

Renewable Operating Permit (ROP) MI-ROP-B4942

FG-UTILITIES Test Report

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Executive Summary

SRN B4942 conducted Title V Renewable Operating Permit compliance testing in October and November 2019. This testing was required at least once during the term of the ROP but not later than five years from the date of the previous performance test. The ROP requires compliance verification of nitrogen oxides (NO_x) and carbon monoxide (CO) concentrations and emission rates defined in FG-UTILITIES. There were three operating modes that are explained in detail later in this document. The Supplemental Mode is the operating mode with the greatest emission potential requiring operation of both burners (boilers) and turbines simultaneously. This is the operating mode regulated by FG-UTILITIES.

In addition to testing in the Supplemental Mode, B4942 tested in Turbine/TEG and Fresh Air TEG Modes (burners only). The Turbine/TEG Mode consisted of three runs at > 90% of maximum rate capacity while the SoLoNO_x™ burner technology was operational on both the North and South Units and three runs were conducted in both Fresh Air and Supplemental Modes on each unit. This equated to a total of 18 runs conducted during this testing event.

The results will be used to demonstrate compliance with the current ROP, which they did. The emission results, that also include particulate matter (PM), will also be used to establish emission factors to support MAERS.

The table below presents a summary of the nitrogen oxides (NO_x) and carbon monoxide (CO) overall compliance results compared to the permitted emissions limits. The results for each of the test runs, including PM results, are presented in Section 2 of this report.

Summary of Results Compared to Permitted Emission Limits

Utilities Units/Operational Mode	Parameter	Permit Limits	Test Result
EU North Burner/EU North Turbine Supplemental Mode	NO _x	13.6 lb/hr	5.2 lb/hr
	CO	14.1 lb/hr	5.9 lb/hr
EU South Burner/EU South Turbine Supplemental Mode	NO _x	13.6 lb/hr	5.2 lb/hr
	CO	14.1 lb/hr	1.5 lb/hr
EU Total North/South Supplemental Mode	NO _x	13.6 lb/hr	10.4 lb/hr
	CO	14.1 lb/hr	7.4 lb/hr
EU North TEG Mode (Permitted Individually)	NO _x	25 ppmv @ 15% O ₂ 3.8 lb/hr	17.7 ppmv @ 15% O ₂ 3.0 lb/hr
	CO	50 ppmv @ 15% O ₂ 4.65 lb/hr	4.4 ppmv @ 15% O ₂ 0.4 lb/hr
EU South TEG Mode (Permitted Individually)	NO _x	25 ppmv @ 15% O ₂ 3.8 lb/hr	14.1 ppmv @ 15% O ₂ 2.3 lb/hr
	CO	50 ppmv @ 15% O ₂ 4.65 lb/hr	14.6 ppmv @ 15% O ₂ 1.4 lb/hr
EU North Burner Fresh Air Mode (Permitted Individually)	NO _x	4.5 lb/hr	4.2 lb/hr
	CO	4.8 lb/hr	3.5 lb/hr
EU South Burner Fresh Air Mode (Permitted Individually)	NO _x	4.5 lb/hr	4.4 lb/hr
	CO	4.8 lb/hr	1.6 lb/hr

Section 1. Introduction

B4942 conducted Title V ROP B4942 compliance testing in October and November 2019. Testing was originally scheduled for the week of October 21, 2019, but some of the testing was delayed until November 2019 due to operational issues and are discussed in this section. This test report presents the test schedule, detailed test results, brief process descriptions, sample methodology, and quality assurance/quality control (QA/QC) performed during this test.

The energy and utilities assets included four emission units:

- EU_N_Burner – North heat recovery steam generator burner;
- EU_S_Burner – South heat recovery steam generator burner;
- EU_N_Turbine – North turbine used to generate process air; and
- EU_S_Turbine – South turbine used to generate process air.

Conditions associated with these four emission units were conducted in three flexible groups:

- FG-Utilities - EU_N_Burner/EU_N Turbine and EU_S_Burner/EU_S_Turbine emission conditions apply at all times as the total of the N and S emission units.
- FG-Burners – EU_N_Burner & EU_S_Burner emission limits apply during Fresh Air Mode operation.
- FG-Turbines - EU_N_Turbine & EU_S_Turbine emission limits apply during Turbine Exhaust Gas (TEG) and Turbine Modes.

The emission limits for each flexible group are presented below.

Fresh Air Mode

FG-BURNERS FLEXIBLE GROUP CONDITIONS

DESCRIPTION

North and South duct burners located in FG-UTILITIES. Both burners are fired with natural gas. (PTI No. 303-98C)

Emission Units: EU_N_BURNER, EU_S_BURNER

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
1. Oxides of Nitrogen (NOx) - Fresh Air Mode	4.5 lbs/hr ²	based upon a calendar day averaging period	Applies individually to EU_N_BURNER, EU_S_BURNER of FG-BURNERS	SC VI.1	R 336.1205(3)
2. Carbon Monoxide (CO) - Fresh Air Mode	4.8 lbs/hr ²	based upon a calendar day averaging period	Applies individually to EU_N_BURNER, EU_S_BURNER of FG-BURNERS	SC VI.1	R 336.1205(3)

*Limits do not include startup, shutdown and malfunction conditions.

Operating Modes:

- Supplemental Mode = gas turbine operating, heat recovery steam generator operating. Emissions for the north unit vent through SV00007 & the south unit through SV00009.
- TEG (Turbine Exhaust Gas) Mode = gas turbine operating & heat recovery steam generator operating (the burner is not operating). Emissions for the north unit vent through SV00007 & the south unit through SV00009.
- Fresh Air Mode = burner operating & heat recovery steam generator operating (the gas turbine is not operating). Emissions for the north unit vent through SV00007 & the south unit through SV00009.
- Turbine Running (Air Generation) = gas turbine operating (the burners & heat recovery steam generator are not operating). Emissions for the north unit vent through SV00008 & the south unit through SV00010.

TEG Mode
FG-TURBINES
FLEXIBLE GROUP CONDITIONS

DESCRIPTION

North and South natural gas fired turbine engines located in FG-UTILITIES. (PTI No. 303-98C)

Emission Units: EU_N_TURBINE, EU_S_TURBINE

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
1. NOx – TEG & Turbine Running Modes	25 Parts per million, by volume, at 15% oxygen ²	instantaneous	Applies individually to EU_N_TURBINE, EU_S_TURBINE of FG-TURBINES	SC VI.2	40 CFR Part 60, Subparts A & GG
2. NOx – TEG & Turbine Running Modes	3.8 lbs/hr ²	based upon a calendar day averaging period	Applies individually to EU_N_TURBINE, EU_S_TURBINE of FG-TURBINES	SC VI.2	40 CFR Part 60, Subparts A & GG
3. CO – TEG & Turbine Running Modes	50 Parts per million, by volume, at 15% oxygen ²	instantaneous	Applies individually to EU_N_TURBINE, EU_S_TURBINE of FG-TURBINES	SC VI.2	R 336.1205(3)
4. CO – TEG & Turbine Running Modes	4.65 lbs/hr ²	based upon a calendar day averaging period	Applies individually to EU_N_TURBINE, EU_S_TURBINE of FG-TURBINES	SC VI.2	R 336.1205(3)

*Limits do not include startup, shutdown and malfunction conditions.

ppm = parts per million by volume at 15 percent oxygen and on a dry gas basis

Operating Modes:

- Supplemental Mode = gas turbine operating, heat recovery steam generator operating. Emissions for the north unit vent through SV00007 & the south unit through SV00009.
- TEG (Turbine Exhaust Gas) Mode = gas turbine operating & heat recovery steam generator operating (the burner is not operating). Emissions for the north unit vent through SV00007 & the south unit through SV00009.
- Fresh Air Mode = burner operating & heat recovery steam generator operating (the gas turbine is not operating). Emissions for the north unit vent through SV00007 & the south unit through SV00009.
- Turbine Running (Air Generation) = gas turbine operating (the burners & heat recovery steam generator are not operating). Emissions for the north unit vent through SV00008 & the south unit through SV00010.

Supplemental Mode

**FG-UTILITIES
FLEXIBLE GROUP CONDITIONS**

DESCRIPTION

All fuel burning devices within FG-UTILITIES including compressed air, steam and chilled water generation equipment. (PTI No. 303-98C)

Emission Unit: EU_N_BURNER, EU_S_BURNER, EU_N_TURBINE, EU_S_TURBINE

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
1. NOx	13.6 lbs/hr*2	Test Protocol	FG-UTILITIES	SC V.1	R 336.1205(3)
2. NOx	59.57 tons per year*2	Based upon a 12-month rolling time period as determined at the end of each calendar month.	FG-UTILITIES	SC VI.2	R 336.1205(3)
3. CO	14.1 lbs/hr*2	Test Protocol	FG-UTILITIES	SC V.1	R 336.1205(3)
4. CO	61.76 tons per year*2	Based upon a 12-month rolling time period as determined at the end of each calendar month.	FG-UTILITIES	SC VI.2	R 336.1205(3)

* Limit applies collectively to EU_N_BURNER, EU_S_BURNER, EU_N_TURBINE, EU_S_TURBINE

A test protocol was submitted for the testing in August 2019 and arranged according to the EGLE Air Quality Division (AQD) Format for Submittal of Source Emission Test Plans guidance document. It will serve as a reference for the testing methodology.

As mentioned above, some of the testing was delayed into November 2019 due to operational issues. The following table presents the revised schedule that was performed to complete the planned testing:

Unit	Mode	Date	Run Times
EU North Burner/EU North Turbine	Supplemental	10/22/2019	PM Run 1 1026-1129 PM Run 2 1159-1305 PM Run 3 1338-1457
EU North Turbine	TEG	10/22/2019	PM Run 1 1541-1646 PM Run 2 1711-1813 PM Run 3 1832-1934
EU South Turbine	TEG	10/23/2019	PM/NOx/CO Run 1 0810-0915 PM/NOx/CO Run 2 0937-1040 PM/NOx/CO Run 3 1103-1205
EU South Burner/EU South Turbine	Supplemental	10/23/2019	PM/NOx/CO Run 1 1454-1557 PM/NOx/CO Run 2 1632-1735 PM/NOx/CO Run 3 1752-1855
EU North Burner	Fresh Air	10/24/2019	PM/NOx/CO Run 1 0807-0911 PM/NOx/CO Run 2 0936-1041 PM/NOx/CO Run 3 1105-1208
EU North Burner/EU North Turbine	Supplemental	11/7/2019	NOx/CO Run 1 0810-0910 NOx/CO Run 2 0925-1025 NOx/CO Run 3 1035-1135
EU North Turbine	TEG	11/7/2019	NOx/CO Run 1 1250-1350 NOx/CO Run 2 1400-1500 NOx/CO Run 3 1510-1610
EU South Burner	Fresh Air	11/8/2019	PM/NOx/CO Run 1 1008-1113 PM/NOx/CO Run 2 1155-1258 PM/NOx/CO Run 3 1323-1427

During EU_N_Turbine compliance testing on October 23, 2019, carbon monoxide (CO) emissions were above 50 ppm (corrected to 15% O₂) and 4.65 pounds per hour. Based on compliance test measurements, the CO average concentration was approximately 80 ppm (corrected to 15% O₂) which corresponds to a mass emission rate of approximately 7 pounds per hour.

SOLAR Turbines® representatives were on-site on October 25, 2019. Based on their investigation, it was believed pilot-injector fouling from lubrication oil present in the natural gas feed likely resulted in elevated CO emissions. The fouling compromised the SoLoNOx® low emission technology.

The facility ordered new injectors. SOLAR Turbine® technicians installed the new injectors on November 1, 2019. Emission measurements collected by the SOLAR Turbine® technicians indicated the corrective action resolved the abnormal condition. Compliance testing resumed on November 7, 2019.

Section 2. Detailed Test Results

The following six tables present the detailed test results for NO_x, CO, and PM. The process data in the form of natural gas usage rates during each test run is presented as well each run parameter emission factor relative to the natural gas rates. The applicable permit emission limit is presented alongside the corresponding test result for ease of review and comparison.

A comprehensive data appendix is included at the end of this report containing the raw sampling data, both PM and NO_x/CO, calculation sheets, process data (natural gas feed rates), PM laboratory report, and calibrations for the PM, NO_x and CO measurement equipment.

EU North Burner/EU North Turbine Supplemental Mode	Run 1	Run 2	Run 3	Average	Permit Limit
11/7/2019	0810 - 0910	0925 - 1025	1035 - 1135	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	1,169	1,159	1,126	1,151	
EMISSIONS DATA					
Stack Gas Flow (dscf/min)	31,745	30,795	31,322	31,287	
NO _x (ppmv)	24.3	23.1	22.5	23.3	
NO _x (lb/hr)	5.5	5.1	5.0	5.2	13.6
NO _x Natural Gas Emission Factor (lb/MMscf)	78.4	73.3	74.0	75.2	
CO (ppmv)	46.0	44.2	40.6	43.6	
CO (lb/hr)	6.3	5.9	5.5	5.9	14.1
CO Natural Gas Emission Factor (lb/MMscf)	89.8	84.8	81.4	85.3	
10/22/2019	1026 - 1129	1159 - 1305	1338 - 1457	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	1,083	1,103	1,065	1,084	
EMISSIONS DATA					
Stack Gas Flow (dscf/hr)	29,220	29,429	29,438	29,363	
PM (grains/dscf)	0.0001	0.0002	0.0001	0.0002	
PM (lb/hr)	0.029	0.058	0.038	0.042	
PM Emission Factor (lb/MMscf)	0.45	0.88	0.59	0.64	

EU North Turbine TEG Mode	Run 1	Run 2	Run 3	Average	Permit Limit
11/7/2019	1250 - 1350	1400 - 1500	1510 - 1610	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	672	672	673	672	
EMISSIONS DATA					
Stack Gas Flow (dscf/min)	31,770	31,315	31,928	31,671	
Oxygen Concentration (%)	16.5	16.6	16.5	16.5	
NOx (ppmv)	12.6	12.8	13.9	13.1	
NOx (ppmv @ 15% O ₂)	17.0	17.3	18.7	17.7	25
NOx (lb/hr)	2.9	2.9	3.2	3.0	3.8
NOx Natural Gas Emission Factor (lb/MMscf)	71.9	71.9	79.2	74.3	
CO (ppmv)	3.2	3.2	3.4	3.2	
CO (ppmv @ 15% O ₂)	4.3	4.3	4.5	4.4	50
CO (lb/hr)	0.4	0.4	0.5	0.4	4.65
CO Natural Gas Emission Factor (lb/MMscf)	9.9	9.9	12.4	10.7	
10/22/2019	1541 - 1646	1711 - 1813	1832 - 1934	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	628	631	634	631	
EMISSIONS DATA					
Stack Gas Flow (dscf/hr)	29,140	30,474	30,504	30,039	
PM (grains/dscf)	0.0002	0.0004	0.0002	0.0003	
PM (lb/hr)	0.049	0.108	0.058	0.072	
PM Emission Factor (lb/MMscf)	1.3	2.9	1.5	1.9	

EU North Burner Fresh Air Mode	Run 1	Run 2	Run 3	Average	Permit Limit
10/24/2019	0907 - 0911	0936 - 1041	1105 - 1208	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	561	595	491	549	
EMISSIONS DATA					
Stack Gas Flow (dscf/min)	26,646	27,935	27,631	27,404	
NOx (ppmv)	22.0	21.1	20.8	21.3	
NOx (lb/hr)	4.2	4.2	4.1	4.2	4.5
NOx Natural Gas Emission Factor (lb/MMscf)	124.8	117.6	139.2	127.2	
CO (ppmv)	30.1	38.5	20.0	29.5	
CO (lb/hr)	3.5	4.7	2.4	3.5	4.8
CO Natural Gas Emission Factor (lb/MMscf)	104.0	131.7	81.5	105.7	
PM (grains/dscf)	0.0002	0.0003	0.0002	0.0002	
PM (lb/hr)	0.045	0.072	0.053	0.057	
PM Emission Factor (lb/MMscf)	1.3	2.0	1.8	1.7	

EU South Burner/EU South Turbine Supplemental Mode	Run 1	Run 2	Run 3	Average	Permit Limit
10/23/2019	1454 - 1557	1632 - 1735	1752 - 1855	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	1,049	1,020	1,027	1,032	
EMISSIONS DATA					
Stack Gas Flow (dscf/min)	30,398	30,783	31,006	30,729	
NOx (ppmv)	23.9	23.6	23.0	23.5	
NOx (lb/hr)	5.2	5.2	5.1	5.2	13.6
NOx Natural Gas Emission Factor (lb/MMscf)	82.6	85.0	82.8	83.5	
CO (ppmv)	11.0	11.0	12.1	11.3	
CO (lb/hr)	1.4	1.5	1.6	1.5	14.1
CO Natural Gas Emission Factor (lb/MMscf)	22.2	24.5	26.0	24.2	
PM (grains/dscf)	0.0005	0.0002	0.0003	0.0003	
PM (lb/hr)	0.135	0.051	0.085	0.090	
PM Emission Factor (lb/MMscf)	2.1	0.83	1.4	1.4	

EU South Turbine TEG Mode	Run 1	Run 2	Run 3	Average	Permit Limit
10/23/2019	0810 - 0915	0937 - 1040	1103 - 1205	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	638	637	630	635	
EMISSIONS DATA					
Stack Gas Flow (dscf/min)	32,507	32,477	31,755	32,246	
Oxygen Concentration (%)	16.8	16.7	16.7	16.7	
NOx (ppmv)	10.2	9.9	9.6	9.9	
NOx (ppmv @ 15% O ₂)	14.7	14.1	13.5	14.1	25
NOx (lb/hr)	2.4	2.3	2.2	2.3	3.8
NOx Natural Gas Emission Factor (lb/MMscf)	62.7	60.2	58.2	60.4	
CO (ppmv)	9.4	10.2	11.3	10.3	
CO (ppmv @ 15% O ₂)	13.5	14.4	15.9	14.6	50
CO (lb/hr)	1.3	1.4	1.6	1.4	4.65
CO Natural Gas Emission Factor (lb/MMscf)	34.0	36.6	42.3	37.6	
PM (grains/dscf)	0.0002	0.0001	0.0002	0.0002	
PM (lb/hr)	0.051	0.037	0.048	0.045	
PM Emission Factor (lb/MMscf)	1.3	1.0	1.3	1.2	

EU South Burner Fresh Air Mode	Run 1	Run 2	Run 3	Average	Permit Limit
11/8/2019	1008 - 1113	1155 - 1258	1323 - 1427	-	
PROCESS DATA					
Natural Gas Flow (scf/min)	615	522	500	546	
EMISSIONS DATA					
Stack Gas Flow (dscf/min)	29,669	26,898	26,865	27,811	
NOx (ppmv)	25.1	20.8	19.5	21.8	
NOx (lb/hr)	5.3	4.0	3.7	4.4	4.5
NOx Natural Gas Emission Factor (lb/MMscf)	143.6	127.7	123.3	131.5	
CO (ppmv)	13.4	13.3	13.1	13.3	
CO (lb/hr)	1.7	1.6	1.5	1.6	4.8
CO Natural Gas Emission Factor (lb/MMscf)	46.1	51.1	50.0	49.1	
PM (grains/dscf)	0.0003	0.0003	0.0003	0.0003	
PM (lb/hr)	0.074	0.081	0.073	0.076	
PM Emission Factor (lb/MMscf)	2.0	2.6	2.4	2.3	

Section 3. Identification and Description of Sources

This section provides information pertaining to the identification and a brief description of the tested sources. The referenced August 2019 test protocol contains more details of the sources and operations.

B4942 operates a pesticide active ingredient manufacturing facility in Harbor Beach, Michigan. Operations include two heat recovery steam generators (HRSG) identified as the north and south duct burners. For the purpose of this test plan and any associated communications, the terms HRSG and duct burners are interchangeable. Both burners are fired with natural gas. The emission units are identified as EU_N_BURNER and EU_S_BURNER. Together these units make up flexible group FG-BURNERS in the ROP.

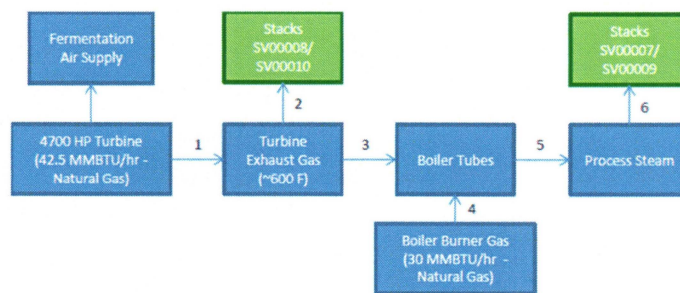
Operations also include two gas fired turbines. These are commonly identified as the north and south natural gas fired turbine engines. The emission units are identified as EU_N_TURBINE and EU_S_TURBINE. Together these units make up flexible group FG-TURBINES in the ROP. These burner and turbine assets only burn natural gas.

These units operate continuously. The emission profile (formation of NO_x and CO) is a function of the natural gas feed rate under normal operating conditions. The facility uses a process control computer to automatically control the process within specific ranges dictated by process limits. Operating ranges are variable and dictated by production demand. Process parameters are monitored for automatic or semi-automatic action. Parameters include, but are not limited to temperatures, pressures and flow rates.

Greater than 95% of the operating time these assets are operated in either Supplemental or Turbine Exhaust Gas (TEG) Modes. The Fresh Air and Turbine Modes only occur when one of the associated assets are down for maintenance. Both turbines are equipped with SoLoNO_x™ technology. SoLoNO_x™ is a low emissions option. SoLoNO_x uses lean-premixed combustion technology to ensure uniform air/fuel mixture and to prevent formation of regulated pollutants such as NO_x.

The boiler and turbine assets are regulated by equipment type and in combination. FG-Burner regulates the natural gas fired HRSG. FG-Turbine regulates the natural gas fired turbines. FG-Facility regulates the assets in combination. Compliance testing is required under FG-Facility for the assets operated in combination.

Block Flow Diagram



Turbine Mode - Air production without steam production. Pt 1 is active. Pt 3 is closed. Emission vent through Pt 2 (SV00008 for North Unit and SV00010 for South Unit.) Approx 1% of operating time.

Supplemental Mode - Air production and steam production. Pt 1 is active. Pt 2 is closed. Pt 3 is open. Pt 4 is active. Pt 5 is open. Emission vent through Pt 6 (SV00007 for North Unit and SV00009 for South Unit.) Approx 40% - 50% of operating time.

Turbine Exhaust Gas Mode - Air production and steam production without the boiler burner operating. Pt 1 is active. Pt 2 is closed. Pt 3 is open. Pt 4 is closed. Pt 5 is open. Emission vent through Pt 6 (SV00007 for North Unit and SV00009 for South Unit.) Approx 40% - 50% of operating time.

Fresh Air Mode - Steam production without air production. Pt 1 is closed. Pt 2 is closed. Pt 3 is closed. Pt 4 is active. Pt 5 is open. Emission vent through Pt 6 (SV00007 for North Unit and SV00009 for South Unit.) Approx 1% of operating time.

Section 4. Parameters Measured and Descriptions of Sampling Methods

The table below lists the parameters and methods used to collect measurements and samples during the testing. These methods were performed according to the protocol listed in the appropriate Appendix A, 40 CFR 60 EPA Reference Test Methods. Schematic diagrams can be found in the EPA Reference Test Methods. The referenced August 2019 test protocol presents more details of the test methods.

Samples will be collected from emission units EU_N_Turbine and EU_S_Turbine while the SoLoNOx™ technology is online. These measurements will be made in TEG mode unless the site steam demand is low. It is very unlikely the steam demand will be too low. However, if this is the situation, measurements will be collected in Turbine Mode. The emission profiles for Turbine and TEG mode are exactly the same. The only difference between the two modes is that when in TEG mode the exhaust gas it passes through the heat recovery steam generator and exits to the atmosphere through stack SV00007/SV00009. In Turbine Mode, the exhaust gas is sent to the atmosphere through stacks SV00008/SV00010 without passing through the steam generator.

Test Matrix for Emission Sampling						
Emission Unit	Mode	Runs	Stack Measurement	Sample Duration	EPA Methods	Stack ID
EU_N_Burner	Fresh Air	3	Flow Rate, PM, NOx, & CO	Minimum 1 Hour	EPA Methods 1, 2, 3A, 4, 5, 7E, 10	SV00007
EU_S_Burner	Fresh Air	3	Flow Rate, PM, NOx, & CO	Minimum 1 Hour	EPA Method 1, 2, 3A, 4, 5, 7E, 10	SV00009
EU_N_Turbine SoLoNOx On	TEG	3	Flow Rate, PM, NOx, & CO	Minimum 1 Hour	EPA Method 1, 2, 3A, 4, 5, 7E, 10	SV00007
EU_S_Turbine SoLoNOx On	TEG	3	Flow Rate, PM, NOx, & CO	Minimum 1 Hour	EPA Method 1, 2, 3A, 4, 5, 7E, 10	SV00009
EU_N_Burner EU_N_Turbine SoLoNOx On	Supplemental	3	Flow Rate, PM, NOx, & CO	Minimum 1 Hour	EPA Method 1, 2, 3A, 4, 5, 7E, 10	SV00007
EU_S_Burner EU_S_Turbine SoLoNOx On	Supplemental	3	Flow Rate, PM, NOx, & CO	Minimum 1 Hour	EPA Method 1, 2, 3A, 4, 5, 7E, 10	SV00009

Section 5. Quality Assurance and Quality Control (QA/QC) Procedures

Data quality objectives are specified in the associated EPA Test Methods. Measurement objectives are presented in the table below. The sampling and analytical procedures used are standard EPA Methods. Each method has minimum quality control checks. Adherence to the prescribed QC procedures ensured data quality met applicable method standards. Only ROP-related testing is described here.

QUALITY PARAMETERS	METHOD OF DETERMINATION	FREQUENCY	TARGET CRITERIA
Calibration Gas Verification	Use Protocol 1 Gases	NA	Zero: < 0.25% Span Mid: 40 - 60% Span High: 80 - 100% Span
Interference Response	Challenge analyzer with interference test gas mixtures or get vendor certification	Initial and after system modifications	< 2% Span
Range Value	Vendor Certification	N/A	0 - 25%
Span Value	Determine Expected Concentration	Before Each Compliance Test	Expected Average Conc. > 20% Span
Analyzer Calibration Error	Challenge Analyzer with Zero, Mid and High Standards	Initial and As Required	< $\pm 2\%$ of span
Sampling System Bias and System Response	Challenge analyzer with Upscale standard (whichever is closest to stack concentration) and zero gas alternately. Gas is introduced upstack at calibration valve assembly.	Before and After Each Run	< $\pm 5\%$ of span Record Response Time (95% Step)
Sample Collection	NA	NA	Maintain $\pm 10\%$ constant sample rate. Sample Time = Run Time plus 2X System Response Time
Calibration and Zero Drift	Sampling System Bias Check	After Each Run	< $\pm 3\%$ of span over entire period of each run

Collected PM samples were analyzed off site by Enthalpy Analytical Laboratories (EAL). The analytical and QA/QC procedures specified in EPA Method 5 were used and followed according to the method protocol. The EAL PM report is presented in the appendix to this report and includes the QA/QC data to support the results.