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## Relative Accuracy Test Audit Test Report

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Lansing Board of Water and Light  
Delta Energy Park Facility  
EUCTGHRSG2 Bypass Stack  
Lansing, Michigan  
Project No. M233603A  
November 14, 2023

mostardi  platt



**Relative Accuracy Test Audit  
Test Report**

**Lansing Board of Water and Light  
Delta Energy Park Facility  
EUCTGHRSG2 Bypass Stack  
Lansing, Michigan 48917  
November 14, 2023**

**Report Submittal Date  
December 12, 2023**

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**Project No. M233603A**

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## 1.0 EXECUTIVE SUMMARY

Mostardi Platt conducted a Continuous Emissions Monitoring System (CEMS) Relative Accuracy Test Audit (RATA) test program for Lansing Board of Water and Light at the Delta Energy Park Facility in Lansing, Michigan, on the EUCTGHRSG2 Bypass Stack on November 14, 2023. This report summarizes the results of the test program and test methods used in accordance with the Mostardi Platt Protocol M233603A dated September 25, 2023. Mostardi Platt is a self-certified air emissions testing body (AETB). A copy of Mostardi Platt's self-certification can be found in Appendix A. Mostardi Platt is a self-certified air emissions testing body (AETB). A copy of Mostardi Platt's self-certification can be found in Appendix A.

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

TEST INFORMATION		
Test Location	Test Date	Test Parameters
EUCTGHRSG2 Bypass Stack	November 14, 2023	Oxygen (O <sub>2</sub> ) and Nitrogen Oxides (NO <sub>x</sub> )

The purpose of the test program was to demonstrate the relative accuracies of the EUCTGHRSG2 Bypass Stack O<sub>2</sub> and NO<sub>x</sub> analyzers during the specified operating conditions. The test results from this test program indicate that each CEMS component meets the United States Environmental Protection Agency (USEPA) annual performance specification for relative accuracy as published in 40 Code of Federal Regulations Part 75 (40CFR75).

RATA RESULTS						
Test Location	Date	Parameter	Units	Relative Accuracy Acceptance Criteria	Relative Accuracy (RA)	Bias Adjustment Factor (BAF)
EUCTGHRSG2 Bypass Stack	11/14/23	NO <sub>x</sub>	lb/mmBtu	≤ 7.5% of the mean reference value	1.52%	1.000
		O <sub>2</sub>	% dry	≤ 7.5% of the mean reference value	1.88%	N/A

The gas cylinders used to perform the RATA are summarized below.

GAS CYLINDER INFORMATION				
Parameter	Gas Vendor	Cylinder Serial Number	Cylinder Value	Expiration Date
NO <sub>x</sub>	Airgas	CC331452	0.0 ppm	12/18/2025
NO <sub>x</sub>	Airgas	CC237509	25.31 ppm	11/15/2024
NO <sub>x</sub>	Airgas	XC031027B	45.02 ppm	5/17/2026
O <sub>2</sub>	Airgas	CC237509	0.0%	11/15/2024
O <sub>2</sub>	Airgas	CC331452	11.92%	12/18/2025
O <sub>2</sub>	Airgas	CC499531	22.47%	12/14/2030

No deviations, additions, or exclusions from the test protocol, test methods, the Mostardi Platt Quality Manual, or the ASTM D7036-12 occurred. The specific test conditions encountered did not interfere with the collection of the data.

The identifications of the individuals associated with the test program are summarized below.

<b>TEST PERSONNEL INFORMATION</b>		
<b>Location</b>	<b>Address</b>	<b>Contact</b>
Test Coordinator	Lansing Board of Water and Light 1232 Haco Drive P.O. Box 13007 Lansing, Michigan 48912	Mr. Nathan Hude Environmental Regulatory Compliance (517) 702-6170 (cell phone) nathan.hude@lbwl.com
Test Facility	Lansing Board of Water and Light Delta Energy Park Facility 3725 South Canal Road Lansing, Michigan 48917 Permit to Install 74-18A	
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Jeffery Gross Project Manager 630-993-2100 (phone) jgross@mp-mail.com
Testing Company Personnel		Mr. Elliot Flynn Test Technician

Copies of the QI certifications for test personnel are included in Appendix B.

## 2.0 TEST METHODOLOGY

Emission testing was conducted following the United States Environmental Protection Agency (USEPA) methods specified in 40CFR75 and 40CFR60, Appendix A in addition to the Mostardi Platt Quality Manual and the test protocol. Schematics of the test section diagrams and sampling trains used are included in Appendix C and D respectively. Calculation and nomenclature are included in Appendix E. Copies of analyzer print-outs for each test run are included in Appendix F. CEM data and process data as provided by Lansing Board of Water and Light are included in Appendix G.

The following methodologies were used during the test program:

### Method 3A Oxygen (O<sub>2</sub>) Determination

Bypass Stack gas O<sub>2</sub> concentrations were determined in accordance with USEPA Method 3A, 40CFR60, Appendix A. An O<sub>2</sub> analyzer was used to determine the O<sub>2</sub> concentrations in the manner specified in the Method. The instrument has a paramagnetic detector and the O<sub>2</sub> operates in the nominal range of 0% to 25% with the specific range determined by the high-level calibration gas of 22.47%. High-range calibrations were performed using USEPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. High- and a mid-range % O<sub>2</sub> levels in balance nitrogen were also introduced. Zero and mid-range calibrations were performed using USEPA Protocol gas after each test run. Copies of the gas cylinder certifications are found in Appendix I. This testing met the performance specifications as outlined in the Method.

## Method 7E Nitrogen Oxides (NO<sub>x</sub>) Determination

Bypass Stack gas NO<sub>x</sub> concentrations and emission rates were determined in accordance with USEPA Method 7E, 40CFR60, Appendix A. A Thermo Scientific Model 42iQSL Chemiluminescence Nitrogen Oxides Analyzer was used to determine nitrogen oxides concentrations, in the manner specified in the Method. The instrument operated in the nominal range of 0 ppm to 50 ppm with the specific range determined by the high-level span calibration gas of 45.02 ppm.

The Model 42iQSL High Level is based on the principle that nitric oxide (NO) and ozone (O<sub>3</sub>) react to produce a characteristic luminescence with an intensity linearly proportional to the NO concentration. Infrared light emission results when electronically excited nitrogen dioxide (NO<sub>2</sub>) molecules decay to lower energy states. Specifically,



NO<sub>2</sub> must first be transformed into NO before it can be measured using the chemiluminescent reaction. NO<sub>2</sub> is converted to NO by a molybdenum NO<sub>2</sub>-to-NO converter heated to about 324°C. The flue gas air sample is drawn into the Model 42iQSL High Level through the sample bulkhead. The sample flows through a particulate filter, a capillary, and then to the mode solenoid valve. The solenoid valve routes the sample either straight to the reaction chamber (NO mode) or through the NO<sub>2</sub>-to-NO converter and then to the reaction chamber (NO<sub>x</sub> mode).

Dry air enters the Model 42iQSL High Level through the dry air bulkhead, through a flow sensor, and then through a silent discharge ozonator. The ozonator generates the necessary ozone concentration needed for the chemiluminescent reaction. The ozone reacts with the NO in the ambient air sample to produce electronically excited NO<sub>2</sub> molecules. A photomultiplier tube (PMT) housed in a thermoelectric cooler detects the NO<sub>2</sub> luminescence.

The NO and NO<sub>x</sub> concentrations calculated in the NO and NO<sub>x</sub> modes are stored in memory. The difference between the concentrations is used to calculate the NO<sub>2</sub> concentration. The Model 42iQSL High Level outputs NO, NO<sub>2</sub>, and NO<sub>x</sub> concentrations to both the front panel display and the analog outputs.

Bypass Stack gas was delivered to the analyzer via a Teflon® sampling line, heated to a minimum temperature of 250°F. Excess moisture in the Bypass Stack gas was removed using a refrigerated condenser. The entire system was calibrated in accordance with the Method, using USEPA Protocol gases introduced at the probe, before and after each test run. This testing met the performance specifications as outlined in the Method.

A list of calibration gases used and the results of all calibration and other required quality assurance checks are found in Appendix H. Copies of the gas cylinder certifications are found in Appendix I. The NO<sub>2</sub> to NO converter test can be found in Appendix J. This testing met the performance specifications as outlined in the Method.

### 3.0 TEST RESULT SUMMARIES

<b>Client:</b> Lansing Board of Water and Light				<b>Location:</b> EUCTGHRSG 2 Bypass Stack				
<b>Facility:</b> Delta Energy Park				<b>Date:</b> 11/14/23				
<b>Project #:</b> M233603				<b>Test Method:</b> 7E, 3A				
<b>Fuel Type:</b> Natural Gas				<b>Fuel Factor:</b> 8710				
<b>O2 based NOx lb/mmBtu RATA</b>								
<b>CEM Analyzer Information</b>								
<b>NO<sub>x</sub> Monitor/Model:</b>			Thermo 42iQSL		<b>NO<sub>x</sub> Serial # :</b>		1192744583	
<b>O2 Monitor/Model:</b>			Thermo 42iQSL		<b>O2 Serial # :</b>		1192744583	
<b>1=accept 0=reject</b>	<b>Test Run</b>	<b>Test Date</b>	<b>Start Time</b>	<b>End Time</b>	<b>RM NO<sub>x</sub> lb/MMBtu</b>	<b>CEM NO<sub>x</sub> lb/MMBtu</b>	<b>(RM-CEM) Difference (di)</b>	<b>(RM-CEM) Difference<sup>2</sup> (di<sup>2</sup>)</b>
1	1	11/14/23	08:03	08:23	0.067	0.068	-0.001	0.000001
1	2	11/14/23	08:34	08:54	0.067	0.066	0.001	0.000001
1	3	11/14/23	09:04	09:24	0.065	0.065	0.000	0.000000
1	4	11/14/23	09:34	09:54	0.066	0.066	0.000	0.000000
1	5	11/14/23	10:04	10:24	0.065	0.065	0.000	0.000000
1	6	11/14/23	10:34	10:54	0.067	0.066	0.001	0.000001
1	7	11/14/23	11:04	11:24	0.066	0.065	0.001	0.000001
1	8	11/14/23	11:34	11:54	0.066	0.065	0.001	0.000001
1	9	11/14/23	12:04	12:24	0.065	0.064	0.001	0.000001
0	10	11/14/23	12:34	12:54	0.065	0.064	0.001	0.000001
<b>n</b>					<b>9</b>			
<b>t(0.025)</b>					<b>2.306</b>			
<b>Mean Reference Method Value</b>					<b>0.066</b>		<b>RM avg</b>	
<b>Mean CEM Value</b>					<b>0.066</b>		<b>CEM avg</b>	
<b>Sum of Differences</b>					<b>0.004</b>		<b>di</b>	
<b>Mean Difference</b>					<b>0.000</b>		<b>d</b>	
<b>Sum of Differences Squared</b>					<b>0.000</b>		<b>di<sup>2</sup></b>	
<b>Standard Deviation</b>					<b>0.001</b>		<b>sd</b>	
<b>Confidence Coefficient 2.5% Error (1-tail)</b>					<b>0.001</b>		<b>cc</b>	
<b>Relative Accuracy</b>					<b>1.52</b>		<b>RA</b>	
<b>Bias Adjustment Factor</b>					<b>1.000</b>		<b>BAF</b>	

<b>Client:</b> Lansing Board of Water and Light				<b>Location:</b> EUCTGHRSG 2 Bypass Stack				
<b>Facility:</b> Delta Energy Park				<b>Date:</b> 11/14/23				
<b>Project #:</b> M233603				<b>Test Method:</b> 3A				
<b>O<sub>2</sub> % (dry) RATA</b>								
<b>CEM Analyzer Information</b>								
<b>O<sub>2</sub> Monitor/Model:</b>			Thermo 42iQSL		<b>O<sub>2</sub> Serial # :</b>		1192744583	
<b>1=accept 0=reject</b>	<b>Test Run</b>	<b>Test Date</b>	<b>Start Time</b>	<b>End Time</b>	<b>RM O<sub>2</sub> % (dry)</b>	<b>CEM O<sub>2</sub> % (dry)</b>	<b>(RM-CEM) Difference (di)</b>	<b>(RM-CEM) Difference<sup>2</sup> (di<sup>2</sup>)</b>
1	1	11/14/23	08:03	08:23	13.6	13.8	-0.2	0.04
1	2	11/14/23	08:34	08:54	13.6	13.8	-0.2	0.04
1	3	11/14/23	09:04	09:24	13.6	13.8	-0.2	0.04
1	4	11/14/23	09:34	09:54	13.6	13.9	-0.3	0.09
1	5	11/14/23	10:04	10:24	13.6	13.9	-0.3	0.09
1	6	11/14/23	10:34	10:54	13.6	13.8	-0.2	0.04
0	7	11/14/23	11:04	11:24	13.6	13.9	-0.3	0.09
1	8	11/14/23	11:34	11:54	13.7	13.9	-0.2	0.04
1	9	11/14/23	12:04	12:24	13.7	13.9	-0.2	0.04
1	10	11/14/23	12:34	12:54	13.7	13.9	-0.2	0.04
<b>n</b>					<b>9</b>			
<b>t(0.025)</b>					<b>2.306</b>			
<b>Mean Reference Method Value</b>					<b>13.633</b>		<b>RM avg</b>	
<b>Mean CEM Value</b>					<b>13.856</b>		<b>CEM avg</b>	
<b>Sum of Differences</b>					<b>-2.000</b>		<b>di</b>	
<b>Mean Difference</b>					<b>-0.222</b>		<b>d</b>	
<b>Sum of Differences Squared</b>					<b>0.460</b>		<b>di<sup>2</sup></b>	
<b>Standard Deviation</b>					<b>0.044</b>		<b>sd</b>	
<b>Confidence Coefficient 2.5% Error (1-tail)</b>					<b>0.034</b>		<b>cc</b>	
<b>Relative Accuracy</b>					<b>1.88</b>		<b>RA</b>	



## 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.

As the program 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. The test program was performed in accordance with the test protocol, test methods, the Mostardi Platt Quality Manual, and the ASTM D7036-12, as applicable.

MOSTARDI PLATT



Jeffery M. Gross

Program Manager



Scott W. Banach

Quality Assurance

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# APPENDICES