FINAL REPORT

DTE ENERGY

DETROIT, MICHIGAN

ST. CLAIR POWER PLANT (SCPP) UNIT 2: RESPONSE CORRELATION AUDIT (RCA)

RWDI #2204121

May 19, 2022

SUBMITTED TO

Mark Grigereit
Principal Engineer
mark.griereit@dteenergy.com

DTE Energy
7940 Livernois
Detroit, Michigan 48210

M: 313.412.0305

FACILITY ADDRESS:

St. Clair Power Plant
4901 Pointe Drive
St. Clair, Michigan 48054

SUBMITTED BY

Brad Bergeron, A.Sc.T., d.E.T.
Senior Project Manager | Principal
Brad.Bergeron@rwdi.com | ext. 2428

Mason Sakshaug, QSTI
Senior Scientist
Mason.Sakshaug@rwdi.com | ext. 3703

RWDI USA LLC
Consulting Engineers & Scientists
2239 Star Court
Rochester Hills, Michigan 48309

T: 248.841.8442
F: 519.823.1316

EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) has been retained by DTE Energy (DTE) to complete the emission sampling program at the St. Clair Power Plant (SCPP) located in St. Clair, Michigan. RWDI performed a Response Correlation Audit (RCA) on the Particulate Matter Continuous Emission Monitoring System (PM CEMS). The RRA was performed on the Unit 2 exhaust stack. The testing is required by 40 CFR Part 63, Subpart UUUUU. Testing was performed in accordance with the Procedure 2 of 40 CFR Part 60, Appendix F, and was conducted from March 29th-31st, 2022.

Response Correlation Audit – St. Clair Power Plant - Unit 2

Test Number	PM CEMS (mg/acm)	RM PM (mg/wac)[2]	PM CEMS (correction)	Correction (-25% Emission Limit)[1]	Correction (+25% Emission Limit)
Test 1	1.1	0.4	0.0	0.0	2.9
Test 2	1.2	0.5	0.0	0.0	3.0
Test 3	0.8	0.3	0.0	0.0	2.8
Test 4	0.8	0.5	0.0	0.0	2.8
Test 5	28.6	5.7	7.6	4.2	11.1
Test 6	24.4	6.7	6.4	3.0	9.8
Test 7	24.7	5.3	6.5	3.0	9.9
Test 9	24.6	6.8	6.5	3.0	9.9
Test 10	41.1	10.8	11.3	7.9	14.8
Test 11	40.7	11.6	11.2	7.8	14.6
Test 12	36.3	8.7	9.9	6.5	13.3
Test 13	41.6	9.2	11.5	8.1	14.9
Test 14	42.7	9.4	11.8	8.4	15.2
PM CEMS < Greatest PM CEMS Response on correlation regression line				< 59.0 mg/wac	PASS
9 of 12 PM CEMS and PM within 25% of numerical emission limit on correlation regression line					PASS

Notes: 1 – negative values replaced with zero
2 – milligrams per actual cubic meter (Raw Output)

TABLE OF CONTENTS

LIST OF TABLES

(Table Section)

LIST OF FIGURES

(Figure Section)

LIST OF APPENDICES

1 INTRODUCTION

RWDI USA LLC (RWDI) has been retained by DTE Energy (DTE) to complete the emission sampling program at the St. Clair Power Plant (SCPP) located in St. Clair, Michigan. RWDI performed a Response Correlation Audit (RCA) on the Particulate Matter Continuous Emission Monitoring System (PM CEMS). The RRA was performed on the Unit 2 exhaust stack. The testing is required by 40 CFR Part 63, Subpart UUUUU. Testing was performed in accordance with the Procedure 2 of 40 CFR Part 60, Appendix F, and was conducted from March 29th-31st, 2022.

Testing was performed pursuant to Title 40, Code of Federal Regulations, Part 60, Appendix A (40 CFR 60 App. A), Methods 1-5. Criterion for acceptable RCA results are located in Procedure 2 Sec 10.4(5)(i-ii) or alternatively, Sec 10.6(1) and (2).

The fieldwork was performed in accordance with EPA Reference Methods and DTE's intent to test. Copy of Intent to Test Plan is provided in **Appendix A**.

1.1 Location and Dates of Testing

The test program was completed from March 29th-31st, 2022, at the SCPP Unit 2.

1.2 Personnel Involved in Testing

Mason Sakshaug Senior Scientist – Team Lead	**RWDI USA LLC** 2239 Star Court Rochester Hills, MI 48309	Mason.Sakshaug@rwdi.com
Brad Bergeron Senior Project Manager		Brad.Bergeron@rwdi.com
Juan Vargas Environmental Scientist		Juan.Vargas@rwdi.com

2 SOURCE DESCRIPTION

The SCPP located at 4901 Pointe Drive, St. Clair, Michigan, employs the use of four (4) coal-fired boilers (Units 2,3,6, and 7). Units 2 and 3 each have Babcock and Wilcox coal-fired boilers capable of producing 1,070,000 pounds per hour of steam and have Allis Chalmers turbine generators each with a nominally rated capability of 170 megawatts (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 450 MW respectively.

The air pollution control equipment on Units 2-3 consist of Wheelbrator Frye electrostatic precipitators on each unit that have designed collection efficiencies of 99.6%. Air pollution control equipment on Unit 6 consists of Research Corporation electrostatic precipitators that have design collection efficiencies of 99.6%. The air pollution control equipment on Unit 7 consists of an American Standard electrostatic precipitator that has design collection efficiency of 99.6%.

The boilers are equipped with Dry Sorbent Injection (DSI) and Activated Carbon Injection (ACI) air quality control systems. The DSI system is used to control acid gas, PM, PM10, PM2.5, and NOx emissions from each unit. Trona is received at the plant where inline mills further refine the Trona. The ACI system is used to control the Mercury emissions from each unit.

Unit	Analyzer	Manufacturer/ Model	Analyzer Range	Serial Number
Unit 2	PM	Sick/Maihak SP100	200 mg/acm	15288504

3 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination (USEPA Method 1 and 2)

The exhaust velocities and flow rates were determined following the US EPA Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and digital manometer. Volumetric flow rates were determined following the equal area method as outlined in US EPA Method 1. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

A cyclonic flow check was performed on the stack during the initial flow monitor certification. There was no cyclonic flow present during testing.

3.2 Oxygen and Carbon Dioxide (USEPA Method 3A)

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

The O_2 and CO_2 analyzers were calibrated per procedures outlined in USEPA Method 3A. Zero, span, and mid-range calibration gases were introduced directly into the analyzer to verify the instruments linearity prior to sampling. Zero and mid gases were introduced after each test period to determine instrument drift. A bag sample was pulled from the stack for the duration of each test and analyzed after the test.

3.3 Moisture Determination (USEPA Method 4)

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 USEPA Method 5 glass impingers and the percentage of water was then derived from the calculations outlined in USEPA Method 4.

3.4 Particulate Metter (USEPA Method 5 MATS Modified)

Filterable Particulate Matter testing was performed using USEPA Method 5 MATS Modified "Determination of Particulate Emissions from Stationary Sources" was used to measure the filterable (front half) particulate emissions. A total of fourteen (14) 60-minute tests were conducted. The tests cover three (3) operational loads.

The quartz filters used in the sampling were initially desiccated for 24 hours and weighed to a constant weight as described in Method 5 – MATS Modified to obtain the initial tar weight.

After completion of the final leak test for each test, 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, location, test date, and level of liquid was marked. Immediately after recovery, the samples were placed in a storage container for safe handling.

At the laboratory the acetone rinses were transferred to clean pre-weighed beakers and evaporated to dryness. The beakers and filters were desiccated for 24 hours and weighed to a constant weight (within 0.5 mg).

Collection of filed blanks consist of a blank filter and acetone solution blank. The acetone blank was collected from the rinse bottle used during sample recovery. The blank filter and acetone were collected and analyzed following the sample procedures used to recover the filed samples.

4 OPERATING PARAMETERS

The test program included the collection of PM CEMs emission data and load during each PM emission test. CEMS data can be found in **Appendix B**.

5 TEST RESULTS AND DISCUSSION

5.1 Discussion of Results

Table 1 presents the reference method particulate emission testing results (RM PM), raw particulate matter continuous emissions monitoring system (PM CEMS) results, unit load, and PM range designation for each test. Particulate emissions are presented in milligram per actual cubic meter (mg/acm).

In order to pass an RCA, the following criteria must be met: Procedure 2 10.4(5)(i-ii).

1 – For all 12 data points, the PM CEMS Correlation value can be no greater than the greatest PM CEMS Correlation value used to develop your correlation curve.

2 – At least 75 percent of minimum number of 12 sets of PM CEMS and reference method measurements must fall within a specified area on a graph of the correlation regression line. The specified area on the graph of the correlation regression line is defined by two lines parallel to the correlation regression line, offset at a distance of +/- 25 percent of the numerical emission limit value from the correlation regression line. If any of the PM CEMS response values resulting from your RCA are lower than the lowest PM CEMS response value of your existing correlation curve, you may extend your correlation regression line to the point corresponding to the lowest PM CEMS response value obtained during the RCA. This extended correlation regression line must be used to determine if the RCA data meets this criterion.

Data from this RCA testing met both criteria.

Table 2 provides a graph of the PM CEMS curve with the RCA data. **Figure 3** provides a graph of the PM CEMS curve with the RCA data. Particulate Matter results are provided in **Appendix C**. CEMS data for oxygen and carbon dioxide for each PM run is provided in **Appendix D**.

Test 8 was not completed due to an issue with the sampling equipment. This test was not included with the average and was thrown out since it was not completed.

5.2 Calibration Sheets

Calibration sheets can be found in **Appendix E**.

5.3 Sample Calculations

Sample calculations can be found in **Appendix F**.

5.4 Field Data Sheets

Field data sheets can be found in **Appendix G**.

5.5 Laboratory Data

Laboratory analytical results can be found in **Appendix H**.

5.6 Coal Analysis

Analytical results from the coal samples can be found in **Appendix I**.

TABLE

Table 1
SCPP Unit 2 Table of Results

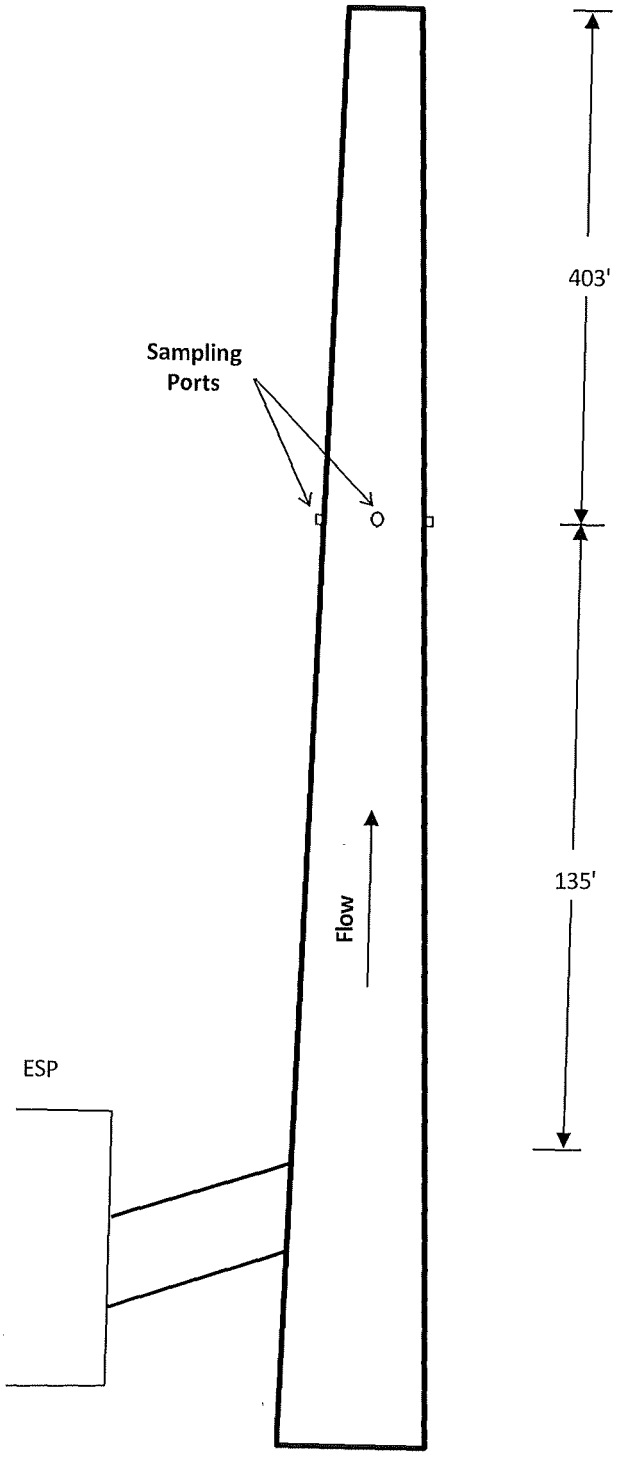
Test Number	Test Date (2022)	Test Time	PM CEMS (mg/wac)[2]	RM PM (mg/acm)	PM CEMS (correction)	Correction (-25% Emission Limit)[1]	Correction (+25% Emission Limit)	PM Load Range	Unit Load (MW)
Test 1	29-March	7:15-8:23	1.1	0.4	0.0	0.0	2.9	Low	68.3
Test 2	29-March	8:42-9:52	0.2	0.5	0.0	0.0	3.0	Low	68.6
Test 3	29-March	10:09-11:17	0.8	0.3	0.0	0.0	2.8	Low	65.9
Test 4	29-March	11:33-12:45	0.8	0.5	0.0	0.0	2.8	Low	67.5
Test 5	30-March	6:37-7:43	28.6	5.7	7.6	4.2	11.1	Mid	100.1
Test 6	30-March	8:05-9:11	24.4	6.7	6.4	3.0	9.8	Mid	100.1
Test 7	30-March	9:30-10:35	24.7	5.3	6.5	3.0	9.9	Mid	100.3
Test 9	30-March	12:15-13:22	24.6	6.8	6.5	3.0	9.9	Mid	100.1
Test 10	31-March	6:48-7:55	49.3	10.8	13.8	10.3	17.2	High	115.7
Test 11	31-March	8:51-9:56	40.7	11.6	11.2	7.8	14.6	High	116.6
Test 12	31-March	10:15-11:21	36.3	8.7	9.9	6.5	13.3	High	99.5
Test 13	31-March	11:38-12:43	41.6	9.2	11.5	8.1	14.9	High	114.7
Test 14	31-March	13:08-14:13	42.7	9.4	11.8	8.4	15.2	High	115.0

1 negative numbers were replaced with zero

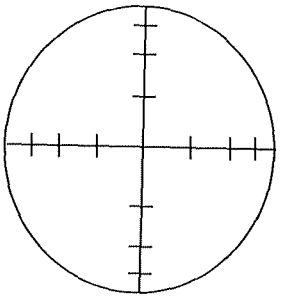
2 milligrams per actual cubic meter (Raw Output)

FIGURES

Figure 1 – Sampling Location
St. Clair Power Plant– Unit 2



Stack Diameter 13'4"



Sample Points

Points	Distance From Inner Wall
1	7.0
2	23.4
3	47.4

Figure 2 –Method 5 (MATS Modified)

St. Clair Power Plant

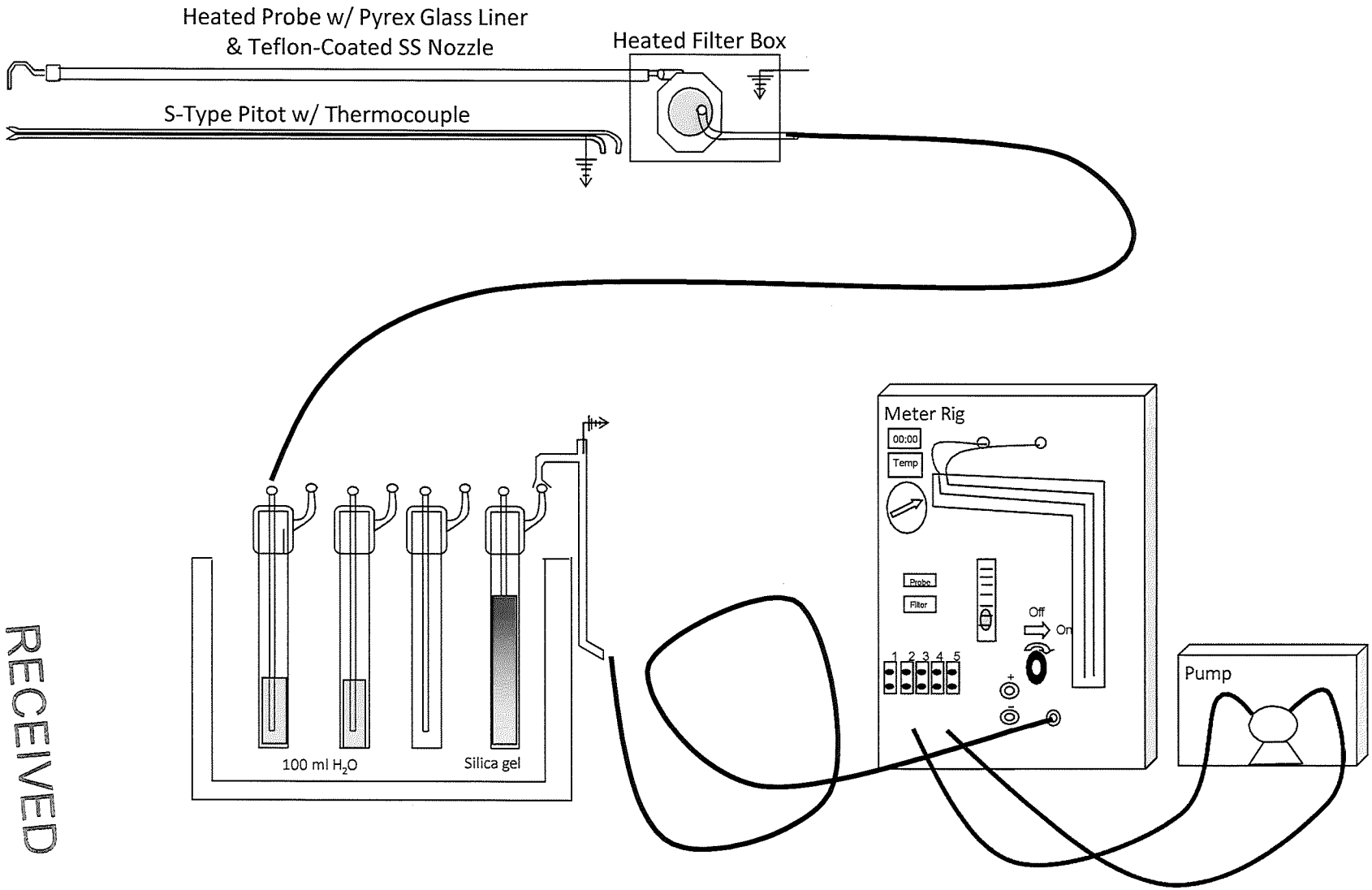


Figure No. 3
ST. CLAIR POWER PLANT
EU-Boiler2-SC
PM CEMS RCA
SUMMARY GRAPH
March 29th - 31st, 2022