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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2715D
Plant ID No.:	071-00008
Applicant:	Columbia Gas Transmission LLC (Columbia)
Facility Name:	Seneca Compressor Station
Location:	Seneca Rocks, Pendleton County
SIC Code:	4922
NAICS Code:	486210
Application Type:	Modification
Received Date:	March 7, 2014
Engineer Assigned:	Jerry Williams, P.E.
Fee Amount:	$4,500
Date Received:	March 7, 2014
Complete Date:	May 23, 2014
Due Date:	August 21, 2014
Applicant Ad Date:	March 20, 2014
Newspaper:	*The Pendleton Times*
UTM's:	Easting: 640.9 km Northing: 4,301.2 km Zone: 17
Description:	Update of carbon monoxide emission limitations for a previously permitted turbine. In addition, with this permitting action, the Seneca Compressor Station will become a major stationary source for NOx under 45CSR14. This permitting action will limit the annual emission increases for this modification below PSD significance levels for NOx, CO, and CO_2e.

PROJECT OVERVIEW

Columbia's Seneca Station is located in Pendleton County near the town of Seneca Rocks. The station receives natural gas via pipeline from an upstream compressor station, compresses it using natural gas fired turbines and then transmits it via pipeline to a downstream station. The station currently has five (5) primary natural gas fired turbines including two (2) Solar Taurus 60-7800S turbines rated at 7,700 hp each that were installed in 2008, one (1) GE 3132R Frame 3 turbine rated at 13,750 hp that was purchased in 1971 and moved to the Seneca Station in 1981, one (1) refurbished Solar Saturn 10 turbine rated at 1,557 hp, and one (1) Solar Mars 100 turbine rated at 15,900 hp. Associated with the new Mars unit is a small (0.8 mmbtu/hr) fuel gas heater. Columbia also has a Waukesha model L36GL/GLD (rated at 880 hp) emergency generator and 36 catalytic space heaters (0.072 MMBTU/hr each) at the facility.

This modification will revise carbon monoxide emission limits associated with the Solar Mars 100 turbine. The error was identified by Columbia during performance testing. All emission limits were reviewed by Columbia and this modification is submitted to propose emission limit revisions to incorporate more recent vendor data. In addition, heater #1 (HTR1) was erroneously removed from the Title V permit. This unit was installed in 2008 and has not been modified since the installation.

DESCRIPTION OF PROCESS

The following process description was taken from Permit Application R13-2715D:

Pipeline transmission of natural gas requires that the gas be compressed. The Seneca Compressor Station has exclusively used RICEs to drive centrifugal gas compressors.

The power output from a natural gas fired turbine is directly related to the fuel input rate and to the ratio of combustion air to fuel. As ambient temperatures decrease, a turbine's maximum power output will increase due to the increased density of the inlet air. The Solar dry low NO_x (DLN) combustion system (known as SoLoNOx) limits formation of NO_x, CO, and VOC by pre-mixing air and fuel prior to combustion. When operating at ambient temperatures $\geq$ to 0 ^oF and at loads $\geq$ 50%, this DLN system is able to limit the exhaust gas concentration of these pollutants (corrected to 15% O_2) to 15 ppm NO_x, 25 ppm CO, and 25 ppm unburned hydrocarbons (UHC, containing at least 80% non-VOC methane and ethane; therefore, 5 ppm VOC). At ambient temperatures of 0 to -20 ^oF, additional pilot fuel is required by the turbine to maintain flame stability, which increases estimated emission concentrations to 42 ppm NO_x, 100 ppm CO, and 50 ppm UHC (10 ppm VOC). At ambient temperatures <-20 ^oF, additional pilot fuel is required by the turbine to maintain flame stability, which increases estimated emission concentrations (based on expected emissions at < 0 ^oF) to 120 ppm NO_x, 150 ppm CO, and 50 ppm UHC (10 ppm VOC). At turbine loads < 50%, additional pilot fuel and air flow are required to maintain flame stability and turbine responsiveness. These changes increase estimated emission concentrations to 66 ppm NO_x, 4,400 ppm CO, and 440 ppm UHC (88 ppm VOC). Should loads drop below 50%, Columbia will make every effort to either bring the load back above 50% or shut a turbine down (e.g., shut down other units and move that volume to the turbine, or shift the turbine volume to other units and shut down the turbine).

In addition, there are changes in NO_x, CO, and VOC emissions during the initial fuel light-off, turbine loading, and flame stabilization steps associated with turbine startup. There are also changes in emissions during the normal turbine shutdown sequence. For a Solar Taurus turbine, the startup sequence takes less than 10 minutes to complete prior to engaging the DLN system. The shutdown sequence for a Taurus turbine requires approximately 10 minutes.

SITE INSPECTION

No site inspection was performed by the writer. The facility is an existing, well known source to DAQ. Karl Dettinger of DAQs Enforcement section (Eastern Panhandle Regional Office) performed a compliance inspection on February 5, 2013. The facility was found to be in compliance.

Latitude: 38.848344
Longitude: -79.376331

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

This modification revises carbon monoxide emission limits associated with the Solar Mars 100 turbine. The error was identified by Columbia during performance testing. All emission limits were reviewed by Columbia and this modification is submitted to propose emission limit revisions to incorporate more recent vendor data.

The following table represents the annual potential emissions (tpy) associated with this project:

Source	Operating Mode	Cycles	Hr/yr	NOx	CO	CO_2e	$PM_{10/2/5}$	VOC	SO_2
E07 Solar Saturn Turbine	Normal Load @ 30 ^oF		744	3.53	5.73	728	0.11	0.16	0.0044
	Low Temp (<0 ^oF)		21.7	0.11	0.18	21	0.003	0.005	0.0001
	Low Load (< 50%)		29.1	0.08	0.21	28	0.004	0.01	0.0002
	Very Low Temp (< -20 ^oF)		1.2	0.01	0.01	1	0	0.0003	0
	Startup/Shutdown	16	4	0.012	0.036	4	0.001	0.002	0
	Total		800	3.74	6.16	783	0.12	0.18	0.005
E08 Solar Mars Turbine	Normal Load @ 30 ^oF		8,442	28.53	28.91	59,041	9.08	3.32	0.36
	Low Temp (<0 ^oF)		240	2.47	3.58	1,678	0.26	0.20	0.01
	Low Load (< 50%)		30	0.24	9.80	210	0.03	0.11	0.001
	Very Low Temp (< -20 ^oF)		12	0.35	0.27	84	0.01	0.01	0.001
	Startup/Shutdown	150	36	0.23	20.45	252	0.04	0.23	0.002
	Total		8,760	31.83	63.02	61,264	9.42	3.88	0.37
G3 Emerg. Gen.	Normal		500	0.97	0.63	200	0.02	0.02	0.001
H2 Fuel Gas Heater	Normal		8,760	0.37	0.31	436	0.03	0.02	0.003
SH1 Catalytic Heaters	Normal		8,760	1.11	0.93	1,329	0.08	0.06	0.01
Project Total				38.02	71.05	64,013	9.67	4.16	0.39

The following table indicates the existing potential to emit (PTE), revised project increase (PTE), and the new facility PTE in tons/year (tpy):

Pollutant	**Current Facility PTE (tpy)**	**Project Increase (tpy)**	**New Facility PTE (tpy)**
Nitrogen Oxides	218.49	38.02	256.50
Carbon Monoxide	150.68	71.05	221.73
Particulate Matter-10/2.5	7.78	9.67	17.45
Sulfur Dioxide	0.84	0.39	1.23
Volatile Organic Compounds	29.61	4.16	33.77
Greenhouse Gas (CO_2e)	137,518	64,013	201,531
Formaldehyde	0.83	0.47	1.30
Total HAPs	1.24	0.70	1.94

REGULATORY APPLICABILITY

The following rules apply to this permitting action:

45CSR13 (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)

45CSR13 applies to this source due to the fact that Columbia exceeds the regulatory emission threshold for criteria pollutants of 6 lb/hr and 10 ton/year, and they are also subject to a substantive requirement of an emission control rule promulgated by the Secretary (40 CFR 60 Subpart KKKK, 40 CFR 63 Subparts YYYY, ZZZZ, DDDDD).

In addition, because this permit will have requirements to limit the annual emission increases for this modification below PSD significance levels, Columbia is subject to Notice Level C (45CSR13 Section 8.5) and will be required to publish a commercial display ad (45CSR13 Section 8.4.a) and post a visible sign at their facility (45CSR13 Section 8.5.a).

Columbia paid the appropriate application fee and published the required legal advertisement for a construction permit application.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

45CSR16 applies to this source by reference of 40CFR60, Subpart KKKK. These requirements are discussed under those rules below.

45CSR30 (Requirements for Operating Permits)

Columbia is subject to 45CSR30. The Seneca Compressor Station has the potential to emit more than major regulatory threshold for NO_x, CO and CO_2e. Due to this facility's potential to emit over 100 tons per year of criteria pollutant, Columbia is required to have an operating permit pursuant to Title V of the Federal Clean Air Act as amended and 45CSR30.

Columbia is required to pay the appropriate annual fees and submit an annual Certified Emissions Statement.

40CFR60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines)

Per §60.4305, Subpart KKKK applies to combustion turbines with a peak heat input of 10 MMBTU/hr or greater. Since the new Solar Mars turbine is rated at 121 MMBTU/hr and the Solar Saturn turbine is rated at 25 MMBTU/hr they will be subject to the rule. §60.4320 requires the turbines to meet the NO_x requirement in Table 1 of the rule. Since the Mars turbine is a new, natural gas fired turbine between 50 and 850 MMBTU/hr, Table 1 requires it to meet a NO_x limit of 25 ppm at 15% O_2 or 150 ng/J of useful output. Since the Saturn turbine is a reconstructed turbine less than 50 MMBTU/hr it has to meet a NO_x limit of 150 ppm at 15% O_2 or 1,100 ng/J of useful output. To demonstrate compliance with the limit, §60.4400(a) requires both an initial (within 180 days of startup or 60 days of achieving full load operation) and annual (not to exceed 14 months from previous test) performance test. However, §60.4340 allows the permittee to be exempted from the annual testing if continuous emission monitors or continuous parameter monitoring systems are installed that meet the requirements of the section. Additionally, if the NO_x testing results show emissions less than 75% of the limit, testing frequency can be reduced to once every 2 years (with no more than 26 months after the previous test.)

The rule also limits SO_2 emissions from the turbines. §60.4330(a)(2) allows the facility to meet this limit by burning fuel with a total potential SO_2 emissions of less than 0.06 lb/MMBTU. Additionally, §60.4365(a) exempts the permittee from monitoring fuel sulfur content if a source burns only natural gas that is covered by a purchase or transportation contract that limits sulfur to no more than 20 grains per 100 scf. Columbia qualifies for this exemption.

40CFR63 Subpart YYYY (National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines)

Per 40 CFR 63.6095(d), there is a stay of standards for lean premix gas-fired stationary combustion turbines until USEPA takes final action to require compliance with this subpart. The only requirement for the turbines (T01, T02) is to comply with the initial notification requirements of 40 CFR 63.6145.

45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants)

45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment)

The Seneca Compressor Station is located in Pendleton County, which is an attainment county for all criteria pollutants, therefore the Seneca Compressor Station is not applicable to 45CSR19.

In order for a project to become subject to PSD review, the major stationary source must have a significant emissions increase from the project **and** a significant net emissions increase as calculated over the 5 year contemporaneous period. The first step is to determine if the proposed project results in a significant emissions increase utilizing the calculation procedures in 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources for the Prevention of Significant Deterioration of Air Quality) Section 3.4. The procedure for calculating whether a significant emissions increase will occur depends on the type of emissions units being modified. The procedure for calculating whether a significant net emissions increase will occur at the major stationary source, which is the second step in the process, is contained in 45CSR14 Section 2.46. Regardless of any such preconstruction projections, a major modification results if the project causes a significant emissions increase and a significant net emissions increase.

The following table represents the annual potential emissions (tpy) associated with this project:

Source	Operating Mode	Cycles	Hr/yr	NOx	CO	CO_2e	$PM_{10/2/5}$	VOC	SO_2
E07 Solar Saturn Turbine	Normal Load @ 30 °F		744	3.53	5.73	728	0.11	0.16	0.0044
	Low Temp (<0 °F)		21.7	0.11	0.18	21	0.003	0.005	0.0001
	Low Load (< 50%)		29.1	0.08	0.21	28	0.004	0.01	0.0002
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	Startup/Shutdown	16	4	0.012	0.036	4	0.001	0.002	0
	Total		800	3.74	6.16	783	0.12	0.18	0.005
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	Low Temp (<0 °F)		240	2.47	3.58	1,678	0.26	0.20	0.01
	Low Load (< 50%)		30	0.24	9.80	210	0.03	0.11	0.001
	Very Low Temp (< -20 °F)		12	0.35	0.27	84	0.01	0.01	0.001
	Startup/Shutdown	150	36	0.23	20.45	252	0.04	0.23	0.002
	Total		8,760	31.83	63.02	61,264	9.42	3.88	0.37
G3 Emerg. Gen.	Normal		500	0.97	0.63	200	0.02	0.02	0.001
H2 Fuel Gas Heater	Normal		8,760	0.37	0.31	436	0.03	0.02	0.003
SH1 Catalytic Heaters	Normal		8,760	1.11	0.93	1,329	0.08	0.06	0.01
	Project Total			38.02	71.05	64,013	9.67	4.16	0.39
	PSD Significance Level			40	100	75,000	15/10	40	40

Final Conclusion

Because no regulated pollutants emissions exceeded the SER, a PSD netting analysis is not necessary, and no PSD review is required.

The Seneca Compressor Station will become a Major Stationary Source with respect to PSD because they will have emissions of nitrogen oxides in excess of 250 tons per year.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. Columbia Gas included the following HAPs as emitted in substantive amounts in their emissions estimate: Benzene, Ethylbenzene, Acetaldehyde, Formaldehyde, Toluene, and Xylene. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	Category B1 - Probable Human Carcinogen
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Ethylbenzene	VOC	No	Inadequate Data
Acetaldehyde	VOC	Yes	Category B2 - Probable Human Carcinogen
Toluene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at *www.epa.gov/iris*.

AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) or 45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) as shown in the table listed in the Regulatory Discussion section under 45CSR14/45CSR19.

SOURCE AGGREGATION DETERMINATION

"Building, structure, facility, or installation" is defined as all the pollutant emitting activities which belong to the same industrial grouping, are located on one or more contiguous and adjacent properties, and are under the control of the same person.

1. The Seneca Compressor Station will operate under SIC code 4922 (Pipeline Transportation of Natural Gas). There are other compressor stations operated by Columbia that share the same two (2) digit SIC code of 49. Therefore, they do share the same two-digit major SIC code of 49.

2. There are no facilities in question that are determined to be under common control with Columbia's Seneca Compressor Station.

3. There are no Columbia properties that are on contiguous or adjacent properties with the Seneca Compressor Station.

The Seneca Compressor Station and other Columbia compressor stations share the same industrial grouping. However, there are no facilities under common control with the Seneca Compressor Station, and they are not located on contiguous or adjacent properties. Therefore, the emissions from the Seneca Compressor Station should not be aggregated in determining major source or PSD status.

MONITORING OF OPERATIONS

Columbia will be required to perform the following monitoring and recordkeeping:

- Monitor and record quantity of natural gas consumed and hours of operation for all combustion sources.
- Continuously monitor the turbines to document any operating periods during which the SoLoNOx system is not in service (startup, shutdown, low-load, or system malfunction).
- Maintain records of turbine startup, shutdown, malfunction per 40 CFR 60 Subpart KKKK and 40 CFR 60.7.
- Maintain turbine operating hours and scenarios.
- Maintain monthly turbine emissions.
- Maintain records of all applicable monitoring, recordkeeping, reporting and testing conducted in accordance with the permit (40 CFR 60 Subparts JJJJ, KKKK and 40 CFR 63 Subparts YYYY, ZZZZ, and DDDDD).

- Maintain records of the visible emission opacity tests conducted per the permit.
- The records shall be maintained on site or in a readily available off-site location maintained by Columbia for a period of five (5) years.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that Columbia meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Seneca Compressor Station should be granted a 45CSR13 modification permit for their facility.

Jerry Williams, P.E.
Engineer

Date