VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

INTRA-AGENCY MEMORANDUM

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Air Permit Manager	James E. Kyle, P.E. & Michael G. Dowd
Memo To	Air Permit File
Date	January 9, 2019
Facility Name	Atlantic Coast Pipeline, LLC – Buckingham Compressor Station
Registration Number	21599
Application No.	1
Date Fee Paid	October 8, 2015
Amount ($)	$1,574
Distance to SNP (km)	>10
Distance to JRF (km)	>10
FLM Notification (Y/N)	Not required for distances greater than 10 km (minor)
Application Fee Classification (Title V, Synthetic Minor, True Minor)	Synthetic Minor after Permit Action
Permit Writer Signature	
Permit Manager Signature	

I. Introduction

Atlantic Coast Pipeline, LLC (ACP) of Richmond, VA submitted an application dated September 11, 2015 to construct and operate a new natural gas pipeline compressor station in Buckingham County, Virginia (Buckingham Compressor Station or BCS)[1]. ACP subsequently submitted several updates based on improvements and changes to the project design. The Local Governing Body Certification Form was received on February 21, 2017. On May 25, 2018, a revised application compiling all of the updates since 2015 was received. The application was deemed complete on July 13, 2018.

BCS is to be constructed on the north side of Route 56, 5.1 miles northwest of the intersection of Route 60 and Route 56, at 5297 S. James River Highway, Wingina (Buckingham County), Virginia. Of the three compressor stations proposed to move natural gas along the Atlantic Coast Pipeline, a 556-mile long interstate pipeline system designed to transport natural gas from West Virginia through Virginia to North Carolina, BCS will be the only one located in Virginia.

On January 5, 2017, the Buckingham County Board of Supervisors held a public hearing and then approved a Special Use Permit for the construction and operation of the compressor station.

There are abundant regulatory and technical considerations in the application review and drafting of an air permit that require significant technical education and experience. Due to the significant

[1] The initial application had a contradiction regarding the requested action. ACP clarified this issue in a later submittal, noting a State Operating Permit, for which there is no preconstruction requirement, was not being requested. The initial Form 7 was correctly filled out as needing a minor NSR permit pursuant to Article 6 of Chapter 80. As noted in Section IV.B, there are no preconstruction requirements for greenhouse gases (GHG).

public interest in the permit process for BCS, an attempt to convey a number of standard concepts and terms within the field has been developed. The discussion here does not reflect all of the statutory, regulatory, and legal implications. This discussion is provided to give the public a basic explanation of some likely confusing and highly technical jargon associated with air permit application reviews.

@15% O_2 – a notation indicating that the concentration is mathematically corrected from the actual stack conditions to a comparable set of conditions. This prevents a source from adding additional ambient air just prior to the testing instrumentation to dilute the concentration of the pollutant being measured. This is not an issue with a mass emission rate since dilution does not change the mass of the pollutant emitted. The ppm limitations for BCS are corrected to 15% O_2.

Blowdown – a venting event where piping at the facility must be emptied of natural gas; a site-wide blowdown is when all piping at the facility must be emptied.

Catalyst – a substance that changes the reaction speed but does not participate in the reaction

CO – Carbon monoxide, a pollutant with a NAAQS

Fugitive – describes a type of emissions that occur but cannot be reasonably collected

ISO conditions – Properties of a gas change based on the gas temperature and pressure exerted on the gas. In order to have a meaningful discussion regarding any gases, these variables must be defined. While several methods exist to define these variables, the International Organization for Standardization (ISO) defines the conditions as 59°F and 14.7 pounds per square inch (psi).

LDAR – Leak Detection and Repair – usually refers to a program a source uses to monitor various pieces of equipment at a facility that may be prone to leaking and fix leaks as detected

MACT – Maximum Achievable Control Technology; federal regulations for certain types of equipment; used in this analysis to refer to such standards promulgated in 40 CFR Part 63, which are technology based.

MMBtu – Million British thermal units – a measure of energy

NAAQS – National Ambient Air Quality Standard; a federal standard for the maximum concentration of a certain air pollutant in the ambient air in the country that is protective of human health. CO, O_3, NO_2, PM10, PM2.5, SO_2, and lead are the pollutants with NAAQS.

NESHAPS – National Emission Standards for Hazardous Air Pollutants; federal regulations for certain types of equipment; used in this analysis to refer to such standards promulgated in 40 CFR Part 61, which are risk based.

NOx – Nitrogen oxides or oxides of nitrogen – a surrogate for the amount of NO_2 (a pollutant with a NAAQS) being emitted; a pollutant that forms ozone when the atmosphere has favorable conditions (hot and dry with enough VOC)

NSPS – New Source Performance Standard; federal regulations for certain types of equipment

Open flare – a stack-like device with a continuous flame at the tip, such that when a flammable gas flows, the 'pilot flame' ignites the gas prior to exiting the flare stack; also described as a candlestick flare for its similarity in appearance to a large candle.

Pigging – the method of removing liquids from the piping; liquids can be generated due to the high pressure of the gas causing some components to condense in the piping.

PM – particulate matter of a certain size that only includes the portion that can be filtered when emitted

PM10 and PM2.5 – particulate matter of a certain size that includes both the portion that can be filtered when emitted and the portion that is a gas when emitted and later condenses; both pollutants have a NAAQS

PPH, lb/hr – pound per hour – a short-term mass emission rate

ppm – parts per million – a concentration that can be converted to a mass emission rate

PSD – Prevention of Significant Deterioration; a pre-construction permitting program that applies to large sources

PTE – potential to emit – the maximum ability of a source to emit pollutants considering permit limitations

Stoichiometric – chemical reactions rely on the correct amount of each chemical. The ideal amount of each chemical is the 'stoichiometric' amount or ratio.

TPY, tons/yr – tons per year – a long-term mass emission rate

Vent Gas Reduction System (VGRS) – a system, including an electrically-driven compressor, which reduces the amount of natural gas released to the atmosphere during compressor turbine shutdowns by maintain sufficient pressure to ensure that the compressor seal remains intact during compressor turbine shutdowns

VOC – Volatile organic compounds – a group of chemicals that form ozone when the atmosphere has favorable conditions (hot and dry with enough NOx).

II. Emission Units / Process Descriptions

Compressor Turbines

To provide pressure for this station, ACP is proposing to construct and operate the following natural gas-fired compressor turbines:

- A 15,900 hp (129 MMBtu/hr) Solar Mars Model 100-16000 S Compressor turbine (CT-01);
- A 11,107 hp (85 MMBtu/hr) Solar Taurus Model 70-10802 S Compressor turbine (CT-02);
- A 20,500 hp (157 MMBtu/hr) Solar Titan Model 130-20502 S Compressor turbine (CT-03);

and

- A 6,276 hp (55 MMBtu/hr) Solar Centaur Model 50-6200 LS Compressor turbine (CT-04).

Note: The rating of the turbines listed here is at standard ISO conditions, MMBtu/hr are based on higher heating value.

Compressor turbines work by converting the energy in the fuel gas to mechanical energy that then powers the pipeline gas compressors. The compressors increase the pressure of the pipeline gas to enable it to move from one location to another, as the gas will flow from higher pressure to lower pressure in the pipeline. The compressor turbines will generate mechanical energy from the combustion of natural gas fuel. Fresh atmospheric air flows through an air compressor, bringing it to higher pressure. Energy is then added by spraying fuel (pipeline natural gas) into the compressed air and igniting it so the combustion generates a high-temperature flow. This high-temperature, high-pressure gas enters a turbine, where it expands, turning a shaft that powers both the turbine's air compressor and other large centrifugal compressors that pressure the pipeline gas.

The proposed lean-premix staged compressor turbines are equipped with Solar's dry low-NOx (DLN) combustion system (known as SoLoNOx), which limits the formation of NOx by pre-mixing air and fuel prior to combustion. This system limits NOx emissions when the turbine is operating at an ambient temperature of 0°F or greater and at a load equal to or greater than 50%. This technology reduces nitrogen oxide (NOx) emissions by operating a lean burn fuel ratio (fuel to air ratios of less than 1:1). The SoLoNOx system does not operate during start-up or shutdown. SoLoNOx efficiency is diminished at low loads (less than 50% of capacity), as well as at full load for temperatures below 0°F. SoLoNOx is operating optimally when the "pilot operating mode" is in "minimum pilot mode," which is explained in Solar's PIL-220 dated August 31, 2017. BCS cannot operate below 50% load unless during start-up or shutdown.

In addition to the use of SoLoNOx, ACP proposes add-on controls to further reduce emissions: selective catalytic reduction (SCR) for NOx control, and use of an oxidation catalyst system to control CO, VOC, and organic HAPs such as formaldehyde. An SCR reduces NOx emissions by injecting ammonia (NH_3) into the exhaust gas upstream of a catalyst. The compounds NOx, NH_3, and O_2 react on the catalyst surface to form N_2 and H_2O. Oxidation catalyst systems are typically used on turbines to achieve a reduction in CO and VOC emissions. The oxidation catalyst system promotes the oxidation of CO and VOC to carbon dioxide (CO_2) and water (H_2O) as the emission stream passes through the catalyst bed. Catalyst systems need to operate above minimum temperatures to achieve the intended reactions for NOx, CO, or VOC. Neither catalyst system will be at temperature during start-up. During shutdown, the oxidation catalyst system will remain above the reaction temperature. The SCR system is more complicated (i.e., requires ammonia injection at the correct stoichiometric rate as well as higher temperatures) and will not operate during shutdown.

Due to the technical considerations for operating the SoLoNOx system and the inability to operate the control systems during start-up and shutdown[2], there are three operating modes for the turbines:

[2] The oxidation catalyst will operate above the minimum temperature for the entirety of the shutdown sequence. Therefore, control of emissions will occur during that period.

- Normal operating load (50% - 100%) at or above 0°F inlet air temperature (Steady-state)
- Low temperature operating mode for operation at temperatures below 0°F (Low Temperature)
- Start-up and Shutdown mode (SUSD)

Ancillary Equipment (Boiler, Line Heaters, and Emergency Engine)
Along with the turbines, a 6.384 MMBtu/hr natural gas-fired boiler, WH-1 (equipped with low-NOx burners), will provide building space heat only, and four 21.22 MMBtu/hr natural gas-fired ETI line heaters (LH-01 through LH-04) will provide process heat at the site. A 2,175 bhp natural gas-fired Caterpillar G3516C emergency engine will provide back-up power in the event that grid power is unavailable.

Tanks
Liquid storage tanks (TK-01 through TK-03) will be used at the facility: TK-01 (2,500 gallon Accumulator Storage Tank) will store pipeline condensate collected by the station's separators and filters. TK-02 (2,000 gallon Hydrocarbon Waste Tank) will receive liquids from the compressor building and auxiliary building floor drains. TK-03 (13,000 gallon Aqueous Ammonia Storage Tank) will store ammonia to be used for the SCR control system for the compressor turbines.

III. Emission Calculations

ACP included air emissions calculations for the proposed Buckingham Compressor Station in Appendix C of the permit application. Those calculations have been reviewed. One correction to the calculation approach was warranted. ACP estimated four pigging events per year; however, ACP requested a permit limit of fifteen events per year. This increased the emissions due to pig launching and receiving from 0.094 TPY to 0.31 TPY and 0.098 TPY to 0.32 TPY, respectively. Based on DEQ's review, no other changes to the calculations are necessary.

Annual permitted emissions for the turbines are calculated based on the following:

- compressor turbines operating at 8,722 hours per year in steady-state mode
- low temperature emissions (for temperatures below 0°F) are estimated to occur for 5 hours per turbine per year, and
- SUSD emissions with a total duration of approximately 33.4 hours (100 start-up/shutdown events x 10 minutes/event) are added to the controlled emissions in steady-state mode.

IV. Regulatory Review

A. 9VAC5 Chapter 80, Part II, Article 6 – Minor New Source Review
The application requests approval for the construction of a new stationary source. The proposed boiler and line heaters are exempt from permitting based on their individual size as external fuel combustion units using gaseous fuel with a maximum heat input of less than 50 MMBtu/hr, per 9VAC5-80-1105 B.1.a(4). The tanks are all exempt from permitting: TK-01 is exempt under 9VAC5-80-1105B.4.b--volatile organic compound storage operations involving any tank of 40,000 gallons or less storage capacity, TK-02 is exempt under 9VAC5-80-1105 B.8.e(1)--petroleum liquids storage operations involving any tank of 40,000 gallons or less storage capacity, and TK-03 is exempt from permitting because ammonia is not a regulated air pollutant.

The remaining units (turbines and emergency engine) are reviewed to determine the uncontrolled emission rate (UER) from the new stationary source. The UER for a new stationary source is calculated as the sum of the uncontrolled emissions from each emission unit[3]. A facility is subject to permitting if the UER for a pollutant exceeds the exemption rate for that pollutant. The exemption rates for new stationary sources are found at 9VAC5-80-1105C.1.

As shown in the summary table below, the UER for CO, NOx, VOC, PM10 and PM2.5 exceed the respective permitting thresholds; therefore, the facility is subject to the permitting requirements of Article 6.

Table 1: Uncontrolled Emission Rate (UER)

Pollutant	UER (TPY)	Exemption Rate (TPY)	Exempt? (Y/N)
Carbon Monoxide	140	100	N
Nitrogen Oxides	68.4	40	N
Sulfur Dioxide	7.0	40	Y
PM	12.0	25	Y
PM10	41.2	15	N
PM2.5	41.2	10	N
Volatile Organic Compounds	75.34	25	N
Lead	0.01	0.6	Y

Based on the application calculations as summarized here, BCS will emit two toxic air pollutants, hexane (hourly) and formaldehyde (hourly and annual), at levels which exceed the respective exemption thresholds in 9VAC5-60-300.

Table 2: Uncontrolled Toxics Emissions subject to Article 6 permitting

Pollutant	Emissions Rate (lb/hr)	Exemption Rate (lb/hr)	TPY	Exemption Level (TPY)
Formaldehyde (50-00-0)	14.0	0.0825	4.25	0.174
Hexane[5] (110-54-3)	23.6	11.616	1.1	25.52

Other air toxics or hazardous air pollutants are emitted from the compressor turbines, boiler, line heaters, and storage tanks to be located at the proposed facility, but the potential to emit of each of these pollutants does not exceed the respective individual hourly and annual exemption thresholds[6] (Table C-10); therefore, the emissions are not subject to permitting requirements.

[3] Since this is a new facility, all emission units are new and have no current uncontrolled emissions to consider. In accordance with 9VAC5-80-1105C.1, emission units exempted by 9VAC5-80-1105B are not considered in this calculation.
[4] This value includes the emissions from fugitive releases such as leaking components and natural gas venting events.
[5] Pre-permit hexane hourly emissions taken from Table C-10 of March 29, 2018 submittal.
[6] POM (polycyclic organic matter) are emitted from the facility, but do not have TLV information published in the 1992 ACGIH handbook. POM is actually a group of many different compounds. Since naphthalene is part of POM, its TLV® information was used to calculate exemption levels for POM emissions.

B. 9VAC5 Chapter 80, Part II, Article 8 and Article 9 – PSD Major New Source Review and Non-Attainment Major New Source Review

The Prevention and Significant Deterioration (PSD) permit program for major stationary sources (defined in the Regulations) located in areas that are in compliance with the National Ambient Air Quality Standards (NAAQS). A NAAQS is the allowable concentration of a pollutant in the ambient air that EPA determines protects the public with an adequate margin of safety. Areas that are meeting the NAAQS are designated as "PSD areas." Areas that have ambient air concentrations higher than the NAAQS are designated as "nonattainment areas." An area's classification is determined for each pollutant with a NAAQS. These pollutants are often referred to as "criteria pollutants." The PSD program also applies to certain other pollutants that are regulated under the Clean Air Act.[7]

Buckingham County is a PSD area for all pollutants as designated in 9VAC5-20-205. BCS is not in a source category with a 100 TPY PSD threshold; therefore, the major stationary source threshold is 250 TPY. After issuance of this permit, the facility will not have the PTE of any regulated NSR pollutant at major stationary source thresholds. PSD review does not apply.

C. 9VAC5 Chapter 50, Part II, Article 5 – NSPS

Requirements of NSPS Subparts Dc, JJJJ, KKKK, and OOOOa are applicable to equipment at this facility. These rules contain federally-enforceable requirements that a source must comply with, regardless of their inclusion in a permit.

The proposed Solar turbines (CT-01, CT-02, CT-03, and CT-04) are subject to 40 CFR 60, Subpart KKKK (§60.4300-§60.4420). Additionally, the facility is subject to LDAR requirements of 40 CFR 60, Subpart OOOOa (§60.5360a-§60.5432a). For this facility, Subpart OOOOa applies to the collection of fugitive emissions components at a compressor station per 40 CFR 60.5365a(j).

The turbines are subject to the NSPS KKKK NOx limit of 15 ppm@15% O_2 (§60.4320). The turbines are subject to a BACT requirement that is more stringent (see Section V). Monitoring and testing and recordkeeping requirements for NOx are located in §60.4333 and §60.4340. The turbines are also subject to the fuel sulfur monitoring requirements in §60.4360.

NSPS OOOOa requires a fugitive emissions monitoring plan in §60.5397a(b) through (j) as well as monitoring surveys (§60.5397a(f) and §60.5397a(g)(2)) and repair/replacement timeframes in §60.5397a(h). The monitoring plan in this permit is equally or more stringent than these requirements (see Section V). Virginia has not accepted delegation of this rule for non-Title V sources.

The emergency engine (EG-01) is subject to 40 CFR 60, Subpart JJJJ because it is spark ignition fired and is considered "new" equipment due to its manufacture date after April 1, 2006. The engine is subject to a BACT requirement that is equally stringent (see Section V). Virginia has not accepted delegation of this rule for non-Title V sources.

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[7] In accordance with the June 23, 2014 Supreme Court decision, GHG cannot cause a source to be subject to PSD permitting by itself. Therefore, the amount of GHG emitted from a facility is not used in determining whether or not a PSD permit is required. However, if a source is required to obtain a PSD permit for any other pollutant, a review of the GHG emissions must be done to determine if a source must apply BACT for GHG.

The line heaters are subject to 40 CFR 60, Subpart Dc because each of these units has heat input capacity between 10 and 100 MMBtu/hr. However, because NSPS Subpart Dc does not include any emission standards for boilers that burn only natural gas, the line heaters are subject only to the recordkeeping and reporting requirements of §60.48c.

The affected facilities have been designed to comply with the applicable requirements of these rules.

D. 9VAC5 Chapter 60, Part II, Article 1 – NESHAPS
The facility is not subject to any NESHAPS requirements.

E. 9VAC5 Chapter 60, Part II, Article 2 – MACT
BCS does not have the PTE of any single HAP or combination of HAPs in excess of the major source threshold; therefore, it is an area source of HAPs. Therefore, no major source MACT requirements apply.

MACT Subpart ZZZZ has area source requirements that are applicable to the emergency engine (EG-01). The MACT requires compliance via compliance with NSPS JJJJ. Virginia has not accepted delegation of this Federal standard for non-Title V sources.

40 CFR 63, Subpart JJJJJJ does not apply to the boiler or line heaters because boilers and process heaters fueled exclusively by natural gas are not subject to the rule.

The affected facilities have been designed to comply with the applicable requirements of these rules.

F. State Only Enforceable (SOE) Requirements (9VAC5-80-1120 F)
Several Virginia regulations are enforceable only by the State Air Pollution Control Board and its designee, DEQ. One such regulation is 9VAC5-60-300 *et seq.*; this regulation is often referred to as the "state toxics rule." The state toxics rule was developed as a health-based "stop-gap" regulation to cover emissions of HAP by sources until EPA made a determination regarding emissions from those source types. Once EPA has made a determination, the state toxics rule no longer applies.

As noted in Section IV.A, formaldehyde and hexane emission rates exceed the exemption thresholds contained in 9VAC5-60-300C. Formaldehyde emissions from the compressor turbines (CT-01, CT-02, CT-03, and CT-04) will be limited in the permit to ensure the facility complies with the significant ambient air concentration (SAAC) for formaldehyde. Hexane emissions resulting from venting events will be limited in the permit to ensure the facility complies with the SAAC for hexane. As discussed in Section V, BCS is implementing BACT for VOC. Formaldehyde and hexane are also VOC. The BACT requirements in the permit for VOC are considered BACT for formaldehyde (oxidation catalyst system) and hexane (VGRS, capped ESD testing).

Formaldehyde and hexane emissions limitations and associated requirements are included in the permit as SOE to implement the requirements of 9VAC5-60-300, et. seq. Neither the inclusion of SOE requirements in this permit nor any resulting comment period make these terms federally

enforceable. As the BACT requirements for VOC are federally enforceable, they are not duplicated in the SOE section of this permit.

V. Best Available Control Technology (BACT) Review (9VAC5-50-260)

BACT is a requirement to reduce emissions through the use of available reduction techniques (i.e., control devices, adjustments to prevent pollution formation, work practices, etc.). This requirement considers whether or not the emission reduction is BACT using various factors including the cost of the control system divided by the amount of pollutant reduced; this is called 'cost effectiveness.' BACT review is relative to a specific pollutant and a specific type of operation. Generally for BACT, minor sources in Virginia undergo a review to compare the relative level of control with other similar Virginia sources. Based on the potential impacts to the surrounding communities, BCS was also compared against other similar projects in other states.

BACT applicability is determined pollutant-by-pollutant, based on the corresponding permit applicability thresholds. For a new stationary source, BACT shall apply for each pollutant with an increase in the UER equal to or greater than the levels in 9VAC 5-80-1105C. Each affected emissions unit emitting a pollutant that is subject to permitting shall apply BACT for that pollutant (9VAC5-50-260B). For the proposed Buckingham Compressor Station, BACT is applicable for NOx, CO, VOC, PM10, and PM2.5.

ACP submitted a Best Available Control Technology review for all units not exempted under 9VAC5-80-1105B (see Section 6 of the application).

Compressor turbines

ACP proposes a dry low-NOx combustion system (SoLoNOx) and SCR control for NOx. A review of issued permits in Virginia for similar compressor stations indicates most turbines are uncontrolled with emission values of 15 ppm NOx. Two recently issued permits with SCR requirements could be found, both of which are compressor stations in other states associated with the ACP. Control of NOx emissions by SCR is considered BACT. ACP originally proposed 5 ppm as a controlled emission rate from each turbine. A review to determine if a lower concentration was appropriate included a draft permit for a gas compressor station in Baltimore County, Maryland. While that station is smaller (2 turbines versus 4 turbines), one of the units is an identical model as at BCS. Based on a comparison of the costs incurred between 5 ppm and 3.75 ppm and the feasibility of such control for the same model turbine at another station, BACT is considered an exhaust concentration of 3.75 ppm NOx.

ACP proposes control of both CO and VOC by oxidation catalyst system. A review of issued permits in Virginia for similar compressor stations indicates most turbines are uncontrolled with emission values of 25 ppm CO and 5 ppm VOC. Two recent permits with oxidation catalyst system requirements could be found, both of which are compressor stations associated with the ACP outside of Virginia. Control of CO and VOC emissions by oxidation catalyst system is considered BACT. No similar facility was found with a lower BACT limit; therefore, BACT is considered an exhaust concentration of 2 ppm CO and 1.25 ppm VOC.

ACP proposes control of particulate emissions (PM10, PM2.5) by filtering the inlet air to reduce the incoming particulate and the use of good combustion practices. A review of issued permits for similar compressor stations indicates these requirements are as stringent. Control of particulate by inlet air filtering and good combustion practices meeting the respective lb/hr emission limit is

considered BACT for BCS (CT-01 – 2.86, CT-02 – 1.92, CT-03 – 3.47, CT-04 – 1.20). Visible emissions from natural gas combustion must be less than 5%.

Start-up and shutdown operations are also subject to BACT. ACP proposes work practice standards and minimization of these operational scenarios as BACT. A review of recent permits indicates these requirements are as stringent. Work practices[8] and minimization of these operational scenarios is considered BACT for start-up and shutdown operations for all pollutants. The requirement to operate the oxidation catalyst system applies during shutdown operations.

In the low temperature mode, the SoLoNOx system does not operate optimally at ambient conditions (less than 0°F); therefore, the inlet loading of NOx, CO, and VOC to the control equipment is higher than during steady-state operations. ACP has proposed installation of the Cold Ambient Temperature Logic that provides for minimal emissions during these periods. The turbines will use the same controls for this operational scenario as for steady-state operations; however, the mass emissions will be higher due to the higher inlet loading. Based on the low hours of expected operation as discussed in Section III, the lb/hr emission limits, based on the control of NOx, CO, and VOC at 58%, 92%, and 50% respectively, is considered BACT when the ambient temperature is below 0°F.

Emergency Engine

The emergency engine emits NOx, CO, VOC, PM10, and PM2.5. The emergency engine is not categorically exempt in accordance with 9VAC5-80-1105B. Based on the emergency classification and the low annual hours of operation, the numeric standards equivalent to the NSPS JJJJ are considered as BACT for NOx, CO, and VOC (2.0 g/hp-hr, 4.0 g/hp-hr, 1.0 g/hp-hr, respectively). While these numeric standards are identical to the NSPS values, BACT, not the NSPS, is the regulatory authority for these limits. This is noted to clarify Virginia has not accepted delegation of the NSPS rule nor is it incorporated into this permit. BACT for PM10 and PM2.5 is good combustion practices and visible emissions less than 5%.

Fugitive Leak Components

Natural gas contains VOC, which is subject to BACT. A daily auditory/visual/olfactory (AVO) as well as quarterly LDAR checks in accordance with Method 21 or an optical gas imaging camera is considered BACT. While these requirements may be similar or identical with the requirements of NSPS OOOOa, the regulatory authority for these conditions is BACT. This is noted to clarify Virginia has not accepted delegation of the NSPS nor is it incorporated into this permit.

Natural Gas Venting (Blowdown)

Natural gas contains VOC, which is subject to BACT. There are four types of anticipated events that result in releases of natural gas: turbine start-up, turbine shutdown, pigging, and site-wide emergency shutdown (ESD) testing. ACP originally proposed no control of start-up or shutdown venting events as well as 100 events each per turbine per year. ACP also proposed one site-wide ESD testing event per year[9]. DEQ considered the emissions and requested information regarding

[8] One practice to clarify is the operation of control devices. There may appear to be a conflict between Conditions 1, 2, and 4.d. Condition 4.d is a work practice for minimizing emissions. It does not require operation of these controls in conflict with Conditions 1 and 2; it requires the source to operate the controls as soon as technically feasible to minimize emissions, even if other parameters may indicate the unit is in start-up or shutdown.

[9] While ACP notes the test will only be once per five years, the emissions calculations assumed one event per year; therefore, those emissions were considered in the original potential to emit.

flaring of the vent gas. Based on ACP's review of start-up and shutdown, flaring, and other control options, ACP proposed a vent gas reduction system to reduce emissions of VOC due to turbine venting related to start-up and shutdown as well as reducing the number of start-up and shutdown events from 100 to 10 each per turbine per year. ACP now proposes capped tests as BACT for ESD testing (no ESD test venting events). As mentioned above, DEQ also considered an alternate control technology: flaring of vented gas. The emissions of VOC based on the latest ACP proposal are less than the VOC emissions after control by the flare. A properly operated and maintained VGRS to reduce the amount of VOC vented to the atmosphere is considered BACT for the turbine venting events, which are limited to ten start-up vents and ten shutdown vents per turbine per year. Capped ESD testing is considered BACT for the site- wide venting events. These two reduction approaches result in a decrease in emissions by approximately 99% for VOC alone.[10] Due to the small amount of VOC released during pigging events, BACT for pigging events is considered the following: fifteen pig launching and fifteen pig receiving events per year, resulting in 0.31 TPY and 0.32 TPY, respectively.

VI. Summary of Potential Emissions Increase

As a new stationary source, the increase in potential emissions is equal to the permitted PTE. The PTE of the facility after issuance of this permit is summarized in the following table:

Source	NOx	CO	VOC	SO2	PM	PM10	PM2.5
Solar Mars 100 Turbine	8.62	5.39	1.31	2.12	3.58	12.45	12.45
Solar Taurus 70 Turbine	5.73	6.47	1.75	1.40	2.37	8.23	8.23
Solar Titan 130 Turbine	10.48	6.46	1.77	2.57	4.35	15.10	15.10
Solar Centaur 50L Turbine	3.68	2.37	0.69	0.90	1.52	5.28	5.28
Hurst S45 Boiler	1.37	2.30	0.15	0.09	0.05	0.21	0.21
ETI Line Heater 1	0.93	3.44	0.50	0.30	0.11	0.45	0.45
ETI Line Heater 2	0.93	3.44	0.50	0.30	0.11	0.45	0.45
ETI Line Heater 3	0.93	3.44	0.50	0.30	0.11	0.45	0.45
ETI Line Heater 4	0.93	3.44	0.50	0.30	0.11	0.45	0.45
Caterpillar G3516C	0.60	2.40	0.60	0.01	0.14	0.18	0.18
Fugitive Leaks- Blowdowns	-	-	0.98	-	-	-	-
Fugitive Leaks – Piping	-	-	0.91	-	-	-	-
Accumulator (Waste Oil) Tank	-	-	<0.01	-	-	-	-
Pipeline Fluids Tank	-	-	0.15	-	-	-	-
Total (tons/yr)	34.20	39.16	9.79	8.30	12.46	43.24	43.24

VII. Dispersion Modeling

A. Criteria Pollutants

As stated in the regulatory review, the criteria pollutants subject to the permit requirements of Article 6 include NOx, CO, VOC, PM10, and PM2.5. An air quality analysis via dispersion modeling was conducted to demonstrate compliance with the NAAQS. For the impact of the VOC emissions, a quantitative analysis was performed in accordance with current EPA guidance.

[10] While not the subject of Article 6 permitting, reduction in venting emissions also significantly reduces the amount of methane emitted, from 54,435 tons per year to 164 tons per year on a CO_2e basis, as well as an addition 3.9 tons per year reduction in hexane emissions.

Modeling was completed by ACP and submitted to the Office of Air Quality Assessments for analysis. The modeling analysis was approved on July 13, 2018 and demonstrated compliance with the applicable NAAQS. The results are summarized below:

Pollutant (Averaging Period)	Total Modeled Concentration ($\mu g/m^3$)	Ambient Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2 (1-hour)	42.0	75.2	117.2	188
NO_2 (Annual)	3.5	16.92	20.4	100
CO (1-hour)	303	1374	1677	40,000
CO (8-hour)	122	1259.5	1382	10,000
PM2.5 (24-hour)	6.6	15	21.6	35
PM2.5 (Annual)	1.5	7.2	8.7	12
PM10 (24-hour)	9.1	27	36.1	150

B. Toxic Pollutants

Modeling is required if potential toxic air pollutant emissions after issuance of the permit exceed the exemption thresholds included in 9VAC 5-60-300 C. An air quality analysis via dispersion modeling was conducted to demonstrate compliance with the respective SAACs.

Modeling was completed by ACP and submitted to the Office of Air Quality Assessments for analysis. The modeling analysis was approved on July 13, 2018 and demonstrated compliance with the applicable SAACs. The results are summarized below:

Toxic Pollutant	Scenario	Modeled Concentration ($\mu g/m^3$)	SAAC ($\mu g/m^3$)
Formaldehyde (1-hour)	50% Load	38.9	62.5
Formaldehyde (1-hour)	75% Load	38.9	62.5
Formaldehyde (1-hour)	100% Load	38.9	62.5
Formaldehyde (1-hour)	Startup (blended with 50% load)	40.5	62.5
Formaldehyde (1-hour)	Shutdown (blended with 50% load)	40.2	62.5
Formaldehyde (annual)	50% Load	0.081	2.4
Formaldehyde (annual)	75% Load	0.079	2.4
Formaldehyde (annual)	100% Load	0.076	2.4
Hexane (1-hour)	Pigging (Launching)	6,277	8,800
Hexane (1-hour)	Pigging (Receiving)	6,897	8,800
Hexane (1-hour)	Purging from Startup Events	1,370	8,800
Hexane (1-hour)	Blowdown from Shutdown Events	4,518	8,800
Hexane (1-hour)	Normal Operations	20	8,800

VIII. Compliance Demonstration

Turbines (CT-01, CT-02, CT-03, and CT-04)

For proper operation of the SCR system, the permit requires monitoring of the compressor turbine inlet air temperature, ammonia injection rate, catalyst bed inlet gas temperature, pilot operating

point, turbine load, and catalyst bed differential pressure. For the oxidation catalyst system, the permit requires monitoring of catalyst bed inlet temperature and catalyst bed differential pressure. ACP must develop a monitoring plan for the turbine monitoring parameters. The turbines must also be tested bi-annually for NOx, CO, and VOC. The time between bi-annual tests must not exceed 26 calendar months. BCS is required to validate the monitoring ranges during each performance test. The inlet filters will be maintained in accordance with the manufacturer's recommendations.

A bi-annual test to demonstrate compliance with the SOE formaldehyde limit is required.

The VGRS allows for 'pressurized hold' by maintaining a seal gas pressure sufficiently higher than the compressor case pressure. A test to determine the appropriate range for each turbine is required using Method 21 or an optical gas imaging camera to ensure no leakage. Records of the daily AVO and quarterly LDAR surveys are also required, as well as corrective actions taken.

Emergency Engine (EG-01)
The engine must be equipped with a non-resettable hour meter. A log containing the reason for operation of the engine and the amount of time operated is required. An initial performance test is required to demonstrate compliance with the emission limits for NOx, CO, and VOC, with subsequent tests being performed every 8,760 hours of operation or 36 months, whichever is less. Records of engine maintenance are required.

Other Records
Records of fuel combusted, venting events, and scheduled and unscheduled maintenance must be maintained for each unit.

IX. Title V Review – 9VAC5 Chapter 80 Part II Article 1

After issuance of this permit, the facility does not have a PTE for any pollutant greater than the respective Title V major source threshold. The facility is not in a category required to obtain a Title V permit regardless of emission rate. Title V permitting does not apply.

X. Site Suitability

On January 5, 2017, the Buckingham County Board of Supervisors held a public hearing and then approved a Special Use Permit for the construction and operation of the compressor station. ACP must operate in compliance with the County's approval as well as any other ordinances or regulations related to land use.

A DEQ site evaluation was conducted on October 31, 2017. The land around the site is forested, with rolling terrain. The area is sparsely populated. No other existing air pollution sources were noted within one mile of the proposed site. The nearest school is approximately 9 miles from the site, with the closest hospital/nursing home located approximately 17 miles away.

Based on a review of the application, the air quality analysis, and resulting draft permit, the proposed facility complies with all regulatory requirements. Air Quality modeling results indicate compliance with all applicable ambient air quality standards. Therefore, the site is deemed suitable from an air quality perspective.

XI. Public Participation Requirements

According to 9VAC5-80-1170 D.4, applications for new stationary sources or projects that have the

potential for public interest concerning air quality issues, as determined by the board, are subject to a public comment period of at least 30 days. At the end of the public comment period, a public hearing shall be held in accordance with 9VAC5-80-1170E.

The public notice will be advertised in the Farmville Herald on August 8, 2018. A public hearing will be held on September 11, 2018 at the Buckingham County Middle School. The public comment period concludes on September 11, 2018.

XII. Other Considerations

None

XIII. Recommendations

Recommend releasing the draft permit for public participation.

Attachments

None