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1. INTRODUCTION

This report presents the results of the source emissions compliance testing conducted by Environmental Quality Management, Inc. (EQM) for TC Energy's Great Lakes Gas Transmission Ltd. (GLGT) at Otisville compressor station, near Otisville, MI, which is located in Genesee County.

The primary purpose of this testing program was to conduct emissions testing to determine compliance with operating permit No. MI-ROP-N3818-2016 for the Natural Gas-Fired Turbine No. EU-Unit 1303 (1303) at TC Energy's ANR Pipeline's gas compressor facility. Unit EU-UNIT 1303 is a GE LM-1600 stationary gas turbine burning only pipeline quality natural gas. The unit peak load HP rating is 23,000 at ISO conditions. The unit is a simple cycle, natural gas fired, single-shaft turbine. In a simple cycle turbine, filtered atmosphere air is first compressed by the axial flow compressor. The hot compressed air is then fired with natural gas in the combustor. The hot exhaust gases expand through two turbine stages. The gas producer (G.P.) turbine drives the axial flow air while the power turbine (P.T.) drives the centrifugal pipeline compressor. The pipeline gas compressor moves natural gas through the pipeline by compressing it from an initial "suction" state to a more compressed "discharge" state.

EQM's responsibility was to conduct the compliance testing for the CO, O₂ and NO_x emissions rates during specified operating conditions and perform data reduction for conformance evaluation. TC Energy's GLGT's responsibility was to maintain process operating parameters and to assist in providing process operating data per compliance test requirements.

The following report provides information pertaining to TC Energy's process operations, and Compliance testing. The Compliance testing conducted on the Combustion Turbine No. 1303 was performed on November 12, 2020, from 8:30 A.M. to 1:22 P.M.

The following requirements were specific for the testing program:

1. Equipment calibrations performed and calibration data provided.
2. Twelve (12) thirty (30) -minute, minimum, CO, O₂ and NO_x test runs performed at the Combustion Turbine 1303 pursuant to EPA, Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Appendix A and Subpart GG.
3. Process manufacturing operations maintained at 4 evenly spaced loads and production and fuel consumption rates recorded during the emissions testing periods.
4. All testing and analyses performed in accordance with current EPA test methodologies and analytical procedures for NO_x and CO emissions determinations.
5. Stratification was found to be less than 5% in turbine exhaust.

The emissions testing program was supervised and performed by EQM, whose headquarters is in Crown Point, Indiana. EQM performed the Compliance testing for the CO, O₂ and NO_x, process data collection, overall emissions data review, and prepared the final report.



The testing program was approved by and/or coordinated with Tyrah Lydia, TC Energy's ANR Pipeline Company. The emission testing was performed by Karl Mast, Manager, Air Emissions Measurement and Project Manager, EQM, Zach Hill, Lead Field Testing Activities, EQM and Kameron King, Field Technician, EQM. The emission testing was observed by Jeremy Howe and Lindsey Wells, MEGLE.



2. TEST RESULTS SUMMARY

The compliance testing was performed on the Combustion Turbine No. 1303 system in accordance with the requirements of the Code of Federal Regulations, Title 40, Part 60, Appendix A and Subpart GG. A summary of the test results is given below:

Table 1. Turbine No. 1303 Emission Test Results-Unit 1303				
Parameter	High Load	Mid-High Load	Low-Mid Load	Low Load
NOx ppm @ 15% O2 Limit 175.2	157.525	120.849	103.701	87.805
NOx – Lb/Hr Limit 89.0	88.320	52.239	37.799	26.421
CO ppm@15% O2 Limit 31.9	13.299	11.597	11.617	16.889
CO – Lb/Hr Limit 22.0	4.539	3.051	2.577	3.093

Based on the information provided above, the Combustion Turbine 1303 met the acceptance criteria during the course of the testing event. A complete list of performance parameters for each test run that was performed at the stack sampling locations can be found in Tables 2 through 9.



Table 2. High Load Engine Operating & Ambient Conditions-Engine 1303

Run	1	2	3	
Date	11/12/20	11/12/20	11/12/20	
Time	8:30	8:51	9:12	
Engine Operating Conditions	High	High	High	Averages
Unit Horsepower from Control Panel	18,036.7	18,040.6	17,993.6	18,023.6
Unit Speed (rpm) CT/GG/GP/Jet	15,670.0	15,690.0	15,694.0	15,684.7
% CT Speed	95.3	95.4	95.4	95.3
Gas Compressor Speed (rpm) PT/Booster	6,275.0	6,236.3	6,141.8	6,217.7
% CT Speed	85.4	84.8	83.6	84.6
Turbine Exhaust Temp T5	1,372.0	1,372.0	1,373.0	1,372.3
Compressor Suction Pressure (PSIG)	633.2	612.2	599.9	615.1
Compressor Discharge Pressure (PSIG)	949.0	954.4	954.4	952.6
Ambient Conditions				
Ambient Temperature (°F)	60.00	60.00	60.00	60.00
Barometric Pressure (psi)	14.37	14.37	14.37	14.37
Ambient Relative Humidity (%)	92.00	86.00	76.00	84.67
Absolute Humidity (grains/LB)	72.75	67.93	59.94	66.87



**Table 3. High Load Emissions Concentrations, Calculated Mass Emissions, & Flows
Engine 1303**

Run	1	2	3	
Date	11/12/20	11/12/20	11/12/20	
Time	8:30	8:51	9:12	
Emissions Concentrations & Calculated Mass Emission	High	High	High	Averages
NO _x ppm (BIAS Corrected)	155.820	155.920	156.030	155.923
NO _x LB/HR	88.719	88.286	87.954	88.320
NO _x (ppm @ 15% O ₂)	157.421	157.522	157.633	157.525
NO _x (ppm @ 15% O ₂ , ISO)	171.297	169.180	165.683	168.720
NO _x LB/MMBTU	5.79605E-01	5.79977E-01	5.80387E-01	5.79990E-01
NO _x Tons/Year	388.589	386.691	385.240	386.840
NO _x LB/SCF Fuel	6.05E-04	6.05E-04	6.05E-04	6.05E-04
CO ppm (BIAS Corrected)	13.140	13.120	13.230	13.163
CO LB/HR	4.554	4.522	4.540	4.539
CO LB/MMBTU **	2.9752E-02	2.9707E-02	2.9956E-02	2.9805E-02
CO (ppm @ 15% O ₂)	13.275	13.255	13.366	13.299
CO (ppm @ 15% O ₂ , ISO)	14.445	14.236	14.048	14.243
CO Tons/Year	19.947	19.806	19.884	19.879
CO LB/SCF Fuel	3.1037E-02	3.0990E-02	3.1250E-02	3.1092E-02
% O ₂ (BIAS Corrected)	15.060	15.060	15.060	15.060
Calculated Emissions Concentrations				
% CO ₂ (Wet) *	3.077	3.080	3.085	3.080
% CO ₂ (Dry) *	3.329	3.329	3.329	3.329
% H ₂ O *	7.585	7.496	7.348	7.476
% O ₂ (Wet) *	13.918	13.931	13.953	13.934
% N ₂ + CO (Wet) *	75.420	75.493	75.614	75.509
Calculated Flows				
Fuel Flow - (SCFM)	2445.500	2432.000	2421.167	2432.889
Fuel Flow - (SCFH)	146,730.000	145,920.000	145,270.000	145,973.333
Exhaust Flow (LB/HR)	310,961.923	308,951.975	307,090.530	309,001.476
Exhaust Flow (WSCFM)	81,688.888	81,237.937	80,876.063	81,267.629
Air Flow (WSCFM)	76,402.753	75,980.983	75,642.526	76,008.754
Exhaust Flow Method 19 (wscfm)	79,316.731	78,878.875	78,527.510	78,907.705
Exhaust Flow Method 19 (lbm/min)	3,591.295	3,570.140	3,552.038	3,571.158
Exhaust Flow Carbon Balance (lbm/min)	6,105.432	6,071.728	6,044.682	6,073.948
Air flow Beshouri (scfm)	79,429.620	78,991.141	78,639.276	79,020.013
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	146.73	145.92	145.27	145.973
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 1	Run 2	Run 3	
* BASED ON CARBON BALANCE (STOICH. + O ₂)				
- A/F IS TOTAL MASS RATIO				



Table 4. Mid-High Load Engine Operating & Ambient Conditions-Engine 1303

Run	4	5	6	
Date	11/12/20	11/12/20	11/12/20	
Time	9:45	10:06	10:27	
Engine Operating Conditions	Mid High	Mid High	Mid High	Averages
Unit Horsepower from Control Panel	12,694.0	12,914.0	12,907.0	12,838.3
Unit Speed (rpm) CT/GG/GP/Jet	15,168.0	15,206.0	15,235.0	15,203.0
% CT Speed	92.2	92.4	92.6	92.4
Gas Compressor Speed (rpm) PT/Booster	5,817.4	5,815.3	5,819.6	5,817.4
% CT Speed	79.1	79.1	79.2	79.1
Turbine Exhaust Temp T5	1,241.0	1,249.0	1,253.0	1,247.7
Compressor Suction Pressure (PSIG)	612.8	616.3	617.9	615.6
Compressor Discharge Pressure (PSIG)	935.0	933.1	934.8	934.3
Ambient Conditions				
Ambient Temperature (°F)	60.00	60.00	60.00	60.00
Barometric Pressure (psi)	14.37	14.37	14.36	14.37
Ambient Relative Humidity (%)	82.00	76.00	73.00	77.00
Absolute Humidity (grains/LB)	64.74	59.95	57.57	60.75

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**Table 5. Mid-High Load Emissions Concentrations, Calculated Mass Emissions, & Flows
Engine 1303**

Run	4	5	6	
Date	11/12/20	11/12/20	11/12/20	
Time	9:45	10:06	10:27	
Emissions Concentrations & Calculated Mass Emission	Mid High	Mid High	Mid High	Averages
NO _x ppm (BIAS Corrected)	102.800	106.050	107.820	105.557
NO _x LB/HR	50.346	52.839	53.532	52.239
NO _x (ppm @ 15% O ₂)	117.771	121.731	123.044	120.849
NO _x (ppm @ 15% O ₂ , ISO)	125.415	127.965	128.530	127.303
NO _x LB/MMBTU	4.33619E-01	4.48198E-01	4.53034E-01	4.44950E-01
NO _x Tons/Year	220.517	231.433	234.468	228.806
NO _x LB/SCF Fuel	4.52E-04	4.68E-04	4.73E-04	4.64E-04
CO ppm (BIAS Corrected)	10.040	10.050	10.300	10.130
CO LB/HR	2.993	3.048	3.113	3.051
CO LB/MMBTU **	2.5779E-02	2.5854E-02	2.6344E-02	2.5992E-02
CO (ppm @ 15% O ₂)	11.502	11.536	11.754	11.597
CO (ppm @ 15% O ₂ , ISO)	12.249	12.127	12.278	12.218
CO Tons/Year	13.110	13.350	13.634	13.365
CO LB/SCF Fuel	2.6892E-02	2.6971E-02	2.7482E-02	2.7115E-02
% O ₂ (BIAS Corrected)	15.750	15.760	15.730	15.747
Calculated Emissions Concentrations				
% CO ₂ (Wet) *	2.767	2.765	2.780	2.770
% CO ₂ (Dry) *	2.969	2.964	2.980	2.971
% H ₂ O *	6.827	6.727	6.709	6.754
% O ₂ (Wet) *	14.675	14.700	14.675	14.683
% N ₂ + CO (Wet) *	75.732	75.809	75.837	75.793
Calculated Flows				
Fuel Flow - (SCFM)	1855.000	1883.500	1887.833	1875.444
Fuel Flow - (SCFH)	111,300.000	113,010.000	113,270.000	112,526.667
Exhaust Flow (LB/HR)	264,424.192	268,725.494	267,776.636	266,975.441
Exhaust Flow (WSCFM)	69,017.153	70,195.311	70,003.993	69,738.819
Air Flow (WSCFM)	65,638.489	66,775.276	66,544.523	66,319.429
Exhaust Flow Method 19 (wscfm)	68,225.491	69,408.473	69,164.476	68,932.814
Exhaust Flow Method 19 (lbm/min)	3,087.176	3,139.528	3,127.909	3,118.204
Exhaust Flow Carbon Balance (lbm/min)	5,226.341	5,316.577	5,299.038	5,280.652
Air flow Beshouri (scfm)	67,992.943	69,166.880	68,938.705	68,699.509
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	111.30	113.01	113.27	112.527
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 4	Run 5	Run 6	
* BASED ON CARBON BALANCE (STOICH. + O2)				
- A / FIS TOTAL MASS RATIO				



Table 6. Mid-Low Load Engine Operating & Ambient Conditions-Engine 1303

Run	7	8	9	
Date	11/12/20	11/12/20	11/12/20	
Time	11:05	11:26	11:47	
Engine Operating Conditions	Mid Low	Mid Low	Mid Low	Averages
Unit Horsepower from Control Panel	9,658.8	9,822.2	9,949.9	9,810.3
Unit Speed (rpm) CT/GG/GP/Jet	14,863.0	14,921.0	14,936.0	14,906.7
% CT Speed	90.4	90.7	90.8	90.6
Gas Compressor Speed (rpm) PT/Booster	5,316.9	5,319.0	5,319.0	5,318.3
% CT Speed	72.3	72.4	72.4	72.4
Turbine Exhaust Temp T5	1,170.0	1,179.0	1,182.0	1,177.0
Compressor Suction Pressure (PSIG)	640.4	643.9	646	643.3
Compressor Discharge Pressure (PSIG)	920.0	920.8	920	920.2
Ambient Conditions				
Ambient Temperature (°F)	60.00	60.00	60.0	60.00
Barometric Pressure (psi)	14.35	14.35	14.34	14.35
Ambient Relative Humidity (%)	63.00	59.00	56.0	59.33
Absolute Humidity (grains/LB)	49.64	46.46	44.09	46.73



**Table 7. Mid-Low Load Emissions Concentrations, Calculated Mass Emissions, & Flows
Engine 1303**

Run	7	8	9	
Date	11/12/20	11/12/20	11/12/20	
Time	11:05	11:26	11:47	
Emissions Concentrations & Calculated Mass Emission	Mid Low	Mid Low	Mid Low	Averages
NO _x ppm (BIAS Corrected)	81.090	83.270	84.500	82.953
NO _x LB/HR	36.327	38.190	38.879	37.799
NO _x (ppm @ 15% O ₂)	100.722	104.530	105.849	103.701
NO _x (ppm @ 15% O ₂ , ISO)	103.019	106.008	106.671	105.233
NO _x LB/MMBTU	3.70848E-01	3.84869E-01	3.89725E-01	3.81814E-01
NO _x Tons/Year	159.111	167.272	170.291	165.558
NO _x LB/SCF Fuel	3.87E-04	4.01E-04	4.07E-04	3.98E-04
CO ppm (BIAS Corrected)	9.370	9.220	9.290	9.293
CO LB/HR	2.555	2.574	2.602	2.577
CO LB/MMBTU **	2.6084E-02	2.5940E-02	2.6081E-02	2.6035E-02
CO (ppm @ 15% O ₂)	11.639	11.574	11.637	11.617
CO (ppm @ 15% O ₂ , ISO)	11.904	11.738	11.727	11.790
CO Tons/Year	11.191	11.274	11.396	11.287
CO LB/SCF Fuel	2.7211E-02	2.7060E-02	2.7208E-02	2.7160E-02
% O ₂ (BIAS Corrected)	16.150	16.200	16.190	16.180
Calculated Emissions Concentrations				
% CO ₂ (Wet) *	2.587	2.565	2.571	2.574
% CO ₂ (Dry) *	2.757	2.731	2.736	2.741
% H ₂ O *	6.173	6.065	6.029	6.089
% O ₂ (Wet) *	15.153	15.217	15.214	15.195
% N ₂ + CO (Wet) *	76.087	76.152	76.186	76.142
Calculated Flows				
Fuel Flow - (SCFM)	1565.000	1585.333	1593.833	1581.389
Fuel Flow - (SCFH)	93,900.000	95,120.000	95,630.000	94,883.333
Exhaust Flow (LB/HR)	239,744.701	245,116.098	245,838.580	243,566.460
Exhaust Flow (WSCFM)	62,460.142	63,858.387	64,081.807	63,466.778
Air Flow (WSCFM)	59,988.388	61,407.015	61,606.647	61,000.683
Exhaust Flow Method 19 (wscfm)	62,406.628	63,889.975	64,096.156	63,464.253
Exhaust Flow Method 19 (lbm/min)	2,820.504	2,886.816	2,895.588	2,867.636
Exhaust Flow Carbon Balance (lbm/min)	4,766.445	4,877.882	4,893.997	4,846.108
Air flow Beshouri (scfm)	62,009.847	63,459.600	63,669.252	63,046.233
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	93.90	95.12	95.63	94.883
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 7	Run 8	Run 9	
* BASED ON CARBON BALANCE (STOICH. + O2)				
- A / FIS TOTAL MASS RATIO				



Table 8. Low Load Engine Operating & Ambient Conditions-Engine 1303

Run	10	11	12	
Date	11/12/20	11/12/20	11/12/20	
Time	12:20	12:41	13:02	
Engine Operating Conditions	Low	Low	Low	Averages
Unit Horsepower from Control Panel	7,211.4	7,384.6	7,440.4	7,345.5
Unit Speed (rpm) CT/GG/GP/Jet	14,563.0	14,631.0	14,631.0	14,608.3
% CT Speed	88.5	88.9	88.9	88.8
Gas Compressor Speed (rpm) PT/Booster	4,792.7	4,792.7	4,790.6	4,792.0
% CT Speed	65.2	65.2	65.2	65.2
Turbine Exhaust Temp T5	1,093.0	1,104.0	1,104.0	1,100.3
Compressor Suction Pressure (PSIG)	666	669	670.8	668.5
Compressor Discharge Pressure (PSIG)	899	897	895.3	897.2
Ambient Conditions				
Ambient Temperature (°F)	60.0	60.0	60.00	60.00
Barometric Pressure (psi)	14.34	14.34	14.33	14.34
Ambient Relative Humidity (%)	51.0	51.0	49.00	50.33
Absolute Humidity (grains/LB)	40.13	40.13	38.56	39.61



**Table 9. Low Load Emissions Concentrations, Calculated Mass Emissions, & Flows
Engine 1303**

Run	10	11	12	
Date	11/12/20	11/12/20	11/12/20	
Time	12:20	12:41	13:02	
Emissions Concentrations & Calculated Mass Emission	Low	Low	Low	Averages
NO _x ppm (BIAS Corrected)	63.680	65.550	65.730	64.987
NO _x LB/HR	25.996	26.463	26.805	26.421
NO _x (ppm @ 15% O ₂)	87.579	87.499	88.339	87.805
NO _x (ppm @ 15% O ₂ , ISO)	87.331	87.255	87.736	87.440
NO _x LB/MMBTU	3.22454E-01	3.22161E-01	3.25253E-01	3.23289E-01
NO _x Tons/Year	113.861	115.906	117.405	115.724
NO _x LB/SCF Fuel	3.36E-04	3.36E-04	3.39E-04	3.37E-04
CO ppm (BIAS Corrected)	12.690	12.560	12.240	12.497
CO LB/HR	3.153	3.086	3.038	3.093
CO LB/MMBTU **	3.9114E-02	3.7575E-02	3.6868E-02	3.7853E-02
CO (ppm @ 15% O ₂)	17.452	16.766	16.450	16.889
CO (ppm @ 15% O ₂ , ISO)	17.403	16.719	16.338	16.820
CO Tons/Year	13.812	13.519	13.308	13.546
CO LB/SCF Fuel	4.0804E-02	3.9198E-02	3.8460E-02	3.9487E-02
% O ₂ (BIAS Corrected)	16.610	16.480	16.510	16.533
Calculated Emissions Concentrations				
% CO ₂ (Wet) *	2.371	2.434	2.420	2.408
% CO ₂ (Dry) *	2.510	2.580	2.564	2.552
% H ₂ O *	5.556	5.679	5.620	5.619
% O ₂ (Wet) *	15.687	15.544	15.582	15.604
% N ₂ + CO (Wet) *	76.386	76.343	76.377	76.369
Calculated Flows				
Fuel Flow - (SCFM)	1288.000	1312.333	1316.667	1305.667
Fuel Flow - (SCFH)	77,280.000	78,740.000	79,000.000	78,340.000
Exhaust Flow (LB/HR)	216,556.199	214,592.873	216,611.491	215,920.188
Exhaust Flow (WSCFM)	56,204.597	55,782.365	56,302.430	56,096.464
Air Flow (WSCFM)	54,599.773	54,014.441	54,558.719	54,390.978
Exhaust Flow Method 19 (wscfm)	56,868.079	56,238.260	56,809.544	56,638.628
Exhaust Flow Method 19 (lbm/min)	2,568.207	2,539.778	2,565.253	2,557.746
Exhaust Flow Carbon Balance (lbm/min)	4,327.800	4,284.336	4,326.824	4,312.987
Air flow Beshouri (scfm)	56,303.226	55,737.774	56,290.527	56,110.509
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	77.28	78.74	79.00	78.340
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 10	Run 11	Run 12	
* BASED ON CARBON BALANCE (STOICH. + O2)				
- A / F IS TOTAL MASS RATIO				



3. TEST PROCEDURES

EQM and EQM's affiliates and subcontractors use current U.S. EPA accepted testing methodologies in their Air Quality Programs as listed in the U.S. Code of Federal Regulations, Title 40, Part 60, Appendix A. For this testing program, the following specific methodologies were utilized:

- U.S EPA Method 1 – Sample and Velocity Traverses for Stationary Sources
- U.S EPA Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
- U.S. EPA Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 7E – Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 10 – Determination of Carbon Monoxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)

USEPA Methods 3A, 7E and 10 were performed at the Exhaust Stack sampling locations by continuously extracting a gas sample from the stack through a single point stainless steel sample probe. The extracted sample was pulled through a series of filters to remove any particulate matter. Directly after the probe, the sample was conditioned by a series of refrigeration dryers to remove moisture from the gas stream. After the refrigeration dryers, the sample was transported through a Teflon® line to the analyzers. The flow of the stack gas sample was regulated at a constant rate to minimize drift.

At the start of the day, each monitor was checked for calibration error by introducing zero, mid-range and high-range EPA Protocol 1 gases to the measurement system at a point upstream of the analyzers. In this report, the calibration error test is referred to as instrument calibration. The gas was injected into the sampling valve located at the outlet of the sampling probe. The bias test was conducted before and after each consecutive test run by introducing zero and upscale calibration gases for each monitor. The upscale calibration gases used for each monitor were the high calibration gases.

Measurement System Performance Specifications

- * Analyzer Calibration Error - Less than +/- 2% of the span of the zero, mid-range and high-range calibration gases.
- * Sampling System Bias - Less than +/-5% of the span for the zero, mid-range and high-range calibration gases.
- * Zero Drift - Less than +/-3% of the span over the period of each test run.
- * Calibration Drift - Less than +/-3% of the span over the period of each set of runs.



Calculations that were used in this testing event are as follows:

Calibration Correction

$$C_{GAS} = (C_R - C_O) \frac{C_{MA}}{C_M - C_O}$$

Where:

- C_{GAS} : Corrected fuel gas concentration (ppmvd)
 C_R : Fuel gas concentration (ppmvd)
 C_O : Average of initial and final zero checks (ppmvd)
 C_M : Average of initial and final span checks (ppmvd)
 C_{MA} : Actual concentration of span gas (ppmvd)

EPA F-Factor: a fuel specific Fd factor will be calculated as described in EPA Method 19

$$F_d = \frac{[(3.64 \cdot H_{Wt\%} \cdot 100) + (1.53 \cdot C_{Wt\%} \cdot 100)]}{GCV} \cdot 10^6 + \frac{[(0.14 \cdot N_{2Wt\%} \cdot 100) - (0.46 \cdot O_{2Wt\%} \cdot 100)]}{GCV} \cdot 10^6$$

$\rho_{FuelGas}$

Where:

- F_d : Fuel specific F-factor, dscf/MMBTU
 $H_{Wt\%}$: Hydrogen weight percent
 $C_{Wt\%}$: Carbon weight percent
 $N_{2Wt\%}$: Nitrogen weight percent
 $O_{2Wt\%}$: Oxygen weight percent
 GCV : Heating value of the fuel, BTU/dscf
 $\rho_{Fuel Gas}$: Density of the fuel gas, lb/scf

NO_x Corrected to 15% O₂

$$Em = NO_x \left(\frac{5.9}{20.9 - \%O_2} \right)$$



Where:

- E_m : Pollutant concentration corrected to 15% O₂, ppm
- NO_x: Pollutant concentration, ppm
- %O₂: Oxygen concentration in percent, measured on a dry basis

Mass emissions calculations: the F-factor Method and guidance from Part 75 will be used to calculate the mass emissions rates.

$$Em = Cd \times Fd \times \frac{20.9}{(20.9 - \%O_2)} \times Qh \times \frac{GCV}{10^6}$$

Where:

- E_m : Pollutant emission rate, lb/hr
- C_d : Pollutant concentration, lb/scf
- F_d : Fuel specific F-factor, dscf/MMBtu
- %O₂: Oxygen concentration, dry basis
- Q_h : Fuel rate from calibrated AGA specified Meter, scfh.
- GCV: Heating value of the fuel, Btu/scf

To Convert from:	To	Multiply by:
ppm CO	lb/scf	7.268 x 10 ⁻⁸
ppm NO _x	lb/scf	1.194 x 10 ⁻⁷



4. PROCESS CONDITIONS

The following table provides a summary of the production rates for each turbine during their respective tests.

Table 10. Combustion Turbine Production Data (Horsepower)				
Run	High Load	Mid-High Load	Low-Mid Load	Low-Mid Load
1	18,036.7	12,694.0	9,658.8	7,211.4
2	18,040.6	12,914.0	9,822.2	7,384.6
3	17,993.6	12,907.0	9,949.9	7,440.4
Average	18,023.6	12,838.3	9,810.3	7,345.5

The above production represents rates close to 100% capacity operation over the period of the testing. Accordingly, the testing was conducted under conditions acceptable for Compliance testing.



Table 11. Turbine 1303 General Information

General Information	
Date:	12-Nov-20
Company:	TC Energy
Station:	Otisville
Unit:	1303
Engine Type:	LM 1600
CT Rated RPM:	16450 RPM
PT Rated RPM:	7350 RPM
Rated BHP:	23000 BHP

Permit Limits				
	ppm@15%	g/Bhp-Hr	lb/hr	TPY
NOx:	175.2		89.0	
CO:	31.9		22.0	
VOC:				
H2CO:				

Limits are actually listed as average values

Fuel Gas Analysis	
Constituent	Mole Percent
Nitrogen	0.548
Carbon Dioxide	0.541
Methane	94.303
Ethane	3.885
Propane	0.565
I-Butane	0.061
N-Butane	0.071
I-Pentane	0.013
N-Pentane	0.007
Hexane +	0.007
Total	100.000

Fuel Meter Type	
Enter Type from List Below	2
Orifice Meter (upstream pressure tap):	1
Orifice Meter (downstream pressure tap):	2
Electronic Flow Meter (EFM):	3
Venturi (Nozzle) Meter:	4
Roots Meter w/ Accumulator:	5
Pipe I.D.:	3.068
Orifice I.D.:	1.5

Flow Schematic

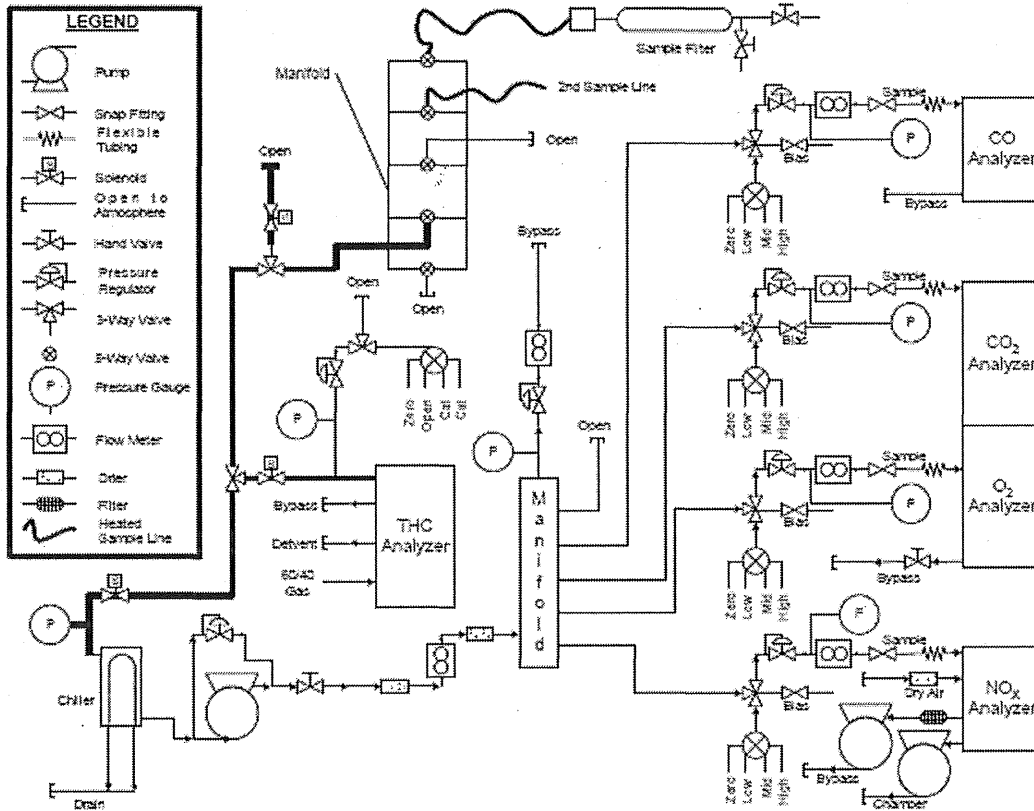


Figure 1



5. QUALITY ASSURANCE PROCEDURES

Each reference method presented in the U.S. Code of Federal Regulations details the instrument calibration requirements, sample recovery and analysis, data reduction and verification, types of equipment required and the appropriate sampling and analytical procedures to assure maximum performance and accuracy. EQM, and EQM's affiliates and subcontractors adhere to the guidelines for quality control set forth by the United States Environmental Protection Agency. These procedures are outlined in the following documents:

- Code of Federal Regulations, Title 40, Part 51
- Code of Federal Regulations, Title 40, Part 60
- Quality Assurance Handbook, Volume 1, EPA 600/9-76-005
- Quality Assurance Handbook, Volume 2, EPA 600/4-77-027a
- Quality Assurance Handbook, Volume 3, EPA 600/4-77-027b



6. CONCLUSIONS

A Compliance Test was conducted on Gas-Fired Turbine No. 1303 at TC Energy's compressor station near Otisville, MI. The Compliance testing was conducted November 12, 2020. During the course of the testing, the Gas-Fired Turbine No. 1303 conformed to the requirements of Code Of Federal Regulations, Title 40, Part 60, Appendix A and Subpart GG.

The usefulness and/or significance of the emissions values presented in this document as they relate to the compliance status of the Combustion Turbine No. 1303 emissions shall be determined by others.

For additional information pertaining to the testing program see Appendix D of this report.