



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-2945A
Plant ID No.: 013-00002
Applicant: Dominion Transmission, Inc. (Dominion)
Facility Name: Orma Station
Location: Calhoun County
NAICS Code: 48621
Application Type: Modification
Received Date: July 17, 2012
Engineer Assigned: Joe Kessler
Fee Amount: \$1000
Date Received: July 20, 2012
Complete Date: August 15, 2012
Due Date: November 13, 2012
Applicant Ad Date: July 19, 2012
Newspaper: *Calhoun Chronicle*
UTM's: Easting: 492.68 km Northing: 4,288.86 km Zone: 17
Description: Replacement of the existing Glycol Dehydration Unit (GDU) with a new Cameron Glycol Dehydration Unit. The existing dehydration unit still, reboiler, and flare will be taken out of service.

DESCRIPTION OF PROCESS/MODIFICATIONS

Orma Station is an existing compressor station that services a natural gas pipeline. The purpose of the facility is to recompress natural gas flowing through a pipeline for transportation. The compressor engines (EN01-EN02) at the facility receive natural gas from a valve on a pipeline and compress it to enable further transportation in the pipeline. The existing station consists of two (2) 660 HP natural gas fired reciprocating engines, one (1) GDU with reboiler and flare, seven (7) storage tanks of various sizes, and one (1) emergency generator. Dominion is now proposing to modify Orma Station by replacing the existing GDU with a new Cameron Model 210/350 9.0 MMscf/hr GDU.

Glycol dehydration is a liquid desiccant system used for the removal of water from natural gas. Lean, water-free glycol is fed to the top of an absorber (known as a "contactor tower") where it is contacted with the wet natural gas stream. The glycol removes water from the natural gas by physical absorption and is carried out the bottom of the column. The dry natural gas leaves the top of the absorption column and is fed into a pipeline for further processing or transportation.

After leaving the absorber, the glycol stream - now referred to as "rich" glycol - is fed to a flash vessel where hydrocarbon vapors are removed and recycled (no vent to atmosphere) and any liquid hydrocarbons are skimmed from the glycol. After leaving the flash vessel, the rich glycol is heated in a heat-exchanger and fed to the Glycol Regenerator Column (DEHY02). The Regenerator Column consists of a column, an overhead condenser, and a reboiler (RBR02). The glycol is thermally regenerated to remove excess water and regain the high purity. The hydrocarbons produced in the glycol regenerator process are sent to the flare (F1) for combustion. The hot, lean glycol is cooled by the heat-exchanger and is then fed to a pump where it is sent to the glycol absorber for reuse.

The emission points associated with this process are the flare (F1) and the combustion exhaust of the reboiler (RBR02). The new GDU will use triethylene glycol (TEG).

SITE INSPECTION

Due to the nature of the modification, the writer did not conduct a site inspection. According to information in the DAQ database, the last full on-site inspection occurred on May 17, 2011 by Mr. James Robertson of the Compliance/Enforcement Section. The facility was given a status code of "30 - In Compliance" as a result of the inspection.

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Glycol Regenerator Column Emissions

VOC and Hazardous Air Pollutant (HAP) emissions from the glycol regenerator (DEHY02), as controlled by the flare (F1), are based on the emissions calculation program GRI-GLYCalc Version 4.0. GRI-GLYCalc is a well-known program for estimating air emissions from glycol units using triethylene glycol (TEG), diethylene glycol (DEG) or ethylene glycol (EG). Included in the application is a copy of the appropriate GLY-Calc analysis sheets. Inputs to the program were based on Dominion specifications and quotes given by the vendor. A minimum hydrocarbon combustion efficiency of 95% was used to determine the controlled emission rate.

NO_x and CO are created from the natural gas-fired flare pilot light and the combustion of the hydrocarbons (in the waste gas) at the flare. These emissions were based on AP-42 (AP-42 is a database of emission factors maintained by USEPA).

The potential-to-emit (PTE) of emissions generated by the glycol regenerator (as flared) and

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the emission factor/emission factor source are given in the following table:

Table 1: Glycol Regenerator Column (As Flared) PTE⁽¹⁾⁽²⁾

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CO (Pilot Light)	84 lb/mmscf	AP-42, Table 1.4-1	0.03	0.12
CO (Waste Gas)	0.37 lb/MMBtu	AP-42, Table 13.5-1	0.24	1.05
Total CO →			0.27	1.17
NO _x (Pilot Light)	100 lb/mmscf	AP-42, Table 1.4-1	0.03	0.15
NO _x (Waste Gas)	0.068 lb/MMBtu	AP-42, Table 13.5-1	0.04	0.19
Total NO_x →			0.07	0.34
VOC (Pilot Light)	5.5 lb/mmscf	AP-42, Table 1.4-2	<0.01	0.01
VOC (Waste Gas)	n/a	GLYCalc Results	1.78	7.81
Total VOC →			1.78	7.82
Hexane	n/a	GLYCalc Results	0.01	0.05
Benzene	n/a	GLYCalc Results	0.02	0.11
Toluene	n.a	GLYCalc Results	0.09	0.39
Ethyl-benzene	n/a	GLYCalc Results	0.02	0.08
Xylene	n/a	GLYCalc Results	0.23	1.04
Total HAPs →			0.38	1.68

- (1) Dominion has provided a heat content rate of the natural gas of 1,302.9 Btu/scf and a heat content rate of the waste gas of 321.2 Btu/scf. Maximum pilot light and waste gas flows were given as 338.40 scfh and 2,010 scfh, respectively.
- (2) As the flare is designed to be smokeless and the natural and waste gas streams have only trace amounts of sulfur, there will be no measurable amounts of particulate matter or SO₂ emitted from the flare.

Reboiler Exhaust Emissions

Emissions from the 0.57 mmBtu/hr natural gas-fired reboiler (RBR02) were based on the emission factors provided for natural gas combustion as given in AP-42 Section 1.4 and the Dominion performance specifications for the reboiler. Hourly emissions were based on the maximum design heat input (MDHI) of the dryer (0.57 mmBtu/hr) and annual emissions were based on an annual operation of 8,760 hours. A natural gas heat content value of 1,302.9 Btu/ft³ was used in the calculations. The potential-to-emit (PTE) of emissions generated by the reboiler and the emission factor/emission factor source are given in the following table:

Table 2: Reboiler Exhaust PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr) ⁽¹⁾
NO _x	n/a	Dominion Performance Spec.	0.05	0.22
CO	n/a	Dominion Performance Spec.	0.04	0.18
VOC	n/a	Dominion Performance Spec.	0.04	0.17
PM ⁽²⁾	7.6 lb/mmscf	AP-42, Table 1.4-2	<0.01	0.01
SO ₂	0.6 lb/mmscf	AP-42, Table 1.4-2	<0.01	<0.01

(1) Based on 8,760 hours operation/year.

(2) All PM emissions are assumed to be PM_{2.5} or less.

Emissions Summary

The aggregate emissions associated with the new GDU and the change in emissions from the replacement of the existing GDU are given in the following tables:

Table 3: Aggregate GDU Annual PTE

Source	PTE (ton/year)					
	CO	NO _x	PM ⁽¹⁾	SO ₂	VOC	HAPs
Regenerator (Flare)	1.17	0.34	<0.01	<0.01	7.82	1.68
Reboiler	0.18	0.22	0.01	<0.01	0.17	<0.01
Total	1.35	0.56	<0.01	<0.01	7.99	1.68

(1) Particulate matter emissions are assumed to all be PM_{2.5} or less.

Table 4: Post-Modification Change in PTE

Source	CO	NO _x	PM	SO ₂	VOCs	HAPs
Existing GDU⁽¹⁾	0.16	0.24	<0.01	<0.01	70.42	16.60
New GDU	1.35	0.56	<0.01	<0.01	7.99	1.68
Change	1.19	0.32	0.00	0.00	(62.43)	(14.92)

(1) Based on information provided in Permit Application R13-2945A and not verified by the writer.

REGULATORY APPLICABILITY

This section will address the potential regulatory applicability/non-applicability of substantive state and federal air quality rules relevant to the proposed emergency generator.

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

Pursuant to the exemption given under §45-2-11, as the MDHI of the Glycol Dehydration Reboiler is less than 10 mmBtu/hr, the unit 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 reboiler is subject to an opacity limit of 10%. Proper maintenance and operation of the reboiler (and the use of natural gas as fuel) should keep the opacity of the units well below 10% during normal operations.

45CSR6: To Prevent and Control Particulate Air Pollution from Combustion of Refuse

Dominion has proposed flaring for control of the waste gas produced from Glycol Regeneration. The flare meets the definition of an “incinerator” under 45CSR6 and is, therefore, subject to the requirements therein. The substantive requirements applicable to the flare are discussed below.

45CSR6 Emission Standards for Incinerators - Section 4.1

Section 4.1 limits PM emissions from incinerators to a value determined by the following formula:

$$\text{Emissions (lb/hr)} = F \times \text{Incinerator Capacity (tons/hr)}$$

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions

<u>Incinerator Capacity</u>	<u>Factor F</u>
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

The proposed flare is designed to be “smokeless” and should emit only trace amounts of particulate matter.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to Section 4.3, and subject to the exemptions under 4.4, the flare has a 20% limit on opacity during operation. Proper design of the “smokeless” flare should prevent any opacity from the flares.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides (non-applicability)

Pursuant to the exemption given under §45-10-10.1, as the MDHI of the Glycol Dehydration Reboiler is less than 10 mmBtu/hr, the unit is not subject to the substantive 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 installation of the new GDU at the existing Orma Compressor Station has the potential, without the enforceable requirement to use a flare, to emit a regulated pollutant (VOC) in excess of six (6) lbs/hour and ten (10) TPY that would, pursuant to §45-13-2.17, define the installation as a “modification” under 45CSR13. Pursuant to §45-13-5.1, “[n]o person shall cause, suffer, allow or permit the modification . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct.” Therefore, Dominion was required to obtain a permit under 45CSR13 for the installation of the new GDU.

As required under §45-13-8.3 (“Notice Level A”), Dominion placed a Class I legal advertisement in a “newspaper of general circulation in the area where the source is . . . located.” The ad ran on July 19, 2012 in the *Calhoun Chronicle* and the affidavit of publication for this legal advertisement was submitted on August 13, 2012.

45CSR14 Major Modification Non-Applicability

Orma Station, according to the PTE given in the (R30-01300002-2011) Title V Fact Sheet is an existing “major stationary source.” However, the PTE associated with the new GDU (see Table 3 above) for all pollutants is less than the “significant” thresholds (§45-14-2.74) that would define the installation as a “major modification” under 45CSR14. Additionally, if the emissions of the new GDU were summed with the PTE of the emergency generator currently out to public notice (R13-2945), the aggregate PTE is remains below the “significant” thresholds (worst-case annual PTE for emergency generator permitted under R13-2945 is CO at 2.87 TPY). Therefore, review pursuant to 45CSR14 is not required.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The Orma Compressor Station, defined under Title V as a “major source,” was last issued a Title V permit on August 8, 2011. Proposed changes evaluated herein must also be incorporated into the facility's Title V operating permit. Commencement of the operations authorized by this permit shall be determined by the appropriate timing limitations associated with Title V permit revisions per 45CSR30.

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

The proposed GDU appears to be subject to the area source requirements of 40 CFR 63, Subpart HH. 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,

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including the area source air toxics provisions of 40 CFR 63, Subpart HH.

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the proposed GDU 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 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 and programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits 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. As noted above, the new GDU has the potential to emit the following HAPs: Hexane, Benzene, Toluene, Ethyl-benzene, and Xylene. The following table lists each HAP’s carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 3: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Hexane	VOC	No	Inadequate Data
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Toluene	VOC	No	Inadequate Data
Ethyl-benzene	VOC	No	Category D - Not Classifiable
Xylene	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

The proposed modification does not meet the definition of a “major modification” pursuant to 45CSR14 and, therefore, an air quality impact (computer modeling) analysis was not required. Additionally, based on the nature of the proposed modification, modeling was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, RECORD-KEEPING, AND REPORTING REQUIREMENTS

The following substantive monitoring, compliance demonstration, and record-keeping requirements relevant to the addition of the new GDU shall be required:

- For the purposes of demonstrating compliance with the maximum wet gas throughput limit set forth in 4.1.2. of the draft permit, Dominion shall be required to monitor and maintain monthly and rolling twelve month records of the wet gas throughput of the GDU;
- For the purpose of demonstrating compliance with section 4.1.5(e)(4) of the draft permit, Dominion shall be required to maintain records of the times and duration of all periods which the pilot flame was absent;
- For the purpose of demonstrating compliance with section 4.1.5(d) of the draft permit, Dominion shall be required to maintain a record of the flare design evaluation. The flare design evaluation shall include, net heat value calculations, exit (tip) velocity calculations, and all supporting concentration calculations and other related information requested by the Director;
- For the purpose of demonstrating compliance with the requirements set forth in sections 4.1.5(e) of the draft permit, Dominion shall be required to maintain records of testing conducted in accordance with 3.3.1. of the draft permit;
- Dominion shall be required to document and maintain the corresponding records specified by the on-going monitoring requirements of 4.2. and testing requirements of 3.3.1. of the draft permit;
- For the purpose of demonstrating compliance with section 4.1.5(e)(3) of the draft permit, Dominion shall be required to maintain records of the visible emission opacity tests conducted per Section 4.3.2. of the draft permit;
- If Dominion is required by the Director to demonstrate compliance with section 4.3.3. of the draft permit, then Dominion shall be required to submit a testing protocol at least thirty (30) days prior to testing and shall submit a notification of the testing date at least fifteen (15) days prior to testing. The permittee shall submit the testing results within sixty (60) days of testing and provide all supporting calculations and testing data;
- Any deviation(s) from the allowable visible emission requirement for any emission source

discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned; and

- Any deviation(s) from the flare design and operation criteria in Section 4.4.5. shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of discovery of such deviation.

PERFORMANCE TESTING OF OPERATIONS

The following substantive performance testing requirements relevant to the addition of the new GDU shall be required:

- In order to demonstrate compliance with the flare opacity requirements of 4.1.5(e)(3) of the draft permit, Dominion shall be required to conduct a Method 22 opacity test for at least two hours. This test shall demonstrate no visible emissions are observed for more than a total of 5 minutes during any 2 consecutive hour period using 40CFR60 Appendix A Method 22. The permittee shall conduct this test within one (1) year of permit issuance or initial startup whichever is later. The visible emission checks shall determine the presence or absence of visible emissions. At a minimum, the observer must be trained and knowledgeable regarding the effects of background contrast, ambient lighting, observer position relative to lighting, wind, and the presence of uncombined water (condensing water vapor) on the visibility of emissions. This training may be obtained from written materials found in the References 1 and 2 from 40 CFR part 60, appendix A, Method 22 or from the lecture portion of 40 CFR part 60, appendix A, Method 9 certification course;
- The Director may require the permittee to conduct a flare compliance assessment to demonstrate compliance with section §63.11(b). This compliance assessment testing shall be conducted in accordance with Test Method 18 for organics and Test Method 2, 2A, 2C, or 2D in appendix A to 40 CFR part 60, as appropriate, or other equivalent testing approved in writing by the Director. Also, Test Method 18 may require the permittee to conduct Test Method 4 in conjunction with Test Method 18; and
- In order to demonstrate compliance with 4.1.3, upon request of the Director, the permittee shall demonstrate compliance with the HAP emissions thresholds using GLYCalc Version 4.0 or higher. The permittee shall sample in accordance with GPA Method 2166 and analyze the samples utilizing the extended GPA Method 2286 as specified in the GRI-GLYCalc V4 Technical Reference User Manual and Handbook.

CHANGES TO PERMIT R13-2945

The existing permit R13-2945 (as of the date of this evaluation, R13-2945 is still out to public notice) only contained requirements pertaining to the emergency generator. The addition of requirements pertaining to the GDU are now included in the draft R13-2945A and make up the majority of the requirements. Substantively, the specific limitations and standards relevant to the emergency generator are now all under 4.1.1. of the draft permit.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable regulations will be achieved. Therefore, I recommend to the Director the issuance of a Permit Number R13-2945A to Dominion Transmission, Inc. for the addition of an emergency generator at the Orma Station located near Orma, Calhoun County, WV.

Joe Kessler, PE
Engineer

Date