COMPLIANCE TEST REPORT

for

PARTICULATE MATTER (PM)

EU-Boiler#3 (Unit 3)

River Rouge Power Plant
River Rouge, Michigan

October 16, 2019

Prepared By
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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed Particulate Matter (PM) emissions testing at the DTE Electric River Rouge Power Plant, located in River Rouge, Michigan. The fieldwork, performed on October 16, 2019 was conducted to satisfy requirements of the Michigan Renewable Operating Permit #B2810-2012b. Emission tests were performed on Unit 3 for Filterable Particulate Matter (PM).

A summary of results of the emissions testing are highlighted below:

PM Emissions Test Results
River Rouge Power Plant – Unit 3
River Rouge, Michigan
October 16, 2019

Unit 3	Load (MW)	Particulate (lb/1000 lb @ 50% ea)
PM	237.3	0.001
Permit Limit		**0.175**

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed Particulate Matter (PM) emissions testing at the DTE Electric River Rouge Power Plant, located in River Rouge, Michigan. The fieldwork, performed on October 16, 2019 was conducted to satisfy requirements of the Michigan Renewable Operating Permit #B2810-2012b. Emission tests were performed on Unit 3 for Filterable Particulate Matter (PM).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1,2, 3A, 4 and 17.

The fieldwork was performed in accordance with EPA Reference Methods and EM&R's Intent to Test[1], Test Plan Submittal. The following EM&R Field Services personnel participated in the testing program: Mr. Mark Grigereit, Principal Engineer, Mr. Thomas Snyder, Environmental Specialist, and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Grigereit was the project leader. Ms. Tanecia Wilson, Environmental Engineer, with EM&R, provided process coordination for the testing program. Mr. Tom Gasloli with the Air Quality Division of the Michigan Department of Environmental Quality (EGLE) approved the Test Plan.

2.0 SOURCE DESCRIPTION

The River Rouge Power Plant (RRPP), located at 1 Belanger Park Dr. River Rouge, Michigan, employs the use of one (1) coal-fired boiler. Unit 3 is a Foster-Wheeler Boiler, nominally rated at 278 GMW. Particulate emissions from Unit 3 are controlled via a Wheelabrator-Fry electrostatic precipitator (ESP). The air pollution control equipment has a design collection efficiency of 99.9%.

During the emissions testing the unit was operated within 10% of its highest achievable load.

A schematic representation of the Unit 3 sampling location is presented in Figure 1.

[1] EGLE, Test Plan, Submitted September 3, 2019. (Attached-Appendix A)
[2] EGLE, Approval Letter, Received May 26, 2015. (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 Methods 1-2	Exhaust Gas Flow Rates	Field data analysis and reduction
USEPA Method 3A	Oxygen & Carbon Dioxide	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." Four (4) sampling ports were utilized on the Unit's exhaust stack, sampling at six (6) points per port for a total of twenty four (24) points. Flow traverses were conducted simultaneously with the particulate sampling.

Cyclonic flow checks were performed on the Unit 3 Stack during the initial flow monitor certification RATAs. Testing at the sampling location demonstrated that no cyclonic flow was present. No changes to the Stack have occurred since the cyclonic flow check was performed.

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.

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3.2 OXYGEN & CARBON DIOXIDE (USEPA METHOD 3A)

3.2.1 Sampling Method

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 analyzers utilize paramagnetic sensors. Testing was performed simultaneously with the gaseous emissions testing.

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

(1) Tedlar sampling bag (collecting gas sample from the meter rig exhaust) into a Tedlar Bag
(2) MAK® gas conditioner with particulate filter
(3) Servomex O_2/CO_2 gas analyzer
(4) Appropriate USEPA Protocol 1 calibration gases
(5) Data Acquisition System

3.2.2 Sampling Train Calibration

The O_2 and CO_2 analyzers were calibrated according to procedures outlined in USEPA Methods 3A. Zero, span, and mid-range calibration gases were introduced directly into the analyzer to verify the instruments linearity.

3.2.3 Quality Control and Assurance

All sampling and analytical equipment was calibrated according to the guidelines referenced in Methods 3A. 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.

3.3 MOISTURE DETERMINATION (USEPA METHOD 4)

3.3.1 Sampling Method

Determination of the moisture content of the exhaust gas was performed using USEPA Method 4, "Determination of Moisture Content in Stack Gases". The moisture was collected in the Method 5B glass impingers, and the percentage of water was then derived from calculations outlined in USEPA Method 4.

Upon completion of each test, the impinger contents were weighed to determine moisture content of the gas stream using the calculations found in USEPA Method 4. After recording the impinger weights, the solution was discarded.

All sampling and analytical equipment was calibrated according to the guidelines referenced in EPA Method 5.

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). three, 60-minute sample runs were conducted. Results from the discarded sampling run are included in Appendix B.

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 quartz filter
(3) Un-heated glass-lined probe and PTFE 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 can be found 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 can be found 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 pounds per hour (lbs/hr) and pounds per 1000 pounds, wet, at 50% excess air (lbs/1000 $lb_{(w)}$ @ 50% EA).

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

4.0 OPERATING PARAMETERS

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

During the emissions sampling, a representative coal sample was collected from the unit and analyzed for heat content, percent ash, and percent sulfur. Operational data and results of the fuel analysis are in Appendix E.

5.0 DISCUSSION OF RESULTS

The Results of the Unit 3 PM testing are presented in Table 1. The PM emissions are presented in grains per dry standard cubic foot (gr/DSCF) and pounds per 1000 pounds corrected to 50% excess air (lb/1000 lb Excess air). Auxiliary test data presented for each test includes unit load in gross MegaWatts (GMW), stack temperature in degrees Fahrenheit (°F), stack gas moisture 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).

The results of the PM testing indicate that Unit 3 is in compliance with Michigan Renewable Operating Permit #B2810-2012b.

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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."

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RESULTS TABLE

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TABLE NO. 1
FILTERABLE PARTICULATE EMISSION TESTING RESULTS
River Rouge Power Plant - Unit 3
October 16, 2019

Test	Test Date	Test Time	Unit Load (MW)	Stack Temperature (°F)	Stack Moisture (%)	Stack Velocity (ft/min)	Exhaust Gas Flowrates (ACFM)	(SCFM)	(DSCFM)	Filterable PM Emissions (gr/DSCF)	(lbs/1000lbs @ 50% EA)[1]
PM-1	16-Oct-19	6:28-7:32	235.6	299.6	8.8	2,807	1,217,274	841,439	767,088	0.001	0.002
PM-2		7:45-8:49	238.1	300.8	8.4	2,843	1,233,117	854,261	782,800	0.001	0.001
PM-3		8:59-10:04	238.2	291.6	8.6	2,831	1,227,820	857,811	783,938	0.001	0.001
	Average:		***237.3***	***297.3***	***8.6***	***2,827***	***1,226,070***	***851,170***	***777,942***	***0.001***	***0.001***

(1) Permit Limit = 0.175 lb/1000 lbs @ 50% EA

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FIGURES

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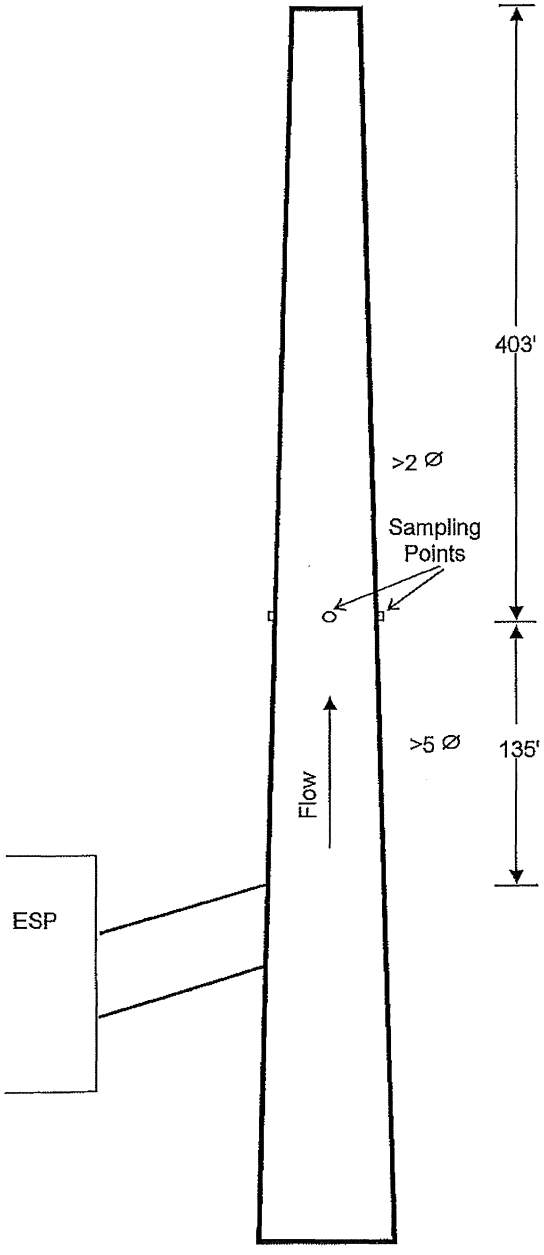
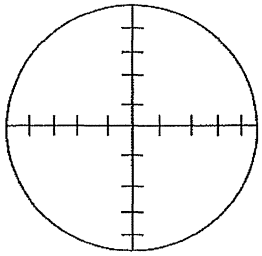
Figure 1 - Sampling Location
River Rouge Power Plant - Unit 3
October 16, 2019



Stack Diameter 282"



Velocity Measurement Points

Points	Distance From Inner Wall
1	5.92
2	18.89
3	33.28
4	49.91
5	70.50
6	100.39

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Figure 2 - EPA Method 3A
River Rouge Power Plant - Unit 3
October 16, 2019

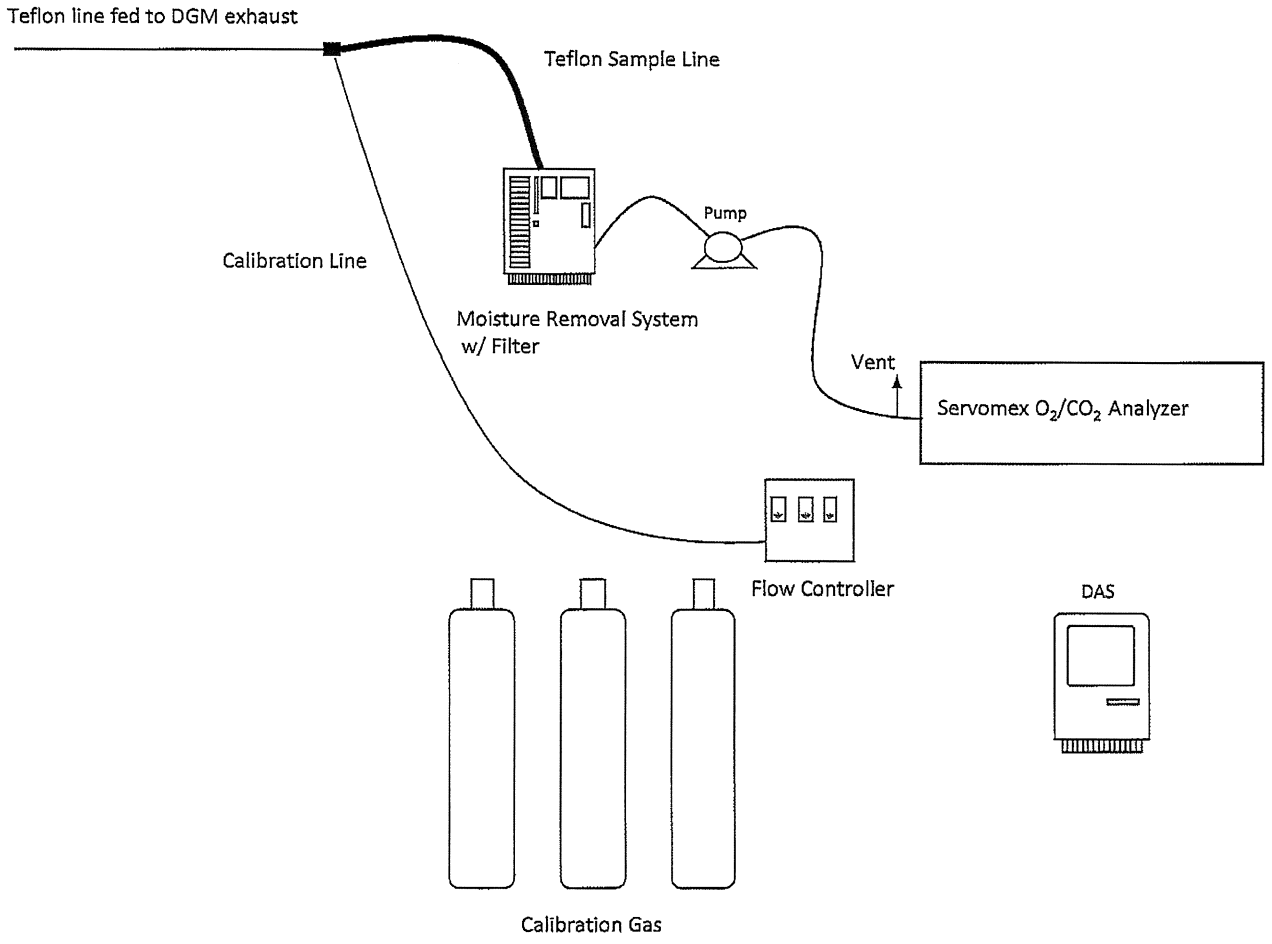

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Figure 3 - EPA Method 17
River Rouge Power Plant - Unit 3
October 16, 2019