COMPLIANCE TEST REPORT

for

OXIDES OF NITROGEN (NO_X) AND CARBON MONOXIDE (CO) EMISSIONS

EU-CTG11-1-GP, EU-CTG11-2-GP, EU-CTG12-1-GP

GWEC Peakers
Kenockee, Michigan

July 12-14, 2022

Prepared By
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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, Greenwood Energy Center, located in Kenockee, Michigan. The fieldwork, performed July 12-14, 2022, was conducted to satisfy requirements of Michigan Renewable Operating Permit No. B6145-2018. Emissions tests were performed on three, natural gas fired peaker turbines (CTG's) (11-1, 11-2 & 12-1) for oxides of nitrogen (NO_x) and carbon monoxide (CO).

The results of the emissions testing are highlighted below:

Emissions Testing Summary
Greenwood CTG's (11-1, 11-2 & 12-1)
July 2022

Unit[1]	Parameter[2] (ppm @ 15% O2)	High Load	Mid-High Load	Mid-Low Load	Low Load
11-1 (712/22)	NO_x	6.9	6.7	6.9	6.4
	CO	4.4	6.1	3.7	4.7
11-2 (7/13/22)	NO_x	7.6	7.6	7.7	7.5
	CO	17.1	19.8	13.5	13.0
12-1 (7/14/22)	NO_x	6.0	5.8	6.0	5.6
	CO	8.1	11.4	7.7	7.9

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

(2) Concentration corrected according to USEPA Method 7E

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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, Greenwood Energy Center, located in Kenockee, Michigan. The fieldwork, performed on July 12-14, 2022, was conducted to satisfy requirements of Michigan Renewable Operating Permit No. B6145-2022. Emissions tests were performed on three, natural gas fired Combustion Turbine Generators (CTG's) (11-1, 11-2 & 12-1) for oxides of nitrogen (NO_x) and carbon monoxide (CO).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A, 7E, 10 and 20.

The fieldwork was performed in accordance with EPA Reference Methods and DTE's Intent to Test[1], Test Plan Submittal, submitted to the Michigan Department of Environment, Great Lakes, and Energy – Air Quality Division (EGLE-AQD) on January 24, 2022. The following EMS personnel participated in the testing program: Mr. Mark Westerberg (Senior Environmental Specialist), Mr. Fred Meinecke, (Environmental Specialist), Mr. Kenneth St. Amant (Environmental Specialist). Mr. Westerberg was the project leader. Mr. Tim Barth, with DTE Energy provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The DTE Energy, Greenwood Energy Center, located at 7000 Kilgore Road in Kenockee, Michigan, employs the use of 3 General Electric Frame 7, simple-cycle, combustion turbines nominally rated at 82.4 megawatts (MW) each at 100% load (dependant 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] MDEQ, Test Plan, Submitted January 24, 2022. (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 Method 3A	Oxygen & CO2	Instrumental Analyzer Method
USEPA Method 7E	Oxides of Nitrogen	Chemiluminecent Instrumental Analyzer Method
USEPA Method 10	Carbon Monoxide	NDIR Instrumental Analyzer Method
USEPA Method 19	Exhaust Gas Flow rates	Stoichiometric Calculations
USEPA Method 20	Oxides of Nitrogen	Ref. Method 7E

3.1 OXYGEN, OXIDES OF NITROGEN, AND CARBON MONOXIDE (USEPA METHODS 3A, 7E, AND 10)

3.1.2 Sampling Method

Oxygen concentrations were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 analyzer utilizes paramagnetic sensors. Oxides of nitrogen (NO_x) emissions were evaluated using USEPA Method 7E, "Determination of Oxides of Nitrogen Emissions from Stationary Sources". 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". The CO analyzer utilizes an NDIR detector.

The EPA Methods 3A, 7E, and 10 sampling system (Figure 2) consisted of the following:

(1) Stainless Steel sampling probe (traversed across 12 points of each stack)

(2) Heated Teflon™ sampling line
(3) MAK® gas conditioner with particulate filter
(4) Flexible unheated Teflon™ sampling line
(5) Servomex 1400 O2 gas analyzer, TECO 42i Chemiluminecent NO/NO_x gas analyzer, and TECO 48i NDIR CO gas analyzer
(6) Appropriate USEPA Protocol 1 calibration gases
(7) IOtech® Data Acquisition System.

Oxides of Nitrogen and Carbon Monoxide emissions testing were performed according to Method 20, and Sub-Part GG. Testing at each of four loads (equally spaced between max load and 49 MW) was performed. Each load was tested in triplicate with a run consisting of sampling for 1-minute plus response time at each of 12 points. Each test was 25 minutes. The probe was moved to each point with sufficient time to allow for sampling system response according to the guidelines of Sub-Part GG. Oxygen concentrations were also measured during the sampling.

3.1.3 Quality Control and Assurance

All sampling and analytical equipment were calibrated according to the guidelines referenced in Methods 7E and 10. 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 in Appendix C.

Zero, span, and mid-range calibration gases were introduced directly into the analyzer to determine the instruments linearity. A zero and mid-range span 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 14.57 ppm. Results from the converter efficiency test demonstrated that the analyzer met the requirements of Method 7E (Eq-1).

Eq. 1

$$Eff_{NO2} = \frac{C_{Dir}}{C_v} = \frac{13.32}{14.57} = 91.4\%$$

3.1.4 Data Reduction

Data was recorded at 10-second intervals and averaged in 1-minute increments. 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.

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4.0 OPERATING PARAMETERS

The test program included the collection of turbine operating data during each test run. Parameters recorded included fuel flowrate (pounds per second), power generation (MW), inlet guide vane angle (%), compressor discharge temperature (°F), compressor discharge pressure (psi), and exhaust temperature (°F).

Natural gas samples were collected once during the testing of each unit and analyzed for heat content and percent sulfur.

Operational data and results of the fuel analysis can be referred to in Appendix F.

5.0 DISCUSSION OF RESULTS

Unit 11-1:

Table No. 1 presents the NOx and CO emissions testing results and operational data for CTG 11-1 at 4 loads (77.7MW, 69.0MW, 59.1MW, and 49.9MW). Emissions are presented as ppm (parts per million) at 15% Oxygen. CTG 11-1 has a Permit Limit for NOx of 9 ppm, and a Permit Limit for CO of 25 ppm. The average NOx emissions were 6.9, 6.7, 6.9, and 6.4 ppm, respectfully for the 4 test loads. These values were all below the permit limit of 9 ppm. The average CO emissions were 4.4, 6.1, 3.7, and 4.7 ppm, respectfully for the 4 test loads. These values were all below the permit limit of 25 ppm.

Unit 11-2:

Table No. 2 presents the NOx and CO emissions testing results and operational data for CTG 11-2 at 4 loads (77.4MW, 70.1MW, 60.0MW, and 49.9MW). Emissions are presented as ppm (parts per million) at 15% Oxygen. CTG 11-2 has a Permit Limit for NOx of 9 ppm, and a Permit Limit for CO of 25 ppm. The average NOx emissions were 7.6, 7.6, 7.7, and 7.5 ppm, respectfully for the 4 test loads. These values were all below the permit limit of 9 ppm. The average CO emissions were 17.1, 19.8, 13.5, and 13.0 ppm, respectfully for the 4 test loads. These values were all below the permit limit of 25 ppm.

Unit 12-1:

Table No. 3 presents the NOx and CO emissions testing results and operational data for CTG 12-1 at 4 loads (79.3MW, 69.9MW, 60.0MW, and 50.0MW). Emissions are presented as ppm (parts per million) at 15% Oxygen. CTG 12-1 has a Permit Limit for NOx of 9 ppm, and a Permit Limit for CO of 25 ppm. The average NOx emissions were 6.0, 5.8, 6.0, and 5.6 ppm, respectfully for the 4 test loads. These values were all below the permit limit of 9 ppm. The average CO emissions were 8.1, 11.4, 7.7, and 7.9 ppm, respectfully for the 4 test loads. These values were all below the permit limit of 25 ppm.

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The Results of the testing indicate that Units 11-1, 11-2 & 12-1 are compliant with Michigan ROP #6145-2018 for NO_x and CO across all operating ranges tested.

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 D. Westerberg, QSTI

This report prepared by: _____

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Environmental Management and Safety
DTE Energy

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RESULTS TABLES

RECEIVED
SEP 13 2022
AIR QUALITY DIVISION

NOx, CO Emissions Testing Results
CTG 11-1
GWEC Peakers
DTE Energy
High Load
July 12, 2022

CTG 11-1

	Run 1	Run 2	Run 3	Average
MW	77.8	77.8	77.6	77.7
NOx (ppm)	7.1	7.1	7.1	7.1
CO (ppm)	4.7	4.5	4.3	4.5
O2 (%)	14.9	14.9	14.8	14.9
NOx (ppm@15% O2)	7.0	7.0	6.9	6.9
CO (ppm @ 15% O2)	4.6	4.4	4.2	4.4
NOx (lb/mmBtu)	**0.026**	**0.026**	**0.025**	**0.026**
CO (lb/mmBtu)	**0.010**	**0.010**	**0.009**	**0.010**
Fuel Flow (lb/sec)	11.7	11.6	11.6	11.6
Fuel Flow (100 scf/hr)	9,621	9,539	9,539	9,566
Heat Input (mmBtu/hr)	**978.4**	**970.1**	**970.1**	**972.9**
Fuel Consumed (100 scf)	**4,169.0**	**4,292.3**	**3,656.4**	**4,039.3**
NOx Emission Rate (lb/hr)	25.17	24.95	24.54	24.89
CO Emission Rate (lb/hr)	10.14	9.63	9.05	9.60
CO Emission Rate (lb/mmscf fuel)	10.54	10.09	9.49	10.04

Gas Analysis:

Gross Heating Value (Btu/scf):	**1017**
Molecular Weight (lbs/lb.mol):	16.8615
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.84

Calculations:

NOx corr. (ppm) = NOx (ppm) x (5.9/(20.9-O2%))

NOx (lb/mmBTU) = NOx(ppm) x 8710 x 1.194-7 x (20.9/(20.9-O2))

Fuel Flow (100scf/hr) = Fuel Flow ((lb/sec) x 3600 x (Gas volume (cf/lb))/100

Heat Input (MBtu/hr) = (Fuel Flow (100scf/hr) x 100 x 991) /10-6

NOx Emission Rate (lb/hr) = NOx (ppm) x 1.194E-7 x 8710 (ft3/Btu) x (20.9/(20.9-O2)) x Fuel Flow (100 scf/hr) x GHV (Btu/scf)

CO Emission Rate (lb/hr) = CO (ppm) x 7.268E-8 x 8710 (ft3/Btu) x (20.9/(20.9-O2)) x Fuel Flow (100 scf/hr) x GHV (Btu/scf)

CO Emission Rate (lb/mm-scf) = CO Emission Rate (lbs/hr) / { Fuel Flow (lb/sec) x 3600 (sec/hr) x Gas volume (scf/lb) / 1,000,000 }

NOx, CO Emissions Testing Results
CTG 11-1
GWEC Peakers
DTE Energy
Mid High Load
July 12, 2022

CTG 11-1

	Run 1	Run 2	Run 3	Average
MW	69.1	68.8	69.0	69.0
NOx (ppm)	6.8	6.9	6.7	6.8
CO (ppm)	7.1	6.5	5.1	6.2
O2 (%)	14.8	14.9	14.9	14.9
NOx (ppm@15% O2)	6.6	6.8	6.6	6.7
CO (ppm @ 15% O2)	6.9	6.4	5.0	6.1
NOx (lb/mmBTU)	**0.024**	**0.025**	**0.024**	**0.024**
CO (lb/mmBtu)	**0.015**	**0.014**	**0.011**	**0.014**
Fuel Flow (lb/sec)	10.5	10.5	10.4	10.5
Fuel Flow (100 scf/hr)	8,634	8,634	8,552	8,607
Heat Input (mmBtu/hr)	**878.1**	**878.1**	**869.7**	**875.3**
Fuel Consumed (100 scf)	**3,741.4**	**3,453.6**	**3,705.8**	**3,633.6**
NOx Emission Rate (lb/hr)	21.28	21.95	21.11	21.44
CO Emission Rate (lb/hr)	13.52	12.59	9.78	11.96
CO Emission Rate (lb/mmscf fuel)	15.66	14.58	11.44	13.89

Gas Analysis:

Gross Heating Value (Btu/scf):	**1017**
Molecular Weight (lbs/lb.mol):	16.8615
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.84

NOx, CO Emissions Testing Results
CTG 11-1
GWEC Peakers
DTE Energy
Mid Low Load
July 12, 2022

CTG 11-1

	Run 1	Run 2	Run 3	Average
MW	59.1	59.2	59.3	59.2
NOx (ppm)	7.0	7.0	7.1	7.0
CO (ppm)	4.1	3.7	3.7	3.8
O2 (%)	14.8	14.9	14.9	14.9
NOx (ppm@15% O2)	6.8	6.9	7.0	6.9
CO (ppm @ 15% O2)	4.0	3.6	3.6	3.7
NOx (lb/mmBTU)	**0.025**	**0.025**	**0.026**	**0.025**
CO (lb/mmBtu)	**0.009**	**0.008**	**0.008**	**0.008**
Fuel Flow (lb/sec)	9.4	9.4	9.4	9.4
Fuel Flow (100 scf/hr)	7,729	7,729	7,729	7,729
Heat Input (mmBtu/hr)	**786.1**	**786.1**	**786.1**	**786.1**
Fuel Consumed (100 scf)	**3,349.4**	**3,349.4**	**3,220.6**	**3,306.5**
NOx Emission Rate (lb/hr)	19.61	19.93	20.22	19.92
CO Emission Rate (lb/hr)	6.99	6.41	6.41	6.61
CO Emission Rate (lb/mmscf fuel)	9.04	8.30	8.30	8.55

Gas Analysis:

Gross Heating Value (Btu/scf):	**1017**
Molecular Weight (lbs/lb.mol):	16.8615
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.84

NOx, CO Emissions Testing Results
CTG 11-1
GWEC Peakers
DTE Energy
Low Load
July 12, 2022

CTG 11-1

	Run 1	Run 2	Run 3	Average
MW	50.0	50.3	49.7	50.0
NOx (ppm)	6.5	6.6	6.4	6.5
CO (ppm)	4.7	4.6	5.1	4.8
O2 (%)	14.9	14.9	14.9	14.9
NOx (ppm@15% O2)	6.4	6.5	6.3	6.4
CO (ppm @ 15% O2)	4.6	4.5	5.0	4.7
NOx (lb/mmBTU)	**0.024**	**0.024**	**0.023**	**0.024**
CO (lb/mmBtu)	**0.010**	**0.010**	**0.011**	**0.011**
Fuel Flow (lb/sec)	8.4	8.4	8.3	8.4
Fuel Flow (100 scf/hr)	6,907	6,907	6,825	6,880
Heat Input (mmBtu/hr)	**702.5**	**702.5**	**694.1**	**699.7**
Fuel Consumed (100 scf)	**2,993.1**	**3,108.2**	**3,185.0**	**3,095.5**
NOx Emission Rate (lb/hr)	16.54	16.80	16.09	16.48
CO Emission Rate (lb/hr)	7.28	7.13	7.81	7.40
CO Emission Rate (lb/mmscf fuel)	10.54	10.32	11.44	10.76

Gas Analysis:

Gross Heating Value (Btu/scf):	**1017**
Molecular Weight (lbs/lb.mol):	16.8615
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.84

NOx, CO Emissions Testing Results
CTG 11-2
GWEC Peakers
DTE Energy
High Load
July 13, 2022

CTG 11-2

	Run 1	Run 2	Run 3	Average
MW	77.8	77.8	77.6	77.7
NOx (ppm)	7.6	7.6	7.6	7.6
CO (ppm)	17.1	17.3	17.0	17.1
O2 (%)	15.0	15.0	15.0	15.0
NOx (ppm@15% O2)	7.6	7.6	7.6	7.6
CO (ppm @ 15% O2)	17.1	17.3	17.0	17.1
NOx (lb/mmBtu)	**0.028**	**0.028**	**0.028**	**0.028**
CO (lb/mmBtu)	**0.038**	**0.039**	**0.038**	**0.038**
Fuel Flow (lb/sec)	11.5	11.6	11.6	11.6
Fuel Flow (100 scf/hr)	9,376	9,458	9,458	9,431
Heat Input (mmBtu/hr)	**961.1**	**969.4**	**969.4**	**966.6**
Fuel Consumed (100 scf)	**4,219.4**	**4,256.0**	**4,256.0**	**4,243.8**
NOx Emission Rate (lb/hr)	26.91	27.14	27.14	27.06
CO Emission Rate (lb/hr)	36.85	37.61	36.96	37.14
CO Emission Rate (lb/mmscf fuel)	39.30	39.76	39.08	39.38

Gas Analysis:

Gross Heating Value (Btu/scf):	**1025**
Molecular Weight (lbs/lb.mol):	17.0053
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.65

Calculations:

NOx corr. (ppm) = NOx (ppm) x (5.9/(20.9-O2%))

NOx (lb/mmBTU) = NOx(ppm) x 8710 x 1.194-7 x (20.9/(20.9-O2))

Fuel Flow (100scf/hr) = Fuel Flow ((lb/sec) x 3600 x (Gas volume (cf/lb))/100

Heat Input (MBtu/hr) = (Fuel Flow (100scf/hr) x 100 x 991) /10-6

NOx Emission Rate (lb/hr) = NOx (ppm) x 1.194E-7 x 8710 (ft3/Btu) x (20.9/(20.9-O2)) x Fuel Flow (100 scf/hr) x GHV (Btu/scf)

CO Emission Rate (lb/hr) = CO (ppm) x 7.268E-8 x 8710 (ft3/Btu) x (20.9/(20.9-O2)) x Fuel Flow (100 scf/hr) x GHV (Btu/scf)

CO Emission Rate (lb/mm-scf) = CO Emission Rate (lbs/hr) / { Fuel Flow (lb/sec) x 3600 (sec/hr) x Gas volume (scf/lb) / 1,000,000 }

NOx, CO Emissions Testing Results
CTG 11-2
GWEC Peakers
DTE Energy
Mid High Load
July 13, 2022

CTG 11-2

	Run 1	Run 2	Run 3	Average
MW	70.0	70.0	70.2	70.1
NOx (ppm)	7.7	7.8	7.8	7.8
CO (ppm)	21.9	19.4	19.0	20.1
O2 (%)	14.9	14.9	14.9	14.9
NOx (ppm@15% O2)	7.6	7.7	7.7	7.6
CO (ppm @ 15% O2)	21.5	19.1	18.7	19.8
NOx (lb/mmBTU)	**0.028**	**0.028**	**0.028**	**0.028**
CO (lb/mmBtu)	**0.048**	**0.043**	**0.042**	**0.044**
Fuel Flow (lb/sec)	10.3	10.3	10.4	10.3
Fuel Flow (100 scf/hr)	8,398	8,398	8,479	8,425
Heat Input (mmBtu/hr)	**860.8**	**860.8**	**869.1**	**863.6**
Fuel Consumed (100 scf)	**3,919.0**	**3,639.1**	**3,815.8**	**3,791.3**
NOx Emission Rate (lb/hr)	24.01	24.32	24.56	24.30
CO Emission Rate (lb/hr)	41.57	36.82	36.41	38.27
CO Emission Rate (lb/mmscf fuel)	49.50	43.85	42.94	45.43

Gas Analysis:

Gross Heating Value (Btu/scf):	**1025**
Molecular Weight (lbs/lb.mol):	17.0053
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.65

NOx, CO Emissions Testing Results
CTG 11-2
GWEC Peakers
DTE Energy
Mid Low Load
July 13, 2022

CTG 11-2

	Run 1	Run 2	Run 3	Average
MW	60.0	59.8	60.1	60.0
NOx (ppm)	7.9	7.9	7.8	7.9
CO (ppm)	14.5	13.1	13.6	13.7
O2 (%)	14.9	14.9	14.9	14.9
NOx (ppm@15% O2)	7.8	7.8	7.7	7.7
CO (ppm @ 15% O2)	14.3	12.9	13.4	13.5
NOx (lb/mmBTU)	**0.029**	**0.029**	**0.028**	**0.028**
CO (lb/mmBtu)	**0.032**	**0.029**	**0.030**	**0.030**
Fuel Flow (lb/sec)	9.4	9.3	9.4	9.4
Fuel Flow (100 scf/hr)	7,664	7,583	7,664	7,637
Heat Input (mmBtu/hr)	**785.6**	**777.2**	**785.6**	**782.8**
Fuel Consumed (100 scf)	**3,448.9**	**3,412.2**	**3,448.9**	**3,436.6**
NOx Emission Rate (lb/hr)	22.48	22.24	22.20	22.31
CO Emission Rate (lb/hr)	25.12	22.45	23.56	23.71
CO Emission Rate (lb/mmscf fuel)	32.77	29.61	30.74	31.04

Gas Analysis:

Gross Heating Value (Btu/scf):	**1025**
Molecular Weight (lbs/lb.mol):	17.0053
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.65

NOx, CO Emissions Testing Results
CTG 11-2
GWEC Peakers
DTE Energy
Low Load
July 13, 2022

CTG 11-2

	Run 1	Run 2	Run 3	Average
MW	49.9	49.9	50.0	49.9
NOx (ppm)	7.7	7.7	7.8	7.7
CO (ppm)	14.1	13.4	12.8	13.4
O2 (%)	14.8	14.8	14.8	14.8
NOx (ppm@15% O2)	7.4	7.4	7.5	7.5
CO (ppm @ 15% O2)	13.6	13.0	12.4	13.0
NOx (lb/mmBTU)	**0.027**	**0.027**	**0.028**	**0.028**
CO (lb/mmBtu)	**0.031**	**0.029**	**0.028**	**0.029**
Fuel Flow (lb/sec)	8.4	8.4	8.4	8.4
Fuel Flow (100 scf/hr)	6,849	6,849	6,849	6,849
Heat Input (mmBtu/hr)	**702.0**	**702.0**	**702.0**	**702.0**
Fuel Consumed (100 scf)	**2,853.7**	**3,082.0**	**3,082.0**	**3,005.9**
NOx Emission Rate (lb/hr)	19.26	19.26	19.51	19.34
CO Emission Rate (lb/hr)	21.47	20.40	19.49	20.45
CO Emission Rate (lb/mmscf fuel)	31.35	29.79	28.46	29.86

Gas Analysis:

Gross Heating Value (Btu/scf):	**1025**
Molecular Weight (lbs/lb.mol):	17.0053
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.65

NOx, CO Emissions Testing Results
CTG 12-1
GWEC Peakers
DTE Energy
High Load
July 14, 2022

CTG 12-1

	Run 1	Run 2	Run 3	Average
MW	77.8	77.8	77.6	77.7
NOx (ppm)	6.1	6.0	6.1	6.1
CO (ppm)	9.8	8.3	6.5	8.2
O2 (%)	14.9	15.0	15.0	15.0
NOx (ppm@15% O2)	6.0	6.0	6.1	6.0
CO (ppm @ 15% O2)	9.6	8.3	6.5	8.1
NOx (lb/mmBtu)	**0.022**	**0.022**	**0.022**	**0.022**
CO (lb/mmBtu)	**0.022**	**0.019**	**0.015**	**0.018**
Fuel Flow (lb/sec)	11.7	11.6	11.4	11.6
Fuel Flow (100 scf/hr)	9,519	9,438	9,275	9,411
Heat Input (mmBtu/hr)	**977.6**	**969.3**	**952.6**	**966.5**
Fuel Consumed (100 scf)	**4,283.6**	**4,247.0**	**4,173.8**	**4,234.8**
NOx Emission Rate (lb/hr)	21.60	21.42	21.41	21.48
CO Emission Rate (lb/hr)	21.13	18.04	13.88	17.68
CO Emission Rate (lb/mmscf fuel)	22.19	19.12	14.97	18.76

Gas Analysis:

Gross Heating Value (Btu/scf):	**1027**
Molecular Weight (lbs/lb.mol):	17.0415
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.60

Calculations:

NOx corr. (ppm) = NOx (ppm) x (5.9/(20.9-O2%))

NOx (lb/mmBTU) = NOx(ppm) x 8710 x 1.194-7 x (20.9/(20.9-O2))

Fuel Flow (100scf/hr) = Fuel Flow ((lb/sec) x 3600 x (Gas volume (cf/lb))/100

Heat Input (MBtu/hr) = (Fuel Flow (100scf/hr) x 100 x 991) /10-6

NOx Emission Rate (lb/hr) = NOx (ppm) x 1.194E-7 x 8710 (ft3/Btu) x (20.9/(20.9-O2)) x Fuel Flow (100 scf/hr) x GHV (Btu/scf)

CO Emission Rate (lb/hr) = CO (ppm) x 7.268E-8 x 8710 (ft3/Btu) x (20.9/(20.9-O2)) x Fuel Flow (100 scf/hr) x GHV (Btu/scf)

CO Emission Rate (lb/mm-scf) = CO Emission Rate (lbs/hr) / { Fuel Flow (lb/sec) x 3600 (sec/hr) x Gas volume (scf/lb) / 1,000,000 }

NOx, CO Emissions Testing Results

CTG 12-1

GWEC Peakers

DTE Energy

Mid High Load

July 14, 2022

CTG 12-1

	Run 1	Run 2	Run 3	Average
MW	70.0	70.0	69.8	69.9
NOx (ppm)	5.8	5.8	5.9	5.8
CO (ppm)	12.5	11.0	10.6	11.4
O2 (%)	15.0	15.0	15.0	15.0
NOx (ppm@15% O2)	5.8	5.8	5.9	5.8
CO (ppm @ 15% O2)	12.5	11.0	10.6	11.4
NOx (lb/mmBTU)	**0.021**	**0.021**	**0.022**	**0.021**
CO (lb/mmBtu)	**0.028**	**0.025**	**0.024**	**0.025**
Fuel Flow (lb/sec)	10.4	10.4	10.4	10.4
Fuel Flow (100 scf/hr)	8,461	8,461	8,461	8,461
Heat Input (mmBtu/hr)	**869.0**	**869.0**	**869.0**	**869.0**
Fuel Consumed (100 scf)	**3,807.7**	**3,807.7**	**3,807.7**	**3,807.7**
NOx Emission Rate (lb/hr)	18.57	18.57	18.89	18.67
CO Emission Rate (lb/hr)	24.36	21.44	20.66	22.15
CO Emission Rate (lb/mmscf fuel)	28.79	25.33	24.41	26.18

Gas Analysis:

Gross Heating Value (Btu/scf):	**1027**
Molecular Weight (lbs/lb.mol):	17.0415
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.60

NOx, CO Emissions Testing Results
CTG 12-1
GWEC Peakers
DTE Energy
Mid Low Load
July 14, 2022

CTG 12-1

	Run 1	Run 2	Run 3	Average
MW	59.9	60.1	59.9	60.0
NOx (ppm)	6.0	6.0	6.0	6.0
CO (ppm)	7.9	7.5	7.7	7.7
O2 (%)	15.0	15.0	15.0	15.0
NOx (ppm@15% O2)	6.0	6.0	6.0	6.0
CO (ppm @ 15% O2)	7.9	7.5	7.7	7.7
NOx (lb/mmBTU)	**0.022**	**0.022**	**0.022**	**0.022**
CO (lb/mmBtu)	**0.018**	**0.017**	**0.017**	**0.017**
Fuel Flow (lb/sec)	9.4	9.4	9.4	9.4
Fuel Flow (100 scf/hr)	7,648	7,648	7,648	7,648
Heat Input (mmBtu/hr)	**785.4**	**785.4**	**785.4**	**785.4**
Fuel Consumed (100 scf)	**3,441.5**	**3,441.5**	**3,569.0**	**3,484.0**
NOx Emission Rate (lb/hr)	17.36	17.36	17.36	17.36
CO Emission Rate (lb/hr)	13.91	13.21	13.56	13.56
CO Emission Rate (lb/mmscf fuel)	18.19	17.27	17.73	17.73

Gas Analysis:

Gross Heating Value (Btu/scf):	**1027**
Molecular Weight (lbs/lb.mol):	17.0415
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.60

NOx, CO Emissions Testing Results
CTG 12-1
GWEC Peakers
DTE Energy
Low Load
July 14, 2022

CTG 12-1

	Run 1	Run 2	Run 3	Average
MW	49.7	50.0	50.2	50.0
NOx (ppm)	5.6	5.7	5.8	5.7
CO (ppm)	8.5	7.6	7.8	8.0
O2 (%)	15.0	14.9	14.9	14.9
NOx (ppm@15% O2)	5.6	5.6	5.7	5.6
CO (ppm @ 15% O2)	8.5	7.5	7.7	7.9
NOx (lb/mmBTU)	**0.021**	**0.021**	**0.021**	**0.021**
CO (lb/mmBtu)	**0.019**	**0.017**	**0.017**	**0.018**
Fuel Flow (lb/sec)	8.3	8.4	8.4	8.4
Fuel Flow (100 scf/hr)	6,753	6,834	6,834	6,807
Heat Input (mmBtu/hr)	**693.5**	**701.9**	**701.9**	**699.1**
Fuel Consumed (100 scf)	**3,038.8**	**3,075.4**	**3,075.4**	**3,063.2**
NOx Emission Rate (lb/hr)	14.31	14.49	14.75	14.52
CO Emission Rate (lb/hr)	13.22	11.76	12.07	12.35
CO Emission Rate (lb/mmscf fuel)	19.58	17.21	17.66	18.15

Gas Analysis:

Gross Heating Value (Btu/scf):	**1027**
Molecular Weight (lbs/lb.mol):	17.0415
Volume (ft^3/lb.mol):	385.14
Volume (ft^3/lb):	22.60

DTE

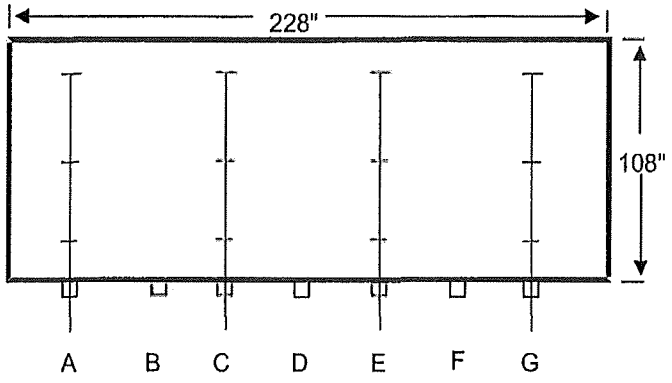
FIGURES

DTE

Figure 1 – Sampling Location
DTE – Greenwood Energy Center CTG's

NOx & CO sampling points

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



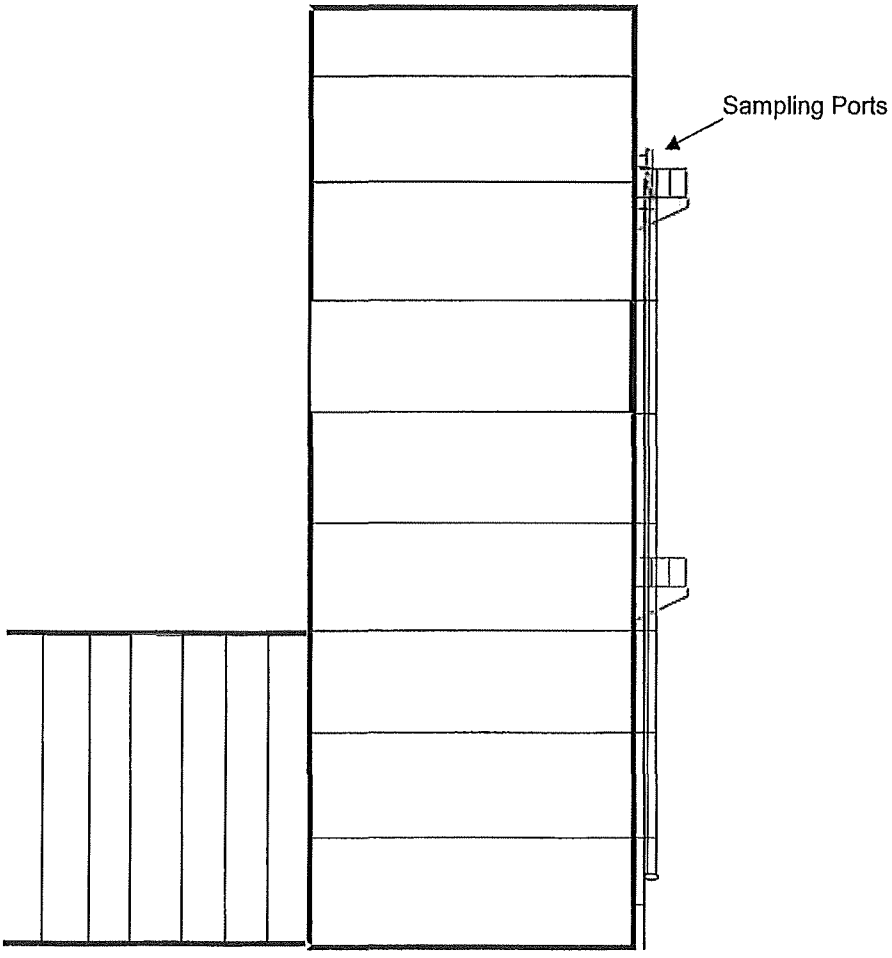


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Figure 2 – Method 7E/10 Sample Train Drawing
DTE – Greenwood Energy Center CTG's