COMPLIANCE TEST REPORT
TRANSCANADA'S ANR PIPELINE COMPANY
GLGT-BOYNE FALLS COMPRESSOR STATION (CS 11)
NATURAL GAS-FIRED TURBINE NO. EU-UNIT 1101
NATURAL GAS-FIRED TURBINE NO. EU-UNIT 1102

Prepared for:

TransCanada's Great Lakes Gas Transmission Limited Partnership
Boyne Falls, MI

Prepared by:

EQM

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DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

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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 Permit (ROP) 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 specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: GLGT Boyne Falls Compressor Station (CS-11) County: Charlevoix

Source Address: 10339 Great Lakes Road City: Boyne Falls

AQD Source ID (SRN): B8573 ROP No.: MI-ROP-B8573-2013 ROP Section No.: D, V.

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

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 ROP, 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 ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, 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 ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

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

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP 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 ROP 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 4/19/2011 To 12/7/2016

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

Emissions Testing units 1101 & 1102 once every five years for NOx and CO compliance.

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

Randall Schmidgall	Vice President US Pipelines	(832) 320-5511
Name of Responsible Official (print or type)	Title	Phone Number

Signature of Responsible Official — Date: 1-25-2017

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

PREFACE

I, Karl Mast, do hereby certify that the source emissions testing conducted at TransCanada in Boyne Falls, MI was performed in accordance with the procedures set forth by the United States Environmental Protection Agency, and that the data and results submitted within this report are an exact representation of the testing.

Karl Mast
Test Supervisor

I, Karl Mast, do hereby attest that all work on this project was performed under my direct supervision, and that this report accurately and authentically presents the source emissions testing conducted at TransCanada's Great Lakes Gas Transmission Ltd.'s Boyne Falls Compressor Station in Boyne Falls, MI.

Karl Mast
Project Manager

SUMMARY

The compliance testing was performed on the Combustion Turbines No. 1101 and 1102 systems in accordance with the requirements of the Code of Federal Regulations, Title 40, Part 60, Appendix A and in fulfillment of Michigan Department of Environmental Quality (MDEQ) permit no. MI-ROP-B8573-2013. A summary of the test results is given below:

Turbine 1101 and Turbine 1102			
Parameter	1101	1102	Emission Limit
NOx ppm @ 15% O2	56.72	63.40	82
NOx – Lb/Hr	31.31	37.75	61.2
CO ppm	120.58	147.69	300
CO – Lb/Hr	80.24	87.86	140

1. INTRODUCTION

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

The primary purpose of this testing program was to conduct emissions testing to determine compliance with operating permit No. MI-ROP-B8573-2013 for the Natural Gas-Fired Turbines No. EU-Unit 1101 (1101) and EU-Unit 1102 (1102) at TransCanada's GLGT gas compressor facility. Units 1101 and 1102 are both Rolls Royce, model Avon 76G stationary gas turbine burning only pipeline quality natural gas. The units peak load HP rating is 16,000 at ISO conditions. The units are a simple cycle, natural gas fired, single-shaft turbines. 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 NOx emissions rates during specified operating conditions and perform data reduction for conformance evaluation. TransCanada'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 TransCanada's process operations, and Compliance testing. The Compliance testing conducted on the Combustion Turbine No. 1101 was performed on Wednesday, December 7, 2016, from 10:15 A.M. to 1:16 P.M. The Compliance testing conducted on the Combustion Turbine No. 1102 was performed on Wednesday, December 7, 2016, from 1:55 P.M. to 4:56 P.M.

The following requirements were specific for the testing program:

1. Equipment calibrations performed and calibration data provided.
2. Three (3) (60) -minute, minimum, CO, O_2, and NOx test runs performed at the Combustion Turbines 1101 and 1102 pursuant to EPA, Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Appendix A.
3. Process manufacturing operations maintained at required load condition. 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 NOx and CO emissions determinations.
5. Stratification was found to be less than 5% in turbine exhaust.

The testing program was approved by and/or coordinated with Roy Cannon, TransCanada's GLGT Ltd. Partnership. The emission testing was performed by Karl Mast, Manager, Emission Measurement and Project Manager, EQM, and Zach Hill, Test Technician, EQM. The emission testing was observed by William Rogers, MDEQ.

2. TEST RESULTS SUMMARY

The compliance testing was performed on the Combustion Turbines No. 1101 and 1102 systems in accordance with the requirements of the Code of Federal Regulations, Title 40, Part 60, Appendix A. A summary of the test results is given below:

Table 1: Test Results Summary -NO_x & CO – Turbine 1101 and Turbine 1102

Turbine 1101 and Turbine 1102			
Parameter	1101	1102	Emission Limit
NOx ppm @ 15% O2	56.72	63.40	82
NOx – Lb/Hr	31.31	37.75	61.2
CO ppm	120.58	147.69	300
CO – Lb/Hr	80.24	87.86	140

Based on the information provided above, the Combustion Turbines 1101 and 1102 met the acceptance criteria during the course of the testing. 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 5.

Additional testing information may be found in Appendix A.

Table 2. Operating & Ambient Conditions, Concentrations & Emissions, & Flows
Turbine 1101

Run	1	2	3	Load 1101 Average
Date	12/07/16	12/07/16	12/07/16	
Time	1015-1118	1116-1215	1217-1316	
Condition	HIGH 1101	HIGH 1101	HIGH 1101	
Operating Parameters				
Turbine				
Horsepower	11,089.9	13,110.0	10,176.5	11,458.8
% Ambient Load	76.8	90.7	70.4	79.3
CT RPM	7,408.1	7,425.6	7,064.2	7,299.3
% CT Speed	98.8	99.0	94.2	97.3
PT RPM	4,898.2	4,968.5	4,718.0	4,861.5
% PT Speed	84.8	86.0	81.7	84.2
Compressor				
Compressor Suction Pressure (PSIG)	759.1	749.5	742.5	750.4
Compressor Suction Temperature (°F)	48.7	48.7	49.5	49.0
Compressor Discharge Pressure (PSIG)	964.0	972.6	971.5	969.4
Compressor Discharge Temperature (°F)	80.7	84.5	85.6	83.6
Compressor Flow (MMSCF/D)	1,137.0	1,155.0	879.8	1,057.3
Ambient Conditions				
Ambient Temperature (°F)	23.00	23.00	23.00	23.00
Barometric Pressure ("Hg)	28.47	28.47	28.46	28.47
Ambient Relative Humidity (%)	72.00	72.00	72.00	72.00
Absolute Humidity (grains/LB)	13.82	13.82	13.82	13.82
Emissions Concentrations & Calculated Mass Emissions				
NO_X ppm (BIAS Corrected)	25.50	32.84	28.22	28.85
NO_X g/BHP-HR	1.28	1.24	1.20	1.24
NOx lb/MMBTU factor	0.197	0.226	0.204	0.21
NO_X LB/HR 61.2 Limit	31.22	35.84	26.87	31.31
NO_X (ppm @ 15% O_2) 82 Limit	53.54	61.32	55.31	56.72
NOx LB/MMBTU	0.197	0.226	0.204	0.21
CO ppm (BIAS Corrected) 300 Limit	132.40	107.53	121.81	120.58
CO g/BHP-HR	4.04	2.47	3.15	3.22
CO LB/HR	98.69	71.44	70.60	80.24
CO (ppm @ 15% O_2)	277.99	200.77	238.76	239.17
% O_2 (BIAS Corrected)	18.09	17.74	17.89	17.91
Calculated Emissions Concentrations				
% O_2 (Wet)	17.49	17.09	17.26	17.28
Calculated Flows				
Fuel Flow - (SCFM)	2,507.8	2,513.7	2,089.0	2,370
Fuel Flow - (SCFH) From Screen	150,470	150,820	125,340	142,210
Exhaust Flow (LB/HR)	670,817	598,977	522,135	597,310
Exhaust Flow (WSCFM)	168,408	168,799	140,282	159,163
Air Flow (WSCFM)	162,704	145,312	126,678	144,898
Heat Rate (BTU/HP-HR)	12,898	10,936	11,708	11,847

** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION
* BASED ON CARBON BALANCE (STOICH. + O2)
- A/F IS TOTAL MASS RATIO

Table 3. Operating & Ambient Conditions, Concentrations & Emissions, & Flows
Turbine 1102

Run	4	5	6	Load 1102 Average
Date	12/07/16	12/07/16	12/07/16	
Time	1355-1454	1456-1555	1557-1656	
Condition	HIGH 1102	HIGH 1102	HIGH 1102	
Operating Parameters				
Turbine				
Horsepower	14,519.4	13,890.8	14,565.1	14,325.1
% Ambient Load	100.5	96.1	100.8	99.1
CT RPM	7,297	7,213	7,269	7,259.6
% CT Speed	97.3	96.2	96.9	96.8
PT RPM	5,040	5,093	5,212	5,115.0
% PT Speed	87.3	88.2	90.2	88.6
Compressor				
Compressor Suction Pressure (PSIG)	725	712	701	713
Compressor Suction Temperature (°F)	43.5	43.8	43.8	43.7
Compressor Discharge Pressure (PSIG)	951	970	970	964
Compressor Discharge Temperature (°F)	83.7	89.2	91.4	88.1
Compressor Flow (MMSCF/D)	1124.0	947.1	948.6	1,006.6
Ambient Conditions				
Ambient Temperature (°F)	23.00	23.00	23.00	23.00
Barometric Pressure ("Hg)	28.46	28.46	28.46	28.46
Ambient Relative Humidity (%)	73.00	73.00	73.00	73.00
Absolute Humidity (grains/LB)	14.01	14.01	14.01	14.01
Emissions Concentrations & Calculated Mass Emissions				
NO_X ppm (BIAS Corrected)	37.46	38.50	40.00	38.65
NO_X g/BHP-HR	1.18	1.19	1.21	1.20
NOx lb/MMBTU factor	0.228	0.232	0.239	0.23
NO_X LB/HR 61.2 Limit	37.74	36.53	38.98	37.75
NO_X (ppm @ 15% O_2) 82 Limit	62.08	63.10	65.01	63.40
NOx LB/MMBTU	0.229	0.233	0.240	0.23
CO ppm (BIAS Corrected) 300 Limit	150.93	146.70	145.45	147.69
CO g/BHP-HR	2.89	2.77	2.69	2.78
CO LB/HR	92.57	84.72	86.28	87.86
CO (ppm @ 15% O_2)	250.14	240.43	236.41	242.32
% O_2 (BIAS Corrected)	17.34	17.30	17.27	17.30
Calculated Emissions Concentrations				
% O_2 (Wet)	16.85	16.86	16.66	16.8
Calculated Flows				
Fuel Flow - (SCFM)	2,614.3	2,489.3	2,578.2	2,561
Fuel Flow - (SCFH) From Screen	156,860	149,360	154,690	153,637
Exhaust Flow (LB/HR)	558,244	526,637	538,342	541,074
Exhaust Flow (WSCFM)	175,559	167,165	173,131	171,952
Air Flow (WSCFM)	134,396	126,569	130,018	130,328
Heat Rate (BTU/HP-HR)	10,270	10,221	10,096	10,196

** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION
* BASED ON CARBON BALANCE (STOICH. + O2)
- A/F IS TOTAL MASS RATIO

Table 4. Gas Composition-AGA Standard Conditions of 14.73 psia and 60 F

GAS COMPOSITION	(Based on AGA standard conditions of 14.73 psia and 60 F)					
Constituent	**Mol. Fraction**	**MW**	**weighted MW**	**DENSITY**	**Weighted Density**	
NITROGEN	0.013542	28.0134	0.3794	0.07399	0.00100	1.3542
CARBON DIOX.	0.006596	44.01	0.2903	0.11624	0.00077	0.6596
METHANE	0.90874	16.04315	14.5791	0.04237	0.03850	90.874
ETHANE	0.063259	30.0703	1.9022	0.07942	0.00502	6.3259
PROPANE	0.00628	44.0975	0.2769	0.11647	0.00073	0.628
I-BUTANE	0.00032	58.1246	0.0186	0.15352	0.00005	0.032
N-BUTANE	0.000468	58.1246	0.0272	0.15352	0.00007	0.0468
I-PENTANE	0.000062	72.1518	0.0045	0.19057	0.00001	0.0062
N-PENTANE	0.000026	72.1518	0.0019	0.19057	0.00000	0.0026
HEXANE +	0.000038	95.958	0.0036	0.32000	0.00001	0.0038
	0.9993	17.4836	17.4836		0.04618	
Upper Dry Heat Value	1053.24	btu/dscf				
Low Dry Heat Value	951	btu/dscf				
Specific Gravity	0.6048					
DENSITY	0.0462	lb/cf				
Total Carbons	1.064540492	Total H	4.074222			

Constituent	LHV ideal	LHV(i) ideal	LHV(i) real	HHV ideal	HHV(i) ideal	HHV(i) real
NITROGEN		0.00	0.00		0	0
CARBON DIOX.		0.00	0.00		0	0
METHANE	911.5	828.32	830.23	1012	919.64488	921.77
ETHANE	1622.4	102.63	102.87	1773.7	112.2024883	112.46
PROPANE	2320.3	14.57	14.61	2522.1	15.838788	15.88
I-BUTANE	3007.3	0.96	0.96	3260.5	1.04336	1.05
N-BUTANE	3017.8	1.41	1.42	3270.1	1.5304068	1.53
I-PENTANE	3707.6	0.23	0.23	4011.1	0.2486882	0.25
N-PENTANE	3715.5	0.10	0.10	4018.2	0.1044732	0.10
HEXANE +	4900.5	0.19	0.19	5288.8	0.2009744	0.20
		LHV real	950.60		HHV real	1053.24

Constituent	SG	SG(i) ideal	b	b(i)	
NITROGEN	0.96723	0.013098229	0.0044	5.95848E-05	
CARBON DIOX.	1.51955	0.010022952	0.0197	0.000129941	Compressibility
METHANE	0.55392	0.503369261	0.0116	0.010541384	0.997696909
ETHANE	1.03824	0.065678024	0.0239	0.00151189	
PROPANE	1.52256	0.009561677	0.0344	0.000216032	
I-BUTANE	2.00684	0.000642189	0.0458	0.000014656	
N-BUTANE	2.00684	0.000939201	0.0478	2.23704E-05	
I-PENTANE	2.49115	0.000154451	0.0581	3.6022E-06	
N-PENTANE	2.49115	6.47699E-05	0.0631	1.6406E-06	
HEXANE +	3.3127	0.000125883	0.0802	3.0476E-06	
	SG real	0.604802051		0.012504149	
					8.46546E-07

Table 5. Gas Composition-EPA Standard Conditions of 14.696 psia and 68 F

GAS COMPOSITION	(Based onEPA standard conditions of 14.696 psia and 68 F)					
Constituent	**Mol. Fraction**	**MW**	**weighted MW**			
NITROGEN	0.0135	28.0134	0.3794			
CARBON DIOX.	0.0066	44.01	0.2903			
METHANE	0.9087	16.04315	14.5791	arbon Wt. % :	0.731332	
ETHANE	0.0633	30.0703	1.9022	rogen Wt. % :	0.234898	
PROPANE	0.0063	44.0975	0.2769	xygen Wt. % :	0.012072	
I-BUTANE	0.0003	58.1246	0.0186	rogen Wt. % :	0.021698	
N-BUTANE	0.0005	58.1246	0.0272		1.0000	
I-PENTANE	0.0001	72.1518	0.0045			
N-PENTANE	0.0000	72.1518	0.0019			
HEXANE +	0.0000	95.958	0.0036			
	0.9993	MW	17.4836			

Upper Dry Heat Value	1051	btu/dscf	Mole Weight	17.4836	btu/dscf
Low Dry Heat Value	952	btu/dscf	A F-Factor (calc)	8700	dscf/MMbtu
Specific Gravity	0.6048				
Density	0.0464	lb/scf			

Total Carbons	1.0645	Total H	4.0743

Constituent	LHV ideal	LHV(i) ideal	LHV(i) real	HHV ideal	HHV(i) ideal	HHV(i) real
NITROGEN		0.00	0.00		0	0
CARBON DIOX.		0.00	0.00		0	0
METHANE	913	829.68	831.59	1010	917.8274	919.95
ETHANE	1624	102.73	102.97	1769.6	111.9431264	112.20
PROPANE	2322	14.58	14.62	2516.1	15.801108	15.84
I-BUTANE	3010	0.96	0.97	3251.9	1.040608	1.04
N-BUTANE	3020	1.41	1.42	3262.3	1.5267564	1.53
I-PENTANE	3711	0.23	0.23	4000.9	0.2480558	0.25
N-PENTANE	3718	0.10	0.10	4008.9	0.1042314	0.10
HEXANE +	4904	0.19	0.19	5278	0.200564	0.20
		LHV real	952.08		HHV real	1051.11

Constituent	SG	SG(i) ideal	b	b(i)	
NITROGEN	0.96723	0.013098229	0.0044	5.95848E-05	
CARBON DIOX.	1.51955	0.010022952	0.0197	0.000129941	Compressibility
METHANE	0.55392	0.503369261	0.0116	0.010541384	0.997696909
ETHANE	1.03824	0.065678024	0.0239	0.00151189	
PROPANE	1.52256	0.009561677	0.0344	0.000216032	
I-BUTANE	2.00684	0.000642189	0.0458	0.000014656	
N-BUTANE	2.00684	0.000939201	0.0478	2.23704E-05	
I-PENTANE	2.49115	0.000154451	0.0581	3.6022E-06	
N-PENTANE	2.49115	6.47699E-05	0.0631	1.6406E-06	
HEXANE +	3.3127	0.000125883	0.0802	3.0476E-06	
	SG real	0.604802051		0.012504149	

3. PROCESS DESCRIPTION

TransCanada's ANR GLGT Boyne Falls Compressor Station #11 is located at 10339 Great Lakes Road, Boyne Falls, MI. The plant operates two Rolls Royce, model Avon 76G stationary gas turbine burning only pipeline quality natural gas. The units peak load HP rating is16,000 at ISO conditions. The units are a simple cycle, natural gas fired, single-shaft turbines. 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.

The following tables provide a summary of the production rates for the Turbines during the test:

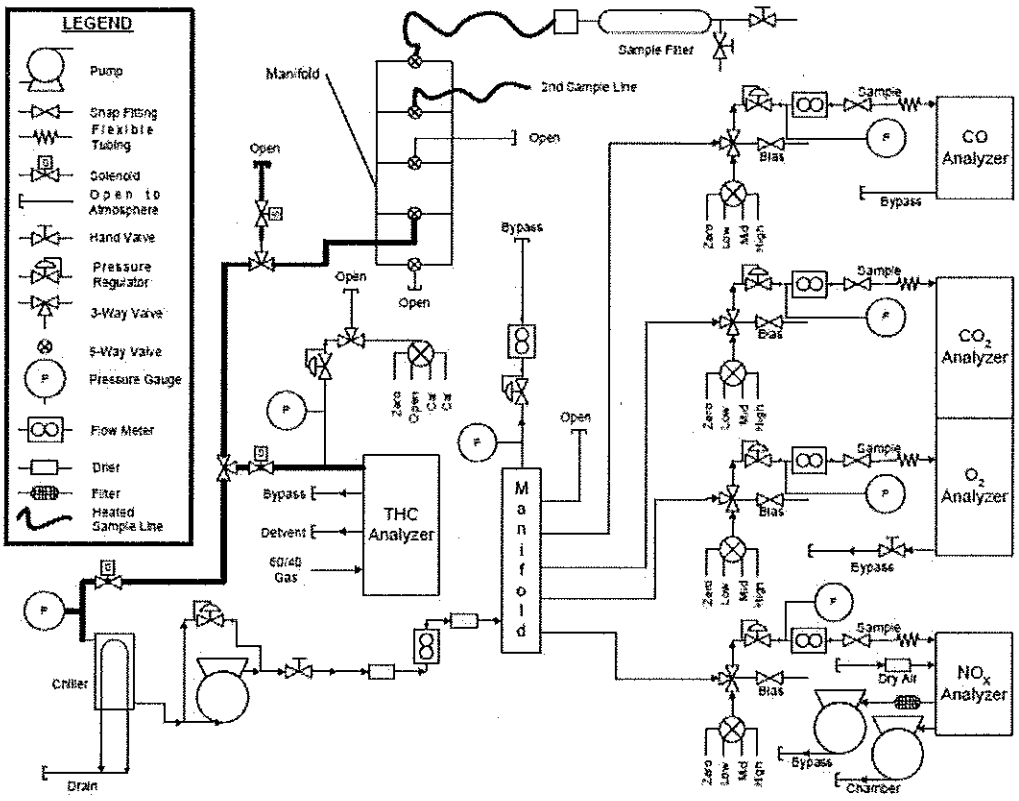
Table 6. Turbine 1101 & 1102 Production Data

Turbines 1101 & 1102 Production Data (Horse Power)		
Run	**1101**	**1102**
1	11,090*	14,519
2	13,110	13,891
3	10,177	14,565
Average	11,459	14,325

The above production represents rates that are evenly spaced based on ambient conditions at the proper load capacity over the period of the testing. Accordingly, the testing was conducted under conditions acceptable for Compliance testing.

*The plant data collected that was used for Run 1 (Unit 1101) ran into the first two minutes of Run No. 2 (Unit 1101). There was a software issue that was not printing the plant data in the beginning of the testing. All plant data may be found in Appendix B.

Figure 1. Flow Schematic



Additional Information pertaining to the Fuel Flows may be found in Appendix B.

4. 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 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 location 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 were as follows:

- 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 flue gas concentration (ppmvd)
C_R:	Flue 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

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

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% O_2

Where:

E_m: Pollutant concentration corrected to 15% O_2, ppm
NO_x: Pollutant concentration, ppm
$\%O_2$: 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
$\%O_2$: 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	7.268×10^{-8}
ppm NO_x	lb/scf	1.194×10^{-7}

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 ensure 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 Turbines No. 1101 and 1102 at TransCanada's compressor station near Boyne Falls, MI. The Compliance testing was conducted on December 7, 2016. During the course of the testing, the Gas-Fired Turbines No. 1101 and 1102 conformed to the requirements of Code Of Federal Regulations, Title 40, Part 60, Appendix A.

The usefulness and/or significance of the emissions values presented in this document as they relate to the compliance status of the Combustion Turbines No. 1101 and 1102 emissions shall be determined by others.

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