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COMPLIANCE TEST REPORT

for

PARTICULATE MATTER (PM) PARTICULATE EMISSIONS

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UNIT 2

St. Clair Power Plant
East China, Michigan

December 3, 2013

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CONTENTS

RESULTS TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EMR) Field Services Group performed emissions testing on the exhaust of Unit 2 at the St. Clair Power Plant, located in St. Clair, Michigan. The testing was required by the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) B2796-2009a to document total filterable particulate matter (PM) stack emissions from Unit 2 while firing coal during normal boiler operating conditions. The testing was conducted on December 3, 2013.

A summary of the emission test results are shown below:

Emissions Testing Summary
St. Clair Unit 2
December 3, 2013

Source	PM ($lb/1000lb_{(wet)}$@50%EA)
Unit 2	0.003

Permit Limit: 0.17 $lb/1000lb_{(wet)}$@50%EA

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EMR) Field Services Group performed emissions testing on the exhaust of Unit 2 at the St. Clair Power Plant, located in St. Clair, Michigan. The testing was required by the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) B2796-2009a to document total filterable particulate matter (PM) stack emissions from Unit 2 while firing coal during normal boiler operating conditions. The testing was conducted on December 3, 2013.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1-4, and 17.

The fieldwork was performed in accordance with EPA Reference Methods and EMR Intent to Test[1], which was approved in a letter by Mr. Mark Dziadosz from the Michigan Department of Environmental Quality (MDEQ), dated May 28, 2013[2]. The following EMR personnel participated in the testing program: Mr. Mark Grigereit, Senior Environmental Specialist, Mr. Mark Westerberg, Environmental Specialist, and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Grigereit was the project leader. Mr. Joe Neruda, Environmental Specialist at the plant provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The St Clair Power Plant (SCPP) located at 4901 Pointe Drive in East China Township, Michigan, employs the use of six (6) coal-fired boilers (Units 1-4, 6, and 7). Units 1-4 each have Babcock and Wilcox boilers capable of producing 1,070,000 pounds per hour of steam. Units 1 and 4 are equipped with General Electric turbine generators each with a nominally rated capability of 167 megawatts (MW). Units 2 and 3 have Allis Chalmers turbine generators each with a nominally rated capability of 170 MW. Full load capability for Units 1-4, while firing coal only, is 135 MW, and 150 MW while over-firing with oil.

Units 6 and 7 have Combustion Engineering boilers capable of producing 2,100,000 and 3,580,000 pounds of steam per hour respectively. The turbine generators on each unit were manufactured by Westinghouse and have a nominally rated capability of 325 and 500 megawatts respectively. Full load capability for Units 6 and 7 while firing coal only is approximately 315 MW and 470 MW respectively.

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[1] MDEQ, Test Plan, Submitted May 1, 2013. (Attached-Appendix A)
[2] MDEQ, Approval Letter, dated May 28, 2013. (Attached-Appendix A)

The air pollution control equipment on Units 1-4 consists of Wheelebrator Frye electrostatic precipitators on each unit that have design collection efficiencies of 99.6%. Each exhaust stack is 599 feet tall with an internal diameter of 13.3 feet. The air pollution control equipment on Unit 6 consists of Research Corporation electrostatic precipitators that have design collection efficiencies of 99.6%. The exhaust stack is 425 feet tall with an internal diameter of 19.0 feet. The air pollution control equipment on Unit 7 consists of an American Standard electrostatic precipitator that has design collection efficiency of 99.6%. The exhaust stack is 600 feet tall with an internal diameter of 16.0 feet

The air pollution control equipment on Unit 2 consists of Wheelebrator Frye electrostatic precipitators on each unit that have design collection efficiencies of 99.6%. Each exhaust stack is 599 feet tall with an internal diameter of 13.3 feet. The air pollution control equipment on Unit 6 consists of Research Corporation electrostatic precipitators that have design collection efficiencies of 99.6%. The exhaust stack is 425 feet tall with an internal diameter of 19.0 feet. The air pollution control equipment on Unit 7 consists of an American Standard electrostatic precipitator that has design collection efficiency of 99.6%. The exhaust stack is 600 feet tall with an internal diameter of 16.0 feet

Testing occurred on Unit 2 at greater than 80% of normal full load capability while burning coal.

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* or listed as an approved *"Other Test Method"*. The sampling and analytical methods used in the testing program are indicated in the table below:

Sampling Method	Parameter	Analysis
USEPA Methods 1-2	Exhaust Gas Flow Rates	Field data analysis and reduction
USEPA Method 3A	Oxygen & CO2	Instrumental Analyzer Method
USEPA Method 4	Moisture Content	Field data analysis and reduction
USEPA Method 17	Particulate Matter (In-Stack Filtration)	Gravimetric Analysis

3.1 STACK GAS VELOCITY AND FLOWRATES (USEPA Methods 1-2)

3.1.1 Sampling Method

Stack gas velocity traverses were conducted in accordance with the procedures outlined in USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," and Method 2, "Determination of Stack Gas Velocity and Volumetric Flowrate." On Unit 2, four (4) sampling ports were utilized, sampling at three (3) points per port for a total of twelve (12) sampling points. See Figure 1 for a diagram of the traverse/sampling points used.

Cyclonic flow checks were performed on the stack during the initial flow monitor certification RATA. Testing at the sampling location demonstrated that no cyclonic flow was present. No changes to the Stack have occurred since the cyclonic flow checks were performed. Additionally, static pressure checks performed confirmed that the null angle was at 0°.

3.1.2 Method 2 Sampling Equipment

The EPA Method 2 sampling equipment consisted of a 0-10" incline manometer, S-type pitot tube (C_p = 0.84) and a type-K calibrated thermocouple.

3.2 OXYGEN AND CARBON DIOXIDE (USEPA Method 3A)

3.2.1 Sampling Method

Stack gas Oxygen (O_2) and Carbon Dioxide (CO_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 / CO_2 analyzers utilize paramagnetic sensors.

3.2.2 O_2 / CO_2 Sampling Train

On Unit 2 the Method 3A sampling system consisted of directly sampling the exhaust of the dry gas meter for O_2/CO_2 using a Servomex 1400 O_2/CO_2 gas analyzer.

3.2.3 Sampling Train Calibration

The O_2 / CO_2 analyzer was calibrated according to procedures outlined in USEPA Method 7E. Zero, span, and mid range calibration gases were introduced directly into the analyzer to verify the instruments linearity. The O_2/CO_2 concentrations were recorded on the field data sheets.

3.3 MOISTURE DETERMINATION (USEPA Method 4)

3.3.1 Sampling Method

Determination of the moisture content of the exhaust gas was performed using the method described in USEPA Method 4, "Determination of Moisture Content in Stack Gases". The moisture was collected in glass impingers and the percentage of moisture was then derived from calculations outlined in USEPA Method 4.

3.4 PARTICULATE MATTER (USEPA METHOD 17)

3.4.1 Filterable Particulate Sampling Method

USEPA Method 17, "Determination of Particulate Emissions from Stationary Sources – In-situ Filtration" was used to measure the filterable particulate emissions (see Figure 2 for a schematic of the sampling train). Triplicate, 60-minute sample runs were conducted on Unit 2.

The Method 17 modular isokinetic stack sampling system (Figure 2) consisted of the following:

(1) Stainless-steel button-hook nozzle
(2) Stainless Steel Filter Holder with 47 mm glass fiber filter
(3) Un-heated glass-lined probe and Teflon sample line
(4) Set of glass impingers for the collection of condensate for moisture determination
(5) Length of sample line
(6) Environmental Supply® control case equipped with a pump, dry gas meter, and calibrated orifice.

The filters used in the sampling were initially weighed to a constant weight as described in the Method to obtain the initial tare weight.

After completion of the final leak test for each test run, the filter was recovered, and the probe, nozzle and the front half of the filter holder assembly were brushed and rinsed with acetone. The acetone rinses were collected in a pre-cleaned sample container. The container was labeled with the test number, test location, test date, and the level of liquid marked on the outside of the container. Immediately after recovery, the sample containers were placed in a cooler for storage.

At the laboratory the acetone rinses were transferred to clean pre-weighed beakers, and evaporated to dryness at ambient temperature and pressure. The beakers and filters were then placed in a desiccator for a minimum of 24 hours prior to their initial final weight. Final weights were taken at 6 hour or greater intervals until two weights agreed within 0.5 mg. The data sheets containing the initial and final weights on the filters and beakers are located in Appendix C.

Collected field blanks consisted of a blank filter and acetone solution blank. The acetone blank was collected from the rinse bottle used in sample recovery. The blank filter and acetone were collected and analyzed following the same procedures used to recover and analyze the field samples. Field data sheets for the Method 17 sampling are located in Appendix B.

3.4.2 Quality Control and Assurance

All sampling and analytical equipment was calibrated according to the guidelines referenced in EPA Method 5 (see Appendix D for equipment calibrations).

3.4.3 Data Reduction

Particulate data collected during the emissions testing was calculated and reported as grains per dry standard cubic foot (grains/dscf), pounds per 1000 pounds, (wet), at 50% excess air (lbs/1000 $lb_{(w)}$ @ 50% EA) and pounds per hour (lbs/hr).

The PM emission calculations are based on calculations located in USEPA Method 5. Example calculations are presented in Appendix E.

4.0 OPERATING PARAMETERS

The test program included the collection of boiler load and stack emissions CEMs data during each test run. Parameters recorded included gross Megawatts (MW) and CEMs data (SO_2, NO_x, CO_2, and Opacity).

Process data collected from the Unit's digital control system included load in gross megawatts (MW), main steam flow in thousand pounds per hour (Klbs/hr), total fuel flow in million Btu per hour (MBtu/hr), and coal flow in tons per hour (Tons/hr).

Coal samples were collected during particulate sampling and subject to proximate and ultimate analysis. Operational data and results of the fuel analysis can be referred to in Appendix F.

5.0 DISCUSSION OF RESULTS

Table 1 presents the Particulate Emission testing results from Unit 2. Particulate (Total Filterable) emissions are presented in grain per dry standard cubic foot (gr/DSCF), pounds per hour (lbs/hr) and pounds per 1000 pounds, (wet), @ 50% excess air ($lb/1000lb_{(w)}$ @ 50% EA). Additional test data presented for each test includes the Unit load in gross megawatts (GMW), stack temperature in degrees Fahrenheit (^{o}F), opacity in percent (%), stack gas velocity in feet per minute (ft/min), and stack gas flow rate in actual cubic feet per minute (ACFM), standard cubic feet per minute (SCFM) and dry standard cubic feet per minute (DSCFM).

Testing demonstrated filterable particulate emissions significantly below the permit limit. Unit 2 had average filterable particulate emissions of 0.003 $lb/1000\ lbs_{(wet)}$ @ 50% ea. The respective Permit Limit for Unit 2 is 0.17 $lb/1000\ lbs_{(wet)}$ @ 50% ea.

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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 for:

Mr. Mark R. Grigereit, QSTI

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Table No. 1
PARTICULATE EMISSION TESTING SUMMARY
St. Clair Power Plant - Unit 2
December 3, 2013

Unit 2 - Total Filterable PM

Test	Test Date	Test Time	Unit Load (GMW)	Stack Temperature (°F)	Opacity (%)	Stack Velocity (ft/min)	Exhaust Gas Flowrates (ACFM)	(SCFM)	(DSCFM)	PM Emissions (grains/dscf)	(lbs/hr)	(lbs/1000lb$_{(w)}$ @ 50% EA)[1]
PM-1	**3-Dec-13**	8:10-9:16	125.8	271	0.0	4,790	668,828	465,587	422,031	0.001	4.4	0.003
PM-2	**3-Dec-13**	9:32-10:40	126.1	268	0.0	4,878	681,060	476,327	444,063	0.001	4.8	0.003
PM-3	**3-Dec-13**	10:56-12:05	126	267	0.0	4,821	673,071	471,334	437,097	0.001	5.3	0.003
	Average:		***126.0***	***269***	***0.0***	***4,830***	***674,320***	***471,083***	***434,397***	***0.001***	***4.9***	***0.003***

(1) Permit Limit = 0.15 lbs/1000lbs$_{(w)}$ @ 50% EA

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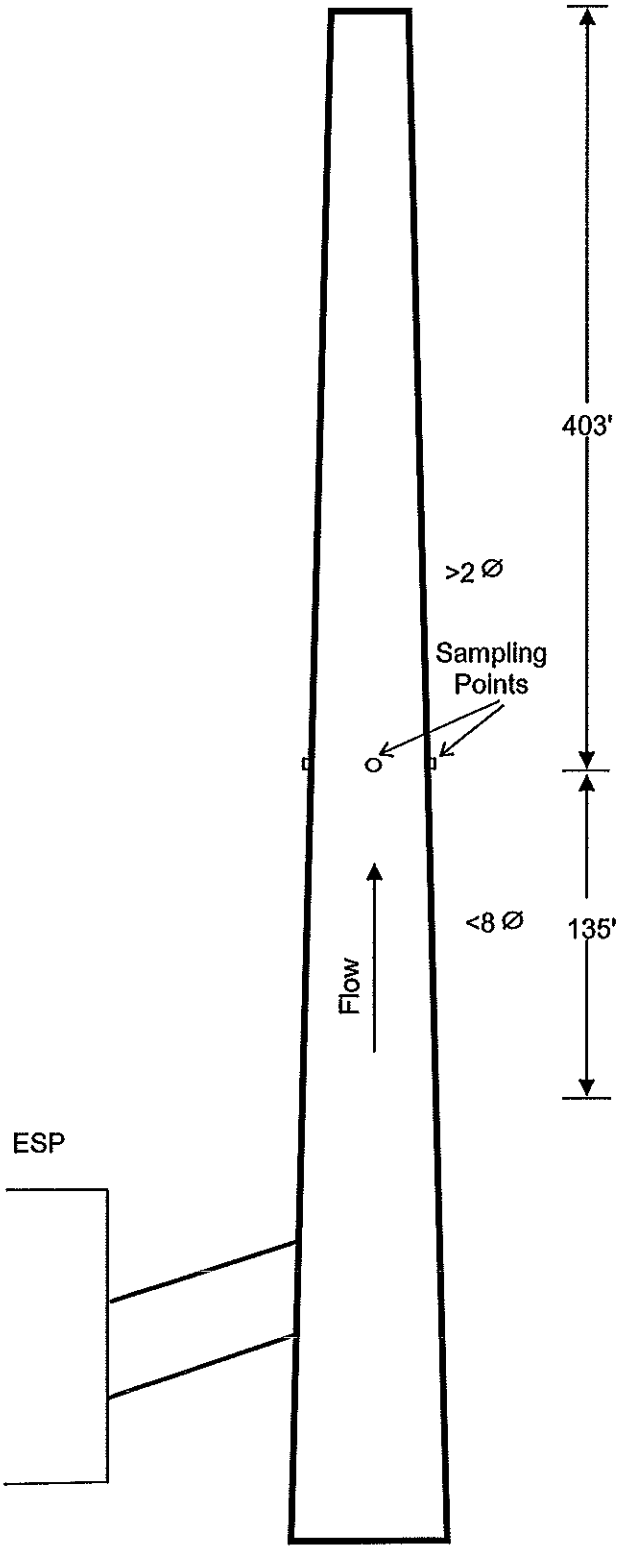
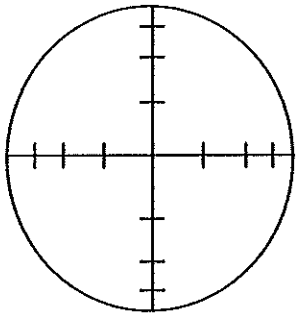
Figure 1 – Sampling Location & Traverse Points
St Clair Power Plant – Unit 2
December 3, 2013



Stack Diameter 13'-4"



Velocity Measurement Points

Points	Distance From Inner Wall
1	7.0
2	23.4
3	47.4

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Figure 2 – EPA Method 17
St Clair Power Plant – Unit 2
December 3, 2013