COMPLIANCE TEST REPORT

for

TOTAL PARTICULATE MATTER (PM)

EU-BOILER7-SC

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AIR QUALITY DIVISION

St. Clair Power Plant
St. Clair, Michigan

September 16, 2021

Prepared By
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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Safety (EM&S) Ecology, Monitoring, and Remediation Group performed particulate emissions testing on the exhausts of EU-BOILER7-SC at the St. Clair Power Plant, located in St. Clair, Michigan. The testing was required by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Michigan Renewable Operating Permit MI-ROP-B2796-2015c to document total filterable particulate matter (PM). Testing was conducted on September 16, 2021.

A summary of the emission test results is shown below:

Emissions Testing Summary
St. Clair Power Plant
EU-BOILER7-SC

Source	Date	Load (MW)	Filterable PM (lbs/1000 lbs @ 50% EA)[1]
EU-BOILER7-SC	Sept 16, 2021	373	0.011

(1) Permit Limit 0.13 lb/1000lbs @ 50% EA

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Safety (EM&S) Ecology, Monitoring, and Remediation Group performed particulate emissions testing on the exhausts of EU-BOILER7-SC at the St. Clair Power Plant, located St. Clair, Michigan. Testing was required by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Michigan Renewable Operating Permit MI-ROP-B2796-2015c to document total filterable particulate matter (PM) on each Unit. Testing was conducted on September 16, 2021.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1, 3, 4, and 5B.

The fieldwork was performed in accordance with EPA Reference Methods and DTE Energy Intent to Test, which was approved in a letter by Mr. Mark Dziadosz from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), dated February 2, 2021[1]. The following DTE Energy personnel participated in the testing program: Mr. Jason Logan, Environmental Specialist, Mr. Mark Westerberg, Senior Environmental Specialist, and Mr. Kenneth St. Amant, Senior Environmental Technician. Mr. Logan was the project leader. Mr. Dominic Vendittelli, Environmental Specialist, provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The St Clair Power Plant (SCPP) located at 4901 Pointe Drive in St. Clair, Michigan, employs the use of four (4) coal-fired boilers (Units 2-3, 6, and 7). Units 2-3 each have Babcock and Wilcox boilers capable of producing 1,070,000 pounds per hour of steam. Units 2 and 3 have Allis Chalmers turbine generators each with a nominally rated capability of 150 MW.

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.

The air pollution control equipment on Units 2-3 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

[1] EGLE, Approval Letter, dated February 2, 2021. (Attached-Appendix A)

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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 EU-BOILER7-SC at greater than 80% of normal full load capability in accordance with the Approval Letter.

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	Gravimetric Analysis
USEPA Method 5B	Filterable Particulate Matter (Non-Sulfuric Acid)	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, 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.

A cyclonic flow check was performed during Unit 7's 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 check was

performed. Additionally, static pressure checks performed each day confirmed that the null angles were at 0°.

3.1.2 Method 2 Sampling Equipment

The EPA Method 2 sampling equipment consisted of a 0-10" incline manometer, calibrated S-type pitot tubes (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, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)".

3.2.2 O_2 / CO_2 Sampling Train

The Method 3A sampling system consisted of continuously collecting a gas sample from the exhaust of the dry gas meter during each test. The sample was drawn through a Teflon® line into a Universal™ gas conditioner and into a Servomex™ MiniMP 5200 gas analyzer.

3.2.3 Sampling Train Calibration

The 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. Upscale and downscale gases were introduced after every test period to determine instrument drift. CO_2 and O_2 concentrations were recorded once per test port and averaged for the test period.

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 as a component of the PM sampling train, and the percentage of moisture was then derived from calculations outlined in USEPA Method 4.

3.4 PARTICULATE MATTER (USEPA Method 5B)

3.4.1 Filterable Particulate Sampling Method

USEPA Method 5B, "Determination of Non-Sulfuric Acid Particulate Emissions from Stationary Sources" was used to measure the filterable (front-half) particulate

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emissions (see Figure 3 for a schematic of the sampling train). Triplicate, 60-minute test runs were conducted.

The Method 5B modular isokinetic stack sampling system consisted of the following:

(1) Stainless-steel button-hook nozzle
(2) Heated glass-lined probe
(3) Heated 3" glass filter holder with a quartz filter (maintained at a temperature of 320 ± 25 °F)
(4) Set of 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 quartz filters used in the sampling were initially baked for 3 hours at 320 °F, desiccated for 24 hours and weighed to a constant weight as described in Method 5B 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 desiccated for 24 hours and weighed to a constant weight (within 0.5 mg) for use as Subpart UUUU Relative Response Audit (MATS RRA) samples. Following this process, filters were then baked for 6 hours at 320 °F, desiccated for 24 hours and reweighed to a constant weight (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 5B sampling can be found in Appendix B.

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3.4.2 Quality Control and Assurance

All sampling and analytical equipment was calibrated according to the guidelines referenced in EPA Method 5B. All Method 1-4, and 5B calibration data is located in Appendix D.

3.4.3 Data Reduction

The filterable PM emissions data collected during the testing was calculated and reported as lb/1000lbs @ 50% excess air for comparison to the permitted emission limits.

4.0 OPERATING PARAMETERS

The test program included the collection of boiler load and stack CEMs monitoring during each test run. Parameters recorded included gross Megawatts (MW), CO_2, NOx, SO_2, and opacity.

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 EU-BOILER7-SC. Total Filterable PM emissions are presented in pounds per 1000 pounds @ 50% excess air for comparison to the permitted emission limit. Additional test data presented for each test includes the Unit load in gross megawatts (GMW), stack temperature in degrees Fahrenheit (°F), 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 average filterable PM emissions from Unit 7 was 0.011 lbs/1000lbs @ 50% excess air, respectively, which is less than the permit limit of 0.13 lbs/1000lbs excess air.

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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
PARTICULATE EMISSION TESTING SUMMARY
St. Clair Power Plant - EU-BOILER7-SC
September 16, 2021

Unit 7 - Total Filterable PM

Test	Test Date	Test Time (EST)	Unit Load (GMW)	Stack Temperature (°F)	Stack Velocity (ft/min)	Exhaust Gas Flowrates (ACFM)	Exhaust Gas Flowrates (SCFM)	Exhaust Gas Flowrates (DSCFM)	PM Emissions (grains/dscf)	PM Emissions (lbs/hr)	PM Emissions (lbs/1000lbs @ 50% EA)[1]
PM-1	**16-Sep-21**	7:06-8:11	373	268	8,234	1,655,627	1,181,356	1,075,925	0.005	47.6	0.009
PM-2	**16-Sep-21**	8:27-9:32	373	271	8,303	1,669,424	1,186,583	1,078,305	0.005	43.6	0.008
PM-3	**16-Sep-21**	9:48-10:52	373	273	8,261	1,660,966	1,177,216	1,073,350	0.008	75.3	0.014
	Average:		***373***	***271***	***8,266***	***1,662,006***	***1,181,718***	***1,075,860***	***0.006***	***55.5***	***0.011***

(1) Permit Limit = 0.13 lbs/1000 lbs @ 50% excess air

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FIGURES

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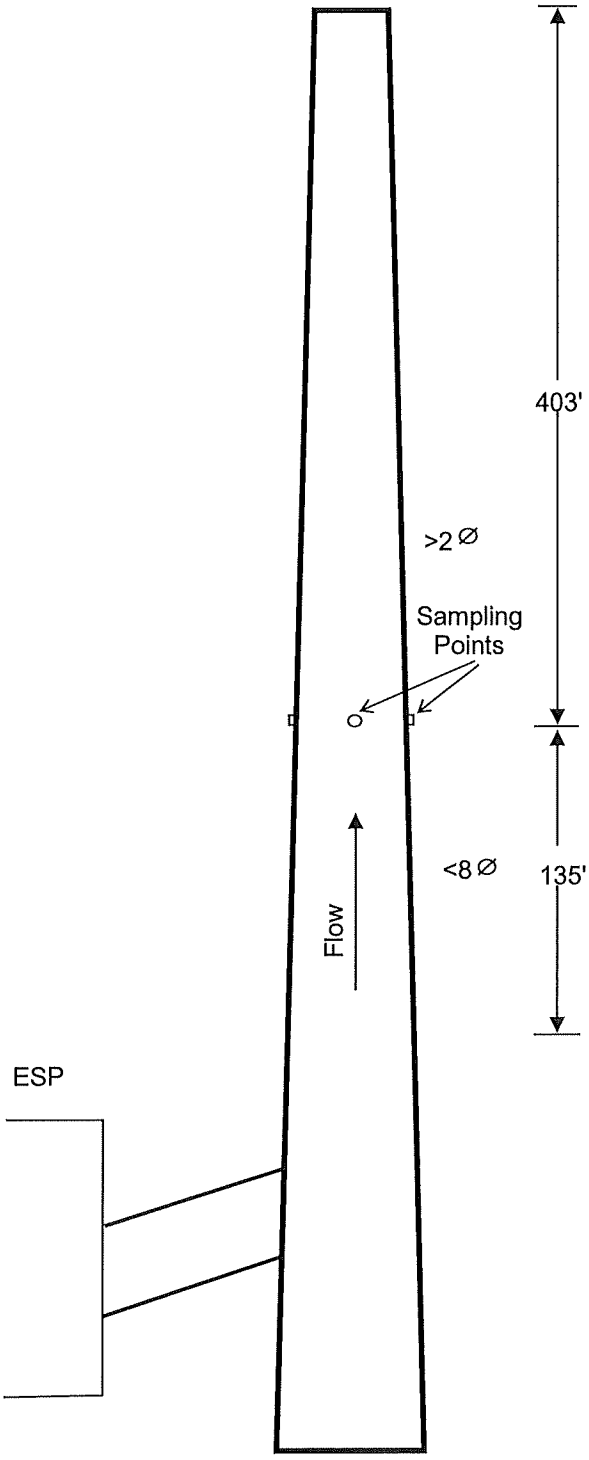
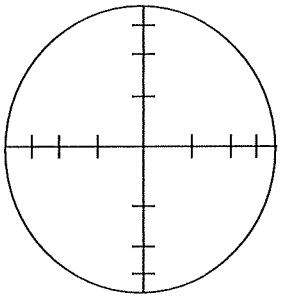
Figure 1 – Sampling Location & Traverse Points
St Clair Power Plant – Units 2-3



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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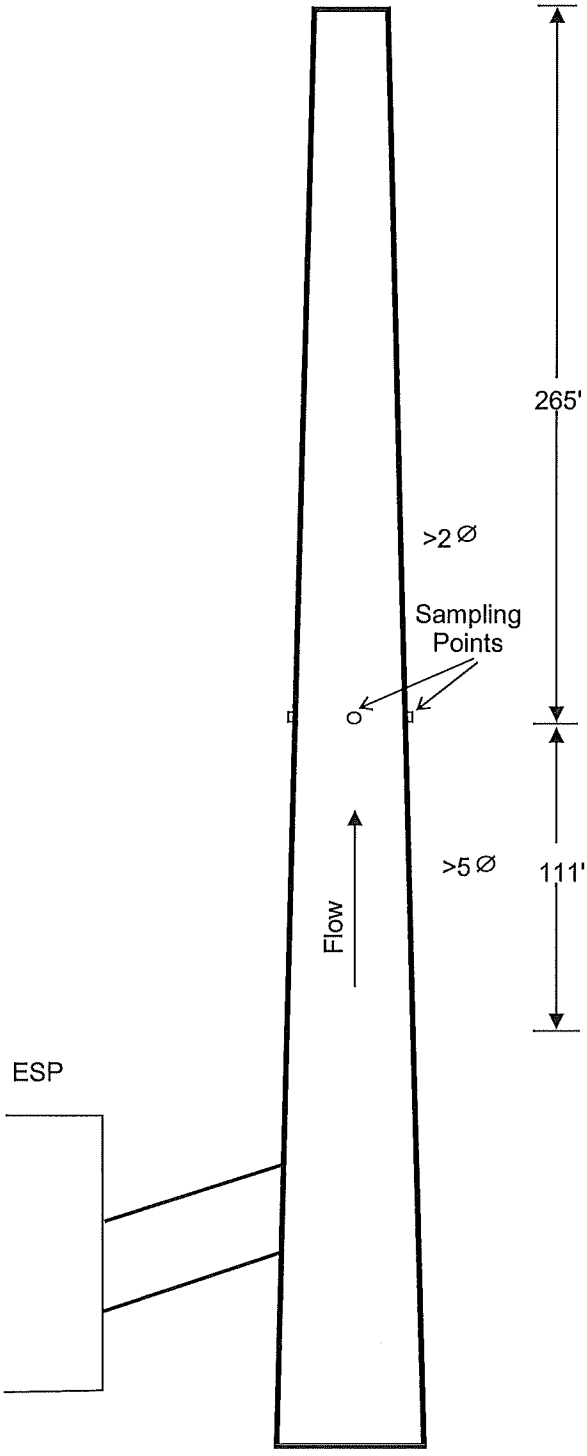
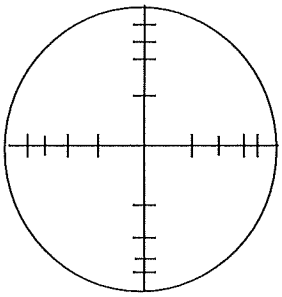
Figure 2 – Sampling Location & Traverse Points
St Clair Power Plant – Unit 6



Stack Diameter 228"



Velocity Measurement Points

Points	Distance From Inner Wall
1	7.3
2	23.9
3	44.2
4	73.6

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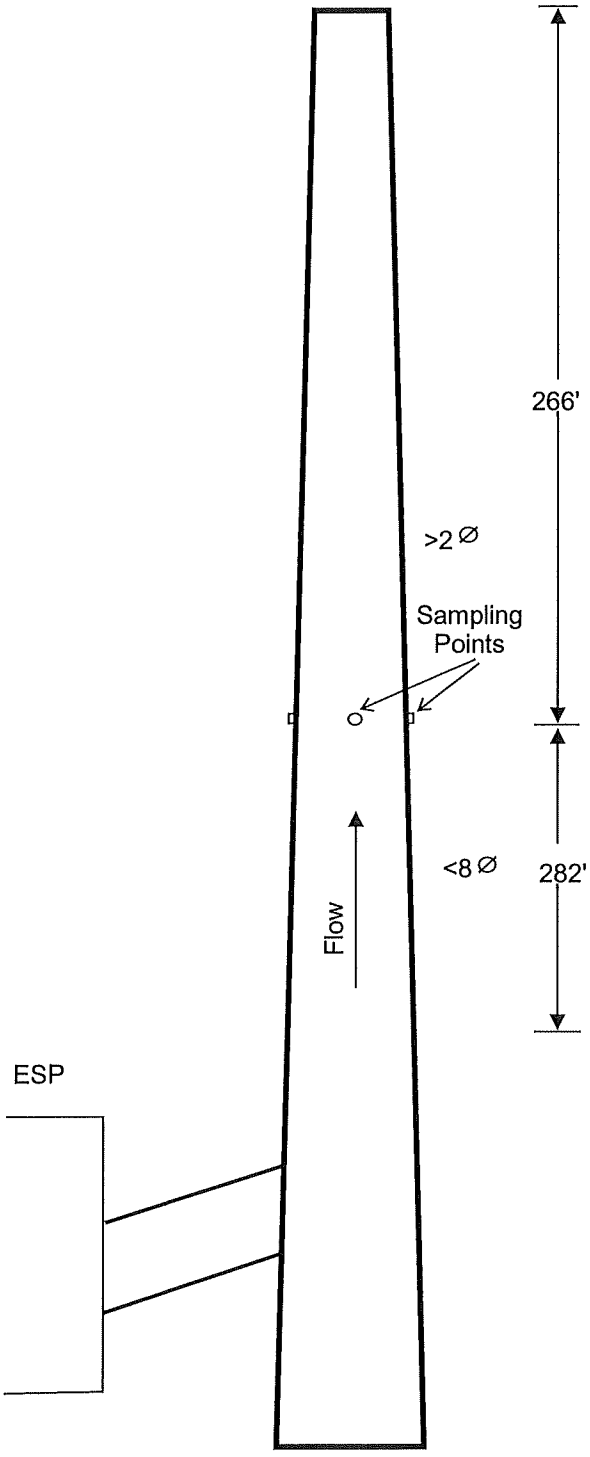
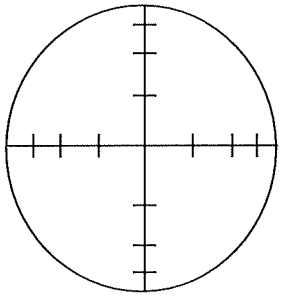
Figure 3 – Sampling Location & Traverse Points
St Clair Power Plant – Unit 7



Stack Diameter 192"



Velocity Measurement Points

Points	Distance From Inner Wall
1	8.4
2	28.0
3	56.8

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Figure 4 – EPA Method 5B
Calendar Year 2021