west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2497A
Plant ID No.:	085-00004
Applicant:	Dominion Transmission, Inc.
Facility Name:	Craig Compressor Station
Location:	Near Smithville, Ritchie County
NAICS Code:	486210
SIC Code:	4922
Application Type:	Modification
Received Date:	April 3, 2015
Engineer Assigned:	Joe Kessler
Fee Amount:	$3,500
Date Received:	April 9, 2015
Complete Date:	May 12, 2015
Due Date:	August 10, 2015
Applicant's Ad Date:	April 15, 2015
Newspaper:	*The Pennsboro News*
UTM's:	Easting: 491.49 km Northing: 4,324.68 km Zone: 17
Latitude/Longitude:	39.07309/-81.09838
Description:	Replacement/Removal of the existing dehydration unit with a new unit. Existing compressor engines are grandfathered.

On April 3, 2015, Dominion Transmission, Inc. (Dominion) submitted a permit application to replace the existing glycol dehydration unit (GDU) with a new unit at the Craig Compressor Station located near Smithville, Ritchie County, WV. The Craig Compressor station was originally constructed in the 1980's (no minor source permit was required for internal combustion engines at the time) and consisted of three (3) Ajax DPC-720 720 horsepower (hp) compressor engines and a GDU. Since that time, the facility was the subject of several new source review (NSR) permitting actions.

- On May 16, 2001 Dominion received a "no permit needed" decision (PD01-043) to increase the power of the engines from 720 to 869 hp;

- On September 27, 2002, Dominion was issued Permit Number R13-2497 to authorize the construction and operation of a flare on the GDU to keep the facility from being a major source of Hazardous Air Pollutants (HAPs); and

- On February 19, 2003, Dominion was issued Permit Number R13-2503 for the installation of two (2) 2,225 hp emergency generators.

DESCRIPTION OF PROCESS/MODIFICATION

Existing Facility

The existing Craig Station receives natural gas from the surrounding area via pipelines and separates, dries, and compresses the gas before sending it via pipeline to other facilities for further processing or distribution. To effect this, the facility consists of three (3) 869 hp Ajax DPC-720 Compressor Engines, one (1) 25 mmscf/day triethylene glycol (TEG) GDU, two (2) 2,225 hp emergency generators, and various material storage tanks. All of the units with the exception of the GDU are grandfathered under 45CSR13.

Proposed Modifications

Dominion has now submitted a permit application to:

- Remove the existing 25 mmscf/day TEG GDU and replace the unit with an Inegral 18 mmscf/day TEG GDU utilizing a thermal oxidizer (enclosed combustion device) to control regenerator still vent emissions.

GDU Process Description

Glycol dehydration is a liquid desiccant system used for the removal of water from natural gas. In the GDU, lean, water-free glycol is fed to the top of an absorber (known as a "contactor") 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 transportation. The dehydrator still vent gases are each sent to a 3.2 mmBtu/hr (combustion gases) thermal oxidizer (2C) for destruction (95% minimum combustion efficiency for hydrocarbons).

After leaving the absorber, the glycol stream - now referred to as “rich” glycol - is fed to a flash vessel where flashed hydrocarbon vapors are captured by the plant suction (created by the compressor engines) and recycled back into the plant. This capture and recycling system is not considered as a vapor recovery unit (VRU) as it runs on the plant’s compression itself. It is therefore in operation at all times the compressor engines are in operation and the plant itself is processing gas. Therefore, it is considered to capture all flash vapors and recycle them back into the plant when operating in accordance with closed vent requirements.

After leaving the flash vessel, the rich glycol is fed to a Glycol Regenerator Column (DEHY02). Each Regenerator Column consists of a column, an overhead condenser, and the

reboiler (RBR02). The glycol is thermally regenerated to remove excess water and regain high purity. The heat for the regeneration is provided by a 0.75 mmBtu/hr natural gas-fired reboiler. The hot, lean glycol is cooled by a heat-exchanger and is then fed to a pump where it is sent to the glycol absorber for reuse. Liquids produced in the regeneration process are sent to one of the facility storage tanks.

SITE INSPECTION

Due to the nature of the proposed modification, a site inspection by the writer was deemed as not necessary. On November 21, 2014, a site inspection of the Craig Compressor Station was conducted by Mr. Doug Hammell of the DAQ Compliance/Enforcement (C/E) Section. This inspection found the facility be "Status 30 - In Compliance."

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Dominion provided an emissions estimate for the GDU in Attachment N of the permit application. The air emissions and calculation methodologies (including any revisions made by the writer) are discussed below.

GDU Reboiler

Emissions from the 0.75 mmBtu/hr natural gas-fired GDU Reboiler (RBR02) were based on the emission factors provided for natural gas combustion as given in AP-42 (AP-42 is a database of emission factors maintained by USEPA) Section 1.4. Hourly emissions were based on the maximum design heat input (MDHI) of the reboiler and annual emissions were based on an annual operation of 8,760 hours. A heat content of the gas of 1,000 Btu/scf was used in the calculations.

Glycol Dehydrator Unit Emissions

Uncontrolled VOC and HAP emissions from the GDU Still Vent were based on the emissions calculation program GRI-GLYCalc Version 4.0. (with a 20% safety factor applied to the emissions). GRI-GLYCalc is a well-known program for estimating air emissions from glycol dehydration units using TEG. Included in the application is a copy of the appropriate GLY-Calc analysis sheets. Input values to GLYCalc are based on gas sampling done at the Craig Compressor Station on February 13, 2014 (inlet to the GDU).

Thermal Oxidizer Combustion Emissions

Two sources of combustion exhaust emissions are present in the thermal oxidizer: the 0.06 mmBtu/hr natural gas-fired pilot light and the combustion (up to 3.2 mmBtu/hr) of the waste gases from the regenerator still vent. Emissions from these combined emissions sources were based on the emission factors provided for natural gas combustion as given in AP-42 Sections 1.4. and 13.5. Hourly emissions were based on the MDHIs as noted above and annual emissions were based on an annual operation of 8,760 hours. A heat content of the natural and waste gas of 1,000 Btu/scf was

used in the calculations for non-CO and NO_x emissions. However, according to the permit application, the waste gases have a heat content of 409 Btu/scf. Therefore, the writer increased the potential combustion exhaust emissions (of non-CO and NO_x emissions) from the thermal oxidizer (ignoring the small contribution made by the pilot light) as calculated by the applicant by the ratio of 1000/409 = 2.44.

Emissions Summary

Based on the above revised estimation methodologies, which are determined to be reasonable, the emissions associated with the new GDU is given in the following tables:

Table 1: GDU Aggregate Hourly (lb/hr) Criteria Pollutant PTE Summary.

Source	CO	NO_x	PM(1)	SO_2	VOCs	HAPs
Reboiler	0.09	0.11	0.01	~0.00	0.01	<0.01
Regenerator Still Vent(2)	0.00	0.00	0.00	0.00	6.83	2.27
Oxidizer Combustion Exhaust	0.99	0.22	0.06	0.00	~0.00	~0.00
Facility-Wide Totals ➜	**1.08**	**0.33**	**0.07**	**0.00**	**6.84**	**2.28**

(1) Conservatively, all particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
(2) As controlled by the thermal oxidizer.
(3) Combustion exhaust only as recalculated by the writer.

Table 2: GDU Aggregate Annual (ton/yr) Criteria Pollutant/GHG PTE Summary.

Source	CO	NO_x	PM(1)	SO_2	VOCs	HAPs
Reboiler	0.41	0.48	0.04	0.00	0.03	0.01
Regenerator Still Vent(2)	0.00	0.00	0.00	0.00	29.91	9.95
Oxidizer Combustion Exhaust	4.35	0.98	0.26	0.02	0.00	0.00
Facility-Wide Totals ➜	**4.76**	**1.46**	**0.30**	**0.02**	**29.94**	**9.96**

(1) Conservatively, all particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
(2) As controlled by the thermal oxidizer.
(3) Combustion exhaust only as recalculated by the writer.

Table 3: GDU Aggregate Annual (ton/yr) Speciated HAP Summary.

Pollutant	ton/yr
n-Hexane	0.23
Benzene	0.20
Toluene	1.14
Ethylbenzene	0.19
Xylene	7.82
Other HAPs	0.38
Total HAPs	9.96

The change in annual facility-wide PTE as a result of the modifications evaluated herein is given in the following table:

Table 4: Change In Facility-Wide Annual PTE(1)

Pollutant	Permit R30-0850004-2011(2)		R13-2497A		Change	
	lbs/hour	tons/year	lbs/hour	tons/year	lbs/hour	tons/year
CO	0.14	0.60	1.08	4.76	0.94	4.16
NO_X	0.06	0.25	0.33	1.46	0.27	1.21
PM(3)	0.01	0.01	0.11	0.30	0.10	0.29
SO_2	0.01	0.01	0.01	0.02	0.00	0.01
VOCs	7.10	31.09	6.84	29.94	-0.26	-1.15
HAPs	0.75	2.75	2.28	9.96	1.53	7.21

(1) As there are no other units involved, this comparison is only for the existing and new GDU.
(2) Emissions from GDU (including reboiler) taken from Permit R30-0850004-2011 Fact Sheet.
(3) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.

Based on Table 4 above and the facility-wide PTE given in Title V Permit R30-0850004-2011, the new facility-wide annual PTE is given in the following table:

Table 5: Facility-Wide Annual PTE Summary

Pollutant	ton/yr
CO	36.95
NO_X	248.80
PM(1)	0.90
SO_2	0.05
VOCs	217.73
HAPs(2)	17.07

(1) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
(2) As the PTE of all individual HAPs are less than 10 TPY and the PTE of total HAPs is less than 25 TPY, the Craig Compressor Station is defined as a minor (area) source of HAPs for purposes of 40 CFR 61, 40CFR63, and Title V.

REGULATORY APPLICABILITY

The following will discuss only the regulatory applicability of general rules and specific rules to the emission units that have been proposed to be modified as part of this permitting action.

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

The Reboiler 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, 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 reboiler 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.

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

Dominion has proposed a thermal oxidizer (enclosed combustor) for controlling the regenerator still vent emissions. This unit meet the definition of an "incinerator" under 45CSR6 and is, therefore, subject to the requirements therein. The substantive requirements applicable to the unit is 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:

Emissions (lb/hr) = F x 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

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

Based on information taken from GRI-GLYCalc, the uncontrolled weight rate of hydrocarbons going to the thermal oxidizer is 217 lbs/hr (0.11 tons/hr). Using this amount as the capacity of the thermal oxidizer, it has a particulate matter limit of 0.59 lbs/hour. The particulate matter emission rate from the thermal oxidizer was estimated to be 0.10 lbs/hr, which is in compliance with the 45CSR6 limit.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to Section 4.3, and subject to the exemptions under 4.4, the thermal oxidizer has a 20% limit on opacity during operation. As a primary constituent in the vapors combusted in the unit shall be clean burning methane/ethane, particulate matter emissions from the unit is expected

to be nominal. Therefore, the unit should easily meet this requirement.

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

45CSR10 has requirements limiting SO_2 emissions from "fuel burning units," limiting in-stack SO_2 concentrations of "manufacturing processes," and limiting H_2S concentrations in process gas streams. The only potential applicability of 45CSR10 to the new GDU is the limitations on fuel burning units. Pursuant to the exemption given under §45-10-10.1, as the MDHI of the Reboiler - which has been determined to meet the definition of a "fuel burning unit" under 45CSR10 - is less than 10 mmBtu/hr, the unit is not subject to the limitations on fuel burning units under 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 changes to the Craig Compressor Station have the potential to increase the PTE of the facility in excess of five (5) TPY of HAPs (see Table 4 above) and, therefore, pursuant to §45-13-2.17, the changes are defined as a "modification" 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, Dominion is required to obtain a permit under 45CSR13 for the modification of the facility.

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 April 15, 2015 in *The Pennsboro News* and the affidavit of publication for this legal advertisement was submitted on May 4, 2015.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration - (NON APPLICABILITY)

The Craig Compressor Station is located in Ritchie County, WV. Ritchie County is classified as "in attainment" with all National Ambient Air Quality Standards. Therefore, as the facility is not a "listed source" under §45-14-2.43, the individual major source applicability threshold for all pollutants is 250 TPY. According to Title V Permit R30-0850004-2011, the Craig Compressor Station does not have a PTE of any pollutant over 250 TPY and is not, therefore, classified as a major source under 45CSR14. Further, as a result of the changes permitted herein, the facility-wide PTE will stay below 250 TPY for all pollutants (see Table 5 above). Therefore, the proposed changes are not defined as a "major modification" under 45CSR14 and the rule does not apply.

45CSR30: Requirements for Operating Permits - (NON APPLICABILITY)

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 Craig Compressor Station, defined under Title V as a "major source," was last issued a Title V permit (R30-0850004-2011) on December 20, 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 HH: National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities

On June 1, 2013 the DAQ took delegation of the area source provisions of 40 CFR 63, Subpart HH. Pursuant to §63.760(a)(3), as the Craig Compressor Station - an area source of HAPs (see Table 5) - "process[es], upgrade[s], or store[s] natural gas prior to the point at which natural gas enters the natural gas transmission and storage source category or is delivered to a final end user," it is defined as an area source subject to the applicable provisions under Subpart HH.

Pursuant to §63.760(b)(2), each TEG GDU located at an area source that meets the requirements under §63.760(a)(3) is defined as an affected facility under Subpart HH. The requirements for affected sources at area sources are given under §63.764(d). However, for a GDU, exemptions to these requirements are given under §63.764(e): if (1) "actual annual average flowrate of natural gas to the glycol dehydration unit is less than 85 thousand standard cubic meters [3 mmscf/day] per day" or (2) "actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram [1 TPY] per year."

Pursuant to information in the permit application, the maximum aggregate PTE of benzene emissions from the GDU process vent is 0.20 TPY. Therefore, the GDU is exempt from the Subpart HH requirements given under §63.764(d).

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the 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 (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), and Sulfur Dioxide (SO_2). 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 for the modified sources 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. The new GDU has the potential to emit the following HAPs in substantive amounts: n-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 6: 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 estimated maximum increases in emissions are less than applicability thresholds that would define the proposed modification as "major" under 45CSR14 and, therefore, no air quality impacts modeling analysis was required. Additionally, based on the nature of the modification and the location of the source, an air quality impacts modeling analysis was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

The following substantive monitoring, compliance demonstration, and record-keeping requirements (MRR) 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, the permittee shall monitor daily, monthly and rolling twelve month records of the wet gas throughput of the GDU;

- For the purposes of demonstrating compliance with the visible emission standard set forth in 4.1.4(d) of the draft permit, the permittee shall be required to meet the requirements under 4.2.2(a) through (c) of the draft permit;

- To demonstrate compliance with the thermal oxidizer pilot flame requirements of section 4.1.5(c) of the draft permit, the permittee shall be required to follow the requirements of 4.2.3(a) and (b), or (c);

- For the purpose of demonstrating compliance with the continuous pilot flame requirements in 4.1.5(c) of the draft permit, the permittee shall be required to maintain records of the times and duration of all periods when the pilot flame was not present and that vapors were vented to the device;

- To demonstrate compliance with the visible emissions requirements of section 4.1.5(d) of the draft permit, the permittee shall be required to conduct the following checks and / or opacity monitoring and recordkeeping:

- To demonstrate compliance with the closed vent system requirements of section 4.1.6 of the draft permit, the permittee shall be required to follow the requirements of 4.2.6(a) through (e); and

- To demonstrate compliance with the closed vent monitoring requirements in 4.2.11 of the draft permit, records shall be maintained of as required under 4.2.7(a) through (d).

Further, the following additional reporting requirements are included in the permit:

- Any deviation of the allowable visible emission requirement for any emission source discovered during observation using 40CFR Part 60, Appendix A, Method 9 per section 4.2.5 of the draft permit must be reported in writing to the Director of the Division of Air Quality as soon as practicable, but within ten (10) calendar days, of the occurrence and shall include, at a minimum, 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.

- Any bypass event of the registered control device must be reported in writing to the Director of the Division of Air Quality as soon as practicable, but within ten (10) calendar days, of the occurrence and shall include, at a minimum, the following information: the date of the bypass, the estimate of VOC emissions released to the atmosphere as a result of the bypass, the cause or suspected cause of the bypass, and any corrective measures taken or planned.

- Any time the air pollution control device is not operating when emissions are vented to it, shall be reported in writing to the Direction of the Division of Air Quality as soon as practicable, but within ten (10) calendar days of the discovery.

PERFORMANCE TESTING OF OPERATIONS

The following substantive performance testing requirements shall be required:

- At such reasonable time(s) as the Secretary may designate, in accordance with the provisions of 3.3 of the draft permit, the permittee shall be required to conduct or have conducted test(s) to determine compliance with the emission limitations or minimum control device efficiencies established in this permit and/or applicable regulations.

- In order to demonstrate compliance with 4.1.3(a) of the draft permit, upon request of the Director, the permittee shall be required to demonstrate compliance with the VOC/HAP emissions limits using GLYCalc Version 3.0 or higher. The permittee shall be required to 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 R13-2497

Permit Number R13-2497 was issued on September 27, 2002 under the old style boilerplate. As such, the proposed new GDU was permitted under the modern boilerplate with the most up-to-date DAQ-developed requirements for permitting a GDU. It is completely different than R13-2497.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of a Permit Number R13-2497A to Dominion Transmission, Inc. for the proposed modification of the Craig Compressor Station located near Smithville, Ritchie County, WV.

_____
Joe Kessler, PE
Engineer

_____
Date

Revised 6/8/15
Combustion exhaust emissions from the thermal oxidizer were adjusted based on use of AP-42 Chapter 13.5 emission factors per pre-notice comments from Dominion.