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Gaseous Emissions Test Report

Lansing Board of Water and Light
REO Town Cogeneration Facility
Emergency Internal Combustion Engine
Lansing, Michigan
September 29, 2016

Report Submittal Date
October 24, 2016

Project No. M163807

888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

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 (RO) Permit 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 described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Lansing Board of Water & Light County: Ingham

Source Address: 601 Island Ave City: Lansing

AQD Source ID (SRN): B2647 RO Permit No.: MI-ROP-B2647-2012c RO Permit Section No.:

Please check the appropriate box(es):

☐ **Annual Compliance Certification (General Condition No. 28 and No. 29 of the RO Permit)**

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 RO Permit, 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 RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, 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 RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (General Condition No. 23 of the RO Permit)**

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

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit 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 RO Permit 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 09/29/2016 To 09/29/2016

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

REO Town Cogeneration Facility Emergency Combustion Engine Gaseous Emissions Test Report

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 Matus	Director Technical Services	517-702-6153
Name of Responsible Official (print or type)	Title	Phone Number

Signature of Responsible Official — Date: 11/02/2016

* Photocopy this form as needed.

EQP 5736 (Rev 9/01)

1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a gaseous emissions test program for Lansing Board of Water and Light on September 29, 2016 at the REO Town Cogeneration Facility on the Emergency Internal Combustion Engine in Lansing, Michigan. This report summarizes the results of the test program and test methods used.

The test location, test date, and test parameters are summarized below.

Test Location	Test Date	Test Parameters
Emergency Internal Combustion Engine	September 29, 2016	Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Carbon Dioxide (CO_2), Oxygen (O_2), Volatile Organic Compounds (VOCs), and Moisture

The purpose of the test program was to evaluate the emissions of the above test parameters with the regulation permit limits. Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS				
Test Location	**Test Date**	**Test Parameter**	**Emission Limits**	**Emission Rates**
Emergency Internal Combustion Engine	September 29, 2016	VOC (as C_3H_8)	0.81 g/bhp-hr	0.53 g/bhp-hr
		CO	2.5 g/bhp-hr	0.27 g/bhp-hr
		NO_x	0.5 g/bhp-hr	0.11 g/bhp-hr

Emissions on g/bhp-hr basis were calculated using bhp supplied by Lansing Board of Water and Light. The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Coordinator	Lansing Board of Water and Light 1232 Haco Drive P.O. Box 13007 Lansing , Michigan 48912	Ms. Trista Gregorski Engineer, Environmental Services (517) 702-6865 (phone) tmg@lbwl.com
Test Facility	REO Town Cogeneration Facility 1110 S. Pennsylvania Avenue Building E Lansing, Michigan	
Testing Company Representative	Mostardi Platt 888 Industrial Drive Lansing, Michigan 60126	Mr. Timothy A. Mei Project Manager (630) 993-2100 (phone) tmei@mp-mail.com

The test crew consisted of Messrs. B. Collins, J. Aksamitowski, and T. Mei of Mostardi Platt.

2.0 TEST METHODOLOGY

Emission testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A. Schematics of the test section diagrams and sampling trains used are included in Appendix A and B, respectively. Calculation examples and nomenclature are included in Appendix C. Copies of analyzer print-outs and field data sheets for each test run are included in Appendices D and E, respectively.

The following methodologies were used during the test program:

Method 1 Traverse Point Determination

Test measurement points were selected in accordance with Method 1A for volumetric flow. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION					
Location	Duct Diameter (Feet)	Area (Square Feet)	Upstream Disturbance Diameter	Downstream Disturbance Distance	Number of Sampling Points
Emergency Internal Combustion Engine	1.125	0.994	2.667	3.778	16

An absence of cyclonic flow test was performed and the test location met the less than 20 degree angle requirement.

Gaseous Sampling Plan

Three points along 17%, 50%, and 83% of the stack diameter were used to sample gaseous emissions.

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate. An S-type pitot tube, differential pressure gauge, Thermal couple and temperature readout were used to determine gas velocity at each sample point. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix I.

Method 3A Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Stack gas O_2 and CO_2 were determined in accordance with Method 3A. Servomex analyzers were used to determine stack gas oxygen and carbon dioxide content. All of the equipment used was calibrated in accordance with the specifications of the Method and calibration data are included in Appendix F. Copies of the gas cylinder certifications are included in Appendix G.

Method 4 Moisture Determination

USEPA Method 4 was utilized to determine water (H_2O) content of the exhaust gas. 100 milliliters (ml) of water were added to each of the first two impingers, the third impinger was left empty, and the fourth impinger was charged with approximately 200 grams of silica gel. The impingers were placed in an ice bath to maintain the sampled gas passed through the silica gel impinger outlet below 68°F in order to increase the accuracy of the sampled dry gas volume

measurement. The water volumes of the impinger train were measured and the silica gel was weighed before and after each test run to determine the mass of moisture condensed.

Each sample was extracted through a heated stainless-steel probe and filter assembly at a constant sample rate of approximately 0.75 cubic feet per minute, which was maintained throughout the course of the test run. A minimum of 21 dry standard cubic feet (dscf) was sampled for each moisture run. After each run, a leak check of the sampling train was performed at a vacuum greater than the sampling vacuum to determine if any leakage had occurred during sampling. Following the leak check, the impingers were removed from the ice bath, water levels were measured, and the silica gel weight was recorded. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix F.

Method 7E Nitrogen Oxide (NO_X) Determination

Stack gas nitrogen oxide concentrations and emission rates were determined in accordance with Method 7E. A Thermo Fisher 42i nitrogen oxide analyzer was used to determine nitrogen oxide concentrations, in the manner specified in the Method.

Stack gas was delivered to the analyzer via a Teflon® sampling line, heated to a minimum temperature of 250°F. Excess moisture in the stack gas was removed using a refrigerated condenser. The entire system was calibrated in accordance with the Method, using certified calibration gases introduced at the probe, before and after each test run.

A list of calibration gases used and the results of all calibration and other required quality assurance checks can be found in Appendix F. Copies of calibration gas certifications can be found in Appendix G.

Method 10 Carbon Monoxide (CO) Determination

Stack gas carbon monoxide concentrations and emission rates were determined in accordance with Method 10. A Thermo Fisher 48i carbon monoxide analyzer was used to determine carbon monoxide concentrations, in the manner specified in the Method.

Stack gas was delivered to the analyzer via a Teflon® sampling line, heated to a minimum temperature of 250°F. Excess moisture in the stack gas was removed using a refrigerated condenser. The entire system was calibrated in accordance with the Method, using certified calibration gases introduced at the probe, before and after each test run.

A list of calibration gases used and the results of all calibration and other required quality assurance checks can be found in Appendix F. Copies of calibration gas certifications can be found in Appendix G.

Method 18/25A Volatile Organic Compound (VOC) Determination

Non-methane hydrocarbon (NMHC) concentrations and emission rates and methane (CH_4) concentrations were determined in accordance with Methods 18 and 25A. A Thermo 55i Gas Chromatograph/Flame Ionization Detector (GC/FID) was used to determine NMHC concentrations and CH_4 concentrations. Stack gas was delivered to the system via a Teflon® sampling line, heated to a minimum temperature of 300°F.

The system was calibrated before and after each test run using certified calibration gases of propane for the NMHC determination and methane for the CH_4 determination. Calibration data are presented in Appendix F, field sheets are presented in Appendix D, and copies of gas certifications are presented in Appendix G.

3.0 TEST RESULT SUMMARY

Lansing Board of Water & Light
REO Town Cogeneration Facility
Emergency Internal Combustion Engine
Gaseous Summary
Normal Load

Test No.	Date	Start Time	End Time	NO_x ppmvd	CO ppmvd	O_2 % (dry)	Moisture %	Flowrate, DSCFM	NMHC ppm as C_3H_8 (wet)	CH_4 ppm as CH_4 (wet)	NMHC ppm as C_3H_8 (dry)
1	09/29/16	11:00	11:59	15.4	66.2	19.4	10.9	3,749	73.9	871.2	82.9
2	09/29/16	12:25	13:24	15.5	63.3	19.5	11.0	3,747	73.0	870.9	82.0
3	09/29/16	13:45	14:44	16.8	68.4	19.3	10.8	3,769	73.7	892.0	82.6
Average				15.9	66.0	19.4	10.9	3,755	73.5	878.0	82.5

Emission Rate Summary

Test No.	Date	Start Time	End Time	Fd Factor, dscf/MMBtu	O2 based NOx lb/MMBtu	O2 based CO lb/MMBtu	O2 based NMHC as C3H8 lb/MMBtu	NO_x lb/hr	CO lb/hr	VOC as C3H8 lb/hr	NO_x g/bhp-hr *	CO g/bhp-hr *	NMHC g/bhp-hr *
1	09/29/16	11:00	11:59	8,710	0.223	0.584	1.149	0.41	1.08	2.13	0.10	0.27	0.53
2	09/29/16	12:25	13:24	8,710	0.241	0.598	1.218	0.42	1.03	2.11	0.10	0.26	0.53
3	09/29/16	13:45	14:44	8,710	0.228	0.565	1.074	0.45	1.12	2.13	0.11	0.28	0.53
Average				8,710	0.231	0.582	1.147	0.43	1.08	2.12	0.11	0.27	0.53

* bhp of 1818 provided by facility

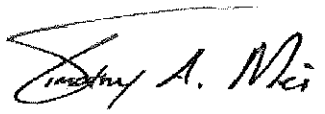
4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Lansing Board of Water and Light. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



Program Manager

Timothy A. Mei

Quality Assurance

Jeffrey M. Crivlare

APPENDICES