EMISSIONS TEST REPORT

for

OXIDES OF NITROGEN (NO_X), CARBON MONOXIDE (CO), AND NON-METHANE NON-ETHANE ORGANIC COMPOUNDS (NMEOC)

UNITS 1 & 2

BLUE WATER RENEWABLES, LLC
Kimball, Michigan

RECEIVED
MAR 16 2017
AIR QUALITY DIV.

January 25 & 31, 2017

Prepared By
Environmental Management & Resources
Environmental Field Services Group
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DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

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RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Blue Water Renewables — County: St. Clair

Source Address: 6797 Smiths Creek Road — City: Smiths Creek

AQD Source ID (SRN): P0262 — ROP No.: P0262-2012a — ROP Section No.: NA

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From Jan 25, 2017 To Jan 31, 2017

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

NSPS Subpart JJJJ Emissions Testing

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Mark R. Hill, Jr.	Vice President - Operations	(734)302-5359
Name of Responsible Official (print or type)	Title	Phone Number
[signature]		3-15-17
Signature of Responsible Official		Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed emissions testing at Blue Water Renewables, LLC, located in Kimball, Michigan. The fieldwork, performed on January 25 & 31, 2017 was conducted to satisfy requirements of the Michigan Renewable Operating Permit No. MI-ROP-P0262-2012a and 40 CFR 60.4244 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. Emissions tests were performed on Units 1 & 2 for oxides of nitrogen (NO_x), carbon monoxide (CO), and non-methane non-ethane organic compounds (NMEOC).

The results of the emissions testing are highlighted below:

Emissions Testing Summary – Units 1 & 2
Blue Water Renewables, LLC
Kimball, MI
January 25 & 31, 2017

	Oxides of Nitrogen (ppm[1])	Carbon Monoxide (ppm[1])	Non-Methane Non-Ethane Organic Compounds (ppm[1])
Unit 1	45.7	264.6	8.0
Unit 2	67.3	330.6	7.5
Permit Limit	150	610	80

[1]ppm @ 15% $O_{2\,dry}$

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed emissions testing at Blue Water Renewables, LLC, located in Kimball, Michigan. The fieldwork, performed on January 25 & 31, 2017, was conducted to satisfy requirements of the Michigan Renewable Operating Permit No. MI-ROP-P0262-2012a and 40 CFR 60.4244 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A and 320.

The fieldwork was performed in accordance with EPA Reference Methods and EM&R's Intent to Test[1], which was approved by the Michigan Department of Environmental Quality (MDEQ)[2]. The following EM&R personnel participated in the testing program: Mr. Mark Grigereit, Principal Engineer, Mr. Thom Snyder, Environmental Specialist, and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Snyder was the project leader.

Mr. Jeff Neumann, DTE Energy Biomass, provided on-site support of the testing. Mr. Tom Gasloli, MDEQ, reviewed the Test Plan and observed the testing. Mr. Iranna Konanahalli, MDEQ, observed the testing.

2.0 SOURCE DESCRIPTION

The Blue Water Renewables, LLC power generating facility, located at 6797 Smiths Creek Road, Kimball, MI is a power generating facility. The facility consists of two (2) landfill gas-fired internal combustion engines with associated electrical generators.

The systems are Caterpillar G3520C – 1200 RPM 1600 kW Gas Generator Sets. The purpose of the source is to utilize land fill gas from the Smiths Creek Landfill to produce energy that is sent to the electrical grid. Each unit was tested while operating at greater than 90% of full load conditions.

See Figure 1 for a diagram of the unit sampling locations and stack dimensions.

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[1] MDEQ, Test Plan, Submitted December 21, 2017. (Attached-Appendix A)

[2] MDEQ, Acceptance Letter, January 5, 2017. (Attached-Appendix A)

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3.0 SAMPLING AND ANALYTICAL PROCEDURES

DTE Energy obtained emissions measurements in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below

Sampling Method	Parameter	Analysis
USEPA Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 320	NOx, CO, Non-Methane Non-Ethane Organic Compounds, & Moisture Content	Fourier Transform Infrared Spectroscopy (FTIR)

3.1 OXYGEN (USEPA METHOD 3A)

3.1.1 Sampling Method

Oxygen (O_2) determinations were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The analyzers utilize paramagnetic sensors. Testing was performed simultaneously with the gaseous emissions testing. The Oxygen analyzer readings were drawn from the exhaust of the FTIR system.

The EPA Method 3A sampling system (Figure 2) consisted of the following:

(1) Single-point sampling probe (located in the centroid of the exhaust stack)
(2) Flexible unheated PTFE sampling line
(3) MAK® gas conditioner with particulate filter
(4) Servomex 1400 O_2/CO_2 gas analyzer
(5) Appropriate USEPA Protocol 1 calibration gases
(6) Data Acquisition System

3.1.2 Sampling Train Calibration

The O_2 analyzer was calibrated according to procedures outlined in USEPA Methods 3A and 7E. Zero, span, and mid-range calibration gases were introduced directly into the analyzer to verify the instruments linearity. A zero and mid-range span gas for

the diluent was then introduced through the entire sampling system to determine sampling system bias for the analyzer at the completion of each test.

3.1.3 Quality Control and Assurance

All sampling and analytical equipment was calibrated according to the guidelines referenced in Methods 3A and 7E. Calibration gases were EPA Protocol 1 gases and the concentrations were within the acceptable ranges (40-60% mid-range and span) specified in Method 7E. Calibration gas certification sheets are located in Appendix C.

3.1.4 Data Reduction

Data collected during the emissions testing was recorded at 10-second intervals and averaged in 1-minute increments. The O_2 emissions were recorded in percent (%). The 1-minute readings collected during the testing are located in Appendix B.

3.2 MOISTURE DETERMINATION (USEPA METHOD 320)

3.2.1 Sampling Method

Moisture content in the exhaust was evaluated using USEPA Method 320, "Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy".

3.3 OXIDES OF NITROGEN, CARBON MONOXIDE, AND NON-METHANE NON-ETHANE ORGANIC COMPOUNDS (USEPA METHOD 320)

3.3.1 Sampling Method

Oxides of Nitrogen (NOx), Carbon Monoxide (CO), and Non-Methane Non-Ethane Organic Compounds (NMEOC) emissions were evaluated using USEPA Method 320, "Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy". Single point sampling was performed. Triplicate 60-minute test runs were performed.

The USEPA Method 320 sampling system (Figure 2) consisted of the following:

(1) Single-point sampling probe (located in the centroid of the exhaust stack)
(2) Flexible heated PTFE sampling line
(3) Air Dimensions Heated Head Diaphram Pump

(4) MKS MultiGas 2030 FTIR spectrometer
(5) Appropriate calibration gases
(6) Data Acquisition System

The FTIR was equipped with a temperature controlled, 5.11 meter multipass gas cell maintained at 191°C. Gas flows and sampling system pressures were monitored using a rotometer and pressure transducer. All data was collected at 0.5 cm^{-1} resolution.

3.3.2 Sampling Train Calibration

The FTIR was calibrated according to procedures outlined in USEPA Method 320. Direct measurements of Nitrogen (N_2), Nitric Oxide (NO), Carbon Monoxide (CO), Propane (C_3H_8), and Ethylene (C_2H_4) gas standards were made at the test location to confirm concentrations.

A calibration transfer standard (CTS) was analyzed before and after testing at each location. The concentration determined for all CTS runs were within ±5% of the certified value of the standard. Ethylene was passed through the entire system to determine the sampling system response time and to ensure that the entire sampling system was leak-free.

Nitrogen was purged through the sampling system at each test location to confirm the system was free of contaminants.

NO, CO, and C_3H_8 gas standards were passed through the entire sampling system at each test location to determine response time and confirm recovery.

NO, CO, and C_3H_8 analyte spiking was performed to verify the ability of the sampling system to quantitatively deliver a sample containing NO, CO, and Propane from the base of the probe to the FTIR. Analyte spiking assures the ability of the FTIR to quantify these compounds in the presence of effluent gas.

As part of the spiking procedure, samples of effluent stack gas were measured to determine NO, CO, and Propane concentrations to be used in the spike recovery calculations. The determined sulfur hexafluoride (SF_6) concentration in the spiked and unspiked samples was used to calculate the dilution factor of the spike and thus used to calculate the concentration of the spiked analyte. The following equation illustrates the percent recovery calculation.

$$DF = \frac{SF_{6(spike)}}{SF_{6(direct)}}$$ (Sec. 9.2.3 (3) USEPA Method 320)

$$CS = DF * Spike_{dir} + Unspike\ (1 - DF)$$ (Sec. 9.2.3 (4) USEPA Method 320)

DF = Dilution factor of the spike gas
$SF_{6(direct)}$ = SF6 concentration measured directly in undiluted spike gas
$SF_{6(spike)}$ = Diluted SF_6 concentration measured in a spiked sample
$Spike_{dir}$ = Concentration of the analyte in the spike standard measured by the FTIR directly
CS = Expected concentration of the spiked samples
Unspike = Native concentration of analytes in unspiked samples

All analyte spikes were introduced using an instrument grade stainless steel rotometer. The spike target dilution ratio was 1:10 or less. All spike recoveries were within the USEPA Method 320 allowance of ±30%.

3.3.3 Quality Control and Assurance

As part of the data validation procedure, reference spectra are manually fit to that of the sample spectra and a concentration is determined. The reference spectra are scaled to match the peak amplitude of the sample, thus providing a scale factor. The scale factor multiplied by the reference spectra concentration is used to determine the concentration value for the sample spectra. Sample pressure and temperature corrections are then applied to compute the final sample concentration. The manually calculated results are then compared with the software-generated results. The data is then validated if the two concentrations are within ± 5% agreement. If there is a difference greater than ± 5%, the spectra are reviewed for possible spectral interferences or any other possible causes that might lead to inaccurately quantified data. PRISM Analytical Technologies, Inc. validated the FTIR data. The data validation reports are located in Appendix C.

3.3.4 Data Reduction

Each spectrum was derived from the coaddition of 64 scans, with a new data point generated approximately every one minute. The NOx, CO and NMEOC emissions were recorded in parts per million (ppm) dry volume basis. The NMEOC (VOC_{dry}) concentrations consist of Propane, Butane, Ethylene, Acetylene, Propylene, Acetaldehyde, and Methanol. The O_2 emissions were recorded in percent (%) dry volume basis. The moisture content was recorded in percent (%).

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4.0 OPERATING PARAMETERS

The test program included the collection of generator load (kW), engine speed (RPM), inlet manifold air pressure (PSI), inlet air temperature (F), and fuel flow (SCFM).

Operational data is located in Appendix G.

5.0 DISCUSSION OF RESULTS

Table Nos. 1 and 2 present the emission testing results from Units 1 & 2 while operating at greater than 90% of full load conditions. The NO_x, CO, and NMEOC emissions are presented in parts per million corrected to 15% Oxygen on a dry basis (ppm@ $15\%O_{2\ dry}$). Additional test data presented for each test includes the generator power in kilowatts (kW). Units 1 & 2 are in compliance with NO_x, CO, and NMOC emission limits as stated in Michigan Renewable Operating Permit No. MI-ROP-P0262-2012a and 40 CFR60.4244 Subpart JJJJ.

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6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Thomas Snyder, QSTI

This report prepared by: _____

Mr. Thomas Snyder, QSTI
Environmental Specialist, Environmental Field Services
Environmental Management and Resources
DTE Energy Corporate Services, LLC

This report reviewed by: _____ for

Mr. Mark R. Grigereit, QSTI
Principal Engineer, Environmental Field Services
Environmental Management and Resources
DTE Energy Corporate Services, LLC

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TABLE NO. 1
EMISSION TESTING RESULTS - UNIT 1
Blue Water Renewables, LLC
Kimball, MI
January 25, 2017

Test	Test Date	Test Time	Generator Power (kW)	Oxygen (%)	Oxides of Nitrogen (ppm)[1]	Carbon Monoxide (ppm)[1]	Non-Methane, Non-Ethane Organics (ppm)[1]
Test 1	**25-Jan-17**	9:30-10:30	1,611	7.9	45.0	264.3	8.1
Test 2		10:50-11:50	1,619	7.9	46.1	264.7	7.9
Test 3		12:11-13:11	1,651	7.9	46.0	264.9	7.9
		Average:	*1,627*	*7.9*	*45.7*	*264.6*	*8.0*

(1) Emissions reported as parts per million, dry corrected to 15% O_2

Permit Limits:

NO_x - 150 ppmd @ 15% O_2

CO - 610 ppmd @ 15% O_2

NMEOC - 80 ppmd @ 15% O_2

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TABLE NO. 2
EMISSION TESTING RESULTS - UNIT 2
Blue Water Renewables, LLC
Kimball, MI
January 31, 2017

Test	Test Date	Test Time	Generator Power (kW)	Oxygen (%)	Oxides of Nitrogen (ppm)[1]	Carbon Monoxide (ppm)[1]	Non-Methane, Non-Ethane Organics (ppm)[1]
Test 1	**31-Jan-17**	9:25-10:25	1,586	7.8	67.7	331.9	6.9
Test 2		10:48-11:48	1,598	7.8	67.2	330.4	7.7
Test 3		12:10-13:10	1,592	7.8	66.9	329.6	7.8
		Average:	*1,592*	*7.8*	*67.3*	*330.6*	*7.5*

(1) Emissions reported as parts per million, dry corrected to 15% O_2

Permit Limits:

NO_x - 150 ppmd @ 15% O_2

CO - 610 ppmd @ 15% O_2

NMEOC - 80 ppmd @ 15% O_2

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Figure 1 – Stack Drawing and Exhaust Sampling Point Location
Blue Water Renewables – Units 1 & 2
January 25 & 31, 2017

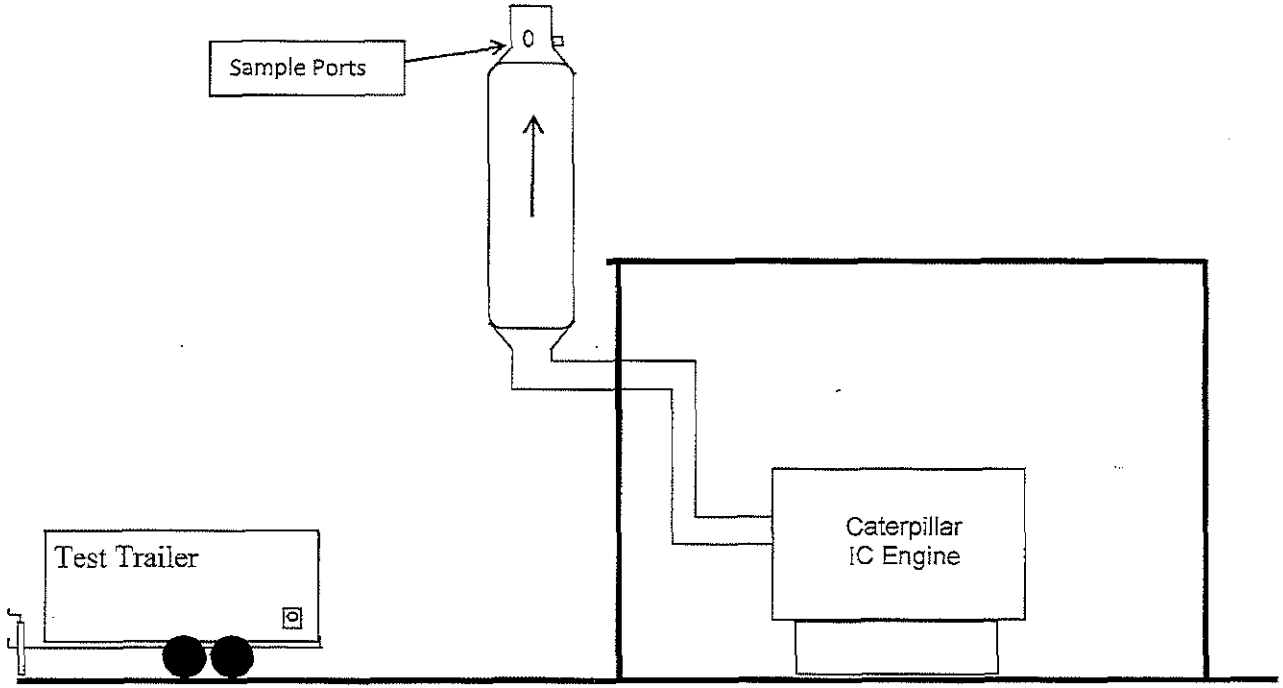

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Figure 2 – USEPA Method 3A/320 Sampling Train
Blue Water Renewables
January 25 & 31, 2017