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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2234A
Plant ID No.:	007-00100
Applicant:	Columbia Gas Transmission, LLC
Facility Name:	Frametown
Location:	Braxton County
SIC Code:	4922
Application Type:	Modification
Received Date:	October 22, 2012
Engineer Assigned:	Steven R. Pursley, PE
Fee Amount:	$2,000.00
Date Received:	October 25, 2012
Complete Date:	January 2, 2012
Due Date:	April 2, 2012
Applicant Ad Date:	October 23, 2012
Newspaper:	*Braxton Citizens News*
UTM's:	Easting: 511.99 km Northing: 4,279.09 km Zone:17
Description:	Installation of 40 space heaters, a new 16,300 hp turbine/compressor, new fuel gas heater and replacement of an existing 400 hp emergency generator with a new 925 hp emergency generator. With the installation of the new turbine, an old 12,500 hp turbine will be moved to standby status.

DESCRIPTION OF PROCESS

Pipeline transmission of natural gas requires that the gas be compressed. At Frametown, natural gas fired turbines are used 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 turbines maximum power output will increase due to the increased density of inlet air. The Solar dry low NO_x (DLN) combustion system (SoLoNO_x) for a Solar turbine limits formation of NO_x, CO and

VOC by premixing air and fuel prior to combustion.

SITE INSPECTION

No site inspection was performed by the writer. The facility is an existing well known source to DAQ. Mike Kolb of DAQs Enforcement section performed a full, on site inspection on March 7, 2011. The facility was found to be in compliance.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions from the facility will be as indicated below. Note that these emissions are simply the existing PTE from the equipment involved in this modification (NOT facility wide PTE), proposed PTE for the new/modified equipment (NOT facility wide PTE) and resulting change in PTE from the facility. For the actual netting analysis see the "Regulatory Applicability" section of this evaluation.

Criteria Pollutants

EXISTING PTE

Existing criteria PTE (from the equipment being removed/limited) is based on AP-42 emission factors (PM, VOCs for turbine E01, PM for emergency generator G04), mass balance (SO_2) and vendor/test data (CO, NO_x for turbine, CO, NO_x and VOCs for emergency generator). Additionally, the calculations assume maximum load and operation 8,760 hours per year.

	NO_x		CO		VOC		SO_2		$PM/PM_{2.5}$	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E01	49.5	216.8	83.6	366.17	0.28	1.23	0.11	0.49	0.28	1.23
G04	2.29	10.03	1.54	6.75	0.66	2.89	0.21	0.92	0.11	0.48
Total	**49.50**	**226.83**	**85.14**	**372.92**	**0.94**	**4.12**	**0.32**	**1.41**	**0.39**	**1.71**

PROPOSED PTE

Proposed PTE (from the new and modified equipment) is based on the following: criteria PTE is based on vendor data/tests for all pollutants from the turbine except for SO_2 which is based on mass balance. For the new emergency generator emissions are based on AP-42 emission factors (PM), mass balance (SO_2) and vendor/test data (CO, NO_x and VOCs). All space heater calculations use AP-42 emission factors for natural gas combustion and conservatively assume 8,760 hours of operation. Additionally, the

emissions in the following tables are for all 40 space heaters combined. For new Engine E04, the calculations assume operations 8,760 hours per year. However, because the SoLoNox controls cannot operate properly at very low ambient temperatures or below 50% of peak load the potential emission estimates include 40 hours per year of operation below 0°F and 100 hours per year at low load. Additionally, an average of 3 startup/shutdown cycles per week (156 per year) were assumed, in order to be conservative. Since engine E01 is being moved to "emergency standby" status, it will be limited to 2000 hours of operation per year in the permit and the calculations reflect that. New Heater H1 is conservatively assumed to operation 8,760 hours per year while the emergency generator is assumed to operate 500 hours per year. Note however, that ALL hourly emissions are based on normal operating mode. Anytime annual emissions are based on operation less than 8,760 hours per year, those limits will be included in the permit.

	NO_x		CO		VOC		SO_2		$PM/PM_{2.5}$	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E01	49.5	49.5	83.6	83.6	0.28	0.28	0.11	0.11	0.28	0.28
E04	7.34	32.97	7.44	100.46	2.14	20.11	0.35	0.19	2.12	9.62
H1	0.08	0.35	0.07	0.29	0.01	0.02	0.01	0.01	0.01	0.01
SH1 (40)	0.29	1.24	0.24	1.04	0.02	0.07	0.01	0.01	0.03	0.10
G05	4.07	1.02	2.65	0.66	0.53	0.13	0.37	0.09	0.01	0.01
Total	**61.28**	**85.08**	**94.00**	**186.05**	**2.98**	**20.61**	**0.85**	**0.41**	**2.45**	**10.02**

Therefore the difference in PTE will be as follows:

	NO_x		CO		VOC		SO_2		$PM/PM_{2.5}$	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total	**11.78**	**-141.75**	**8.84**	**-186.86**	**2.04**	**16.49**	**0.53**	**-1.00**	**2.06**	**8.31**

Non-criteria Pollutants

EXISTING EMISSIONS

Formaldehyde and total HAP emissions are based on AP-42 and 8,760 hours per year of operation.

	Formaldehyde		Toluene		Xylene		Acetaldehyde		Benzene		Ethylbenzene		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E01	0.11	0.49	0.02	0.09	0.01	0.05	0.01	0.03	0.01	0.01	0.01	0.03	0.16	0.67
G04	0.17	0.74	0.01	0.01	0.01	0.01	0.01	0.04	0.01	0.03	0.01	0.01	0.19	0.82
Total	**0.28**	**1.23**	**0.03**	**0.10**	**0.02**	**0.06**	**0.02**	**0.07**	**0.02**	**0.04**	**0.02**	**0.04**	**0.35**	**1.49**

PROPOSED PTE

Formaldehyde, CO_2 and total HAP emissions are based on AP-42, manufacturer data and 2,000 hours per year of operation for E01, 500 hours of operation for G05 and 8,760 hours of operation for E04 and H1.

	Formaldehyde		Toluene		Xylene		Acetaldehyde		Benzene		Ethylbenzene		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E01	0.11	0.11	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.16	0.16
E04	0.09	0.37	0.02	0.07	0.01	0.03	0.01	0.02	0.01	0.01	0.01	0.02	0.13	0.54
H1	0.01	0.01	--	--	--	--	--	--	--	--	--	--	0.01	0.01
G05	0.34	0.08	0.01	0.01	0.01	0.01	0.06	0.02	0.01	0.01	0.01	0.01	0.40	0.10
Total	**0.55**	**0.57**	**0.05**	**0.10**	**0.03**	**0.05**	**0.08**	**0.05**	**0.03**	**0.03**	**0.03**	**0.04**	**0.70**	**0.81**

Note: Methane and N_2O emissions were not submitted by the applicant so they were performed by the writer.

	Methane	CO_2	N_2O	CO_2e
	tpy	tpy	tpy	tpy
E01	1.27	16,225	0.45	16,391
E04	4.52	58,796	1.58	59,381
H1	0.03	412	--	413
SH1	0.03	1484	0.03	1494
G05	1.98	174	--	216

Total	**7.83**	**77,091.00**	**2.06**	**77,895.00**

REGULATORY APPLICABILITY

The following state and federal rules apply to the modified portion of the facility:

45CSR2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

The Fuel Gas Heater (H1) has been determined to meet the definition of a "fuel burning unit" under 45CSR2 and is, therefore, subject to the applicable requirements therein. However, pursuant to the exemption given under §45-2-11, as the MDHI of the unit is less than 10 mmBtu/hr (800,000 Btu/hr), it is not subject to sections 4, 5, 6, 8 and 9 of 45CSR2. The only remaining substantive requirement is under Section 3.1 - Visible Emissions Standards.

Pursuant to 45CSR2, Section 3.1, the line heater is subject to an opacity limit of 10%. Proper maintenance and operation of the unit (and the use of natural gas as fuel) should keep the opacity of the unit well below 10% during normal operations.

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 modification of the Frametown Compressor Station has a potential to emit in excess of six (6) lbs/hour and ten (10) TPY of a regulated pollutant and, therefore, is subject to 45CSR13.

As required under §45-13-8.3, Columbia placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on October 23, 2012 in *Braxton Citizens News* and the affidavit of publication for this legal advertisement was submitted on November 1, 2012. Upon the DAQs preliminary determination to approve the permit application, Columbia will be required to run a commercial display ad and post a sign in accordance with §45-13-8.5.a (Notice Level C).

45CSR30: Requirements for Operating Permits

The facility is an existing major Title V source with an issued Title V permit. This modification does not change that status.

40 CFR 60 Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

The proposed 925 hp emergency generator G5 is defined under 40 CFR 60, Subpart JJJJ as stationary spark-ignition internal combustion engines (SI ICE) and is, pursuant to §60.4230(a)(4)(ii), subject to the applicable provisions of the rule. Pursuant to §60.4233(e): "Owners and operators of stationary SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 to this subpart for their stationary SI ICE." Therefore, as the proposed generator engine is an emergency engine greater than 130 HP, the engine must comply with the following emission standards:

	NO_x	CO	VOC
Standard (g/HP-hr)	2.0	4.0	1.0

Since the applicant submitted nothing indicating that the engine is a "certified engine" (and I can find nothing online indicating that it is a certified engine) under the rule, it will have to demonstrate compliance by performing testing in accordance with §60.4244 of the rule. Additionally, per §60.4243(b)(2)(i) the permittee will have to "keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions."

40 CFR 60 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 122 MMBTU/hr it will be subject to the rule. §60.4320 requires the turbine to meet the NO_x requirement in Table 1 of the rule. Since the 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. 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 turbine. §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.

40 CFR 63 Subpart ZZZZ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines - (NON-DELEGATION)

The proposed emergency generator appear to be subject to the area source requirements of 40 CFR 63, Subpart ZZZZ. However, the DAQ has not been delegated authority from USEPA to enforce the area source requirements of this rule. Therefore, unless otherwise stated, DAQ did not formally determine whether the permittee is subject to an area source air toxics standard requiring Generally Achievable Control Technology (GACT) promulgated after January 1, 2007 pursuant to 40 CFR 63, including the area source air toxics provisions of 40 CFR 63, Subpart ZZZZ.

NOT APPLICABLE

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration.

Determination of Existing Major Source Status

The plant is located in an area - Braxton County- classified as “in attainment” with all National Ambient Air Quality Standards (NAAQS). Therefore, the major source standards for all criteria pollutants are determined by 45CSR14.

A “major modification” is defined under section 2.40 of 45CSR14 as a:

> . . . physical change in or change in the method of operation of a major stationary source which results in: a significant emissions increase (as defined in subsection 2.75) of any regulated NSR pollutant (as defined in subsection 2.66); and a significant net emissions increase of that pollutant from the major stationary source. [. . .]

The first step in determining whether a change is a “major modification” is determining whether a “physical change in or change in the method of operation of a major stationary source,” is occurring.

The replacement of 12,500 hp turbine/compressor with a 16,300 hp turbine compressor constitutes a “physical change” to the source.

Section 3.4 of 45CSR14 provides guidance on the process of determining if proposed changes are a *major* modification. §45-14-3.4(a) states that:

> . . . consistent with the definition of major modification contained in subsection 2.40, a project is a major modification for a regulated NSR pollutant if it causes two types of emissions increases -- a significant emissions increase (as defined in subsection 2.75), and a significant net emissions increase (as defined in subsections 2.46 and 2.74). The proposed project is not a major modification if it does not cause a significant emissions increase. . . .

Therefore, for the proposed changes to meet the definition of a major modification, the changes themselves must result in a significant emissions increase. The methodology for calculating the emissions increase under the first step is given under Sections 3.4(b), 3.4(c), 3.4(d) and 3.4(f). The substantive language of each is given below:

> [§45-14-3.4(b)]
> The procedure for calculating (before beginning actual construction) whether a significant emissions increase (i.e., the first step of the process) will occur depends upon the type of emissions units being modified, according to subdivisions 3.4.c through 3.4.f.
>
> [§45-14-3.4(c)]
> Actual-to-projected-actual applicability test for projects that only involve existing emissions units. -- A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the projected actual emissions (as defined in subsection 2.63) and the baseline actual emissions (as defined in subdivisions 2.8.a and 2.8.b), for each existing emissions unit, equals or exceeds the significant amount for that pollutant (as defined in subsection 2.74).
>
> [§45-14-3.4(d)]
> Actual-to-potential test for projects that only involve construction of a new emissions unit(s). – A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the potential to emit (as defined in subsection 2.58) from each new emissions unit following completion of the project and the baseline actual emissions (as defined in subdivision 2.8.c) of these units before the project equals or exceeds the significant amount for that pollutant (as defined in subsection 2.74).
>
> [§45-14-3.4(f)]
> Hybrid test for projects that involve multiple types of emissions units. -- A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the emissions increases for each emissions unit, using the method specified in subdivisions 3.4.c through 3.4.d as applicable with respect to each emissions unit, for each type of emissions unit equals or exceeds the significant amount for that pollutant (as defined in subsection 2.74).

Note that the following tables represents potential emissions from the new turbine, new heaters and new generator.

	NO_x		CO		VOC		SO_2		$PM/PM_{2.5}$	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
E04	7.34	32.97	7.44	100.46	4.26	20.11	0.35	0.19	2.12	9.62
H1	0.08	0.35	0.07	0.29	0.01	0.02	0.01	0.01	0.01	0.01
SH1	0.29	1.24	0.24	1.04	0.02	0.07	0.01	0.01	0.03	0.10
G05	4.07	1.02	2.65	0.66	0.53	0.13	0.37	0.09	0.01	0.01
Total	**11.78**	**35.58**	**10.40**	**102.45**	**4.82**	**20.33**	**0.74**	**0.30**	**2.17**	**9.74**

	Methane	CO_2	N_2O	CO_2e
	tpy	tpy	tpy	tpy
E04	4.52	58,796	1.58	59,381
H1	0.03	412	--	413
SH1	0.03	1484	0.03	1494
G05	1.98	174	--	216
Total	**6.56**	**60,866.00**	**1.61**	**61,504.00**

Pollutant	**Proposed Emissions (tpy)**	**Significant Level (tpy)**	**Significant?**
NO_x	35.58	40.00	No
SO_2	0.30	40.00	No
PM	9.74	25.00	No
PM_{10}	9.74	15.00	No
$PM_{2.5}$	9.74	10.00	No
CO	102.45	100.00	Yes
VOCs	20.25	40.00	No
CO_{2e}	61,504.00	75,000.00	No

"Significant" is defined under §45-14-2.74(a). As shown in the preceding table, the

change in emissions resulting from the proposed modifications exceeds the definition of "significant" only for CO. In order to avoid PSD applicability Columbia has proposed to move turbine/compressor E01 to "standby status" thus limiting (through this permit) its allowable operating hours to 2,000 per year. These reductions can only be included in the analysis as part of step 2 - the determination of a "significant net emissions increase."

It is important to note that when any emissions decrease is claimed (including those associated with the proposed modification), the second step of the test is triggered - a determination if the project results in a "significant **net** emissions increase." This determination is defined under the definition of "net emissions increase" [§45-14-2.46] and must include "any other increases and decreases in actual emissions at the major source that are contemporaneous with the particular change and are otherwise creditable." A change is contemporaneous if it "occurs not more than five (5) years prior to the date on which construction on the particular change commences nor later than the date on which the increase from the particular change occurs.

In order to claim a reduction for netting purposes, said reduction must have occurred (per 45CSR14.2.46.c) within the 5 years preceding the date upon which the actual construction or emission increase occurred. In section 2.3 of the application, Columbia lists no other contemporaneous increases that have occurred at the facility other than the decreases which are part of the application and netting analysis.

Pollutant	E01 Past Actual Emissions (tpy)[1]	E01Proposed Emissions (tpy)	Decrease (tpy)
CO	89.54	83.70	-5.84

[1]The applicant selected the 24 consecutive months from May 2007 through April 2009 as representative of past actual emissions. The applicant based these emission calculations on a test derived emission factor of 0.0067 pounds per BHP-hr.

Therefore the "Net Emission Increase" under 45CSR14 is as follows:

Pollutant	Increases (tpy)	Decreases (tpy)	Change (tpy)
CO	102.45	-5.84	96.61

With the decrease in CO emissions from the reduction in operating hours of E01, the net emissions increase of CO falls below the significance level of 100 TPY. Therefore, the proposed modifications are not defined as a "major modification" and are not subject to PSD review.

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 - Probably 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 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

Since this is a minor modification (as defined in 45CSR14) to a major stationary source, no modeling was performed.

MONITORING AND TESTING OF OPERATIONS

The permittee shall monitor and record the following:

* Monthly operating hours of the compressor turbines (E04) and (E01) and the

Emergency Generator (G5).

* Monthly operating hours of the compressor turbine (E04) at less than 50% load.

* Monthly operating hours of the compressor turbine (E04) at less than 0°F.

* Monthly number of compressor turbine (E04) startup and shutdown cycles.

* Per §60.4243(b)(2)(i) for the emergency generator, the permittee will have to "keep a maintenance plan and records of conducted maintenance and must..."

The permittee shall perform the following tests:

* Testing to determine the emission rates of NO_x, CO and VOCs from the emergency generator per §60.4244.

* Testing to determine the NO_x emissions from the new turbine (E04) per §60.4400(a).

CHANGES TO PERMIT R13-2234

R13-2234 addressed only generator G4. Since that generator is being removed with this application, R13-2234A is a completely new permit.

RECOMMENDATION TO DIRECTOR

Information supplied in the application indicates that compliance with all applicable regulations will be achieved. Therefore it is the recommendation of the writer that permit R13-2234A for the modification of a compressor station in Frametown, Braxton County, be granted to Columbia Gas Transmission, LLC.

Steven R. Pursley, PE
Engineer

February 13, 2013