



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-3294
Plant ID No.: 039-00670
Applicant: Columbia Gas Transmission LLC (CGT)
Facility Name: Elk River Station
Location: Clendenin, West Virginia
NAICS Code: 486210
Application Type: Construction
Received Date: January 25, 2016
Engineer Assigned: David Keatley
Fee Amount: \$2,000
Date Received: January 26, 2016
Complete Date: October 7, 2016
Due Date: January 5, 2017
Applicant Ad Date: January 18, 2016
Newspaper: The Charleston Gazette
UTM's: Easting: 471.8 Northing: 4,259.9 Zone: 17
Description: Installation and operation of: three (3) 15,600-hp turbines, one (1) 880-hp emergency generator engine, one (1) 0.4-mmBtu/hr fuel gas heater, one (1) 0.25-mmBtu/hr fuel gas heater, eight (8) 0.005-mmBtu/hr catalytic heaters, twenty-seven (27) 0.072-mmBtu/hr catalytic heaters, and fourteen (14) 0.03-mmBtu/hr catalytic heaters.

DESCRIPTION OF PROCESS

This facility is a transmission natural gas compressor station which will increase the pressure of the incoming natural gas. This facility will have three compressors to increase the pressure of the natural gas. The compressors will be powered by three (3) 15,600-bhp Mars Solar 100 turbines. The turbines will be equipped with advanced dry-low-NO_x combustion controls from SoLoNO_x. This facility will also have a 880-bhp four-stroke lean-burn Waukesha VGF-L36GL natural gas-fired reciprocating internal combustion engine (RICE) powering an emergency generator.

SITE INSPECTION

The permit writer and Dan Bauerle of DAQ's Compliance Enforcement Section performed a site visit on April 5, 2016. This proposed facility is adjacent to SR 4 and is co-located with Columbia's Cobb Station.

From Charleston travel north on I79 until exit 19. Take exit 19 and take US 119 south until you reach Clendenin. In Clendenin turn onto SR 4 east for approximately 1.5 miles until you the site on the right.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

All CO₂e emissions were estimated using emission factors from 40CFR90. Emissions for the turbines were estimated using vendor data for NO_x, CO, and VOC and AP-42 for the remainder of pollutants. Emissions for NO_x, CO, and VOCs are higher when ambient air temperature is below 0°F and below 50% load and startup/shutdown events cause more CO and VOC emissions. Emissions were estimated for NO_x, CO, and VOC were estimated at the following hours per year under the following operating conditions: Above 50% load, 8,580 hrs; Below 50% load, 65 hours; startup/shutdown, 67 hrs; and Below 0°F. VOC emissions for the turbines are conservatively estimated as 20% of the unburned hydrocarbons. Emissions for the emergency generator were estimated with GE spec sheets for NO_x, CO, VOC, and formaldehyde; AP-42 emission factors were used for the remained of emissions. Yearly emissions were estimated using 100 hrs/year for emergency generator engine G1.

Table 1: Estimated Maximum Controlled PTE

Point ID	Unit ID	Emission Source	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
T01 through T03	T1 through T3	Solar Mars 100 Turbines 15,600 hp (each) (Emissions per Unit)	Nitrogen Oxides ¹	7.21	32.29
			Carbon Monoxide ¹	7.31	80.63
			Volatile Organic Compounds ¹	0.84	4.19
			PM ₁₀	0.88	3.85
			Formaldehyde	0.09	0.41
			CO ₂ e	15,608	68,362

G1	G1	Emergency Generator Waukesha VGF-L36L 880 bhp	Nitrogen Oxides	3.88	0.19
			Carbon Dioxide	2.52	0.16
			Volatile Organic Compounds	0.47	0.02
			Sulfur Dioxide	0.39	<0.01
			Total Particulate Matter	0.07	<0.01
			Formaldehyde	0.37	0.02
			CO ₂ e	799	40
H1	HTR1	Heater 0.4 mmBtu/hr	Nitrogen Oxides	0.04	0.17
			Carbon Monoxide	0.03	0.14
			Volatile Organic Compounds	<0.01	0.01
			PM ₁₀	<0.01	0.01
H2	HTR2	Heater 0.25 mmBtu/hr	Nitrogen Oxides	0.02	0.11
			Carbon Monoxide	0.02	0.09
			Volatile Organic Compounds	<0.01	0.01
			PM ₁₀	<0.01	0.01
SH1	HTR3	49 Catalytic Heaters (Total Emissions)	Nitrogen Oxides	0.24	1.03
			Carbon Monoxide	0.20	0.87
			Volatile Organic Compounds	0.01	0.06
			Sulfur Dioxide	<0.01	0.01
			PM ₁₀	0.02	0.08
	Venting	Blowdowns etc.	Volatile Organic Compounds	-	32.35
Fugitive Emissions	SSM (Startup, Shutdown, and Maintenance)	Fugitive Sources	Volatile Organic Compounds	-	9.3
			Benzene	-	0.04
			Ethylbenzene	-	0.04
			Toluene	-	0.04
			Xylenes	-	0.04
			n-Hexane	-	0.04
			CO ₂ e	-	517

¹Emissions above 50% load for lb/hr and total estimated emissions for tpy.

Table 2: Proposed Estimated Maximum Controlled Facility Wide PTE

Pollutant	Facility Wide PTE (tons/year)
Nitrogen Oxides	98.38
Carbon Monoxide	243.15
Volatile Organic Compounds	45.10
Particulate Matter-10	11.66
Sulfur Dioxide	1.26
Formaldehyde	1.26
Total HAPs	1.85
Carbon Dioxide Equivalent	227,640

REGULATORY APPLICABILITY

The following rules and regulations apply to this permitting action:

45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

The purpose of 45CSR2 is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units. 45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of the fuel gas heaters (HTR1, HTR2, and HTR3) is below 10 MMBTU/hr. Therefore, these units is exempt from the aforementioned sections of 45CSR2.

Emission units HTR1, HTR2, and HTR3 are subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

45CSR4 (To Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors)

This facility shall not cause the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public. 45CSR4 states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable.

45CSR10 (To Prevent and Control Air Pollution from the Emissions of Sulfur Oxides)

The purpose of 45CSR10 is to establish emission limitations for sulfur dioxide which are discharged from fuel burning units. 45CSR10 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 3 (weight emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring, recordkeeping, reporting). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of emission units HTR1, HTR2, and HTR3 is below 10 MMBTU/hr. Therefore, these emission units are exempt from the aforementioned sections of 45CSR10.

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)

The proposed construction has potential to emit in excess of six (6) lbs/hour and ten (10) TPY of a regulated pollutant and, therefore, pursuant to §45-13-2.24, meets the definition of a “stationary source” under 45CSR13. Pursuant to §45-13-5.1, “[n]o person shall cause, suffer, allow or permit the construction, modification, relocation and operation of any stationary source to be commenced without . . . obtaining a permit to construct.” Therefore, CGT is required to obtain a permit under 45CSR13 for the construction of the facility.

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

45CSR16 applies to this source by reference of 40CFR60 Subparts JJJJ and KKKK. These requirements are discussed under that rule below.

45CSR22 (Air Quality Management Fee Program)

This facility is a major source as can be seen in Table 2 and is subject to 45CSR30. Columbia will pay annual fees according to 45CSR30.

45CSR30 (Requirements for Operating Permits)

CGT is subject to 45CSR30. The Elk River Compressor Station has the potential to emit more than major regulatory threshold for CO. Due to this facility's potential to emit over 100 tons per year of a criteria pollutant, CGT is required to have an operating permit pursuant to Title V of the Federal Clean Air Act as amended and 45CSR30. CGT is required to pay the appropriate annual fees and submit an annual Certified Emissions Statement.

40CFR60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE))

40CFR60 Subpart JJJJ establishes emission standards for applicable SI ICE. The 880 bhp Waukesha emergency generator (G1) was manufactured after the January 1, 2009 applicability date for emergency engines. The 880 hp Waukesha emergency generator (G1) will be subject to the following emission limits: NO_x – 2.0 g/hp-hr (3.88 lb/hr); CO – 4.0 g/hp-hr (7.76 lb/hr); and VOC – 1.0 g/hp-hr (1.94 lb/hr). Based on the manufacturer’s specifications for this engines, the emission standards will be met.

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 proposed turbines (T01 – T03) are rated at 130 mmBtu/hr each and these turbines are subject to this regulation. §60.4320 requires the turbines to meet the NO_x requirement in Table 1 of the rule. Since the turbines are new, natural gas fired turbines between 50 and 850 MMBTU/hr, Table 1 requires it to meet a NO_x limit of 25 ppm at 15% O₂ or 150 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 SO₂ emissions from the turbines. §60.4330(a)(2) allows the facility to meet this limit by burning fuel with a total potential SO₂ 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. CGT qualifies for this exemption.

40CFR63 Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines)

Subpart ZZZZ establishes national emission limitations and operating limitations for HAPs emitted from stationary RICE located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations. This facility is subject to the area source requirements and has non-emergency spark ignition engines.

Engine G1 is "New Stationary RICE" sources at an area source of HAPs and are affected source because construction will commenced after June 12, 2006 [63.6590(a)(2)(iii)] due to the manufacture's dates of the engine.

Stationary RICE subject to Regulations under 40 CFR Part 60 must meet the requirements of those subparts that apply (40 CFR 60 Subpart JJJJ, for spark ignition engines) if the engine is a new stationary RICE located at an area source (§63.6590(c)(1)). No additional requirements apply for these engines under this subpart.

The following rules and regulations to not apply to this facility:

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

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

The Elk River Compressor Station is located in Kanawha County which is currently in attainment for all pollutants. shown in the following table, CGT is not a major source subject to 45CSR14 or 45CSR19 review. According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, the fugitive emissions are not included in the PTE below:

Table 3:

Pollutant	PSD (45CSR14) Threshold (tpy)	NANSR (45CSR19) Threshold (tpy) Kanawaha County	Facility Wide PTE (tpy)	45CSR14 or 45CSR19 Review Required?
Carbon Monoxide	250	NA	243.15	No
Nitrogen Oxides	250	NA	98.38	No
Sulfur Dioxide	250	NA	1.26	No
Ozone (VOC)	250	NA	45.10	No
Particulate Matter 2.5	250	NA	11.66	No

40CFR60 Subpart GG (Standards of Performance for Stationary Gas Turbines)

The provisions of this subpart are applicable to the following affected facilities: All stationary gas turbines with a heat input at peak load equal to or greater than 10 MMBtu/hr, based on lower heating value of the fuel fired.

The facility’s proposed turbines are greater than 10 mmBtu/hr (130 mmbtu/hr) and construction will occur after October 3, 1977. However this facilities turbines are subject to 40CFR60 subpart KKKK and is therefore exempt from this regulation.

40CFR60 Subpart OOOOa (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after September 18, 2015)

EPA published its New Source Performance Standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. EPA published amendments to the Subpart on September 23, 2013 and June 3, 2016. 40CFR60 Subpart OOOOa establishes emission standards and compliance schedules for the control of the pollutant greenhouse gases (GHG). The greenhouse gas standard in this subpart is in the form of a limitation on emissions of methane from affected facilities in the crude oil and natural gas source category that commence construction, modification or reconstruction after September 18, 2015. This subpart also establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO₂) emissions from

affected facilities that commence construction, modification or reconstruction after September 18, 2015. The effective date of this rule is August 2, 2016.

Turbines are driving compressors at a transmission station for a natural gas pipeline system. Subpart OOOOa (Standards of Performance for Crude Oil and Natural Gas Production) establishes standards for certain process equipment. Each centrifugal compressor using wet seals is subject to this subpart. The proposed compressors will use dry seals. Therefore, they are not affected sources and not subject to the performance standards of Subpart OOOOa.

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

Subpart YYYY establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emissions from stationary combustion turbines located at major sources of HAP emissions, and requirements to demonstrate initial and continuous compliance with the emission and operating limitations.

Section §63.6090(b)(3), Subcategories with limited requirements, states that a new stationary combustion turbine with a rated peak power output of less than 1.0 megawatt (MW) at International Organization for Standardization (ISO) standard day conditions, which is located at a major source, does not have to meet the requirements of this subpart and of subpart A of this part. This determination applies to the capacities of individual combustion turbines, whether or not an aggregated group of combustion turbines has a common add-on air pollution control device. No initial notification is necessary, even if the unit appears to be subject to other requirements for initial notification.

The turbines at this facility are greater than 10 mmBtu/hr (130 mmBtu/hr). However this facility is not a major source of HAPs as can be seen in Table 2.

40CFR63 Subpart JJJJJJ (NESHAP for Industrial, Commercial, and Institutional Boilers Area Sources)

According to 40CFR63.11195 natural gas fired boilers are not subject to this subpart.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from this facility and that are not classified as “criteria pollutants.” Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM₁₀), Particulate Matter less than 2.5

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microns (PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) standards promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

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. Antero included the following HAPs as emitted in substantive amounts in their emissions estimate: Benzene, n-Hexane, Toluene, Xylene, Formaldehyde, and Ethylbenzene. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
n-Hexane	HAP	No	Inadequate Data
Benzene	TAP/HAP	Yes	Category A - Known Human Carcinogen
Toluene	HAP	No	Inadequate Data
Xylene	HAP	No	Inadequate Data
Formaldehyde	TAP/HAP	Yes	Category B - Probable Human Carcinogen
Ethylbenzene	HAP	No	Category D - Not classifiable as to human carcinogenicity

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects 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 performed 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) as can be seen in Table 2.

MONITORING OF OPERATIONS

The following substantive monitoring, compliance demonstration, reporting and recording requirements (MRR) shall be required:

CGT will be required to maintain the following records for the turbines (T01-T04)

Monthly operating hours

Monthly operating hours at less than 50% load

Monthly operating hours at less than 0 °F ambient temperature

Monthly number of startup and shutdown cycles

These records will be used to calculate monthly emissions and 12-month rolling total.

Monthly emissions for each pollutant will be calculated using the following equation:

$MEP_x = DLNP_x * DLN \text{ hrs} + LLP_x * LL \text{ hrs} + LTP_x * LT \text{ hrs} + SSP_x * SS \text{ cycles}$

Where:

DLNP_x is the unit emission rates (lb/hr) for pollutant X during normal (DLN) operation

LLP_x is the unit emission rates (lb/hr) for pollutant X during low-load (LL) operation

LTP_x is the unit emission rates (lb/hr) for pollutant X during low-temperature (LT) operation

SSP_x is the unit emission rates (lb/cycle) for pollutant X during startup/shutdown (SS) operation

At the end of each month, the monthly emissions will be summed for the preceding 12 months to determine compliance with the annual emissions limits.

CGT shall be required to meet all applicable Monitoring, Compliance Demonstration, Source-Specific Recording and Reporting Requirements as given under 40 CFR 60, Subparts JJJJ and KKKK.

PERFORMANCE TESTING OF OPERATIONS

The following performance testing requirements shall be required for the new equipment:

In addition to the NO_x performance testing as required under 40 CFR 60, Subpart KKKK, within 60 days after achieving full load, but not later than 180 days after initial startup, and at such times thereafter as may be required by the Director, CGT shall be required to conduct, or have

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conducted, a performance test on each turbine to determine compliance with the "normal load" CO emission limit specified under the permit.

CGT shall be required to meet all applicable testing requirements as given under 40 CFR 60, Subparts JJJJ for G1 and KKKK for T01-T03.

RECOMMENDATION TO DIRECTOR

The information provided in this facility's permit application indicates that compliance with all state and federal air quality requirements will be achieved. It is recommended that Columbia Gas Transmission, LLC should be granted a 45CSR13 Construction permit for their Elk River facility.

David Keatley
Permit Writer - NSR Permitting

October 21, 2016

Date

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