thermodynamic efficiency and engine reliability. BWR submitted a maintenance plan.

Sec. 2 ROP-N6207-2018 FG-ICENGINES-BWR2

FG-ICENGINES-BWR2 may also be referred to as FG-ICENGINES: Two (2) reciprocating internal combustion engines (RICE) that will only combust treated landfill gas for fuel. Each engine has an associated generator set for producing electricity (PTI No. 163-09D).

FG-ICENGINES-BWR2, I. EMISSION LIMITS

See above under NSPS 4J stack tests. Also, included are results of formaldehyde and hydrogen chloride stack tests.

In CY 2019 DTE BWR used 476 MM SCF of LFG in the two engines. Corresponding to this amount LFG used or burnt in the engines, the annual emissions were: 54.40 and 86 tons of SO₂ and CO, respectively, per year. CH₄ content in LFG ranged from 52 to 57%v on monthly basis. Likewise, sulfur content in LFG ranged from 387 to 507 milligrams per cubic meter, on monthly basis.

BWR submitted MAP.

FG-ICENGINES-BWR2, III. PROCESS/OPERATIONAL RESTRICTION(S)

Engines burn only landfill gas (LFG) to generate electric power. Engines are not certified, and, hence, BWR conducts annual NSPS 4J stack tests. The engine maintenance plan is present.

FG-ICENGINES-BWR2, IV. DESIGN/EQUIPMENT PARAMETER(S)

Air-to-fuel ratio control is working properly (FG-ICENGINES-BWR2, IV.1: Air-to-fuel ratio). The engines are equipped with non-resettable hours meters to track the operating hours (FG-ICENGINES-BWR2, IV.2: non-resettable hours meters). Operating hours readings on September 14, 2017 are: Engine1 = 49,091 & Engine2 = 49,153 hours. The engines are equipped with one common device to monitor and record the total landfill gas fuel (LFG: landfill gas) usage for FG-ICENGINES-BWR2 on a continuous basis (FG-ICENGINES-BWR2, IV.3: a device to monitor and record the total landfill gas fuel usage). LFG readings on September 13, 2017 are: 1.332932 MM SCF per day for engines (2) and 0.000285 MM SCF per day for flares (2); only one of two flares is used depending upon volume of landfill gas. Original 2011 engines: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output Serial No. GZJ00491 (EUCENGINE1) & GZJ00493 (EUCENGINE2) (FG-ICENGINES-BWR2, IV.4: max. HP = 2,233 BHP)

FG-ICENGINES-BWR2, V. TESTING/SAMPLING

Annual NSPS 4J testing for NMOC, NO_x & CO were performed (FG-ICENGINES-BWR2, V.2: annual NSPS 4J tests for NMOC, NO_x & CO). Formaldehyde tests were performed (FG-ICENGINES-BWR2V.1: 1/5yr tests for formaldehyde). Weekly H₂S sampling is done using Draeger Tubes (FG-ICENGINES-BWR2, V.4: weekly H₂S sampling). Weekly sulfur sampling is performed according to the plan dated November 01, 2016. HCl & SO₂ tests are not performed. SO₂ & HCl emissions may be calculated from Sulfur and Chlorine in LFG.

FG-ICENGINES-BWR2, VI. MONITORING/RECORDKEEPING

LFG usage and hours of operation is monitored (FG-ICENGINES-BWR2, VI.1: landfill gas fuel usage and the hours of operation). SO₂ emission rates are calculated and tabulated (FG-

ICENGINES-BWR2, VI.2 & 3: calculate and record the SO₂ emission rates). Engines information is maintained (FG-ICENGINES-BWR2, VI.4: engines info). The required records are maintained (FG-ICENGINES-BWR2, VI.5: records).

CY2019 Emission Summary

1. LFG = 475.862MM CF for two engines in CY2019
2. Rolling 12-month LFG usage = 237.769 MM CF for Engine1 and 238.095 MM CF for Engine2.
My calculated value for total = 475.864 based upon monthly values.
3. Methane content = 51-58 % CH₄
4. Heat content = 523 -579 BTU per SCF
5. Sulfur content = 102 (Feb 2017) -293 (Jul 2017) = 387 (Jul 2019) -507 (May 2019) mg per m³
6. SO₂ emissions = 9.75 (Jan 2019) -12.04 (June 2019) tons per month. CY 2019 = 11.67 TPY
SO₂. (FG-ICENGINES, I.9 limit: 54.4 tpy)
7. NO_x emissions CY 2019 = 41 tons per year
8. CO emissions CY 2019 = 85.63 TPY (SOURCE-WIDE, I.1 limit: 225 tpy)
9. VOC emissions CY 2019 = 12 TPY
10. PM₁₀ emissions CY 2019 = 6 TPY

During my inspection, I recorded the following engine parameters:

September 14, 2017, operating data

	Engine #1	Engine #2
Serial #	GZJ00491	GZJ00493
Engine Hours	49091	49154
Correction Factor %	97	98
LFG Btu	455	440
Fuel Temp (°F)	78.8	80.6
Fuel Pressure (psi)	16.2	16.3
Inlet Air Temp (°F)	131	141
Manifold Air Pressure (psi)	44.9	43.8
Air-Fuel Ratio	8.3	7.9
Air Flow (scfm)	4254	4037
Fuel Flow (scfm)	514	510
Oil Pressure (psi)	68.7	68.4
Oil Differential (psi)	7.2	6
Oil Temp(°F)	204	208
Battery Voltage	26	25.5
Speed (RPM)	1200	1199
Throttle %	57	55
Load %	100	100
Coolant Temp (°F)	221	226

**February 11, 2020,
operating data**

Conclusion

BWR operates its electric power generating engines (Nos. 1-2) in compliance with the RO permit and incorporated federal regulations (NSPS 4J and SI RICE MACT 4Z).

Cylinder Temps (°F)	1131	1180	Blue Water Renewables, LLC (P0262)– DTE Engines 6797 Smiths Creek Road Smiths Creek (Kimball). Michigan 48074-3506 NAICS: 221119 & SCC: 2-01-008-02 ROP: MI-ROP-N6207-2018 Effective June 07, 2018, Expiring June 07, 2023 (consolidated two ROPs into SRN N6207: MI-ROP-P0262-2012a expired June 5, 2017 and MI-ROP-N6207-2012). The ROP incorporated PTI No. 163-09D.
	Engine #1	Engine #2	
Serial #	GZJ00491	GZJ00493	
Engine Hours	69030	68585	
Correction Factor %	99	100	
LFG Btu/ SCF LFG	490	505	
Fuel Temp (°F)	60.8	62.6	
Fuel Pressure (psi)	16.7	16.7	
Inlet Air Temp (°F)	128.7	132.3	
Manifold Air Pressure (psi)	43.9	43.5	
Air-Fuel Ratio	8.7	9	
Air Flow (scfm)	4202	4146	
Fuel Flow (scfm)	482	464	
Oil Pressure (psi)	63.4	65	
Oil Differential (psi)	4.6	8.3	
Oil Temp(°F)	201	195	
Battery Voltage	26	26	
Speed (RPM)	1200	1200	
Throttle %	59	53	
Load %	96	96	
Coolant Temp (°F)	228	228	
Cylinder Temps (°F)	1110	1120	

ROP Application Nos.: 201600183 Smiths Creek Landfill (N6207) as two facilities (SCL & BWR) have been consolidated and 201700078 for BWR Minor Mod to incorporate PTI No. 163-09D.

PTI No. 163-09D (Melissa Byrnes) dated May 31, 2017. This modification increased the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 1,300 ppmv. i.e., Sulfur Dioxide(SO₂) emissions increase of 44.9 tons of SO₂ per year based on 1,300 ppm sulfur in the fuel. Correspondingly, SO₂ limits were raised to 6.21 pph and 54.4 tpy from 2.18 pph 9.54 tpy (Mod163-09C → 163-09D) based upon 1300 ppm sulfur content in the fuel. It is not expected the sulfur will ever reach this level; e.g., < 400 ppm S in LFG in CY 2019, monthly average. DTE – St. Clair and Belle River power plants (DTE-SC/BR) were included in the modeling analysis. LANDGEM predicts the maximum landfill gas (LFG) production to be no more than 2,220 scfm and the actual LFG available for combustion is 1,554 scfm (2,220 x 70% capture efficiency). The flare has a capacity of 2,000 scfm and each engine of two engines has a capacity of 480.48 scfm. In addition to annual RICE NSPS engine testing, BWR is required to perform LFG gas sampling on a weekly basis to determine the sulfur content in the fuel and stack testing once every five years for NO_x, CO, SO₂, and formaldehyde (based on ROP schedule). Practically all DTE-BWR

operations of the engines (2) is governed by this permit which is incorporated into the ROP.

VN: September 23, 2014, Violation Notice for exceeding the Single Hazardous Air Pollutant (HAP) emission limit of 9 TPY (formaldehyde) and failing comply with NESHAP / MACT 4Z.

CO: Consent Order AQD No. 25-2015 (for exceeding single HAP limit of 9 tpy and failure to comply with NESHAP / MACT 4Z as cited in Sep 14, 2014, Violation Notice). The CO requires BWR to comply with the permit (most recent: PTI No. 163-09D), increase stack heights (25 feet to 38 feet), test for formaldehyde emissions rates from each engine (two Caterpillar G3520C SI RICE engines) by August 21, 2015. Settlement \$33,000.00. CO void request was approved before the ROP was issued.

PTI Mods: PTI No. 163-09 (approved for two Caterpillar G3520C SI RICE engines [G3520C, 2,233 bhp at 100% load] and one Caterpillar G3516 SI RICE engine [G3516, 1,148 bhp at 100% load], which was never installed) → PTI No. 163-09A (remove Sec. 112 HAP limits contained in FG-FACILITY because the Company was required to test their RICE for formaldehyde [HAP] and the emissions were greater than 10 tpy, a major source; also third engine, Caterpillar G3516, was removed as it was never installed) → PTI No. 163-09B (Denied: increase the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 800 ppmv) → PTI No. 163-09C (increase the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 228 ppmv) → PTI No. 163-09D (increase the amount of allowable hydrogen sulfide (H₂S) content of the landfill gas to 1,300 ppmv).). In addition to annual RICE NSPS engine testing, BWR is required to perform LFG gas sampling on a weekly basis to determine the sulfur content in the fuel and stack testing once every five years for NO_x, CO, SO₂, and formaldehyde (based on ROP schedule). Practically all DTE-BWR operations of the engines (2) is governed by this permit which is incorporated into the ROP

PTI voids: PTI Nos. 163-09 (approved: 10/26/2009 & voided: 02/11/2015); 163-09A (approved: 02/11/2015 & voided: 08/18/2015); 163-09B (Denied: 03/10/2016); 163-09C (approved: 10/19/2016 & voided: 06/01/2017); 163-09D (approved: 06/01/2017 & voided: will be voided upon issuing ROP).

Rule 702 BACT: Compliance with NSPS 4J for VOC is deemed to satisfy this BACT.

Subject to NSPS 4J: Two (PTI No. 163-09D, FG-ICENGINES: EU- ICENGINE1 and EU- ICENGINE2) SI RICE engines are subject to New Source Performance Standard 40 CFR, Part 60, Subpart JJJJ. SI RICE NSPS 4J requires annual (every 8,760 hours based upon non-resettable hour meter) stack testing for CO, NO_x, NMOC (VOC excluding methane).

Subject to NESHAP / MACT 4Z: All SI RICE engines are subject to Major Source National Emissions Standards for Hazardous Air Pollutants, as specified in 40 CFR, Part 63, Subpart A and Subpart ZZZZ, for Stationary Reciprocating Internal Combustion Engines.

NSPS 4J & MACT Z: Page 3568 Federal Register / Vol. 73, No. 13 / Friday, January 18, 2008 / Rules and Regulations / Final rule. NSPS 4J Revision: Page 37954 Federal Register / Vol. 76, No. 124 / Tuesday, June 28, 2011 / Rules and Regulations / Final rule. Amendments to the NESHAP for RICE MACT 4Z and also NSPS 4J: Page 6674 Federal Register / Vol. 78, No. 20 / Wednesday, January 30, 2013 / Rules and Regulations / Final rule. Notice of final decision on reconsideration of January 30, 2013 Final Rule: Page 48072 Federal Register / Vol. 79, No. 158 / Friday, August 15, 2014 / Rules and Regulations. Notice of final decision on reconsideration of January 30, 2013 Final Rule: Page 48072 Federal Register / Vol. 79, No. 158 / Friday, August 15, 2014 / Rules and Regulations

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Mr. Nick T. Diedrich (Phone: 734-302-5392; Cell: 734-276-8233; E-mail: Nicholas.Diedrich@dteEnergy.com), P.E., Sr. Environmental Engineer, and Mr. Daniel E. Morris (Phone: 734-389-5079; Cell: 810-434-4196; ; E-mail: Daniel.E.Morris@dteEnergy.com). Both Messrs. Diedrich and Morris moved to other areas of DTE.

Mr. Mark R. Hill, Jr. (Phone: 734-302-5359; E-mail: Mark.Hill@DTEEnergy.com), VP – Operations, Responsible Official.

Tester: Mr. Roger Mellars (Phone: 734-519-2936; Cell: 734-914-5645; E-mail: rMellars@LemosLabs.com), Emissions Analyst, Lemos Labs, LLC, 6017 Enterprise Dr., Suite B, Export, PA 15632.

On February 11, 2020, I conducted a level-2 **FY2020 ROP CMS scheduled** inspection of Blue Water Renewables, LLC (“Blue Water” or “BWR”), located at 6797 Smiths Creek Road, Smiths Creek (Kimball). Michigan 48074-3506. The inspection was conducted to determine compliance with the Federal Clean Air Act; Article II, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451; and Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) administrative rules.

During the FY 2020 inspection, Mr. Robert B. Sanch (Phone: 734-302-5383; Cell: 734-834-4117; E-mail: Robert.Sanch@dteEnergy.com), P.E., Sr. Environmental Supervisor, DTE Energy Resources, LLC, 414 S. Main St., Suite 600, Ann Arbor, MI 48104 and Mr. David M. Harris (Phone: 734-479-0707; Cell: 313-804-9116; E-mail: HarrisonD@dteEnergy.com), DTE Biomass Operations., assisted me.

Smiths Creek Landfill (owned by St. Clair County) is a municipal solid waste landfill, located at 6779 Smiths Creek Road, Smiths Creek, Michigan. Blue Water Renewables, Inc., (operated by DTE Biomass Energy) owns an electric generating facility that utilizes landfill gas as fuel; the address for this facility is also 6797 Smiths Creek Road, Smiths Creek, Michigan. Smiths Creek Landfill (SRN: N6207) is a Type II Sanitary Landfill, owned and

operated by St. Clair County. Blue Water Renewables (operated by DTE Biomass, SRN: P0262) owns an electric generating facility located at the landfill that utilizes the landfill gas as fuel. An agreement was made between AQD management and the managements of Smiths Creek Landfill and Blue Water Renewables, Inc. This agreement allowed the two entities (SCL & BWR) to have separate ROPs; together these entities comprise one single stationary source. As result of this policy reversal, a consolidated ROP (Sec. 1: SCL & Sec. 2: BWR) was issued on June 7, 2018, under SRN N6207.

Blue Water Renewables, LLC, owns and operates two landfill gas fueled, Caterpillar, Model G3520C, spark ignition (SI) reciprocating internal combustion engines (RICE). The engines are permitted under MI-ROP-N6207-2018 (consolidated from MI-ROP-P0262-2012 and most recent PTI No. 163-09D dated May 31, 2017) and are subject to the National Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, 40 CFR Part 60 Subpart JJJJ, and the National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, 40 CFR Part 63 Subpart ZZZZ.

In addition, to the engines, Blue Water Renewables operated a landfill gas (LFG) treatment system which dewateres, filters, and compresses the LFG prior to combustion in the engines.

PTI No. 163-09D, EU-TREATMENTSYS is subject to the New Source Performance Standards for Municipal Solid Waste Landfills promulgated in 40 CFR, Part 60, Subparts A and WWW. Smiths Creek is primarily responsible for complying with landfill requirements. As I observed, the process is equipped with one in-line filter system and one moisture knock-out drum (reduce gas pressure such that moisture condenses).

Flexible Groups

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FG-ICENGINES-BWR2	Two (2) internal combustion, lean burn engines for combusting treated landfill gas to produce electricity.	EU-ICENGINE1-BWR2 EU-ICENGINE2-BWR2

Emission Units

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
EU-TREATMENTSYS-BWR2	This emission unit treats landfill gas before it is used for electrical generation. The treatment system removes particulate to at least the 10 micron level, compresses the landfill gas, and removes enough moisture to ensure good combustion during subsequent use. The treatment of the LFG ensures that a high percentage of NMOC will be destroyed in the internal combustion engines (spark ignition, lean burn, reciprocating internal combustion	June 1, 2011	NA

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
	engine Caterpillar G3520C, 2,233 bhp at 100% load engines and associated generator producing 1.6 megawatt gross electrical output).		
EU-ICENGINE1-BWR2	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt or MW gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output) Serial No. GZJ00491	June 1, 2011	FG-ICENGINES-BWR2
EU-ICENGINE2-BWR2	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output) Serial No. GZJ00493	June 1, 2011	FG-ICENGINES-BWR2
Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1290.			

All NSPS Engines (Nos. 1 and 2): Caterpillar Model G3520C (mechanical engine work output 2,333 BHP > 500 BHP at 100% load, 1.6 MW [megawatt] gross electrical power output), Year 2011 (construction / reconstruction after December 19, 2002), lean burn SI RICE, landfill gas (LFG) only, non-emergency. Two engines are subject to SI RICE NSPS 4J (40 CFR, Part 60, Subpart JJJJ). All NSPS engines were installed about June 1, 2011 (construction / reconstruction after December 19, 2002). All engines are subject to Major Source RICE NESHAP / MACT 4Z. All engines fire only landfill gas (LFG) from Smith Creek Landfill. All engines are subject to annual (8,760 hours) testing per NSPS 4J.

September 23, 2014, Violation Notice and Consent Order

AQD issued September 23, 2014, Violation Notice to Blue Water Renewables (DTE Energy) for exceeding the Single Hazardous Air Pollutant (HAP) emission limit of 9 TPY (formaldehyde) and failing comply with NESHAP / MACT 4Z. AQD settled the issues with Consent Order AQD No. 25-2015. DTE Energy (DTE Biomass Energy) of Ann Arbor requested termination of AQD No. 25-2015 via the June 21, 2017 letter from Mark R. Hill, Jr. to Lynn Fiedler. AQD agreed to terminate the consent order.

Based upon FY 2017 thru FY 2020 inspection, the stack height has been increased. On October 19, 2015, AQD received formaldehyde test report. See below for stack test results.

Stack Tests

January 11-12, 2012, stack test (PTI No. 163-09)

1. Engine1 (all units in pounds per hour & g/bhp-hr, respectively): NA (HCl limit: 0.51 lb/hr); 2.5 & 0.5 (NO_x limit: 3.0 & 0.6); 12.5 & 2.5 (CO limit: 16.3 & 3.3) and ND (NMOC limit: 1.0 g/bhp-hr)
2. Engine2 (all units in pounds per hour & g/bhp-hr, respectively): 0.05 (HCl limit: 0.51 lb/hr); 2.5 & 0.5 (NO_x limit: 3.0 & 0.6); 12.0 & 2.4 (CO limit: 16.3 & 3.3) and 0.14 (NMOC limit: 1.0 g/bhp-hr)

August 18-19, 2015, formaldehyde test

On October 19, 2015, AQD received formaldehyde test report. Formaldehyde sampling for two SI RICE engines (Engine #1 [08/18/2015] & Engine #2 [08/19/2015]) was performed on August 18-19, 2015. BWR reported emission rates of 1.7 and 1.8 pounds per hour for Engine1 and Engine2, respectively (PTI No. 163-09D, FG-ICENGINES, 1.7 limit: 2.12 pounds per hour)

February 04,2020 testing – Formaldehyde, nitrogen oxides (NO_x), Carbon Monoxide (CO) Volatile Organic Compounds (VOC)

AQD received formaldehyde test report (LEMOS LABS LLC PROJECT 00913). Formaldehyde sampling for two SI RICE engines (Engine #1 [02/04/2020] & Engine #2 [02/04/2020]) was performed on February 04,2020. BWR reported emission rates of 1.245 and 1.805 pounds per hour for Engine1 and Engine2, respectively (MI-ROP-N6207-2018, PTI No. 163-09D, FG-ICENGINES, 1.7 limit: 2.12 pounds per hour)

The February 04,2020, sampling also included, in addition to formaldehyde, nitrogen oxides (NO_x), Carbon Monoxide (CO) Volatile Organic Compounds (VOC) per the ROP (MI-ROP-N6207-2018, FG-ICENGINES-BWR2, V.1: every five years from the date of completion of the most recent stack test, the permittee shall verify NO_x, HCl, CO, SO₂ emission rates). The test results are as follows:

FG-ICENGINES-BWR2 (may also be referred to as FG-ICENGINES), I.1-9 (1 in 5 yrs tests)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	February 04,2020, test
1. CO	16.3 ² pph (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	
2. CO	5.0 ² g/bhp-hr or 610 ²	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	327 (Eng1) & 305 (Eng2) ppmvd @ 15% O ₂

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	February 04,2020, test
	ppmvd corrected to 15% O ₂ (applies to each engine)			
3. NO _x	3.0 ² pph (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	
4. NO _x	2.0 ² g/bhp-hr or 150 ² ppmvd corrected to 15% O ₂ (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	49 (Eng1) & 52 (Eng2) ppmvd @ 15% O ₂
5. Hydrogen Chloride (HCl)	0.51 ² pph (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	Not a part of February 04,2020, test report.
6. VOC	1.0 ² g/bhp-hr or 80 ² ppmvd corrected to 15% O ₂ (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	2.0 (Eng1) & 1.5 (Eng2) ppmvd @ 15% O ₂
7. Formaldehyde	2.12 ² pph ¹ (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	1.245 (Eng1) & 1.805 (Eng2) pounds per hour
8. SO ₂	6.21 ² pph (applies to each engine)	Hourly	EU-ICENGINE1-BWR2 and EU-ICENGINE2-BWR2	Weekly sampling < 400 ppm S in LFG in 2019 Vs limit of 1300 pm
9. SO ₂	54.4 ² tpy ^A	12-month rolling time period, as determined at the end of each calendar month	FG-ICENGINES-BWR2	Weekly sampling < 400 ppm S in LFG in 2019 Vs limit of 1300 pm

^A This limit is based on the calculation in Appendix 7-2

Jan 25 & 31, 2017, NSPS 4J stack tests

Jan 25 & 31, 2017, annual, SI RICE NSPS 4J, Stack Test of DTE Engines (NSPS 4J Engines: EU- ICENGINE1 and EU- ICENGINE2) –

In all two (2) engines are present: ROP: MI-ROP--P0262-2012a and PTI No. 163-09D dated May 31, 2017. Two engines (FG-ICENGINES: EU- ICENGINE1 and EU- ICENGINE2) are required to be tested annually (every 8,760 hours based upon non-resettable hour meter) because these two engines, manufactured after June 12, 2006 (installed June 01, 2011), are subject to NSPS 4J. During the Jan 25 & 31, 2017, annual / 8,760-hour stack test pursuant to MI-ROP--P0262-2012a, FG-ICENGINES, V.2 TESTING/SAMPLING and PTI No. 163-09D, FG-ICENGINES, V.2 TESTING/SAMPLING (stack test every 8,760 hours of operation using non-resettable hour meter), the engines are as follows:

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Installation Date / Modification Date	Flexible Group ID
EUICENGINE1	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output Serial No. GZJ00491	June 1, 2011	FGICENGINES
EUICENGINE2	Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output). Model: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output Serial No. GZJ00493	June 1, 2011	FGICENGINES

All NSPS Engines (Nos 1 and 2): Caterpillar Model G3520C (mechanical engine work output 2,333 BHP > 500 BHP at 100% load, 1.6 MW [megawatt] gross electrical power output), Year 2011 (construction / reconstruction after December 19, 2002), lean burn SI RICE, landfill gas (LFG) only, non-emergency. Two engines are subject to SI RICE NSPS 4J (40 CFR, Part 60, Subpart JJJJ). All NSPS engines were installed about June 1, 2011 (construction / reconstruction after December 19, 2002). All engines are subject to Major Source RICE NESHAP / MACT 4Z. All engines fire only landfill gas (LFG) from Smith Creek Landfill.

Smiths Creek Landfill (N6207) is currently producing nearly 1000 scfm of LFG (800-920 scf). Unless either of the RICE engines are malfunctioning or shut down for scheduled

maintenance, all of the LFG produced by the landfill is combusted by the DTE engines. Smiths Creek does have two flares (open flares with shrouds): a 10” diameter flare with a 2000 scfm capacity, a 3” diameter flare with a 30-200 scfm capacity. When in operation the flow and temperature are recorded every 15 minutes as required by the ROP. Blue Water Renewables keeps electronic copies of the data for the flares; Smiths Creek still maintains the flow/temp data chart at the flares.

Mechanical engine work output BHP is not measured but calculated using the following equation:

Engine work output

$$= (\text{generator output power (kW)}) * (\text{HP} / 0.7457 \text{ kW}) * (1 / \text{generator efficiency } 96\%)$$

Generator electrical output power 1, 600 kW ≈ engine work output 2,233 HP

Smiths Creek Landfill (N6207) supplies conditioned landfill gas (LFG ≈ 50% methane) to the DTE engines (2).

Mr. Mark Grigereit (Phone: 313-897-1324; Cell: 734-276-8233; E-mail: GrigereitM@dteEnergy.com), Principal Engineer, Field Services, DTE Energy, Environmental Management and Resources, submitted test plan via letter dated December 21, 3016. The test plan is for verification of carbon monoxide (CO), nitrogen oxides (NOx) and non-methane organic compounds (NMOC or VOC excluding methane) concentrations in exhaust gases and emission rates from NSPS 4I engines (FG-ICENGINES: EU-ICENGINE1 and EU- ICENGINE2). On January 05, 2017, Mr. Tom Gasloli of AQD-TPU approved the test plan. On January 25 & 31, 2017, Field Services, DTE Energy, Environmental Management and Resources DTE Corporate Services, LLC, of Detroit conducted sampling. On March 15, 2017, AQD received the test report dated March 15, 2017.

LFG RICE generator power output averaged 1,627 kW for Engine1 / Generator1 1,592 kW for Engine2 / Generator2 during the testing. RICE fuel consumption was 531 SCFM for Engine1 and 513 SCFM for Engine2. Lower Heating Value (LHV) of LFG are 435 BTU per SCF for Engine1 (Jan 25, 2017) and 455 BTU per SCF for Engine2 (Jan 31, 2017). US EPA Reference Methods 3A and 320 were used.

PTI No. 163-09D, FG-ICENGINES (EU- ICENGINE1 and EU- ICENGINE2), I. EMISSION LIMIT(S) and TESTED EMISSIONS with OPERATING PARAMETRS

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Pollutant	Limit	Average tested emission rate	Equipment		Underlying Applicable Requirements
1. CO	16.3 pph (applies to each engine)		EUICENGINE1, EUICENGINE2	SC V.1	R 336.1205, 40 CFR 52.21 (d)

Pollutant	Limit	Average tested emission rate	Equipment		Underlying Applicable Requirements
2. CO	5.0 g/bhp-hr or 610 ppmvd corrected to 15% O ₂ (applies to each engine)	Engine1 = 264.6 Engine2 = 330.6 ppmv at 15% O ₂ dry	<u>EU-ICENGINE1 (Jan 25)</u> 1610-1650 kW Power 1201 rpm 113 °F inlet air temp 43 psi inlet air pressure 532 SCF LFG <u>EU-ICENGINE2 (Jan 31)</u> 1586-1597 kW Power 1201 rpm 130 °F inlet air temp 44 psi inlet air pressure 513 SCF LFG	SC V.2	40 CFR Part 60 Subpart JJJJ, 40 CFR 60.4233(e) and Table 1
3. NO _x	3.0 pph (applies to each engine)	Hourly	EUICENGINE1, EUICENGINE2	SC V.1	40 CFR 52.21 (c) & (d)
4. NO _x	2.0 g/bhp-hr or 150 ppmvd corrected to 15% O ₂ (applies to each engine)	Engine1 = 45.7 Engine2 = 67.3 ppmv at 15% O ₂ dry	<u>EU-ICENGINE1 (Jan 25)</u> 1610-1650 kW Power 1201 rpm 113 °F inlet air temp 43 psi inlet air pressure 532 SCF LFG <u>EU-ICENGINE2 (Jan 31)</u> 1586-1597 kW Power 1201 rpm 130 °F inlet air temp 44 psi inlet air pressure 513 SCF LFG	SC V.2	40 CFR Part 60 Subpart JJJJ, 40 CFR 60.4233(e) and Table 1
5. Hydrogen Chloride (HCl)	0.51 pph (applies to each engine)	Engine1 = NA Engine2 = 0.05 Jan 11-12, 2012, stack test	EUICENGINE1, EUICENGINE2	SC V.1	R 336.1225
6. VOC or NMOC	1.0 g/bhp-hr or 80 ppmvd corrected to 15% O ₂ (applies to each engine)	Engine1 = 8 Engine2 = 7.5 ppmv at 15% O ₂ dry	<u>EU-ICENGINE1 (Jan 25)</u> 1610-1650 kW Power 1201 rpm 113 °F inlet air temp 43 psi inlet air pressure 532 SCF LFG <u>EU-ICENGINE2 (Jan 31)</u> 1586-1597 kW Power 1201 rpm 130 °F inlet air temp 44 psi inlet air pressure 513 SCF LFG	SC V.2	40 CFR Part 60 Subpart JJJJ, 40 CFR 60.4233(e) and Table 1
7. Formaldehyde	2.12 pph ¹ (applies to each engine)	Engine1 = 1.7 Engine2 = 1.8 Pounds per hour	EUICENGINE1, EUICENGINE2	SC V.3	R 336.1225(2)

Pollutant	Limit	Average tested emission rate	Equipment		Underlying Applicable Requirements
		Aug 18-19, 2015 stack tests			
8. SO ₂	6.21 pph (applies to each engine)	Weekly sampling and calculations	EUICENGINE1, EUICENGINE2	SC V.1	40 CFR 52.21 (c) & (d)
9. SO ₂	54.4 tpy ^A	Weekly sampling and calculations	FGICENGINES	SC V.4, VI.2, and Appendix A	R 336.1205(3)

^AThis limit is based on the calculation in Appendix A. Also, included in this table are results of formaldehyde (August 18-19, 2015) and hydrogen chloride (January 11-12, 2012) stack tests.

The January 25 and 31, 2017, tested emission rates show compliance with the limits. Although pounds per hour (pph) values are not reported, these pph values are deemed to be in compliance since the engines (2) operated at maximum capacity and ppmv values are well within the limits.

Other routine annual (8,760 hrs) NSPS 4J tests for Engine Nos. 1 & 2.

Nomenclature: NO_x = Oxides of Nitrogen (NO_x). CO = Carbon Monoxide (CO). NMOC = Non-Methane Organic Compounds (NMOC). HCl = Hydrogen Chloride (HCl). SO₂ = Sulfur Dioxide (SO₂).

1. January 21 & 25, 2016 (NO_x, CO, NMOC), Ening1 and Engine2, respectively: 35.6 & 36.7 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 237 & 239 ppm CO (limit: 610 ppmvd corrected to 15% O₂); ND & <2 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂). The test was conducted by Environmental Management & Resources, Environmental Field Services, DTE Energy.
2. January 25 & 31, 2017 (NO_x, CO, NMOC), Ening1 and Engine2, respectively: See above for detailed analysis. The test was conducted by Environmental Management & Resources, Environmental Field Services, DTE Energy.
3. January 23 & 24, 2018 (NO_x, CO, NMOC, HCl, SO₂), Ening1 and Engine2, respectively: 31 & 42 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 236 & 255 ppm CO (limit: 610 ppmvd corrected to 15% O₂); 9.6 & 12.3 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂); 0.02 & 0.02 pounds of HCl per hour (limit: 0.51 lbs/hr HCl); 1.0 & 1.0 pounds of SO₂ per hour

(limit: 6.21 lbs/hr SO₂). The test was conducted by BT Environmental Consulting, Inc. of Royal Oak (BTEC Project No. 049AS-324444 dated March 16, 2018)

4. February 06, 2019 (NO_x, CO, NMOC), Ening1 and Engine2, respectively: 42.8 & 35.3 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 287.1 & 276.3 ppm CO (limit: 610 ppmvd corrected to 15% O₂); 3.3 & 1.2 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂); NA & NA pounds of HCl per hour (limit: 0.51 lbs/hr HCl); NA & NA pounds of SO₂ per hour (limit: 6.21 lbs/hr SO₂). The test was conducted by Lemos Labs LLC of Butler, Pennsylvania 16001 (LEMOS LABS LLC PROJECT 0793). As landfill gas sampling and analysis is performed periodically (weekly by gas sampling (e.g., Draeger Tubes, Tedlar Sampling Bags, etc.) and semi-annually by gas sampling using an EPA approved method and laboratory analysis) per the permit (MI-ROP-N6207-2018, FG-ICENGINES-BWR2, V.4), stack sampling may be not necessary for SO₂ and HCl. Also, previous sampling has shown that SO₂ and HCl emission rates are well below the permit limits. H₂S (TRS equivalent) concentration of the landfill gas is well below 1,300 ppmv.

5. February 04, 2020 (NO_x, CO, NMOC, Formaldehyde), Ening1 and Engine2, respectively: 49 & 52 ppm NO_x (limit: 150 ppmvd corrected to 15% O₂); 327.1 & 304 ppm CO (limit: 610 ppmvd corrected to 15% O₂); 2.0 & 1.5 ppm NMOC or Nor-Methane Organic Compounds (limit: 80 ppmvd corrected to 15% O₂); NA & NA pounds of HCl per hour (limit: 0.51 lbs/hr HCl); NA & NA pounds of SO₂ per hour (limit: 6.21 lbs/hr SO₂); 1.245 & 1.085 pounds of formaldehyde per hour (limit: 2.12 pounds of formaldehyde per hour; pentennial or quinquennial or 1 in 5 years testing for formaldehyde per MI-ROP-N6207-2018, FG-ICENGINES-BWR2, V.3). The test was conducted by Lemos Labs LLC of Butler, Pennsylvania 16001 (LEMOS LABS LLC PROJECT 0913).

For example, Traverse City Laboratory (Phone 231-421-8202) of Traverse City, MI 49686, Certificate of Analysis # 8010-19090104-001A dated September 30, 2019, states that hydrogen sulfide (H₂S) concentration in LFG is 325 ppmv. Total Sulfur(TRS) is 332.5.

Sec. 2 ROP: ROP-N6207-2018, dated June 7, 2018, and PTI No. 163-09D dated May 31, 2017 – Compliance Determination

PTI No. 163-09D modified MI-ROP--P0262-2012a especially for sulfur dioxide and hydrogen sulfide limits.

Sec. 2 ROP: ROP-N6207-2018, SOURCE-WIDE

In CY 2019, DTE BWR emitted 86 tons carbon monoxide (CO) per year (ROP-N6207-2018, Source-Wide limit: 225 tons of carbon monoxide (CO), including Sec 1 landfill, which has hardly any CO emissions).

Sec. 2 ROP-N6207-2018 EU-TREATMENTSYS-BWR2

This emission unit treats landfill gas before it is used for electrical generation. The treatment system removes particulate to at least the 10 micron level, compresses the landfill gas, and removes enough moisture to ensure good combustion during subsequent use. The treatment of the LFG ensures that a high percentage of NMOC will be destroyed in the internal combustion engines (spark ignition, lean burn, reciprocating internal combustion engine Caterpillar G3520C, 2,233 bhp at 100% load engines and associated generator producing 1.6 megawatt gross electrical output).

I observed an in-line filter that removes particulate matter. Also, one knock drum is present to remove moisture by lowering pressure. Such LFG treatment is demanded by the proper operation of the engines as well to improve thermodynamic efficiency and engine reliability. BWR submitted a maintenance plan.

Sec. 2 ROP-N6207-2018 FG-ICENGINES-BWR2

FG-ICENGINES-BWR2 may also be referred to as FG-ICENGINES: Two (2) reciprocating internal combustion engines (RICE) that will only combust treated landfill gas for fuel. Each engine has an associated generator set for producing electricity (PTI No. 163-09D).

FG-ICENGINES-BWR2, I. EMISSION LIMITS

See above under NSPS 4J stack tests. Also, included are results of formaldehyde and hydrogen chloride stack tests.

In CY 2019 DTE BWR used 476 MM SCF of LFG in the two engines. Corresponding to this amount LFG used or burnt in the engines, the annual emissions were: 54.40 and 86 tons of SO₂ and CO, respectively, per year. CH₄ content in LFG ranged from 52 to 57%v on monthly basis. Likewise, sulfur content in LFG ranged from 387 to 507 milligrams per cubic meter, on monthly basis.

BWR submitted MAP.

FG-ICENGINES-BWR2, III. PROCESS/OPERATIONAL RESTRICTION(S)

Engines burn only landfill gas (LFG) to generate electric power. Engines are not certified, and, hence, BWR conducts annual NSPS 4J stack tests. The engine maintenance plan is present.

FG-ICENGINES-BWR2, IV. DESIGN/EQUIPMENT PARAMETER(S)

Air-to-fuel ratio control is working properly (FG-ICENGINES-BWR2, IV.1: Air-to-fuel ratio). The engines are equipped with non-resettable hours meters to track the operating hours (FG-ICENGINES-BWR2, IV.2: non-resettable hours meters). Operating hours readings on September 14, 2017 are: Engine1 = 49,091 & Engine2 = 49,153 hours. The engines are equipped with one common device to monitor and record the total landfill gas fuel (LFG: landfill gas) usage for FG-ICENGINES-BWR2 on a continuous basis (FG-ICENGINES-BWR2, IV.3: a device to monitor and record the total landfill gas fuel usage). LFG readings on September 13, 2017 are: 1.332932 MM SCF per day for engines (2) and 0.000285 MM SCF per day for flares (2); only one of two flares is used depending upon volume of landfill gas. Original 2011 engines: Caterpillar G3520C, 2,233 BHP at 100% load with a generator 1.6 megawatt gross electrical output Serial No. GZJ00491 (EUCENGINE1) & GZJ00493 (EUCENGINE2) (FG-ICENGINES-BWR2, IV.4: max. HP = 2,233 BHP)

FG-ICENGINES-BWR2, V. TESTING/SAMPLING

Annual NSPS 4J testing for NMOC, NO_x & CO were performed (FG-ICENGINES-BWR2, V.2: annual NSPS 4J tests for NMOC, NO_x & CO). Formaldehyde tests were performed (FG-

ICENGINES-BWR2V.1: 1/5yr tests for formaldehyde). Weekly H2S sampling is done using Draeger Tubes (FG-ICENGINES-BWR2, V.4: weekly H2S sampling). Weekly sulfur sampling is performed according to the plan dated November 01, 2016. HCl & SO2 tests are not performed. SO2 & HCl emissions may be calculated from Sulfur and Chlorine in LFG.

FG-ICENGINES-BWR2, VI. MONITORING/RECORDKEEPING

LFG usage and hours of operation is monitored (FG-ICENGINES-BWR2, VI.1: landfill gas fuel usage and the hours of operation). SO2 emission rates are calculated and tabulated (FG-ICENGINES-BWR2, VI.2 & 3: calculate and record the SO2 emission rates). Engines information is maintained (FG-ICENGINES-BWR2, VI.4: engines info). The required records are maintained (FG-ICENGINES-BWR2, VI.5: records).

CY2019 Emission Summary

1. LFG = 475.862MM CF for two engines in CY2019
2. Rolling 12-month LFG usage = 237.769 MM CF for Engine1 and 238.095 MM CF for Engine2. My calculated value for total = 475.864 based upon monthly values.
3. Methane content = 51-58 % CH4
4. Heat content = 523 -579 BTU per SCF
5. Sulfur content = 102 (Feb 2017) -293 (Jul 2017) = 387 (Jul 2019) -507 (May 2019) mg per m3
6. SO2 emissions = 9.75 (Jan 2019) -12.04 (June 2019) tons per month. CY 2019 = 11.67 TPY SO2. (FG-ICENGINES, I.9 limit: 54.4 tpy)
7. NOx emissions CY 2019 = 41 tons per year
8. CO emissions CY 2019 = 85.63 TPY (SOURCE-WIDE, I.1 limit: 225 tpy)
9. VOC emissions CY 2019 = 12 TPY
10. PM10 emissions CY 2019 = 6 TPY

During my inspection, I recorded the following engine parameters:

September 14, 2017, operating data

	Engine #1	Engine #2
Serial #	GZJ00491	GZJ00493
Engine Hours	49091	49154
Correction Factor %	97	98
LFG Btu	455	440
Fuel Temp (°F)	78.8	80.6
Fuel Pressure (psi)	16.2	16.3
Inlet Air Temp (°F)	131	141
Manifold Air Pressure (psi)	44.9	43.8
Air-Fuel Ratio	8.3	7.9
Air Flow (scfm)	4254	4037
Fuel Flow (scfm)	514	510
Oil Pressure (psi)	68.7	68.4

February 11, 2020, operating data

Conclusion

BWR operates its electric power generating engines (Nos. 1-2) in compliance with the RO permit and incorporated federal regulations (NSPS

4J and SI RICE
MACT 4Z).

Oil Differential (psi)	7.2	6
Oil Temp(°F)	204	208
Battery Voltage	26	25.5
Speed (RPM)	1200	1199
Throttle %	57	55
Load %	100	100
Coolant Temp (°F)	221	226
Cylinder Temps (°F)	1131	1180
	Engine #1	Engine #2
Serial #	GZJ00491	GZJ00493
Engine Hours	69030	68585
Correction Factor %	99	100
LFG Btu/ SCF LFG	490	505
Fuel Temp (°F)	60.8	62.6
Fuel Pressure (psi)	16.7	16.7
Inlet Air Temp (°F)	128.7	132.3
Manifold Air Pressure (psi)	43.9	43.5
Air-Fuel Ratio	8.7	9
Air Flow (scfm)	4202	4146
Fuel Flow (scfm)	482	464
Oil Pressure (psi)	63.4	65
Oil Differential (psi)	4.6	8.3
Oil Temp(°F)	201	195
Battery Voltage	26	26
Speed (RPM)	1200	1200
Throttle %	59	53
Load %	96	96
Coolant Temp (°F)	228	228
Cylinder Temps (°F)	1110	1120

NAME L S McninchallJoyce DATE December 7, 2020 SUPERVISOR