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COMPLIANCE TEST REPORT FOR GRAND HAVEN BOARD OF POWER & LIGHT UNIT 3

February 14, 2017

Grand Haven Board of Power & Light
1700 Eaton Drive
Grand Haven, MI 49417

Job # 17-028

Test Report Date: 03-03-17

Grace Consulting, Inc.
Emissions Testing Services

March 3, 2017

I, Tim Moody, hereby certify that the data obtained for Grand Haven Board of Power & Light on Unit 3 is in accordance with procedures set forth by the USEPA. This report accurately represents the data obtained from the testing procedures and analysis of this data.

Tim Moody/JS

Tim Moody, QSTI
Crew Chief

I, Carl Vineyard, hereby certify that I have reviewed this report and to the best of my knowledge, the data presented herein is complete and accurate.

Carl Vineyard, P.E., QSTI
Test Engineer

Grace Consulting, Inc.
P.O. Box 58
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Wellington, OH 44090

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INTRODUCTION

This report presents the results of the emissions test performed for Grand Haven Board of Power & Light on Unit 3.

The purpose of the tests was to determine the emissions of the unit for compliance. The results can be found in the Summary of Test Results section of this report.

The testing was performed by Grace Consulting, Inc., located at 510 Dickson Street, Wellington, OH 44090. Present during the testing from Grace Consulting, Inc. were Tim Moody, Dave Moody, Zac Mills, and Tyree Wilson. Also, present during the testing were Paul Cederquist and Chris Morse from Grand Haven Board of Power & Light.

The tests were performed on February 14, 2017. The testing was completed in accordance with USEPA test methods as published in the July 1, 2016 Federal Register, - "Standards of Performance for New Stationary Sources" and subsequent revisions.

The sampling and analytical procedures can be found in the Methods and Discussion section of this report. The raw field data and the equations used to determine the final results are presented in the Appendix section.

SUMMARY OF TEST RESULTS

SUMMARY OF TEST RESULTS

The following presents the results of the emissions tests performed for Grand Haven Board of Power & Light on Unit 3.

PARTICULATE EMISSIONS
Method 5 MATS

Run #	Date	lb/dscf	lbs/hr	lb/mmBtu	lb/MWH
1	02-14-17	4.11E-07	5.51	0.007	0.077
2	02-14-17	3.08E-07	4.17	0.005	0.058
3	02-14-17	3.68E-07	4.99	0.006	0.070
AVG.		**3.62E-07**	**4.89**	**0.006**	**0.068**

6.0×10^{-3} $= 7.0 \times 10^{-2}$

Limit 3.0×10^{-2} 3.0×10^{-1}

LEE 1.5×10^{-2} 1.5×10^{-1}

The complete results can be found on the computer printouts following.

Grace Consulting, Inc.

Particulate Analysis

Grand Haven Board of Light & Power
Grand Haven, MI
Unit 3
17-028

Run Number			1	2	3
Date			2/14/2017	2/14/2017	2/14/2017
Location			Unit 3	Unit 3	Unit 3
Comment			Method 5 MATS	Method 5 MATS	Method 5 MATS
Start Time			7:55	10:20	12:50
End Time			10:04	12:30	14:58
Barometric Pressure	In. Hg.	Pb	29.89	29.89	29.89
Static Pressure	In. H2O	Pf	1.80	1.80	1.70
Condensate Collected	grams	Vlc	251.2	274.6	274.1
Volume Sampled	dcf	Vm	81.628	83.559	83.379
Meter Correction Factor		Y	1.018	1.018	1.018
Pitot Tube Correction Factor		Pc	0.836	0.836	0.836
Square Root of Delta P			0.546	0.556	0.556
Orifice Pressure	In. H2O		1.450	1.509	1.504
Meter Temperature	Degree F		53	55	54
Flue Temperature	Degree F		152	151	151
Percent CO2	%		10.90	10.90	11.10
Percent O2	%		7.40	7.30	7.10
Diameter of Nozzle	In.		0.301	0.301	0.301
Area of Flue	Sq. ft.		148.5	148.5	148.5
Sample Time	min.		120	120	120
Weight Gain	grams		0.0160	0.0122	0.0146
F-Factor			1,800	1,800	1,800
MW			71.7	71.6	71.5
Absolute Flue Pressure	in. Hg	Ps	30.02	30.02	30.02
Corrected Sample Volume	dscf	Vms	85.75	87.45	87.43
Measured Moisture of Flue Gas	%	Bws	12.14%	12.90%	12.88%
Calculated Saturated Moisture	%	Bwsat	N/A	N/A	N/A
Moisture used for Calculations	%	Bwsu	12.14%	12.90%	12.88%
Molecular Weight	lb/lb-mole	Ms	28.58	28.48	28.51
Velocity of Flue Gas	fps	Vs	32.96	33.59	33.58
Volume of Flue Gas	ACFM	Vo	293,646	299,277	299,193
Volume of Flue Gas	DSCFM	Qsd	223,356	226,040	225,967
Dust Concentration	lb/dscf	Wd	4.11E-07	3.08E-07	3.68E-07
Dust Concentration	lb/hr	Wh	5.51	4.17	4.99
Dust Concentration	gr/acf	Wa	2.19E-03	1.63E-03	1.95E-03
Dust Concentration	gr/dscf	Ws	2.86E-03	2.15E-03	2.58E-03
Isokinetic Rate	%	%I	96.1	96.9	96.9
Dust Concentration	mg/ACM @ 160 C		3.933	2.915	3.489
Sample Volume @ Stack Conditions	dacm	Vstack	2.8048	2.8557	2.8558
Sample Volume @ Standard Cond	dscm	Vms (metric)	2.4281	2.4762	2.4757
Particulate Concentration	mg/acm (wet)	Cpm(stack)	5.012	3.721	4.454
Particulate Concentration	mg/wscm		5.790	4.291	5.138
Particulate Concentration	mg/DSCM		6.590	4.927	5.897
Particulate Concentration	mg/Ncm		5.790	4.291	5.138
Particulate Emissions	lb/mmBtu	DI	0.007	0.005	0.006
Particulate Emissions	lb/MWH		0.077	0.058	0.070

Averages:			Part. Emis:	
Flue Temp.:	151.3		lb/dscf	3.62E-07
ACFM:	297,372		lb/hr	4.89
DSCFM:	225,121		gr/acf	1.92E-03
Percent O2:	7.27%		gr/dscf	2.54E-03
			lb/mmBtu	0.006
			lb/MWH	0.068

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

Grand Haven Board of Light and Power
Grand Haven, MI - Unit 3

Date: 2/14/2017
Pollutant: CO2
Monitor Span: 19.67

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	11.10	0.13	0.04	-0.46	11.09	11.14	0.25	10.93	10.90
2	11.19	0.04	0.08	0.20	11.14	11.21	0.36	10.93	10.90
3	11.22	0.08	0.13	0.25	11.21	10.94	-1.37	10.93	11.10

$$Cgas = (Cavg - Co) * Cma / (Cm - Co) \qquad \text{Eq. 6C-1}$$

where:

Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent

Grace Consulting, Inc.

Sampling System Bias Check and Measured Value Correction

Grand Haven Board of Light and Power
Grand Haven, MI - Unit 3

Date: 2/14/2017
Pollutant: O2
Monitor Span: 22.07

Run Number	Average Measured Percent	Initial Zero Gas Bias	Final Zero Gas Bias	Zero Gas Drift	Initial Upscale Gas Bias	Final Upscale Gas Bias	Upscale Gas Drift	Calibration Gas	Corrected Value, Dry Basis
1	7.37	0.11	0.23	0.54	10.88	10.91	0.14	10.95	7.40
2	7.36	0.23	0.18	-0.23	10.91	10.96	0.23	10.95	7.30
3	7.23	0.18	0.12	-0.27	10.96	11.13	0.77	10.95	7.10

Cgas = (Cavg - Co) * Cma / (Cm - Co) Eq. 6C-1

where: Cgas = Effluent gas concentration, dry basis, percent
Cavg = Average gas concentration indicated by gas analyzer, dry basis, percent
Co = Average of initial and final system calibration bias check responses for the zero gas, percent
Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent
Cma = Actual concentration of the upscale calibration gas, percent