COMPLIANCE TEST REPORT

for

CARBON MONOXIDE EMISSIONS

UNIT 1

Belle River Power Plant
China Township, Michigan

August 15 & September 8, 2016

Prepared By
Environmental Management & Resources
Environmental Field Services Group
DTE Corporate Services, LLC
7940 Livernois H-136
Detroit, MI 48210

DTE Energy®

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RECEIVED

OCT 1 1 2016

AIR QUALITY DIV.

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating (RO) Permit program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: St. Clair Power Plant - Belle River Power Plant County: St. Clair

Source Address: 4505 King Rd City: East China

AQD Source ID (SRN): B2796 RO Permit No.: MI-ROP-B2796-2015b RO Permit Section No.: 3

Please check the appropriate box(es):

☐ **Annual Compliance Certification (General Condition No. 28 and No. 29 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (General Condition No. 23 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From 9/8/2016 To 9/8/2017

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:

ROP Emissions Test Report, EU-BOILER1-BR CO

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete.

Timothy G. Kerry	Plant Manager	(810) 326-3245
Name of Responsible Official (print or type)	Title	Phone Number
Timothy G. Kerry		10/5/2016
Signature of Responsible Official		Date

* Photocopy this form as needed.

EQP 5736 (Rev 9/01)

DTE Energy

EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EM&R) Field Services Group performed carbon monoxide emissions testing on the exhaust of Unit 1 at the DTE Electric, Belle River Power Plant, located in China Township, Michigan. The fieldwork, performed on August 15 & September 8, 2016, satisfies requirements of the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. ROP-MI-B2796-2015b. Testing was performed for carbon monoxide (CO) at two loads (high & intermediate loads) as required by permit conditions.

The results of the emissions testing are highlighted below:

CO Emissions Test Results
Belle River Power Plant - Unit 1
August 15 & September 8, 2016

Boiler Operating Condition	Average CO Concentration (ppm)	Average CO Concentration (lb/MMBtu)
High Load (8/15)	1.4	0.0018
Mid Load (9/8)	1.0	0.0017

1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R) Field Services Group performed carbon monoxide emissions testing on the exhaust of Unit 1 at the DTE Electric, Belle River Power Plant, located in China Township, Michigan. The fieldwork, performed on August 15 & September 8, 2016, satisfies requirements of the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. ROP-MI-B2796-2015b. Testing was performed for carbon monoxide (CO) at two loads (high & intermediate loads) as required by permit conditions.

The testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Method 3A and ASTM Method D6348.

The fieldwork was performed in accordance with EPA Reference Methods and EM&R's MATs HCl Intent to Test[1], submitted April 27, 2017. On July 11, DTE requested to the MDEQ that the annual CO emissions testing be performed in conjunction with the HCl testing. Mr. Mark Dziadosz with the Michigan Department of Environmental Quality (MDEQ), approved the modified testing strategy. The following EM&R personnel participated in the testing program: Mr. Thomas Snyder, Environmental Specialist and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Snyder was the project leader. Mr. David Huxhold, Senior Environmental Engineer at the plant provided process coordination for the testing program.

2.0 SOURCE DESCRIROPON

The Belle River Power Plant (BRPP) located at 4505 King Road in China Township, Michigan, employs the use of two (2) Babcock and Wilcox coal-fired boilers (Units 1 & 2) each capable of producing 4,550,000 pounds per hour of steam. Each Unit has a Siemens Power Corporation turbine generator with a nominally rated capability of 635 (Unit 1) and 645 (Unit 2) megawatts (MW).

A schematic representation of the Boiler exhaust and sampling locations is presented in Figure 1.

[1] MDEQ, Test Plan, Submitted April 27, 2016, (Attached-Appendix A)

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
ASTM Method D6348	CO and CO_2	FTIR

3.1 CARBON MONOXIDE AND CARBON DIOXIDE (ASTM METHOD D6348)

3.2.1 Sampling Method

Carbon Monoxide and Carbon Dioxide emissions were evaluated using ASTM Method D6348, "Measurement of Vapor Phase Organic Emissions by Extractive Fourier Transform Infrared (FTIR)". Single point sampling was performed. Triplicate 60-minute test runs were performed.

The Method D6348 sampling system (Figure 2) consisted of the following:

(1) Single-point sampling probe
(2) Flexible heated PTFE sampling line
(3) Air Dimensions Heated Head Diaphragm Pump
(4) MKS MultiGas 2030 FTIR spectrometer
(5) Appropriate calibration gases
(6) Data Acquisition System

The FTIR was equipped with a temperature controlled, 5.11 meter multipass gas cell maintained at 191°C. Gas flows and sampling system pressures were monitored using a rotometer and pressure transducer. All data was collected at 0.5 cm^{-1} resolution.

3.2.2 Sampling Train Calibration

The FTIR was calibrated according to procedures outlined in ASTM Method D6348. Direct measurements of nitrogen, carbon monoxide (CO), carbon dioxide (CO_2), and ethylene (C_2H_4) gas standards were made at the test location to confirm concentrations.

1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R) Field Services Group performed carbon monoxide emissions testing on the exhaust of Unit 1 at the DTE Electric, Belle River Power Plant, located in China Township, Michigan. The fieldwork, performed on August 15 & September 8, 2016, satisfies requirements of the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. ROP-MI-B2796-2015b. Testing was performed for carbon monoxide (CO) at two loads (high & intermediate loads) as required by permit conditions.

The testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Method 3A and ASTM Method D6348.

The fieldwork was performed in accordance with EPA Reference Methods and EM&R's MATs HCl Intent to Test[1], submitted April 27, 2017. On July 11, DTE requested to the MDEQ that the annual CO emissions testing be performed in conjunction with the HCl testing. Mr. Mark Dziadosz with the Michigan Department of Environmental Quality (MDEQ), approved the modified testing strategy. The following EM&R personnel participated in the testing program: Mr. Thomas Snyder, Environmental Specialist and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Snyder was the project leader. Mr. David Huxhold, Senior Environmental Engineer at the plant provided process coordination for the testing program.

2.0 SOURCE DESCRIROPON

The Belle River Power Plant (BRPP) located at 4505 King Road in China Township, Michigan, employs the use of two (2) Babcock and Wilcox coal-fired boilers (Units 1 & 2) each capable of producing 4,550,000 pounds per hour of steam. Each Unit has a Siemens Power Corporation turbine generator with a nominally rated capability of 635 (Unit 1) and 645 (Unit 2) megawatts (MW).

A schematic representation of the Boiler exhaust and sampling locations is presented in Figure 1.

[1] MDEQ, Test Plan, Submitted April 27, 2016, (Attached-Appendix A)

A calibration transfer standard (CTS) was analyzed before and after testing at each location. The concentration determined for all CTS runs were within ±5% of the certified value of the standard. Ethylene was passed through the entire system to determine the sampling system response time and to ensure that the entire sampling system was leak-free.

Nitrogen was purged through the sampling system at each test location to confirm the system was free of contaminants.

Carbon Monoxide gas standards were passed through the sampling system at each test location to determine the response time and confirm recovery.

Spiking was performed to verify the ability of the sampling system to quantitatively deliver a sample containing CO from the base of the probe to the FTIR. Analyte spiking assures the ability of the FTIR to quantify CO in the presence of effluent gas.

As part of the spiking procedure, samples from the source were measured to determine CO concentrations to be used in the spike recovery calculations. The determined sulfur hexafluoride (SF_6) concentration in the spiked and unspiked samples was used to calculate the dilution factor of the spike and thus used to calculate the concentration of the spiked CO. The following equation illustrates the percent recovery calculation.

$$DF = \frac{SF_{6(spike)}}{SF_{6(direct)}}$$ (Sec. 9.2.3 (3) ASTM Method D6348)

$$CS = DF * Spike_{dir} + Unspike(1 - DF)$$ (Sec. 9.2.3 (4) ASTM Method D6348)

DF = Dilution factor of the spike gas
$SF_{6(direct)}$ = SF6 concentration measured directly in undiluted spike gas
$SF_{6(spike)}$ = Diluted SF_6 concentration measured in a spiked sample
$Spike_{dir}$ = Concentration of the analyte in the spike standard measured by the FTIR directly
CS = Expected concentration of the spiked samples
Unspike = Native concentration of analytes in unspiked samples

All analyte spikes were introduced using an instrument grade stainless steel rotometer. The spike target dilution ratio was 1:10 or less. The CO spike recovery was within the Method D6348 allowance of ±30%.

3.2.3 Quality Control and Assurance

As part of the data validation procedure, reference spectra are manually fit to that of the sample spectra and a concentration is determined. The reference spectra are scaled to match the peak amplitude of the sample, thus providing a scale factor. The scale factor multiplied by the reference spectra concentration is used to determine the concentration value for the sample spectra. Sample pressure and temperature corrections are then applied to compute the final sample concentration. The manually calculated results are then compared with the software-generated results. The data is then validated if the two concentrations are within ± 5% agreement. If there is a difference greater than ± 5%, the spectra are reviewed for possible spectral interferences or any other possible causes that might lead to inaccurately quantified data. PRISM Analytical Technologies, Inc. validated the FTIR data. The data validation reports are located in Appendix D.

3.2.4 Data Reduction

Each spectrum was derived from the coaddition of 64 scans, with a new data point generated approximately every one minute. The CO and CO_2 emissions were recorded in parts per million (ppm) wet volume basis.

Emissions calculations (lb/MMBtu) are based on calculations located in USEPA Method 19. Coal samples were collected during the testing and analyzed to determine the F_c factor. Laboratory results from the coal analysis are presented in Appendix E.

4.0 OPERATING PARAMETERS

The test program included the collection of boiler emissions and operating data during each test run. Parameters recorded included CO_2, SO_2, and NO_x emissions, opacity, and stack flow as well as boiler load. Operational data can be referred to in Appendix E.

5.0 RESULTS

The results from the CO testing on Unit 1 are displayed in Table No. 1. The results table presents the CO emissions in terms of parts per million (ppm) and pounds per million British thermal unit (lbs/MMBtu) for both the high and intermediate loads tested. The carbon dioxide (CO_2) in percent (%) is also presented. The ppm emissions were corrected for analyzer drift per USEPA Method 7E procedures. Example calculations are presented in Appendix D.

DTE Energy

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."

Mark Grigereit, QSTI

This report prepared by:

Mr. Thomas Snyder, QSTI
Environmental Specialist, Environmental Field Services
Environmental Management and Resources
DTE Energy

This report reviewed by:

Mr. Mark Grigereit, QSTI
Principal Engineer, Environmental Field Services
Environmental Management and Resources
DTE Energy

DTE Energy

TABLE NO. 1
CARBON MONOXIDE (CO) EMISSION TESTING RESULTS
Unit 1 - Belle River Power Plant
August 15 & September 8, 2016

High Load (August 15, 2016)

Test	Time (DAHS)	Load (MW_{gross})	CO_2 Emissions (% $_{wet}$)[1]	CO Emissions (ppm $_{wet}$)	CO Emissions (lbs/MBtu)
Run - 1	8:39-9:39	579.7	10.1	1.4	0.0018
Run - 2	9:55-10:55	580.1	10.1	1.2	0.0016
Run - 3	11:15-12:15	579.6	10.0	1.5	0.0020
	Avg:	*579.8*	*10.0*	*1.4*	*0.0018*

(1) Emissions corrected for analyzer drift per USEPA Method 7E

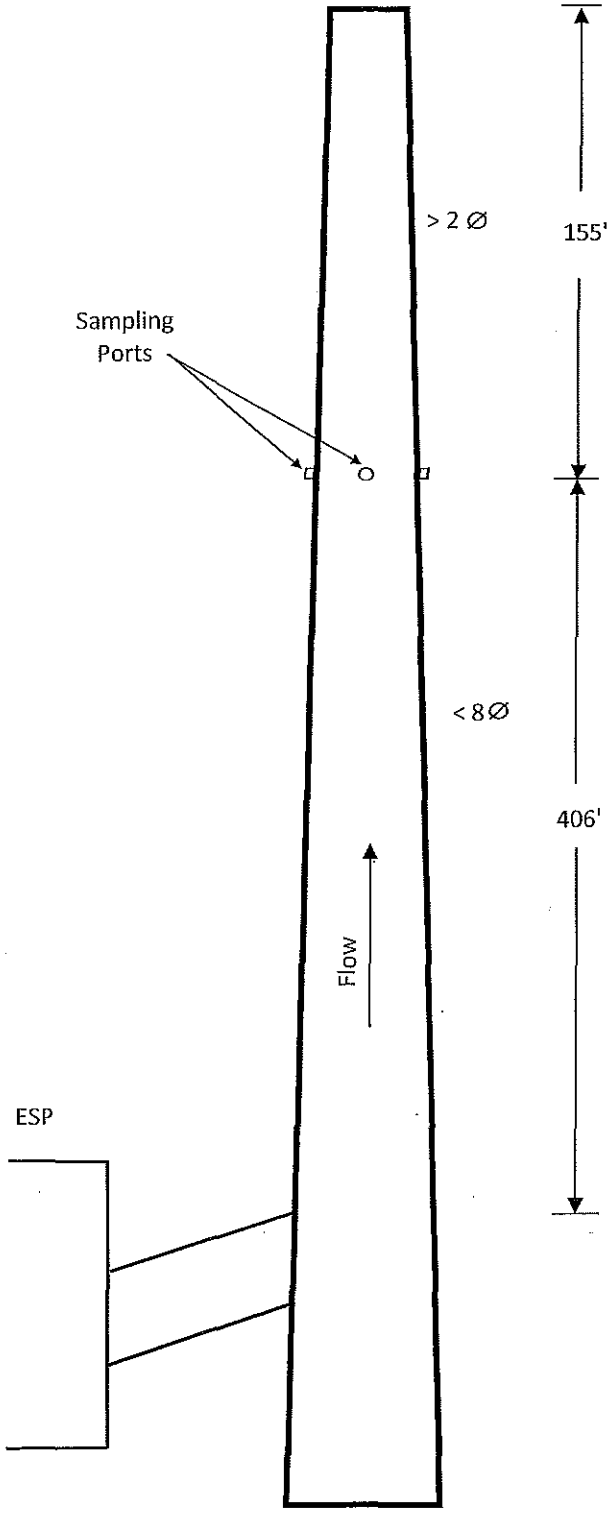
Mid Load (September 8, 2016)

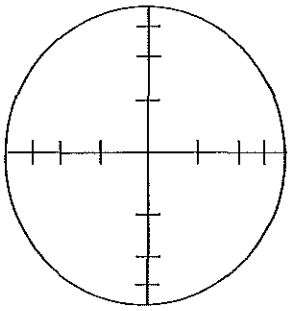
Test	Time (DAHS)	Load (MW_{gross})	CO_2 Emissions (% $_{wet}$)[1]	CO Emissions (ppm $_{wet}$)	CO Emissions (lbs/MBtu)
Run - 1	00:07-01:07	329.1	8.0	1.0	0.0017
Run - 2	01:18-02:18	329.4	8.1	1.1	0.0017
Run - 3	02:27-03:27	334.5	8.1	1.1	0.0018
	Avg:	*331.0*	*8.1*	*1.0*	*0.0017*

(1) Emissions corrected for analyzer drift per USEPA Method 7E

DTE Energy

Figure 1 – Sampling Location
Belle River Power Plant – Unit 1
August 15 & September 8, 2016





DTE Energy

Figure 2 – ASTM D6348
Belle River Power Plant
August 15 & September 8, 2016