

TO Air Quality Permit File: OP-65-00840
Dominion Energy Transmission, Inc. / South Oakford Compressor Station

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DATE March 1, 2018

RE Review of Application for Renewed Title V Operating Permit & Minor Mod.
Dominion Energy Transmission, Inc. / South Oakford Compressor Station
Hempfield Township, Westmoreland County
APS #769944; AUTH #910218; PF #276148 Renewal
APS #927348; AUTH #1159101; PF #276148 Minor Modification

Background:

The South Oakford Compressor Station is a natural gas compressor station, with two, NG-fired, 6,350-bhp, compressor engines, one, NG-fired, 778-bhp, emergency generator engine, and one, NG-fired, 3.347 MMBtu/hr boiler. The Department's earliest records of the station are from 1994.

On November 16, 1995, CNG Transmission Corporation submitted an application for an initial Title V Operating Permit (TVOP) for the South Oakford Compressor Station. On October 13, 1996, the Department issued a Reasonably Available Control Technology Permit, RACT-65-000-840 for the station. On July 17, 1998, the initial TVOP, which was the first facility-wide permit for the station, was issued with an expiration date of July 17, 2003.

During the year 2000, Consolidated Natural Gas Company (the parent company of CNGT) was merged with Dominion Resources Inc., and Dominion became the owner of the facility. On December 26, 2002, Dominion submitted an application to renew the TVOP. On October 31, 2007, the renewed permit was issued with an expiration date of October 31, 2012. The two parts washers (Source ID 111) at the facility were added as a subfacility, as part of this renewal.

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On January 11, 2012, Dominion Transmission, Inc. submitted an application to, again renew the TVOP for the South Oakford Compressor Station. Since that time, the name of the owner has changed to Dominion Energy Transmission, Inc.

On June 3, 2016, Dominion submitted an application to install a Clean Burn System on each of the two compressor engines (Source IDs 101 and 102). This included improved engine components which included cylinder heads, pistons, cylinder liners, and turbochargers. In addition, on June 16, 2016, the Department received a petition for an Alternate Compliance Schedule for compliance with the requirements of RACT II for the compressor engines. The final compliance date requested in the petition was February 16, 2018. On April 18, 2017, the Department mailed its approval of both of these requests to the company in the form of a reply to a Request for Determination RFD - 65 - 00840A.

On October 24, 2016, the company submitted an application for a Modification, to incorporate the requirements of RACT II into the Title Operating Permit. This application requested that a limit be placed on the annual operating time of the Aux. Emergency Generator Engine (Source ID 103). No other changes have been made to the sources or controls at the facility since December 2002. These applications are the subject of the Technical Review Document (TRD). The proposed TVOP renewal incorporates both applications.

On December 19 and 20, 2017, both compressor engines (Source IDs 101 and 102) were tested for NO_x, CO, and VOC. The results demonstrated compliance with the presumptive NO_x and VOC emission limits established to comply with the requirements of RACT II. The testing completed all changes, whose delayed performance was authorized by the Alternate Compliance Schedule, prior to the final performance date of February 16, 2018.

Sources, Control Devices, and Emissions:

The South Oakford Compressor Station is a natural gas compressor station, which is part of a NG transmission and storage system. The system processes pipeline quality natural gas. Its primary sources are two, Cooper, Model No. 14W-330, SI, 2SLB, NG-fired, 6,350-bhp engines, powering two, natural gas compressors, two, additional, 5,750-bhp Cooper, Model No. LM5, natural gas compressors driven by electric motors, one, Waukesha, Model No. L-5790-550, SI, 4SRB, NG-fired, 778-bhp, emergency generator engine, and one, Ajax Model No. WGEFD-4000, NG-fired, 3.347 MMBtu/hr boiler.

The main emission processes at the South Oakford Compressor Station and their control are listed in Table 1. Emissions from other sources are insignificant and listed in Section H of the proposed permit:

**Table 1: Emission Sources and Control
 Dominion Energy Transmission, Inc. - South Oakford Compressor Station (TVOP-65-00840)**

ID	Source Name	Emission Control	Installation or Startup
031	Ajax Boiler 1 (3.347 MMBtu/hr, NG, Model WGEFD-4000)		1992
101	Cooper Engine 1 (6,350-bhp, NG, SI, 2SLB, Model 14W-330)	High Energy Plasma Ignition and Clean Burn Technology ¹ , operated to lower NO _x emissions.	1/15/1973
102	Cooper Engine 2 (6,350-bhp, NG, SI, 2SLB, Model 14W-330)	High Energy Plasma Ignition and Clean Burn Technology ¹ , operated to lower NO _x emissions.	1/15/1973
103	Waukesha Aux. Emergency Generator Engine 1 (778-bhp, NG, SI, 4SRB, Model L-5790-550)	Annual operating limit of fewer than 500-hours.	1/1/1972
105	Glycol Dehydration System	Flare.	1/1/1973
110	Storage Tank P-1, Produced Fluids; 10,000-Gal		
111	2 Parts Washers		
112	2 NG Compressors #1 and #2 (Driven by Source IDs 101 & 102)		1/15/1973
113	2 Cooper, NG Compressors #3 and 4 (Driven by 5,750-bhp, electric motors)		1996
P01	Facility Pumps, Valves, Flanges, etc.		1/15/1973

¹On December 19, 2017, compliance using Clean Burn Technology was demonstrated on these engines. This initiated permanent operation of the control.

Total potential annual air criteria emissions from the sources at the facility are listed in Tables 2A and 2B:

Table 2A: Potential Criteria Emissions prior to installation of Clean Burn Technology on the Compressor Engines and RACT II Requirements
Dominion Energy Transmission, Inc. - South Oakford Compressor Station (TVOP-65-00840)

		Emissions														
		PM _{2.5}			PM ₁₀			NO _x			CO			VOC		
ID	Source Name	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY
031	Ajax Boiler 1 (3,347 MMBtu/hr, NG) ¹		0.025	0.11		0.025	0.11		0.33	1.44		0.28	1.21		0.0180	0.08
101	Cooper Engine 1 (6,350-bhp, NG, SI, 2SLB) ²	0.178	2.5	10.89	0.178	2.5	10.89	9.0	125.99	551.80	4.0	56.00	245.30	2.0	28.00	122.60
102	Cooper Engine 2 (6,350-bhp, NG, SI, 2SLB) ²	0.178	2.5	10.89	0.178	2.5	10.89	9.0	125.99	551.80	4.0	56.00	245.30	2.0	28.00	122.60
103	Waukesha Aux. Emergency Generator Engine 1 (778-bhp, NG, SI, 4SRB) ³	0.071	0.122	0.03	0.071	0.122	0.03	11.0	18.9	82.60	13.7	23.46	5.87	8.1	13.94	3.48
105	Glycol Dehydration System ⁴		0.0091	0.04		0.0091	0.04		0.116	0.51		0.098	0.43		0.90	3.96
110	Storage Tank P-1, 10,000-Gal ⁵		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.0070	0.03
111	2 Parts Washers ⁶		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.112	0.49
112	2 NG Compressors #1 and #2 (Driven by Source IDs 101 & 102) ⁷		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.171	0.75
113	2 Cooper, NG Compressors #3 and 4 (Driven by 5,750-bhp, electric motors) ⁷		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.171	0.75
P01	Facility Pumps, Valves, Flanges, etc. ⁵		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		2.9	12.50
Facility Total			5.1	21.96		5.1	21.96		271	1,188.15		136	498.10		74	267.24

All emission sources, except the emergency generator engine (Source ID 104), at the facility operate 8,760 hours per year. For emissions, the emergency generator is assumed to operate 500 hours per year.

²For Table 2A: Emission of NO_x, CO, and VOC are based on emission limits. Other emissions are based on AP-42.

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Footnotes common to both Tables 2A and 2B.

¹Emissions are based on AP-42.

³Emission of NO_x is based on permit limits. Other emissions are based on AP-42.

⁴Emissions are peak annual emissions reported by Dominion for South Oakford over the period of 2012 - 2016.

⁵Emissions were supplied by the company.

⁶Emissions for 2 parts washers, together, were assumed to be the same as the single parts washer at JB Tonkin (Permit # TVOP-65-00634).

⁷Blow-by emissions from the compressor are based on 23 (11.5*2) scfh/piston rod (EPA EnergyStar), 4 piston rods, and NG analysis supplied by the company, in its 2015 annual report.

Values reported in this table were rounded from calculations performed elsewhere.

Total facility emissions are a combination of regulated potential emissions and estimated emissions.

Table 2B: Potential Criteria Emissions after installation of Clean Burn Technology on the Compressor Engines and RACT II Requirements.

Dominion Transmission, Inc - South Oakford Compression Station (TVOP-65-00840)

		Emissions														
		PM _{2.5}			PM ₁₀			NO _x			CO			VOC		
ID	Source Name	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY	Gm/bhp-hr	lb/hr	TPY
031	Ajax Boiler 1 (3.347 MMBtu/hr, NG) ¹		0.025	0.11		0.025	0.11		0.33	1.44		0.28	1.21		0.018	0.08
101	Cooper Engine 1 (6,350-bhp, NG, SI, 2SLB) ^{2, 8}	0.178	2.5	10.89	0.178	2.5	10.89	3.0	42	183.95	0.85	11.2	49.13	1.00	14.0	61.32
102	Cooper Engine 2 (6,350-bhp, NG, SI, 2SLB) ^{2, 8}	0.178	2.5	10.89	0.178	2.5	10.89	3.0	42	183.95	0.85	11.2	49.13	1.00	14.0	61.32
103	Waukesha Aux. Emergency Generator Engine 1 (778-bhp, NG, SI, 4SRB) ^{3, 9}	0.071	0.122	0.03	0.071	0.122	0.03	11.0	18.9	4.72	13.7	23.5	5.87	8.1	13.9	3.48
105	Glycol Dehydration System ⁴		0.0091	0.04		0.009	0.04		0.116	0.51		0.098	0.43		0.90	3.96
110	Storage Tank P-1, 10,000-Gal ⁵		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.0068	0.03
111	2 Parts Washers ⁶		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.112	0.49
112	2 NG Compressors #1 and #2 (Driven by Source IDs 101 & 102) ⁷		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.171	0.75
113	2 Cooper, NG Compressors #3 and #4 (Driven by 5,750-bhp, electric motors) ⁷		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.171	0.75
P01	Facility Pumps, Valves, Flanges, etc. ⁴		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		2.9	12.50
Facility Total			5.1	21.96		5.1	21.96		103	374.56		46	105.76		46	144.68

All emission sources, except the emergency generator engine (Source ID 104), at the facility operate 8,760 hours per year. The emergency generator, is limited to a maximum operation of less than 500 hours per year.

²For Table 2B: Emission of NO_x and VOC are based on emission limits. CO is based on stack testing. Other emissions are based on AP-42.

⁸Cooper Engines 1 & 2 are subject to RACT II presumptive emission limits of 3.0 grams NO_x and 1.0 gram of VOC/bhp-hr, during normal operation at rated load.

⁹Hourly and annual NO_x emissions are based on permit limits.

Total potential annual Hazardous Air Pollutant (HAP) emissions from the sources at the facility, after incorporation of the requirements for RACT II, are shown in Table 3. No credit was taken for any reduction in organic HAP emissions from the use of Clean Burn Technology on the compressor engines. However, the new limit on the hours of operation of the emergency engine did reduce its emissions:

**Table 3: Potential Hazardous Air Pollutant Emissions
Dominion Energy Transmission, Inc. - South Oakford Compressor Station (TVOP-65-00840)**

Source ID	031	101 & 102	103	105	112 & 113	110, 111, & P01	Facility
Description	Boiler ¹	Compressor Engines ²	Emergency Generator Engine ³	Glycol Dehydration System ⁴	4 NG Compressors ⁵	Storage Tank, Parts Washers, Piping ^{6, 7, 8}	
HAP	Tons per Year						
Formaldehyde	0.00	18.79	0.03	0.00	0.00	0.00	18.82
GLYET	0.00	0.00	0.00	0.00	0.00	4.13	4.13
Acrolein	0.00	3.51	0.00	0.00	0.00	0.00	3.51
Acetaldehyde	0.00	3.50	0.00	0.00	0.00	0.00	3.50
Benzene	0.00	0.87	0.00	0.81	0.00	0.00	1.69
Methanol	0.00	1.12	0.00	0.00	0.00	0.00	1.12
Other HAPS	0.03	1.60	0.00	0.26	0.16	0.08	2.13
Sum of All HAPs	0.03	29.39	0.05	1.07	0.16	4.21	34.92

All emission sources, except the emergency generator, at the facility operate 8,760 hours per year. The emergency generator, which was assumed to operate 500 hours per year, prior to issuance of this proposed TVOP, is limited to a maximum of less than 500 hr/yr.

¹Emissions from the boiler are based on AP-42, Table 1.4-2.

²Except for formaldehyde from the compressor engine, emissions are based on AP-42, Table 3.2-1 (2SLB). Formaldehyde emissions from the Compressors are based on March 13, 2013 testing.

³Emissions are based on AP-42, Table 3.2-3 (4SRB).

⁴Emissions are peak annual emissions reported by Dominion for South Oakford over period of 2012 - 2016.

⁵Blow-by emissions from the compressor are based on 23 (11.5*2) scfh/piston rod (EPA EnergyStar), 4 piston rods, and NG analysis supplied by the company, in its 2015 annual report.

⁶Emissions were reported by the company.

⁷The value for facility fugitive emissions was reported in the 1995 application for an initial TVOP.

⁸Emissions for 2 parts washers, together, were assumed to be the same as the single parts washer at JB Tonkin (Permit # TVOP-65-00634).

Values reported in this table were rounded from calculations performed elsewhere.

Total potential annual emissions of Greenhouse Gases (GHG) from the sources at the facility, after incorporation of the requirements for RACT II, are shown in Table 4:

**Table 4: Potential Greenhouse Gas Emissions (GHGs)
Dominion Energy Transmission, Inc. - South Oakford Compressor Station (TVOP-65-00840)**

		Greenhouse Gas							
		CO ₂		CH ₄		N ₂ O		Total CO ₂ e ¹	
ID	Source Name	Lb/Hr	Ton/Yr	Lb/ Hr	Ton/ Yr	Lb/ Hr	Ton/ Yr	Lb/ Hr	Ton/ Yr
031	Ajax Boiler 1 ²	394	1,725	0.0075	0.033	0.0072	0.032	396	1,735
101	Cooper Engine 1 ³	5,662	24,800	75	327	0.00	0.00	7,528	32,972
102	Cooper Engine 2 ³	5,662	24,800	75	327	0.00	0.00	7,528	32,972
103	Waukesha Aux. Emergency Generator Engine 1 ³	694	173	1.5	.036	0.00	0.00	730	182
105	Glycol Dehydration System	136	596	0.0023	0.0100	0.00	0.00	136	596
110	Storage Tank P-1	0.00	0.00	0.00	0.00	0.00	0.00	0	0
111	2 Parts Washers	0.00	0.00	0.00	0.00	0.00	0.00	0	0
112	2 NG Compressors #1 and #2 ⁴	0.194	1	14.2	62	0.00	0.00	356	1,558
113	2 Cooper, NG Compressors #3 and #4	0.194	1	14.2	62	0.00	0.00	356	1,558
P01	Facility Pumps, Valves, Flanges, etc. ⁵	0.00	0.00	237	1,038	0.00	0.00	5,923	25,943
Facility Total		12,548	52,095	416	1,817	0.0072	0.032	22,953	97,518

All emission sources, except the emergency generator, at the facility operate 8,760 hours per year. The emergency generator, which was is assumed to operate 500 hours per year, prior to issuance of this proposed TVOP, will be limited to a maximum of less than 500 hr/yr, when the permit is issued.

¹Emission estimates of CO₂e are based on 100-year horizon Global Warming Potentials (1 ton CH₄ = 25 ton CO₂ and 1 ton N₂O = 298 ton CO₂) in Table A-1 to Part A of Part 98. (Values effective January 1, 2014.)

²Emissions from the boiler are based on AP-42, Table 1.4-2.

³Emissions from the engines are based on AP-42, Table 3.2-1 & Table 3.2-3.

⁴Blow-by emissions from the compressor are based on 23 (11.5 * 2) scfh/piston rod (EPA EnergyStar), 8 piston rods, and NG analysis supplied by the company, in its 2015 annual report.

⁵Methane emissions from P01 are based on CH₄ emissions from the natural gas compressors and the ratio of VOC from the two sources.

Values reported in this table were rounded from calculations performed elsewhere.

Total facility emissions are a combination of regulated potential emissions and estimated emissions.

The use of Clean Burn Technology has a negligible effect on emissions of CO₂e. However, the reduction in authorized operation of the emergency engine lowered emissions from this source.

The change in potential emissions from the facility, since the TVOP was last evaluated is shown in Table 5:

**Table 5: Change in Emissions Since the TVOP was last Renewed
Dominion Transmission, Inc - South Oakford Compression Station (TVOP-65-00840)**

Date		PM _{2.5}	PM ₁₀	NO _x	CO	VOC	HAPs	CO _{2e}
		Tons per Year						
10/31/2007	Potential Emissions at Last Renewal	21.96	21.96	1,188.15	498.10	267.24	35.92	97,518
1/1/2017	Addition of Operating Time Limit on the Aux. Generator ¹	0.00	0.00	-77.88	0.00	0.00	0.00	0
11/7/2017	Addition of Clean Burn Technology on the Compressor Engines ¹	0.00	0.00	-735.70	-392.34	-122.57	0.00	0
	Total Change over Period	0.00	0.00	-813.59	-392.34	-122.57	0.00	0
Issue Date of Renewal	Potential Emissions	21.96	21.96	374.56	105.76	144.68	34.92	97,518

¹Both changes were made to comply with the requirements of RACT II.

Regulatory Analysis:

The South Oakford Compressor Station is a Title V source, because its potential emissions of NO_x and CO are greater than the Major Source threshold of 100 tons per year and VOC are greater than the Major Source threshold of 50 tons per year. Its annual emissions of PM_{2.5}, PM₁₀, and SO₂ from the facility are less than the Major Source threshold of 100 tons per year. For Hazardous Air Pollutant (HAP) emissions, the facility has a single HAP (Formaldehyde) with an emission potential greater than the 10 TPY major source threshold. This means that South Oakford is also a Major Source of HAP emissions. Finally, CO_{2e} emissions from South Oakford are less than the Major Source threshold of 100,000 tpy. Therefore, South Oakford is a minor source of CO_{2e}.

The facility was evaluated for the applicability of New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), other Federal Standards, and applicable requirements of 25 Pa. Code Chapters 121 - 145, of the Commonwealth of Pennsylvania. The following standards were considered:

**Table 5: Regulatory Analysis
 Dominion Energy Transmission, Inc.
 South Oakford Compressor Station (TVOP-65-00840)**

Federal Regulations	
NSPS	
40 CFR Part 60, Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.	Any condensate stored in storage vessels at the South Oakford Compressor Station does not have sufficient vapor pressure for Subpart Kb to have any applicable requirements for these tanks.
40 CFR Part 60, Subpart LLL - Standards of Performance for SO ₂ Emissions From Onshore Natural Gas Processing for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.	South Oakford compresses pipeline quality natural gas, and does not have equipment which "sweetens" the natural gas. This Subpart regulates removal of acid gas (H ₂ S and SO ₂). No source at the facility has applicable requirements under the Subpart.
40 CFR Part 60, Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.	This Subpart applies to SI engines larger than 500-bhp, constructed after July 1, 2007, and lean burn SI engines, rated greater than 1,350 HP, manufactured after January 1, 2008. The SI engines at South Oakford pre-date this Subpart, and have no applicable requirements under it.

(Continued)

(Table 5 NSPS - Continued)

40 CFR Part 60, Subpart KKKK - Standards of Performance for Stationary Combustion Turbines.	The facility has no combustion turbines. No source at the facility has applicable requirements under the Subpart.
40 CFR Part 60, Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after August 23, 2011, and on or before September 18, 2015.	South Oakford is not a natural gas processing plant, and only its compressors could have requirements under the subpart. The natural gas compressors were constructed before this time. This Subpart is not applicable to any source at South Oakford.
40 CFR Part 60, Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015.	The South Oakford Compressor Station was constructed before this date, and the Subpart is not applicable.
NESHAPS	
40 CFR Part 63, Subpart H - National Emission Standards for Organic Hazardous Air Pollutants for Equipment Leaks.	This Subpart has requirements for equipment at Major Sources of HAPs ¹ , which includes compressors. However, it is only applicable for sources that have requirements under a NSPS or MACT standard that call for this Subpart, which is not the case for any source at the South Oakford Compressor Station. Therefore, this Subpart has no requirements for any source at this facility.
40 CFR Part 63, Subpart HH - National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities.	This subpart has differing requirements for both facilities that are a Major Source of HAPs, and facilities that are area sources. South Oakford is a Major Source of HAP emissions, but has no equipment of the types affected by this Subpart. Also, the South Oakford Station compresses natural gas that was processed to pipeline quality standards, prior to entering the station. Therefore, this Subpart has no applicable requirements for any source at South Oakford.

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¹ Maximum potential emissions of the highest individual HAP and combined HAPs are greater than either, 10 TPY, or 25 TPY, respectively.

(Table 5 NESHAPS - Continued)

<p>40 CFR Part 63 Subpart HHH - National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities.</p>	<p>This subpart applies to natural gas storage facilities that are Major Sources of HAPs, and this is true for South Oakford. This NESHAPs deals with the glycol dehydration unit and its associated control device (flare). BTEX emissions from the flare exhaust must be lower than the value calculated by Equation 1 in §40 CFR 63.1275(b)(1)(iii). The Glycol Dehydration System (Source ID 105) is an existing, small, glycol dehydration unit, equipped with a flare, and must have achieved compliance with this Subpart by October 15, 2015. All pertinent requirements of Subpart HHH have been included in this renewal Title V permit, including provisions for monitoring, recordkeeping and reporting.</p>
<p>40 CFR Part 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.</p>	<p>This MACT was initially promulgated during June 2004 and covers all stationary RICE. It was revised during both, January 2008 and March 2010, with requirements for additional classes of engines. The compressor engines (Source IDs 101 & 102) are existing, non-emergency, Spark Ignition, two-stroke, Lean Burn (LB), reciprocating internal combustion engines (RICE) with a rated capacity greater than 500-bhp, and located at a Major Source of HAP emissions. The auxiliary generator engine (Source ID 103) is an existing, emergency, Spark Ignition, four-stroke, Rich Burn (RB), reciprocating internal combustion engine (RICE) with a rated capacity greater than 500-bhp, and located at a Major Source of HAP emissions, which does not produce power for sale. 40 CFR 63.6590(b)(3) exempts the compressor engines, which meet the description in (i), and auxiliary engine which is covered in (iii). Therefore, the compressor engines (Source IDs 101 & 102) and the auxiliary generator engine (Source ID 103) have no requirements under Subpart ZZZZ. No source at South Oakford has any requirements under this Subpart.</p>

(Continued)

(Table 5 NESHAPS - Continued)

<p>40 CFR Part 63, Subpart DDDDD - National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters</p>	<p>Some Industrial, Commercial, Institutional (ICI) Boilers and Process Heaters at major sources of HAPs are subject to Subpart DDDDD. The natural gas-fired, 3.347 MMBtu/hr Ajax Boiler 1 (Source ID 031) does have applicable requirements under Subpart DDDDD. The effective date of this subpart was January 16, 2016, under the subpart. The operator is required to submit an initial notification, perform a one-time energy assessment, tune-up the boiler once every five years, and operate the boiler in a manner to minimize emissions.</p>
<p>Other Air Programs</p>	
<p>40 CFR Part 64 - Compliance Assurance Monitoring (CAM)</p>	<p>Each of the compressor engines (Source IDs 101 & 102) have NO_x and VOC emission limits, add-on controls, and uncontrolled potential emissions of NO_x and VOC greater than the major source amounts. However, the definition of control device for CAM in §64.1 Definitions excludes controls that prevent pollutants from forming, which is the case for both, the High Energy Ignition and the Clean Burn Technology on the engines. Therefore, no source at South Oakford is subject to CAM.</p>
<p>40 CFR Part 98 - Mandatory Greenhouse Gas Reporting</p>	<p>The South Oakford Compressor Station has potential emissions in excess of 25,000 of CO₂e per year. If it emits greater than this amount, the owner/operator must report those emissions to EPA.</p> <p>However, the preamble of the final version of the GHG MRR, located at 74 Fed Reg 209, pp. 56287-56288, states that the GHG MRR is not considered an “applicable requirement” under the Title V Operating Permit program. Therefore, this Subpart, while an obligation for the South Oakford, is not considered an applicable requirement for this TVOP.</p>

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(Table 5 Pa. Code - Continued)

Pennsylvania Air Pollution Control Regulations	
25 Pa Code 121.7 (Prohibition of Air Pollution)	Section is applicable.
25 Pa Code § 123.1 (Prohibition of Certain Fugitive Emissions)	Section is applicable.
25 Pa Code § 123.2 (Fugitive Particulate Matter)	Section is applicable.
25 Pa Code § 123.11 (Combustion Units)	Section is applicable.
25 Pa Code § 123.13 (Processes)	Section is applicable.
25 Pa Code § 123.21 (General) [Related to SO ₂]	Section is applicable.
25 Pa Code § 123.22 (Combustion units) [Related to SO ₂]	Section is applicable.
25 Pa Code § 123.31 (Odor Emissions)	Section is applicable.
25 Pa Code § 123.41 (Limitations - Visible Emissions)	Section is applicable.
25 Pa Code § 123.42 (Exceptions - Visible Emissions)	Section is applicable.
25 Pa Code § 123.43 (Measuring Techniques)	Section is applicable.
25 Pa Code Chapter § 127.441 (Operating permit terms and conditions)	Section is applicable. Emission control, workpractice, recordkeeping, and reporting restrictions for the facility were created under the authority of this section. Also, restrictions relating to emission of SO ₂ were removed, since they are non-applicable. This is because no source at the facility is capable of generating SO ₂ emissions that approach regulatory limits.
25 Pa Code Chapter § 129.14 (Open Burning Operations)	Section is applicable. The facility is not in an air basin, and open burning is allowed, with certain exceptions.
25 Pa Code Chapter § 129.63 (Degreasing Operations)	The facility has two parts washers (Source ID 111) which have applicable requirements under this Section.
25 Pa Code 129.91 - 129.95 (Stationary Sources of NO _x and VOCs)	Sources at the Station had requirements under RACT I. However, except for the NO _x emission limits on the emergency generator engine (Source ID 103), these were superseded by RACT II requirements. Also, the existing permit contained limits on CO emissions from the compressor engines, added under the authority of RACT I (§ 129.91 - 129.95). This authority does not exist, and these limits were not carried forward into the proposed permit.

(Continued)

(Table 5 Pa. Code - Continued)

<p>25 Pa Code 129.96 - 129.100 (Additional RACT Requirements for Major Sources of NO_x and VOCs)</p>	<p>The Station is a Major Source of both NO_x and VOCs. Sources at the Station were constructed before July 20, 2012, and emit NO_x and VOC in excess of 1 tpy. These are the boiler (Source ID 031), compressor engines (Source IDs 101 & 102), and emergency generator engine (Source ID 103). The compressor engines (Source IDs 101 & 102) are subject to a presumptive, maximum, NO_x emission limit of 3 gram/hp-hr and a presumptive, maximum, VOC emission limit of 1 gram/hp-hr, during normal operation, under 25 Pa. Code § 129.97(g)(3)(i). The compressor engines required an alternate compliance schedule, which is now complete, to meet this limit. The boiler (Source ID 031) with potential NO_x emissions of less than 5 TPY and potential VOC emissions of less than 2.7 TPY and the emergency generator engine (Source ID 103), with the addition of a fewer than 500-hour annual operation limit are required to be maintained and operated in accordance with manufacturer's specifications and good operating practices, as presumptive RACT, under 25 Pa. Code § 129.97(c)(1) and (8). These requirements were added to the proposed permit.</p>
<p>25 Pa Code Chapter 135.3 (Reporting)</p>	<p>South Oakford is a Title V facility, and the owners/operators must submit annual emission reports.</p>
<p>25 Pa Code Chapter 135.5 (Recordkeeping)</p>	<p>Dominion Energy Transmission, Inc. must fulfill the following requirements: 1. The permittee shall maintain comprehensive, accurate records which, at a minimum, shall include: a. The number of hours per month that each piece of equipment operated; and b. The amount of fuel used per month, in each piece of equipment; 2. The owner/operator shall keep daily records of all product delivery. 3. These records shall be kept on site for a period of five years, and be made available to the Department upon request.</p>

Changes from Existing Operating Permit:

1. The name of the owner has changed from Dominion Transmission, Inc., to Dominion Energy Transmission, Inc. The names of the Responsible Official and Permit Contact have also been updated.
2. The general prohibition against air pollution 25 Pa. Code § 121.7 has been added (Section C, Condition #001, New).
3. Since the natural gas compressors have blow-by emissions of natural gas, the compressors (Source ID 112 for Compressors #1 and #2 and Source ID 113 for Compressors #3 and #4) at the station, were added as sources in the proposed permit.
4. A requirement for weekly surveys of the facility for visible stack emissions, visible fugitive emissions, and malodors, when it is active and manned, and to keep records of these surveys, was added (Section C, Condition #010, New).
5. The applicable requirements of 40 CFR Part 63, Subpart DDDDD were added for the boiler (Section D, Source ID 031, Conditions #002 - #015, New).
6. The applicable requirements for 40 CFR Part 63, Subpart HHH, which have become effective for sources at the facility since the last permit renewal, were added to the permit (Section D, Source ID 105, Conditions #003 - #011, New). Old permit requirements for Subpart HHH were removed (Section C, Conditions #007 and #020 - #024, Old), because the dehydration unit is a small unit, and at the time the previous TVOP was issued, it was exempt from the Subpart.

7. The applicable requirements for RACT II, which have become effective for sources at the facility since the last permit renewal, were added to the permit (Section C, Conditions #026 - #027; Section D, Source ID 031, Condition #001; Section D, Source ID 103, Condition #004; Section E, Source Group G01, Conditions #001 - #002 and #005, New). Clean Burn Technology, a proprietary, very high Air/Fuel ratio combustion process, was added to the compressor engines, and a voluntary limit on the hours of operation of the auxiliary generator engine was added to meet RACT II requirements (Section D, Source ID 103, Condition #002, New). RACT I requirements were removed (Section C, Conditions #008 - #010; Section D, Source ID 031, Conditions #003 - #004; Section D, Source ID 101, Conditions #003 - #007; Section D, Source ID 102, Conditions #003 - #007, Old), except for limits on NO_x emission from the aux. generator engine (Section D, Source ID 103, Condition #003, Old), since they were superseded by RACT II. Annual NO_x emissions from Source ID 103 were proportioned to its new hourly operation limit (Section D, Source ID 103, Condition #002, New).
8. Limits on CO emissions imposed under RACT I were removed, since the authority to impose these limits did not exist (Section D, Source ID 101, Condition #003 and Section D, Source ID 102, Condition #003, Old).
9. Limits on SO₂ emissions have been removed (Section D, Source ID 031, Condition #002; Section D, Source ID 101, Condition #002; Section D, Source ID 102, Condition #002, Old), since emissions are negligible. The natural gas processed and used at the station is of pipeline quality.
10. The language of other conditions in the permit was updated.

Dominion Energy Transmission, Inc.
 South Oakford Compressor Station
 TVOP-65-00840

Conclusions and Recommendations:

An inspection of South Oakford Compressor Station for a Full Compliance Evaluation was last conducted on April 3, 2016, by Anna Fabrizi, Air Quality Specialist of PA DEP. Ms. Fabrizi determined that the plant met all of the requirements of the existing TVOP. The Compressor Engines (Source IDs 101 and 102) were last tested for NO_x, CO, and VOC emissions on December 19, 2017, and found to be in compliance with both, the limits in the current permit and the new limits in the proposed permit. These engines were last tested for formaldehyde on March 13, 2013. The notice of the intent to issue a renewed TVOP, incorporating a Minor Permit Modification with the applicable requirements of RACT II appeared in the Greensburg Tribune-Review on January 18, 19, and 20, 2018. Copies of the proposed permit were sent to Judi W. Fox, Environmental Specialist III, for Dominion, EPA, George Traister, the Department’s Air Quality inspector for the facility, and Tom Norris, Air Quality District Supervisor for the District.

The Dominion Energy Transmission, Inc. has proposed, in this application, to continue to operate a natural gas compressor station in Hempfield Township, Westmoreland County. I recommend the issuance of a five-year Operating Permit for this facility, subject to the conditions in the proposed Title V Operating Permit.

Permit Authorized by this Authorization					
Quantity	Facility Name	PF ID:	276148		
2	Dominion Energy Transmission, Inc. / South Oakford Compressor Station (OP-65-00840)				
	Renewal	APS ID:	769944	Auth. ID:	910218
	Minor Mod. To add RACT II	APS ID:	927348	Auth. ID:	1159101
Short Descr.	Operating Permit for a natural gas compressor station.				
Permits Inactivated by this Authorization					
Permit #					
		APS ID		Auth. ID	

Attachment 1

Dominion Transmission-South Oakford Station (TVOP-65-00840)

MLH
PA DEP
2/6/2018

Table 1: Emission Sources and Control
Dominion Transmission, Inc. - South Oakford Compressor Station (TVOP-65-00840)

ID	Source Name	Emission Control	Installation or Startup
31	Ajax Boiler 1 (3,347 MMBtu/hr, NG, Model WGEFD-4000)		Prior to 1995
101	Cooper Engine 1 (6,350-bhp, NG, SI, 2SLB, Model 14W-330)	High Energy Plasma Ignition, operated to lower NO _x emissions.	1/15/1973
102	Cooper Engine 2 (6,350-bhp, NG, SI, 2SLB, Model 14W-330)	High Energy Plasma Ignition, operated to lower NO _x emissions.	1/15/1973
103	Waukesha Aux. Emergency Generator Engine 1 (778-bhp, NG, SI, 4SRB, Model L-5790-550)		1/1/1972
105	Glycol Dehydration System	Flare	1/1/1973
110	Storage Tank P-1, Produced Fluids; 10,000-Gal		
111	2 Parts Washers		
112	2 NG Compressors #1 and #2 (Driven by Source IDs 101 & 102)		1/15/1973
113	2 Cooper, NG Compressors #3 and 4 (Driven by 5,750-bhp, electric motors)		1996
P01	Facility Pumps, Valves, Flanges, etc.		1/15/1973

Compressor Engine Emissions

Natural Gas Compressor Engines (Source IDs 101 & 102)

8760 hours/year

6,350 bhp

For each engine:

Cooper Bessemer 14W-330-C2, 2SLB

Calculation of heat input rate for the engines from 7/31/1986 JB Tonkin engine test

Output power 6013 bhp
NG burned during test 22.3 MSCF
Test duration 28 minutes

NG heat value 1020 Btu/ft³ from EPA AP-42, Table 1.4-1

Heat Input-test 48.74142857 MMBtu/hr
8.106 Btu/bhp-hr

Heat Input@6.350-bhp 51.47 MMBtu/hr

NG Input@6.350-bhp 0.0505 MMCF/hr

Emission Limits

NOx 551.8 tpy (Equip to 9.0 gram/hp-hr)

CO 56.00 lb/hr (Equip to 4.0 gram/hp-hr)

VOC 28.00 lb/hr (Equip to 2.0 gram/hp-hr)

For PM10 & PM2.5 Emissions

3.84E-02 lb PM₁₀-FIL/MMBtu 3.84E-02 lb PM₁₀-FIL/MMBtu

9.01E-03 lb PM_{2.5}-COND/MMBtu 9.01E-03 lb PM_{2.5}-COND/MMBtu

4.83E-02 lb PM_{2.5}/MMBtu 4.83E-02 lb PM_{2.5}/MMBtu

or 0.1776 Gm PM₁₀/bhp-hr 0.1776 Gm PM₁₀/bhp-hr

AP-42 Table 3.2-1 Uncontrolled 2SLB

AP-42 Table 3.2-1 Uncontrolled 2SLB

(For engines PM-FIL = PM₁₀-FIL = PM_{2.5}-FIL)

Emission Testing Results for Engines #1 and #2

Engine #	NOx lb/hr	CO lb/hr	VOC lb/hr	FORM lb/hr	Test Method
2/24/1997	1 22.3	16.8	2.2	Stack Testing	(Not included in averages.)
2/24/1997	2 16.4	14.6	2.8	Stack Testing	(Not included in averages.)
3/16/1998	1 112.6	10	0.00	Portable Emissions Test	(Not included in averages.)
3/16/1998	2 102.6	11.3	0.00	Portable Emissions Test	(Not included in averages.)
3/18/2008	1 36.39	5.31	0.52	Stack Testing	
3/18/2008	2 124.99	9.71	0.92	Stack Testing	
2/3/2009	1 120.83	11.85	0.49	Portable Emissions Test	
2/3/2009	2 122.34	10.49	0.45	Portable Emissions Test	
2/23/2010	1 87	11.04	0.27	Portable Emissions Test	
2/23/2010	2 116.89	9.79	0.21	Portable Emissions Test	
2/22/2011	1 97.36	11.35	1.18	Portable Emissions Test	
2/22/2011	2 116.15	10.32	0.15	Portable Emissions Test	
2/19/2013	1 114.75	12.37	2.24	Portable Emissions Test	
2/19/2013	2 118.2	10.39	2.05	Portable Emissions Test	
3/13/2013	1 102.31	12.24	1.18	Stack Testing	
3/13/2013	2 100.79	10.35	0.15	Stack Testing	
2/11/2014	1 59.88	15.13	0.28	Portable Emissions Test	
2/11/2014	2 68.92	13.37	0.00	Portable Emissions Test	
10/15/2015	1 73.2	12.76	3.96	Portable Emissions Test	
10/15/2015	2 64.39	11.65	3.64	Portable Emissions Test	
2/9/2016	1 77.21	11.49	11.9100	Stack Testing	
2/9/2016	2 84.91	10.25	11.9100	Stack Testing	
12/20/2016	1	0.00	0.00	Stack Testing	
12/20/2016	2	12.5700	3.96	Stack Testing	
4/4/2017	1 86.97	11.9100	3.64	Stack Testing	
4/4/2017	2 96.14	11.9100	3.64	Stack Testing	

Average All Tests 93.48 All Tests 11.22 All Tests 1.33 All Tests 2.15

Stack Test Only Stack Test Only

To Determine Potential Emissions:
Use emission limit for NO_x and VOC.
Formaldehyde has no limit. Use testing average.
For CO before RACT II, use emission limit.
For CO after RACT II, emission limits were removed. Use testing average.

Compressor Emissions (From piston rod packing blow-by)

Composition of Natural Gas

8760 hours/year

from 2015 Tonkin Annual Report

Constituent	MW (g/g mole)	Composition' (mole %)	Density of Constituent Gases (lbw)	Contribution to Overall Sample Density by Species	Calculation of Average MW
Methane	16	93.105%	0.675	0.629	14.8968
Ethane	30	5.425%	1.266	0.069	1.6275
Propane	44	0.262%	1.857	0.005	0.11528
Isobutane	58	0.024%	2.448	0.001	0.01392
n-Butane	58	0.037%	2.448	0.001	0.02146
Isopentane	72	0.010%	3.039	0.000	0.0072
n-Pentane	72	0.006%	3.039	0.000	0.00432
Hexanes+	86	0.021%	3.630	0.001	0.01806
Oxygen	16	0.000%	0.675	0.000	0.00000
Nitrogen	28	0.647%	1.182	0.008	0.18116
CO2	44	0.463%	1.857	0.009	0.20372
TOTAL		100.000%	0.721	100.000%	17.08942

8 Number of Piston Rods
 11.5 scfh (Average Blow-by from each rod, when packing is new.)
 2 Multiplication factor for compressors that are not subject to 40 CFR Part 60, Subpart OOOO.

Total Blow-by 184 scfh
 8.158 lb blow-by/hr

Gas density 45,038 lb/MMscf
 VOC content 1.05% weight %
 HAP content 0.11% weight %

Emergency Generator Engine Emissions

Natural Gas Generator Engine (Source ID 103)
 Waukesha, Model No. L-5790-550, S1, 45RE

Output power 778 bhp
 Heat/Power Ratio 8.106 Btu/bhp-hr (from Cooper Engine)
 Heat Input 6.306474543 MMBtu/hr
 0.006182818 MM CF NG/hr

Emission Limits NOx 18.87 lb/hr 82.6 tpy (Equiv to 11.0 gram/tp-hr)
 CO 3.72E-00 lb/MMBtu from AP-42 Table 3.2-3
 VOC 2.21E-00 lb/MMBtu from AP-42 Table 3.2-3

For PM10 & PM2.5 Emissions
 9.50E-03 lb PM_{2.5}-FIL/MMBtu 9.50E-03 lb PM₁₀-FIL/MMBtu AP-42 Table 3.2-3 Uncontrolled 4SRB
 9.91E-03 lb PM_{2.5}-COND/MMBtu 9.91E-03 lb PM₁₀-COND/MMBtu AP-42 Table 3.2-3 Uncontrolled 4SRB
 1.94E-02 lb PM_{2.5}/MMBtu 1.94E-02 lb PM₁₀/MMBtu (PM-FIL = PM₁₀-FIL = PM_{2.5}-FIL)

NG-fired Boiler Emissions

NOx 100 lb/MMCF NG from AP-42 Table 1.4-1
 CO 84 lb/MMCF NG from AP-42 Table 1.4-1
 VOC 5.5 lb/MMCF NG from AP-42 Table 1.4-2
 PM10 7.6 lb/MMCF NG from AP-42 Table 1.4-2
 PM2.5 7.6 lb/MMCF NG from AP-42 Table 1.4-2

3.347 MMBtu/hr
 0.003281373 MMCF/hr

Dehy Still & Flare

8760 hours/year

8760 hours/year

500 hours/year
 (Not a limit prior to RACT II.
 Limited to less than by RACT II.)

778 bhp

8760 hours/year

8760 hours/year

From AIm's EI (TPY)	PM10	NOX	CO	VOC	CH4	CO2	N2O	Hexane	Toluene	FORM	Benzene
2016	0.04	0.51	0.43	3.96	0.01	596.0000	0	0.1249	0.14	0	0.81
2015	0.03	0.45	0.38	3.95	0.01	529	0	0.1246	0.14	0	0.81
2014	0.04	0.5	0.42	3.95	0	583	0	0.1246	0.14	0	0.81
2013	0.04	0.49	0.41	2.97	0.01	574	0	0.11	0.14	0	0.53
2012	0.03	0.36	0.3	2.17	0.01	416	0	0.1	0.14	0	0.52
Use Highest Value for Potential Emission	0.04	0.51	0.43	3.96	0.01	596	0	0.1249	0.14	0	0.81

Storage Tank Emissions
 0.03 TPY VOC. (1995 TVOP application)
 0.03 TPY GLVET (1995 TVOP application)
 8760 hours/year

Parts Washer Emissions
 VOC 1% 0.49 tpy (from 2008 JB Tonkin TRD)
 Xylene 1% 0.0049 tpy HAP's were proportioned from VOC, using 40 CFR Part 63, Subpart VVV, Table 6
 Toluene 1% 0.0049 tpy
 Ethylbenzene 1% 0.0049 tpy
 8760 hours/year

The two Parts Washers (Source ID 111) were not included in the initial 1997 TVOP. They were not mentioned in the 2002 TVOP renewal application. However, they were added in the 2007 TVOP renewal. For this emission estimate, assume that their total emissions are equal to the single parts washer at JB Tonkin.

Facility Pumps, Valves, Flanges, etc. Emissions
 VOCs 12.5000 tpy (from 1995 TVOP application)
 Benzene 0.0040
 Toluene 0.0070
 Ethylbenzene 0.0004
 Xylenes 0.0020
 Hexane 0.0550
 GLVET 4.1000
Total HAPs 4.1684
 8760 hours/year

Table 2A: Potential Criteria Emissions prior to installation of Clean Burn Control on the Compressor Engines and RACT II Requirements
Dominion Transmission, Inc - South Oakford Compression Station (TVOP-65-00840)

ID	Source Name	PM2.5						PM10						NOx						CO						VOC					
		Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY			
31	Ajax Boiler 1 (3.347 MMBtu/hr, NG) ¹		0.025	0.11	0.025	0.11		0.33	1.44		0.28	1.21		0.0180	0.08																
101	Cooper Engine 1 (6,350-bhp, NG, SI, 2SLB) ²	0.178	2.5	10.89	0.178	2.5	10.89	9.0	125.99	551.80	4.00	56.00	245.30	2.00	122.60																
102	Cooper Engine 2 (6,350-bhp, NG, SI, 2SLB) ²	0.178	2.5	10.89	0.178	2.5	10.89	9.0	125.99	551.80	4.00	56.00	245.30	2.00	122.60																
103	Waukesha Aux. Emergency Generator Engine 1 (778-bhp, NG, SI, 4SRB) ³	0.071	0.122	0.03	0.071	0.122	0.03	11.0	18.87	82.60	13.68	23.46	5.87	13.94	3.48																
105	Glycol Dehydration System ⁴		0.0091	0.04	0.0091	0.04	0.04		0.116	0.51		0.098	0.43		3.96																
110	Storage Tank P-1, 10,000-Gal ⁵		0.00	0.00	0.00	0.00		0.00	0.00			0.00	0.00		0.03																
111	2 Parts Washers ⁶		0.00	0.00	0.00	0.00		0.00	0.00			0.00	0.00		0.49																
112	2 NG Compressors #1 and #2 (Driven by Source IDs 101 & 102) ⁷		0.00	0.00	0.00	0.00		0.00	0.00			0.00	0.00		0.75																
113	2 Cooper, NG Compressors #3 and #4 (Driven by 5,750-bhp, electric motors) ⁷		0.00	0.00	0.00	0.00		0.00	0.00			0.00	0.00		0.75																
P01	Facility Pumps, Valves, Flanges, etc. ⁴		0.00	0.00	0.00	0.00		0.00	0.00			0.00	0.00		12.50																
	Facility Total		5.1	21.96	5.1	21.96		271	1188.15		136	498.10		74	267.24																

All emission sources, except the emergency generator, at the facility operate 8,760 hours per year. For emissions from the emergency generator other than NOx, while not limited, is assumed to operate 500 hours per year.

- ¹Emissions are based on AP-42.
 - ²Emission of NOx, CO, and VOC are based on permit limits. Other emissions are based on AP-42.
 - ³Emission of NO_x is based on permit limits. Other emissions are based on AP-42.
 - ⁴Emissions were supplied by the company and are the peak annual emissions over 2012 - 2016.
 - ⁵Emissions were supplied by the company.
 - ⁶Emissions for 2 parts washers, together, were assumed to be the same as the single parts washer at JB Tonkin.
 - ⁷Blow-by emissions from the compressor are based on 23 (11.5*2) scfh/piston rod (EPA EnergyStar), 4 piston rods, and NG analysis supplied by the company, in its 2015 annual report.
- Values reported in this table were rounded from calculations performed elsewhere
 Total facility emissions are a combination of regulated potential emissions and estimated emissions

II. Criteria Emissions after installation of Clean Burn Control on the Compressor Engines and RACT II requirements.

- A. Clean Burn Control was added as a control on each of two compressor engines (Source IDs 101 & 102) on April 18, 2017, to lower NOx emissions
- B. The added control enables these engines to use the presumptive RACT II emission limit in 129.97(g)(3)(A) & (B) of

3.0 grams NOx/bhp-hr

And

1.0 grams VOC/bhp-hr

This limits were added to the proposed TVOP.

C. Neither RACT I nor RACT II, regulate CO. Therefore, the CO emission limits were improperly added in the old TVOP, and the CO limits have been removed from the proposed permit

Table 2B: Potential Criteria Emissions after installation of Clean Burn Control on the Compressor Engines and RACT II requirements.
 Dominion Transmission, Inc - South Oakford Compression Station (TVOP-65-00840)

ID	Source Name	PM2.5			PM10			NOx			CO			VOC		
		Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY	Gm/ bhp-hr	lb/ hr	TPY
31	Ajax Boiler 1 (3.347 MMBtu/hr, NG)1	0.025	0.11	0.11	0.025	0.11	0.11	0.33	1.44	1.44	0.28	1.21	0.018	0.08	0.08	
101	Cooper Engine 1 (6,350-bhp, NG, SI, 2SLB)2	0.178	2.5	10.89	0.178	2.5	10.89	3.0	183.95	183.95	11.2	49.13	1.00	14.0	61.32	
102	Cooper Engine 2 (6,350-bhp, NG, SI, 2SLB)2	0.178	2.5	10.89	0.178	2.5	10.89	3.0	183.95	183.95	11.2	49.13	1.00	14.0	61.32	
103	Waukesha Aux. Emergency Generator Engine 1 (778-bhp, NG, SI, 4SRB)3	0.071	0.122	0.03	0.071	0.122	0.03	11.0	4.72	4.72	23.5	5.87	8.1	13.9	3.48	
105	Glycol Dehydration System4	0.0091	0.04	0.04	0.0091	0.04	0.04	0.116	0.51	0.51	0.098	0.43	0.90	3.96		
110	Storage Tank P-1, 10,000-Gal5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0068	0.03		
111	2 Parts Washers6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.112	0.49		
112	2 NG Compressors #1 and #2 (Driven by Source IDs 101 & 102)7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.171	0.75		
113	2 Cooper, NG Compressors #3 and #4 (Driven by 5,750-bhp, electric motors)7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.171	0.75		
P01	Facility Pumps, Valves, Flanges, etc.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	12.50		
Facility Total		5.1	21.96	21.96	5.1	21.96	21.96	103	374.56	374.56	46	105.76	46	144.68		

All emission sources, except the emergency generator engine (Source ID 104), at the facility operate 8,760 hours per year. The emergency generator, is limited to a maximum operation less than 500 hours per year.
⁸Cooper Engines 1 & 2 are subject to the RACT II presumptive NO_x emission limit of 3.0 grams/bhp-hr during normal operation at rated load.

⁹While hourly NO_x emissions are still based on the emission limit, annual emissions of NO_x are based on the hourly limit and 500 hr/yr operation.

II. HAP Emissions

HAPs from NG-fired boiler

AP-42, Chapter 1-4 Natural Gas Fired Boilers Tables 1.4-3 & 4

No.	HAP Emission Factors	Boiler (Source ID 031)	
		lb/hr	tpy
2-Methylnaphthalene	2.40E-05	7.88E-08	3.45E-07
3-Methylchloranthrene	9.00E-07	2.95E-09	1.29E-08
7,12-Dimethylbenz(a)anthracene	8.00E-06	2.63E-08	1.15E-07
Acenaphthene	9.00E-07	2.95E-09	1.29E-08
Acenaphthylene	9.00E-07	2.95E-09	1.29E-08
Anthracene	1.20E-06	3.94E-09	1.72E-08
Benz(a)anthracene	9.00E-07	2.95E-09	1.29E-08
Benzene	2.10E-03	6.89E-06	3.02E-05
Benzo(a)pyrene	6.00E-07	1.97E-09	8.62E-09
Benz(b)fluoranthene	9.00E-07	2.95E-09	1.29E-08
Benz(o,g,h,i)perylene	6.00E-07	1.97E-09	8.62E-09
Benz(k)fluoranthene	9.00E-07	2.95E-09	1.29E-08
Chrysene	9.00E-07	2.95E-09	1.29E-08
Dibenz(a,h)anthracene	6.00E-07	1.97E-09	8.62E-09
Dichlorobenzene	1.20E-03	3.94E-06	1.72E-05
Fluoranthene	3.00E-06	9.84E-09	4.31E-08
Fluorene	2.80E-06	9.19E-09	4.02E-08
Formaldehyde	7.50E-02	2.46E-04	1.08E-03
Hexane	1.80E+00	5.91E-03	2.59E-02
Indeno(1,2,3-cd)pyrene	9.00E-07	2.95E-09	1.29E-08
Naphthalene	6.10E-04	2.00E-06	8.77E-06
Phenanthrene	1.70E-05	5.58E-08	2.44E-07
Pyrene	5.00E-06	1.64E-08	7.19E-08
Toluene	3.40E-03	1.12E-05	4.89E-05
Arsenic	2.00E-04	6.56E-07	2.87E-06
Beryllium	6.00E-06	1.97E-08	8.62E-08
Cadmium	1.10E-03	3.61E-06	1.58E-05
Chromium	1.40E-03	4.59E-06	2.01E-05
Cobalt	8.40E-05	2.76E-07	1.21E-06
Manganese	3.80E-04	1.25E-06	5.46E-06
Mercury	2.60E-04	8.53E-07	3.74E-06
Nickel	2.10E-03	6.89E-06	3.02E-05
Selenium	1.20E-05	3.94E-08	1.72E-07

HAPs from Compressor Engines (Source IDs 101 and 102)

HAP	AP-42 Uncontrolled Emission Factor	Sum of Compressor Engines 1 & 2 (Source IDs 101 & 102)	
		lb/hr	tpy
1,1,2,2-Tetrachloroethane	6.63E-05	6.83E-03	2.99E-02
1,1,2-Trichloroethane	0.0000527	5.43E-03	2.38E-02
1,3-Dichloropropene	0.0000438	4.51E-03	1.97E-02
2,2,4-Trimethylpentane	0.000846	8.71E-02	3.81E-01
2-Methylnaphthalene	0.0000214	2.20E-03	9.65E-03
Acenaphthene	0.0000133	1.37E-04	6.00E-04
Acenaphthylene	0.00000317	3.26E-04	1.43E-03
Acetaldehyde	0.00776	7.99E-01	3.50E-00
Acrolein	0.00778	8.01E-01	3.51E-00
Anthracene	0.00000718	7.39E-05	3.24E-04
Benz(a)anthracene	0.000000336	3.46E-05	1.52E-04
Benzene	0.00194	2.00E-01	8.75E-01
Benz(o)pyrene	5.68E-09	5.85E-07	2.56E-06
Benz(b)fluoranthene	8.51E-09	8.76E-07	3.84E-06
Benz(e)pyrene	2.34E-08	2.41E-06	1.06E-05
Benz(o,g,h,i)perylene	2.48E-08	2.55E-06	1.12E-05
Benz(k)fluoranthene	4.26E-09	4.39E-07	1.92E-06
Biphenyl	0.00000395	4.07E-04	1.78E-03
Carbon Tetrachloride	0.0000607	6.25E-03	2.74E-02

Chlorobenzene	0.0000444	4.57E-03	2.00E-02
Chloroform	0.0000471	4.85E-03	2.12E-02
Chrysene	0.00000672	6.92E-05	3.03E-04
Ethylbenzene	0.000108	1.11E-02	4.87E-02
Ethylene Dibromide	0.0000734	7.56E-03	3.31E-02
Fluoranthene	0.00000361	3.72E-05	1.63E-04
Fluorene	0.00000169	1.74E-04	7.62E-04
Formaldehyde	0.0552	5.68E-00	2.49E-01
Indeno(1,2,3-c,d)pyrene	9.93E-09	1.02E-06	4.48E-06
Methanol	0.00248	2.55E-01	1.12E-00
Methylene Chloride	0.000147	1.51E-02	6.63E-02
n-Hexane	0.000445	4.58E-02	2.01E-01
Naphthalene	0.0000963	9.91E-03	4.34E-02
PAH	0.000134	1.38E-02	6.04E-02
Perylene	4.97E-09	5.12E-07	2.24E-06
Phenanthrene	0.0000353	3.63E-04	1.59E-03
Phenol	0.0000421	4.33E-03	1.90E-02
Pyrene	0.00000584	6.01E-05	2.63E-04
Styrene	0.0000548	5.64E-03	2.47E-02
Toluene	0.000963	9.91E-02	4.34E-01
Vinyl Chloride	0.0000247	2.54E-03	1.11E-02
Xylene	0.000268	2.76E-02	1.21E-01
THAPs	0.07871512	8.10343	35.49303
Total			

Compressor Engine - Stack Testing for Formaldehyde

3/13/2013 Engine 1
3/13/2013 Engine 2
Use this testing value for FORM instead of AP-42

Formaldehyde
lb/hr 2.24 9.81
tpy@full utilization 2.05 8.98

Total **4.29** **18.79**

HAPs from Emergency Auxiliary Engine (Source ID 103)

AP-42
Uncontrolled Emission Factor (Uncontrolled EFs from AP-42, Table 3.2-3, 45RB)

HAP	Uncontrolled Emission Factor	lb/MMBtu	lb/MMBtu	Emissions from Emergency Auxiliary Engine (Source ID 103)
1,1,2,2-Tetrachloroethane	2.53E-05	0.000253	1.60E-04	3.99E-05
1,1,2-Trichloroethane	<1.53E-05	7.65E-06	4.82E-05	1.21E-05
1,1-Dichloroethane	<1.13E-05	5.65E-06	3.56E-05	8.91E-06
1,2-Dichloroethane	<1.13E-05	5.65E-06	3.56E-05	8.91E-06
1,2-Dichloropropane	<1.30E-05	0.000065	4.10E-05	1.02E-05
1,3-Butadiene	6.63E-04	0.000663	4.18E-03	1.05E-03
1,3-Dichloropropene	<1.27E-05	6.35E-06	4.00E-05	1.00E-05
Acetaldehyde	2.79E-03	0.00279	1.76E-02	4.40E-03
Acrolein	2.63E-03	0.00263	1.66E-02	4.15E-03
Benzene	1.58E-03	0.00158	9.96E-03	2.49E-03
Butyl/isobutylaldehyde	4.86E-05	0.000486	3.06E-04	7.66E-05
Carbon Tetrachloride	<1.77E-05	8.85E-06	5.58E-05	1.40E-05
Chlorobenzene	<1.29E-05	6.45E-06	4.07E-05	1.02E-05
Chloroform	<1.37E-05	6.85E-06	4.32E-05	1.08E-05
Ethylbenzene	<2.48E-05	0.000124	7.82E-05	1.96E-05
Ethylene Dibromide	<2.13E-05	1.065E-05	6.72E-05	1.68E-05
Formaldehyde	2.05E-02	0.0205	1.29E-01	3.23E-02
Methanol	3.06E-03	0.00306	1.93E-02	4.82E-03
Methylene Chloride	4.12E-05	0.000412	2.60E-04	6.50E-05
Naphthalene	<9.71E-05	4.855E-05	3.06E-04	7.65E-05
PAH	1.41E-04	0.000141	8.89E-04	2.22E-04
Styrene	<1.19E-05	5.95E-06	3.75E-05	9.38E-06
Toluene	5.58E-04	0.000558	3.52E-03	8.80E-04
Vinyl Chloride	<7.18E-06	3.59E-06	2.26E-05	5.66E-06
Xylene	1.95E-04	0.000195	1.23E-03	3.07E-04
Total			0.20412	0.05103

HAPs from Compressor Emissions (From piston rod packing blow-by.)

HAPs in Parts Washer (Source ID 500)

Total HAPs	lb/hr	tpy
0.00897	0.00897	0.039305666
	Xylene	0.0049 (from 2008 JB Tonkin TRD)
	Toluene	0.0049
	Ethylbenzer	0.0049
Total		0.0147

HAPs in Facility Pumps, Valves, Flanges, etc. Emissions (Source ID P01 (from 1995 TVOP application))

Benzene	0.004
Toluene	0.007
Xylenes	0.002
Hexane	0.055
GLYET	4.1
Total HAPs	4.1684

031	101 & 102	103	105	112 & 113	110, 111, & 101	Facility Total
Boiler	Compress or Engines	Emergency Generator Engine	Glycol Dehydration System	4 NG Compressors	Storage Tank, Parts Washers, Piping	

tpy

2-Methylnaphthalene	3.44938E-07					
3-Methylchloranthrene	1.29352E-08					
7,12-Dimethylbenz(a)anthracene	1.14979E-07					
Acenaphthene	1.29352E-08					
Acenaphthylene	1.29352E-08					
Anthracene	1.72469E-08					
Benz(a)anthracene	1.29352E-08					
Benzene	3.01821E-05					
Benzof(a)pyrene	8.62345E-09					
Benzof(b)fluoranthene	1.29352E-08					
Benzof(g,h)perylene	8.62345E-09					
Benzof(k)fluoranthene	1.29352E-08					
Chrysene	1.29352E-08					
Dibenzof(a,h)anthracene	8.62345E-09					
Dichlorobenzene	1.72469E-05					
Fluoranthene	4.31172E-08					
Fluorene	4.02428E-08					
Formaldehyde	0.001077931					
Hexane	0.0258770341					
Indeno(1,2,3-cd)pyrene	1.29352E-08					
Naphthalene	8.76717E-06					
Phenanthrene	2.44331E-07					
Pyrene	7.18621E-08					
Toluene	4.88662E-05					
Arsenic	2.87448E-06					
Beryllium	8.62345E-08					
Cadmium	1.58097E-05					
Chromium	2.01214E-05					
Cobalt	1.20728E-06					
Manganese	5.46152E-06					
Mercury	3.73683E-06					
Nickel	3.01821E-05					
Selenium	1.72469E-07					
1,1,2,2-Tetrachloroethane	2.99E-02					
1,1,2-Trichloroethane	2.38E-02					
1,3-Dichloropropene	1.97E-02					
2,2,4-Trimethylpentane	3.81E-01					

2-Methylnaphthalene 9.65E-03
 Acenaphthene 6.00E-04
 Acenaphthylene 1.43E-03
 Acetaldehyde 3.50E+00
 Acrolein 3.51E+00
 Anthracene 3.24E-04
 Benz(a)anthracene 1.52E-04
 Benzene 8.75E-01
 Benzo(a)pyrene 2.56E-06
 Benzo(b)fluoranthene 3.84E-06
 Benzo(e)pyrene 1.06E-05
 Benzol(g,h,i)perylene 1.12E-05
 Benzo(k)fluoranthene 1.92E-06
 Biphenyl 1.78E-03
 Carbon Tetrachloride 2.74E-02
 Chlorobenzene 2.00E-02
 Chloroform 2.12E-02
 Chrysene 3.03E-04
 Ethylbenzene 4.87E-02
 Ethylene Dibromide 3.31E-02
 Fluoranthene 1.63E-04
 Fluorene 7.62E-04
 Formaldehyde 1.88E+01
 Indeno(1,2,3-cd)pyrene 4.48E-06
 Methanol 1.12E+00
 Methylene Chloride 6.63E-02
 n-Hexane 2.01E-01
 Naphthalene 4.34E-02
 PAH 6.04E-02
 Perylene 2.24E-06
 Phenanthrene 1.59E-03
 Phenol 1.90E-02
 Pyrene 2.63E-04
 Styrene 2.47E-02
 Toluene 4.34E-01
 Vinyl Chloride 1.11E-02
 Xylene 1.21E-01

1,1,2,2-Tetrachloroethane 3.99E-05
 1,1,2-Trichloroethane 1.21E-05
 1,1-Dichloroethane 8.91E-06
 1,2-Dichloroethane 8.91E-06
 1,2-Dichloropropane 1.02E-05
 1,3-Butadiene 1.05E-03
 1,3-Dichloropropene 1.00E-05
 Acetaldehyde 4.40E-03
 Acrolein 4.15E-03
 Benzene 2.49E-03
 Butyl/isobutylaldehyde 7.66E-05
 Carbon Tetrachloride 1.40E-05
 Chlorobenzene 1.02E-05
 Chloroform 1.08E-05
 Ethylbenzene 1.96E-05
 Ethylene Dibromide 1.68E-05
 Formaldehyde 3.23E-02
 Methanol 4.82E-03
 Methylene Chloride 6.50E-05
 Naphthalene 7.65E-05
 PAH 2.22E-04
 Styrene 9.38E-06
 Toluene 8.80E-04
 Vinyl Chloride 5.66E-06
 Xylene 3.07E-04

1.25E-01
 1.40E-01
 0.00E+00
 8.10E-01

1.57E-01

Total HAPs

- GLVET 3.00E-02
- Xylene 4.90E-03
- Toluene 4.90E-03
- Ethylbenzene 4.90E-03
- Benzene 4.00E-03
- Toluene 7.00E-03
- Ethylbenzene 4.00E-04
- Xylenes 2.00E-03
- Hexane 5.50E-02
- GLVET 4.10E+00

031	101 & 102	103	105	112 & 113	110, 111, & 101	Facility Total
Boiler	Compress or Engines	Emergency Generator Engine	Glycol Dehydration System	4 NG Compressors	Storage Tank, Parts Washers, Piping	
0.001077931	1.88E+01	3.23E-02	0.00E+00			18.82359861
Formaldehyde			tpv			4.13E-00
GLVET						4.13
Acroline	3.51E+00	3.21E-03				3.511248926
Acetaldehyde	3.50E+00	4.40E-03				3.503420199
Benzene	3.01821E-05	2.49E-01	8.10E-01		4.00E-03	1.691276598
Methanol	1.12E+00	4.82E-03				1.123068416
Toluene	4.88662E-05	8.80E-04	1.40E-01		1.19E-02	0.587049965
2,2,4-Trimethylpentane	3.81E-01					0.381465481
Hexane	0.025870341		1.25E-01		5.50E-02	0.205770341
n-Hexane	2.01E-01					0.200652647
Total HAPs				1.57E-01		0.157222664
Xylene	1.21E-01	3.07E-04			6.90E-03	0.128049933
Methylene Chloride	6.63E-02	6.50E-05				0.066347966
PAH	6.04E-02	2.22E-04				0.06064355
Ethylbenzene	4.87E-02	1.96E-05			5.30E-03	0.054017271
Naphthalene	4.34E-02	7.65E-05				0.043507447
Ethylene Dibromide	3.31E-02	1.68E-05				0.031113205
1,1,2,2-Tetrachloroethane	2.99E-02	3.99E-05				0.029934878
Carbon Tetrachloride	2.74E-02	1.40E-05				0.027383876
Styrene	2.47E-02	9.38E-06				0.024718965
1,1,2-Trichloroethane	2.38E-02	1.21E-05				0.023774745
Chloroform	2.12E-02	1.08E-05				0.021248417
Chlorobenzene	2.00E-02	1.02E-05				0.020030343
1,3-Dichloropropene	1.97E-02	1.00E-05				0.019759643
Phenol	1.90E-02					0.018983093
Vinyl Chloride	1.11E-02	5.66E-06				0.011143909
2-Methylnaphthalene	3.44938E-07	9.65E-03				0.009649708
Biphenyl	1.78E-03					0.001781074
Phenanthrene	2.44331E-07	1.59E-03				0.001591938
Acenaphthylene	1.29352E-08	1.43E-03				0.001429381
1,3-Butadiene	4.02428E-08	7.62E-04	1.05E-03			0.001045298
Fluorene	1.29352E-08	6.00E-04				0.000762069
Acenaphthene	1.72469E-08	3.24E-04				0.000599716
Anthracene	1.29352E-08	3.03E-04				0.000303021
Pyrene	7.18621E-08	2.63E-04				0.0002634
Fluoranthene	4.31172E-08	1.63E-04				0.00016282
Benz[a]anthracene	1.29352E-08	1.52E-04				0.000151517
Butyr/isobutyraldehyde		7.66E-05				7.66237E-05
Nickel	3.01821E-05					3.01821E-05
Chromium	2.01214E-05					2.01214E-05
Dichlorobenzene	1.72469E-05					1.72469E-05
Cadmium	1.58097E-05					1.58097E-05

1,1-Dichloroethane	8.62345E-09	1.12E-05	8.91E-06	8.9079E-06
Benzo(g,h,i)perylene	1.06E-05			1.11911E-05
Benzo(e)pyrene				1.05512E-05
1,2-Dichloropropane		1.02E-05		1.0248E-05
Manganese	5.46152E-06			5.46152E-06
Indeno(1,2,3-c,d)pyrene	1.29352E-08	4.48E-06		4.49042E-06
Benzo(b)fluoranthene	1.29352E-08	3.84E-06		3.85014E-06
Mercury	3.73683E-06			3.73683E-06
Arsenic	2.87448E-06			2.87448E-06
Benzo(a)pyrene	8.62345E-09	2.56E-06		2.566976E-06
Perylene		2.24E-06		2.241E-06
Benzo(k)fluoranthene	1.29352E-08	1.92E-06		1.93379E-06
Cobalt	1.20728E-06			1.20728E-06
Selenium	1.72469E-07			1.72469E-07
7,12-Dimethylbenz(a)anthracene	1.14979E-07			1.14979E-07
Beryllium	8.62345E-08			8.62345E-08
3-Methylchloranthrene	1.29352E-08			1.29352E-08
Dibenzof(a,h)anthracene	8.62345E-09			8.62345E-09
Sum of Other HAPs	0.03	1.60	0.00	0.08
Sum of All HAPs	0.03	29.39	0.05	0.16
				4.21
				34.92

Table 3: Potential Hazardous Air Pollutant Emissions
 Dominion Transmission, Inc - South Oakford Compression Station (TVOP-65-00840)

HAP	Source ID	Tons per Year					Facility
		101 & 102	103	105	112 & 113	110, 111, & PO1	
Formaldehyde	031	18.79	0.03	0.00	0.00	0.00	18.82
GLVET	031	0.00	0.00	0.00	0.00	4.13	4.13
Acrolein	031	3.51	0.00	0.00	0.00	0.00	3.51
Acetaldehyde	031	3.50	0.00	0.00	0.00	0.00	3.50
Benzene	031	0.87	0.00	0.81	0.00	0.00	1.69
Methanol	031	1.12	0.00	0.00	0.00	0.00	1.12
Sum of All Other HAPs	031	1.60	0.00	0.26	0.16	0.08	2.13
Sum of All HAPs	031	29.39	0.05	1.07	0.16	4.21	34.92

All emission sources, except the emergency generator, at the facility operate 8,760 hours per year. The emergency generator, which was assumed to operate 500 hours per year, prior to issuance of this proposed TVOP, will be limited to a maximum less than 500 hr/Yr, when the permit is issued.

¹Emissions from the boiler are based on AP-42, Table 1.4-2.
²Except for formaldehyde from the compressor engine, emissions are based on AP-42, Table 3.2-1 (2SLB). Formaldehyde emissions from the Compressors are based on March 13, 2013 testing.
³Emissions are based on AP-42, Table 3.2-3 (4SRB).
⁴Emissions are peak annual emissions reported by Dominion for South Oakford over 2012 - 2016
⁵Blow-by emissions from the compressor are based on 23 (11.5*2) scfh/piston rod (EPA EnergyStar), 4 piston rods, and NG analysis supplied by the company, in its 2015 annual report.
⁶Emissions were reported by the company.
⁷The value for facility fugitive emissions was reported in the 1995 application for an initial TVOP.
⁸Emissions for 2 parts washers, together, were assumed to be the same as the single parts washer at JB Tonkin.
 Values reported in this table were rounded from calculations performed elsewhere

III. Greenhouse Gas Emissions

GHGs from the Compressor Engines (Source IDs 101 & 102)

AP-42
 Uncontrolled Emission Factor
 (Uncontrolled EFs from AP-42, Table 3.2-1)

lb/MMBtu

CO₂ 110.00
 Methane 1.45

GHGs from the Emergency Engine (Source IDs: 103)

AP-42
 Uncontrolled Emission Factor
 (Uncontrolled EFs from AP-42, Table 3.2-3)

lb/MMBtu

CO₂ 110.00
 Methane 0.23

GHGs from the Boiler (Source ID 031)

lb/10⁶ scf

AP-42, Table 1.4-2

CO₂ 120000
 Nitrous Oxide 2.2
 Methane 2.3

GHGs from each Compressor (2 each, Source IDs 112 & 113)¹

lbm/hr TPY

CO₂ 0.097081242 0.4252158
 Methane 7.111404951 31.147954

Global Warming Potentials (100 year horizon) Table A-1 to Part A of Part 98 (Values effective on January 1, 2014).

GHG	CAS No	GWP
CO ₂	124-38-9	1
N ₂ O	10024-97-2	298
CH ₄	74-82-8	25

Table 4: Potential Greenhouse Gas Emissions
 Dominion Transmission, Inc. - South Oakford Compression Station (TVOF-65-00840)

ID	Source Name	CO ₂			CH ₄			N ₂ O			Total CO ₂ e ³			
		Lb/Hr	Ton/Yr	GWP	Lb/Hr	Ton/Yr	GWP	Lb/Hr	Ton/Yr	GWP	Lb/Hr	Ton/Yr		
31	Ajax Boiler 1 ²	394	1,725	1	0.0075	0.033	0.0072	0.032	0.0072	0.032	0.0072	0.032	396	1,735
101	Cooper Engine 1 ³	5,662	24,800	1	75	327	0.00	0.00	0.00	0.00	0.00	0.00	7,528	32,972
102	Cooper Engine 2 ³	5,662	24,800	1	75	327	0.00	0.00	0.00	0.00	0.00	0.00	7,528	32,972
103	Waukesha Aux. Emergency Generator Engine 1 ³	694	173	1	1.5	0.36	0.00	0.00	0.00	0.00	0.00	0.00	730	182
105	Glycol Dehydration System	136	596	1	0.0023	0.0100	0.00	0.00	0.00	0.00	0.00	0.00	136	596
110	Storage Tank P-1	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
111	2 Parts Washers	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
112	2 NG Compressors #1 and #2 ⁴	0.194	1	1	14.2	62	0.00	0.00	0.00	0.00	0.00	0.00	356	1,558
113	2 Cooper, NG Compressors #3 and #4 ⁴	0.194	1	1	14.2	62	0.00	0.00	0.00	0.00	0.00	0.00	356	1,558
P01	Facility Pumps, Valves, Flanges, etc. ⁵	0.00	0	0	237	1,038	0.00	0.00	0.00	0.00	0.00	0.00	5,923	25,943
Facility Total		12,548	52,095	416	416	1,817	0.0072	0.032	0.0072	0.032	0.0072	0.032	22,953	97,518

All emission sources, except the emergency generator, at the facility operate 8,760 hours per year. The emergency generator, which was assumed to operate 500 hours per year, prior to issuance of this proposed TVOP, will be limited to a maximum less than 500 hr/yr, when the permit is issued.

¹Emission estimates of CO₂e are based on AP-42, Table 3.2-2 and 100 year horizon Global Warming Potentials (1 ton CH₄ = 25 ton CO₂ and 1 ton N₂O = 298 ton CO₂) in Table A-1 to Part A of Part 98. (Values effective January 1, 2014.)

²Emissions from the boiler are based on AP-42, Table 1.4-2.

³Emissions from the engines are based on AP-42, Table 3.2-1 & Table 3.2-3.
⁴Blow-by emissions from the compressor are based on 23 (11.5**2) scfh/piston rod (EPA EnergyStar), 8 piston rods, and NG analysis supplied by the company, in its 2015 annual report
⁵Methane emissions from P01 are based on CH4 emissions from the natural gas compressors and the ratio of VOC from the two sources
 Values reported in this table were rounded from calculations performed elsewhere
 Total facility emissions are a combination of regulated potential emissions and estimated emissions.

IV. Change in Emissions Since the TVOP was last renewed

Table 5: Change in Emissions Since the TVOP was last renewed
 Dominion Transmission, Inc. - South Oakford Compression Station (TVOP-65-00840)

Date	Tons per Year							CO ₂ e
	PM2.5	PM10	NOx	CO	VOC	HAPs		
10/31/2007 Potential Emissions at Last Renewal	21.96	21.96	1,188.15	498.10	267.24	34.92	97,518	
1/1/2017 Addition of Operating Time Limit on the Aux. Generator ¹	0.00	0.00	-77.88	0.00	0.00	0.00	0	
11/7/2017 Addition of Clean Burn Technology on the Compressor Engines and imposition of RACT II emission limits ¹	0.00	0.00	-735.70	-392.34	-122.57	0.00	0	
Total Change over Period	0.00	0.00	-813.59	-392.34	-122.57	0.00	0	
Date of Current Renewal	21.96	21.96	374.56	105.76	144.68	34.92	97,518	

¹Both changes were made to comply with the requirements of RACT II.