Compliance Test Report

for

Oxides of Nitrogen (NO_X) and Carbon monoxide (CO) Emissions

EU-CTG12-1-BP, EU-CTG12-2-BP, EU-CTG-13-1-BP

Belle River Power Plant
China Township, Michigan

August 11-20, 2021

Prepared By
Environmental Management & Safety
Ecology, Monitoring, and Remediation Group
DTE Corporate Services, LLC
7940 Livernois Ave. G4-S
Detroit, MI 48210

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CONTENTS

Section | Page

RESULTS TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Safety (EMS) Ecology, Monitoring, and Remediation Group performed CO and NOx emissions testing at the DTE Energy, Belle River Peaking Facility, located in China Twp., Michigan. The fieldwork, performed during the period of August 11-20, 2021, was conducted to satisfy testing requirements of Michigan Permit to Install (PTI) No. 331-98C. Emissions tests were performed on the exhaust of three natural gas-fired Combustion Turbine Generators (CTG's) (12-1, 12-2, & 13-1).

The average results of the emissions testing are highlighted below:

Emissions Testing Summary
CTG's 12-1, 12-2, 13-1
Belle River Peaking Facility
August 11-20, 2021

Unit	Parameter	High Load[1,2]	Mid Load[1,2]
12-1	NO_x	7.7	7.8
	CO	6.0	2.9
	MW	79	60
12-2	NO_x	7.1	8.3
	CO	0.3	0.3
	MW	78	60
13-1	NO_x	8.0	7.5
	CO	7.3	15.0
	MW	74	60

(1) Units in ppmvd @ 15% O2
(2) Permit Limits: NOx – 9.0 ppm @ 15% O2
CO – 25.0 ppm @15% O2

1.0 INTRODUCTION

DTE Energy's Environmental Management and Safety (EMS) Ecology, Monitoring, and Remediation Group performed CO and NOx emissions testing at the DTE Energy, Belle River Peaking Facility, located in China Twp., Michigan. The fieldwork, performed during the period of August 11-20, 2021, was conducted to satisfy testing requirements of Michigan Permit to Install (PTI) No. 331-98C. Emissions tests were performed on the exhaust of three natural gas-fired Combustion Turbine Generators (CTG's) (12-1, 12-2, & 13-1).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A, 7E, and 10.

The fieldwork was performed in accordance with EPA Reference Methods and DTE Energy's Intent to Test[1], which was approved in a letter[2] by Mr. Mark Dziadosz from the Michigan Department of Environment, Great Lakes, and Energy – Air Quality Division (EGLE-AQD). The following DTE Energy personnel participated in the testing program: Mr. Mark Westerberg, Senior Environmental Specialist, and Mr. Jason Logan, Environmental Specialist. Mr. Logan was the project leader. Mr. Dennis Farver, with the DTE Energy Peaker Group provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The DTE Energy, Belle River Peaking Facility, located at 4505 King Road, China Twp., Michigan, employs the use of three General Electric Frame 7, simple-cycle, combustion turbines nominally rated at 82.4 megawatts (MW) each at 100% load (dependent upon ambient conditions). Flue gases from each unit exhaust through a separate rectangular stack (108" x 228") that has an exit height of 56.0 feet above ground level. See Figure 1 for a diagram of the units' sampling locations and stack dimensions.

[1] DTE Test Plan, Submitted July 8, 2021. (Attached-Appendix A)

[2] EGLE Approval Letter received July 27, 2021 (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
USEPA Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 7E	Oxides of Nitrogen	Chemiluminecent Instrumental Analyzer Method
USEPA Method 10	Carbon Monoxide	NDIR Instrumental Analyzer Method

3.1 OXYGEN AND CARBON DIOXIDE (USEPA METHOD 3A)

3.1.1 Sampling Method

Exhaust gas oxygen (O_2) concentrations were evaluated using USEPA Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)". The O_2 analyzer utilizes paramagnetic sensors.

3.1.2 O_2 / CO_2 Sampling Train

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

(1) Stainless Steel sampling probe
(2) Heated Teflon™ sampling line
(3) Gas conditioner with particulate filter
(4) Flexible unheated Teflon™ sampling line
(5) Servomex O_2/CO_2 gas analyzer
(6) Appropriate USEPA Protocol 1 calibration gases
(7) Data Acquisition System.

3.1.3 Sampling Train Calibration

The sampling train was calibrated per procedures outlined in USEPA Method 7E. Zero, span, and mid-range calibration gases were introduced directly into the analyzer to determine the instruments linearity. An upscale and downscale gas was then introduced through the entire sampling system to determine sampling system bias for the analyzer at the completion of each test.

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3.2 OXIDES OF NITROGEN AND CARBON MONOXIDE (USEPA METHODS 7E AND 10)

3.2.1 Sampling Method

Oxides of nitrogen (NO_x) emissions were evaluated using USEPA Method 7E, "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)". The NO_x analyzer utilizes a Chemiluminecent detector. Carbon monoxide (CO) emissions were evaluated using USEPA Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)". The CO analyzer utilizes a non-dispersive infrared (NDIR) detector.

The EPA Methods 7E and 10 sampling system (Figure 2) consisted of the following:

(1) Stainless Steel sampling probe
(2) Heated Teflon™ sampling line
(3) Gas conditioner with particulate filter
(4) Flexible unheated Teflon™ sampling line
(5) 42i Chemiluminecent NO/NO_x gas analyzer and TECO 48i NDIR CO gas analyzer
(6) Appropriate USEPA Protocol 1 calibration gases
(7) Data Acquisition System.

NOx and CO testing consisted of triplicate 1-hour runs at a high and mid load in accordance with PTI requirements.

3.2.2 Quality Control and Assurance

All sampling and analytical equipment were calibrated per the guidelines referenced in Methods 7E and 10. Calibration gases were EPA Protocol 1 gases and the concentrations were within the acceptable ranges specified in Method 7E. Calibration gas certification sheets are in Appendix C.

Zero, span, and mid-range calibration gases were introduced directly into the analyzer to determine the instruments linearity. An upscale and downscale gas for each pollutant was then introduced through the entire sampling system to determine sampling system bias for each analyzer at the completion of each test.

DTE performed NO_x converter efficiency testing by directly challenging the NO_x analyzer with a nitrogen dioxide (NO_2) calibration gas of 51.05 ppm. Results from the converter efficiency test demonstrated that the analyzer met the requirements of Method 7E (Eq-1).

Eq. 1 $$Eff_{NO2} = \frac{C_{Dir}}{C_v} = \frac{47.2}{51.05} = 92\%$$

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3.2.3 Data Reduction

Data was recorded in 1-minute averages. The NO_x and CO emissions were reported in parts per million corrected to 15% oxygen (ppm @ 15% O_2). The 1-minute readings collected can be found in Appendix B.

4.0 OPERATING PARAMETERS

The test program included the collection of turbine fuel flowrate (scfm), power generation (MW), and CEMS data (NOx, CO, and O_2). Unit operational data during each test can be found in Appendix E.

5.0 DISCUSSION OF RESULTS

Table Nos. 1-3 present the nitrogen oxides (NOx) and carbon monoxide (CO) emission testing results for CTGs 12-1, 12-2, and 13-1, respectively. NOx and CO emissions are presented in parts per million, dry, corrected to fifteen percent oxygen (ppm @ 15% O_2). NOx and CO emissions for each unit at each load were below the permit limits of 9 ppm NOx @ 15% O_2 and 25 ppm CO at 15% O_2.

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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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Jason Logan, QSTI

This report prepared by: ______________________________

Mr. Jason Logan, QSTI
Environmental Specialist, Ecology, Monitoring, and Remediation
Environmental Management and Safety
DTE Energy

This report reviewed by: ______________________________

Mr. Mark Westerberg, QSTI
Sr Environmental Specialist, Ecology, Monitoring, and Remediation
Environmental Management and Safety
DTE Energy

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RESULTS TABLES

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TABLE NO. 1

NO_x & CO EMISSIONS TESTING RESULTS

EU-CTG12-1-BP

August 19-20, 2021

Test	Test Date	Unit Load (GMW)	Fuel Flow (scfm)	NOx Emissions (ppm@15%O_2)	CO Emissions (ppm@15%O_2)
High	**19-Aug-21**	79	11299	7.7	6.0
Mid	**20-Aug-21**	60	9222	7.8	2.9
	Permit Limit:			***9***	***25***

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TABLE NO. 2

NO_x & CO EMISSIONS TESTING RESULTS

EU-CTG12-2-BP

August 16-17, 2021

Test	Test Date	Unit Load (GMW)	Fuel Flow (scfm)	NOx Emissions (ppm@15%O_2)	CO Emissions (ppm@15%O_2)
High	**16-Aug-21**	78	11257	7.1	0.3
Mid	**17-Aug-21**	60	9246	8.3	0.3
	Permit Limit:			***9***	***25***

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TABLE NO. 3

NO_x & CO EMISSIONS TESTING RESULTS

EU-CTG13-1-BP

August 11-12, 2021

Test	Test Date	Unit Load (GMW)	Fuel Flow (scfm)	NOx Emissions (ppm@15%O_2)	CO Emissions (ppm@15%O_2)
High	**11-Aug-21**	74	10792	7.3	8.0
Mid	**12-Aug-21**	60	9203	7.5	15.0
	Permit Limit:			*9*	*25*

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FIGURES

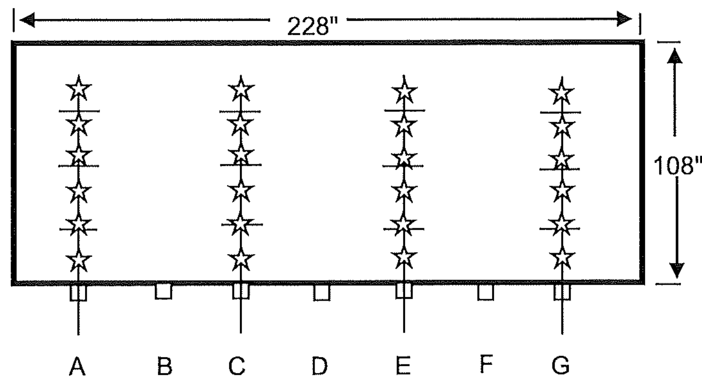
Figure 1 – Sampling Location
DTE Energy – BRPP CTGs

—— NOx & CO sampling points

Point	Distance (in.)
3	18
2	54
1	90

☆ PM sampling points

Point	Distance (in.)
6	4.75
5	15.77
4	31.97
3	76.03
2	92.23
1	103.25



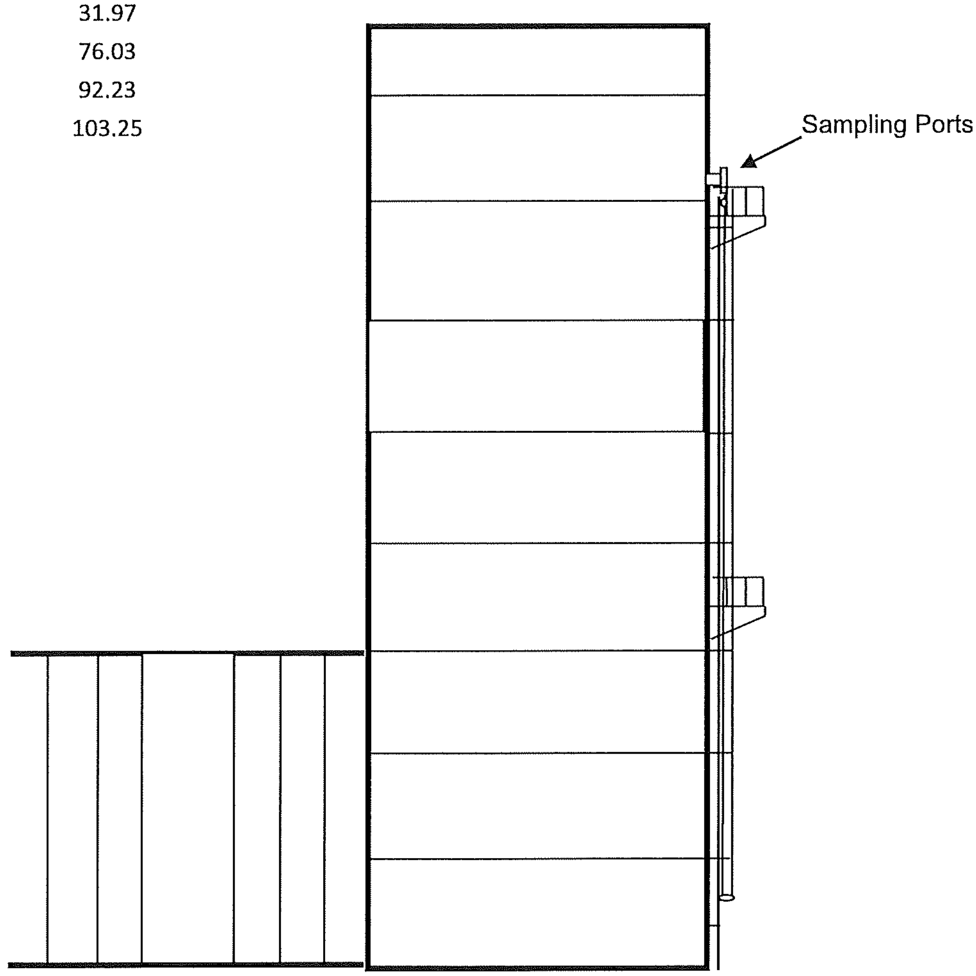


Figure 2 – EPA Method 3A/7E/10
DTE Energy – BRPP CTGs