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***Submitted via email*:**

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Chairman Richard D. Langford and Members of the Air Pollution Control Board
c/o Office of Regulatory Affairs
Department of Environmental Quality
P.O. Box 1105
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RE: Buckingham Compressor Station, Registration No. 21599

To Mr. Dowd, Chairman Langford, and Members of the Air Pollution Control Board:

The Southern Environmental Law Center offers the following comments on the draft air permit for the Atlantic Coast Pipeline, LLC's ("Atlantic") proposed Buckingham Compressor Station, Registration Number 21599 ("Draft Permit"). These comments are submitted on behalf of the Southern Environmental Law Center, Friends of Buckingham, Natural Resources Defense Council, Sierra Club, Shenandoah Riverkeeper, Potomac Riverkeeper, Shenandoah Valley Battlefields Foundation, Virginia Wilderness Committee, Augusta County Alliance, Shenandoah Valley Network, Highlanders for Responsible Development, the Chesapeake Climate Action Network, Wild Virginia, the Allegheny-Blue Ridge Alliance, and Defenders of Wildlife.

The proposed Buckingham Compressor Station is one of three that would provide compression of natural gas along the proposed 600-mile Atlantic Coast Pipeline ("ACP"), a project primarily owned by Dominion Energy and Duke Energy. The facility would be the only compressor station in Virginia and would be sited in a predominantly African-American community. The compressor station threatens to harm public health in that community and to violate the Clean Air Act. Because of significant errors in the Draft Permit, unanswered

questions about risks to human health, greenhouse gas pollution that threatens to undermine Virginia's proposed new carbon regulations, and unaddressed environmental justice concerns, these public-interest organizations respectfully request that the Virginia Department of Environmental Quality ("VDEQ") withdraw this Draft Permit, complete a thorough environmental justice and health assessment of the community that would be subject to the air pollution from this facility, and conduct additional analysis as described in more detail below. In the event that the Draft Permit is submitted to the Air Pollution Control Board, we ask that the Board reject approval of the Draft Permit.

This comment letter is in two parts and will address the following issues:

The Buckingham Compressor Station Would be a Major New Source of Greenhouse Gas Pollution and is Unsuitably Sited in an Environmental Justice Community:

- As a major source of greenhouse gas emissions, the Buckingham Compressor Station should be subject to greater scrutiny from VDEQ; and
- Pollution from the Buckingham Compressor Station threatens the health of the historic, predominantly African-American community of Union Hill and requires additional study, consistent with the recommendations of the Virginia Advisory Committee on Environmental Justice.

Technical Comments on Deficiencies in the Draft Permit:

- The best available control technology ("BACT") analysis relied on by VDEQ is inadequate because it failed to consider the "maximum degree" of Nitrogen Oxide emissions reduction;
- VDEQ did not consider electric motor compressor turbines in its BACT analysis;
- VDEQ should require continuous emission monitoring systems for Nitrogen Oxide emissions from the four compressor turbines;
- VDEQ should require BACT for fugitive emissions;
- The National Ambient Air Quality Standard (NAAQS) Modeling Analyses for the Buckingham Compressor Station contains significant flaws; and
- Atlantic has not adequately demonstrated that the Buckingham Compressor Station will not cause or contribute to any concentration that may exceed a significant ambient air concentration for air toxics

I. The Buckingham Compressor Station Would be a Major New Source of Greenhouse Gas Pollution and is Unsuitably Sited in an Environmental Justice Community.

A. ACP and Buckingham Compressor Station Would Be a Major New Source of Greenhouse Gas Emissions.

Before addressing particular technical concerns with the draft air pollution permit for the proposed Buckingham Compressor Station, the public-interest groups lodge their objections to the climate impacts that would be brought by the ACP and its compressor station in Virginia.

According to the Atlantic permit application[1], the facility-wide potential greenhouse gas ("GHG") emissions include 291,812 tons per year of carbon dioxide ("CO2"), 70.9 tons per year of methane (which is roughly 30 times more potent as a greenhouse gas than CO2[2]), and 7.05 tons per year of nitrous oxide (which is roughly 300 times more potent as a greenhouse gas than CO2[3]). Atlantic identifies the facility-wide potential CO2 equivalent emissions of the Buckingham Compress Station as 295,686 tons per year.[4] In comparison, a new major stationary source with a potential to emit greenhouse gas emissions in excess of 75,000 tons per year would be subject to major source permitting requirements under the prevention of significant deterioration ("PSD") permitting program if such source was also a major source for a regulated new source review pollutant that is not a greenhouse gas pollutant.[5]

Atlantic has indicated the Buckingham Compressor Station will have a potential to emit greenhouse gases of almost four times the PSD emissions threshold for subjecting a source to PSD requirements. Nevertheless, the projected greenhouse gas emissions from the Buckingham Compressor Station are not subject to *any* air permitting requirements because the facility is being permitted as a minor source for all non-greenhouse gas regulated new source review ("NSR") pollutants.[6] If the Buckingham Compressor Station was subject to relevant PSD requirements, these would include the application of best available control technology

[1] *See* May 25, 2018 New Source Permit Application for Buckingham Compressor Station at 17 (Table 3.9).

[2] *See* https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

[3] *Id.*

[4] Considering the downstream carbon-equivalent emissions of the ACP as a whole puts this issue in even starker relief. The Federal Energy Regulatory Commission estimated that the downstream carbon emissions from combusting the gas that will flow through the ACP to equal 29,028,450 tons per year of CO2-equivalent emissions.

[5] *See, e.g.*, 40 C.F.R. §52.21(b)(49)(iv)(a).

[6] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599 at 1, note 1, and at Section IV.B.

("BACT"). VDEQ needs to address this regulatory loophole that allows such new significant unregulated GHG pollution.

Given that the Commonwealth of Virginia has become a member of the Under2 Coalition, committing to support the Paris Climate Agreement's goal of keeping global warming below two degrees Celsius,[7] it is imperative that Virginia address how allowing the construction and operation of the Buckingham Compressor Station and its potential 295,686 tons of CO2 equivalent emissions per year is consistent with the Commonwealth's climate change commitments. Indeed, allowing an additional 295,686 tons per year of CO2 equivalent emissions with the Buckingham Compressor Station will frustrate the Commonwealth's proposed plans to reduce CO2 emissions from the electric sector. Specifically, Virginia recently released a draft regulation to impose statewide CO2 emission caps on the electric sector to reduce carbon emissions by 30% between 2020 and 2030.[8] While the Commonwealth has proposed a couple of different options, the draft plan would be to reduce CO2 emissions from the electric sector statewide by approximately one million tons per year.[9] Yet, concurrently, VDEQ is proposing to allow the construction and operation of the Buckingham Compressor Station, which would negate a little less than one-third (i.e., about 296,000 tons of CO2 emissions) of those planned CO2 emissions reductions per year. While we strongly support the Commonwealth's membership in the Under2 Coalition and its commitment to do its part to reduce climate-changing emissions from the electric sector, Virginia also needs to address other sources of climate changing emissions, especially a source like the Buckingham Compressor Station that will frustrate the state's attempt to reduce statewide CO2 emissions.

As part of its review of the Draft Permit, the Air Pollution Control Board shall consider "facts and circumstances relevant to the reasonableness of the activity involved…including…(2) [t]he social and economic value of the activity involved."[10] This statutory mandate includes not only a consideration of the GHG emissions from the Buckingham Compressor Station, but also the lack of demonstrated need for the ACP as a whole. This massive, $6.5 billion project is

[7] As discussed at https://www.climateweeknyc.org/virginia-becomes-latest-us-state-commit-action-climate-change.

[8] *Id.*

[9] As indicated in the declining base emission budgets of draft rule 9VAC5-140-6190, in the January 8, 2018 Virginia Register of Regulations available at http://register.dls.virginia.gov/details.aspx?id=6770.

[10] Va. Code Ann. § 10.1-1307(E).

owned by a conglomeration of energy companies, including Dominion Energy.[11] Affiliates of those same companies have contracts to purchase nearly all of the gas from the ACP, which, according to Atlantic's FERC filings, will be used to generate electricity for monopolized markets in Virginia and North Carolina.[12] At the end of the day, Dominion will seek to recover its costs, along with a 14% return on equity,[13] from its captive ratepayers in the Commonwealth.[14] Our Virginia members will be stuck with the bill even if this proves to be a stranded asset. Demand for electricity has been flat or declining for the last decade.[15] The need for more natural gas for power generation in this region is not expected to increase through 2030. The capacity of existing pipeline and storage infrastructure is more than sufficient to meet demand for natural gas through that time.[16] In the last several months, Dominion has announced that it does not plan to build any new gas-fired power plants.[17] At the same time, non-polluting efficiency measures and renewable energy technologies are increasingly proving capable to meeting our energy needs for less money than fossil-fuel resources.[18]

Our overarching concern regarding the lack of need for this project is relevant to the Draft Permit for the Buckingham Compressor Station and the decision of the Air Pollution Control Board. As noted above, the ACP and Buckingham compressor station will be a major

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[11] Robert Walton, *Atlantic Coast Pipeline Price Tag Could Teach $6.5B, Says Duke CEO*, Utility Dive (Aug. 22, 2018), https://www.utilitydive.com/news/atlantic-coast-pipeline-pricetag-could-reach-65b-says-duke-ceo/517661/.

[12] According to Atlantic's application, 79% of the pipeline's capacity will supply power plants. ACP Application for CPCN at 6-8, 12 (Sept. 18, 2015) (FERC eLibrary No. 20150918-5212).

[13] Atlantic Coast Pipeline, LLC, 161 FERC ¶ 61,042 at P 102-104 (Oct. 13, 2017).

[14] *Id.* at P 60. FERC authorizes Atlantic to recover a certain rate of return—the "recourse rate." Atlantic will then pass on the costs of that recourse rate to its shippers, who in turn pass on the cost to the end users. Because the end user is a regulated utility, the public utility's ratepayers bear the increases in gas prices attributable to the recourse rate. When, as here, the regulated utility's parent company also owns the pipeline, the utility has a vested interest in buying gas shipped on its pipeline, even if adequate, lower-cost gas is available from a pre-existing, and lower-cost, source. Thus, captive ratepayers are at risk of inflated prices from this massive project.

[15] *See* James F. Wilson, Wilson Energy Economics, *Evaluating Market Need for the Atlantic Coast Pipeline* (2017).

[16] *See* Rachel Wilson et al., Synapse Energy Economics, *Are the Atlantic Coast Pipeline and the Mountain Valley Pipeline Necessary? An Examination of the Need for Additional Pipeline Capacity into Virginia and the Carolinas* (2016), https://www.southernenvironment.org/uploads/words_docs/2016_09_12_Synapse_Report_-_Are_the_ACP_and_MVP_Necessary__FINAL.PDF.

[17] Alwyn Scott, *General Electric's power unit fights for growth as wind, solar gain* Reuters (May 24, 2018), https://www.reuters.com/article/us-ge-renewables/general-electrics-power-unit-fights-for-growth-as-wind-solar-gain-idUSKCN1IP0LE.

[18] *See* Matt Cox, Ph.D., Greenlink, *Clean Energy Has Arrived: Tapping Regional Resources to Avoid Locking In Higher Cost Natural Gas Alternatives in the Southeast* (April 2017).

new source of methane emissions—an extremely potent greenhouse gas—as well as on-site and downstream carbon emissions. These new sources of greenhouse gas pollution threaten to undermine Virginia's proposed new carbon regulations, which are designed to reduce Virginia's role in exacerbating climate change. Permitting this major new source of greenhouse gas emissions also runs counter to the Governor's commitment to the Paris Climate Accords. Given the concerns that the primary purpose of the ACP and its attendant Buckingham compressor station is to enrich shareholders of utility holding companies and that the project is not necessary for meeting the energy needs of the Commonwealth, the Board can conclude that there is little social or economic value in the proposed activity.

B. Pollution from the Buckingham Compressor Station Threatens the Health of the Predominantly African-American Surrounding Community and Requires Additional Scrutiny Regarding Site Suitability.

Atlantic has decided to place the sole Virginia compressor station—a 68-acre industrial facility—in the populated Union Hill community in Buckingham County. As set forth in more detail below, an exhaustive, rigorous, door-to-door study conducted by Friends of Buckingham of those who live within a 1.1-mile radius from the proposed gas-fired compressor station reveal that the harmful effects of the compressor station will be most felt in a predominantly African-American community. This community-based qualitative research study of 99 households encompassed the culturally cohesive community of Union Hill. The study design and methods included using National Institutes of Health (NIH) protocols for confidentiality. [19]

As required by law, VDEQ's engineering analysis included a section on "site suitability." This analysis is supposed to include an evaluation of the "suitability of the activity to the area in which it is located."[20] But VDEQ did not comply with the requirements of Virginia law to consider the suitability of placing this industrial source of pollution in the Union Hill

[19] The study was designed by a Lakshmi Fjord, Ph.D. The study included open-ended interview questions about: existing, diagnosed health conditions and numbers of household residents on weekdays or otherwise; the study also included questions about: race; age ranges (to protect anonymity of heath data); present uses of land, including whether it is used to grow food, raise domestic animals, or grow timber or other agricultural uses; family history in this place based on family burials in nearby cemeteries; and, slave and freedmen history based on location of unmarked slave burials; existing Freedmen-era home-places or foundation sites, if no longer standing. Study data as of September 4, 2018 includes 75 households that were reached over two years in three one-month long intensive periods. 67 of the respondents were able to cover the full list of questions.

[20] *Id.*

community. The disproportionate risk of harm faced by the predominantly African-American community that lives within a mile of the proposed compressor station has not been considered.

The survey conducted by Friends of Buckingham identified nearly 100 households in the 1.1-mile radius of the proposed compressor stations.[21] The 75 households surveyed to date are made up of 199 residents (with additional residents on weekends and for family gatherings, including reunions). Racial and ethnic minorities make up 83 percent of those residents, a far higher percentage than in the Commonwealth as a whole.[22] A significant number of respondents provided information about their health. Many elderly residents reported suffering from chronic respiratory ailments such as asthma, chronic obstructive pulmonary disease, bronchitis, allergies, and other unspecified heart and lung ailments. In addition, many of these residents report high blood pressure, heart disease, diabetes, and other ailments that would make them particularly susceptible to pollution and fugitive emissions from the compressor station. A number of children were reported to suffer from asthma and other chronic lung diseases as well.

Multiple studies have found that African Americans are more than twice as likely as white Americans to live near sources of harmful air pollution and have suffered disproportionate respiratory sickness as a result.[23] Putting the compressor station in this predominately African American community will further this legacy of concentrating environmental harms in poorer communities and communities of color.

A key step of Environmental Justice review includes identifying vulnerable populations who are at risk of disproportionate and cumulative harm from polluting facilities.[24] The high

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[21] Union Hill Community Household Study Results, Friends of Buckingham, Lakshmi Fjord, Ph.D., **included as Attachment 1.**

[22] United States Census, Virginia Quick Facts (nearly 70% of Virginians identify as white, in contrast to the 16.6% of survey respondents who identified as white), https://www.census.gov/quickfacts/va.

[23] Gamble, J.L., et al, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. Ch. 9: Populations of Concern, U.S. Global Change Research Program, Washington, DC (2016). http://dx.doi.org/10.7930/J0Q81B0T (citing Frumkin, *Urban sprawl and public health*. Public Health Reports, pp. 117, 201-217 (2002)); Robert Bullard, *et al*, *Toxic Wastes and Race at Twenty: Why Race Still Matters After all of These Years*, 38 Environmental Law 371, 379 (2007) (citing David Pace, *More Blacks Live with Pollution*, Associated Press (2005) (noting that most pollution inequities result from historical land use decisions that were based on racial segregation and the prevalence of regulators focusing on one plant or one pollutant without regard to the potential cumulative impact of multiple sources of pollutants).

[24] *See, e.g., Promising Practices for EJ Methodologies in NEPA Reviews: Report of the Federal Interagency Working Group on Environmental Justice & NEPA Committee*, Identifying Minority Populations, at 21 (Mar. 2016), https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

levels of diagnosed respiratory ailments and related health issues will make many in the Union Hill community especially susceptible to harm from increased air pollution and is one of the reasons why community members have specifically requested a health assessment before moving forward with the permitting process.

Pollution from the Buckingham facility could lead to adverse health effects to the surrounding population even under the limits set by the Draft Permit. In its Environmental Impact Statement for the ACP, the Federal Energy Regulatory Commission ("FERC") recognized the health risks from pollution from the ACP's compressor stations, which:

> include carbon monoxide (CO), carbon dioxide (CO_2), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM2.5). These air pollutants are known to increase the effects of asthma and may increase the risk of lung cancer….

When considering the health impacts associated with compressor station emissions, increased rates of lung cancer were identified associated with the compounds emitted by compressor station operations. Studies have shown that several different cancer-related compounds and chemicals are present in the air in proximity to construction and operation of compressor stations, and that some of these have documented health effects on the general and vulnerable populations.[25]

The studies cited by FERC found elevated concentrations of dangerous pollutants from samples collected near compressor stations. These include volatile organic compounds ("VOCs"), fine particulate matter, and gaseous radon. Some VOCs, such as benzene and formaldehyde, are carcinogens.

According to a recent report from Physicians for Social Responsibility, a "growing body of scientific evidence documents leaks of methane, toxic volatile organic compounds and particulate matter throughout [our country's natural gas] infrastructure. These substances affect [human] health." [26] People living near compressor stations suffer from a "range of symptoms

[25] Atlantic Coast Pipeline, Final Environmental Impact Statement, at 4-513 to 514.

[26] *Too Dirty Too Dangerous: Why Health Professionals Reject Natural Gas, Physicians for Social Responsibility* (Feb. 2017), http://www.psr.org/assets/pdfs/too-dirty-too-dangerous.pdf ["Too Dirty Too Dangerous"]. This report compiled new scientific studies that indicate additional potential pollution from natural gas infrastructure, including compressor stations.

ranging from skin rashes to gastrointestinal, respiratory, neurological and psychological problems."[27] Air samples collected around compressor stations have revealed elevated concentrations of many of the dangerous substances associated with gas extracted from hydraulic fracturing operations. These dangerous substances include "volatile organic compounds, particulate matter, and gaseous radon."[28] The federal Agency for Toxic Substances and Disease Registry examined air quality near a natural gas compressor station in Pennsylvania and discovered PM2.5 at dangerous levels.[29] Just last year, the NAACP, in cooperation with the Clean Air Task Force, released a report about the threats to the health of communities of color from oil and gas infrastructure, including the proposed Atlantic Coast Pipeline and compressor stations.[30]

The company's reported "annual potential to emit" in terms of tons of pollutants per year does not reflect the variability of emissions and thus, the potential for local residents to be exposed to elevated concentrations of dangerous pollutants. Emissions over short time periods can vary significantly day to day. Operating compressor stations have been observed to have such highly variable emissions, including large spikes of harmful VOC emissions.[31] One compressor station in Pennsylvania emitted dangerous amounts of ethylbenzene, butane, and benzene on some days and hardly detectable amounts on other days, resulting in averages that did not appropriately indicate the compressor station's threats to human health.[32]

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[27] *Id.* (citing Brown, Weinberger, & Weinberger, *Human exposure to unconventional natural gas development: A public health demonstration of periodic high exposure to chemical mixtures in ambient air*, Journal of Environmental Science and Health, Part A, 50:5, 460-472 (2015), https://www.ncbi.nlm.nih.gov/pubmed/25734822).

[28] New York State Department of Health (2014). A public health review of high volume hydraulic fracturing for shale gas development. http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf.

[29] *Id.* (citing Agency for Toxic Substances and Disease Registry, *Health Consultation: Exposure Investigation, Natural Gas Ambient Air Quality Monitoring Initiative Brigich Compressor Station, Chartiers Township, Washington County, Pennsylvania* (Jan. 29, 2016); Agency for Toxic Substances and Disease Registry, *Health Consultation: Brooklyn Township PM2.5, Brooklyn Township, Susquehanna County, Pennsylvania. U.S.* Department of Health and Human Services, Atlanta, GA. (April 22, 2016).

[30] Lesley Fleischman (Clean Air Task Force) & Marcus Franklin (NAACP), *Fumes Across the Fence-Line: The Health Impacts of Air Pollution from Oil & Gas Facilities on African American Communities*, p. 7 (Nov. 2017), http://www.naacp.org/wp-content/uploads/2017/11/Fumes-Across-the-Fence-Line_NAACP_CATF.pdf.

[31] Southeast Pennsylvania Health Project, *Summary on Compressor Stations and Health Impacts* (Feb. 24, 2015), http://www.environmentalhealthproject.org/files/Summary%20Compressor-station-emissions-and-health-impacts-02.24.2015.pdf.

[32] *Id.* at 2.

Communities that are nearby or downwind from compressor stations likely suffer from elevated exposure to methane and related pollutants. This was the conclusion of a recently published analysis of methane emissions from compressor stations in New York and Pennsylvania, which found highly elevated levels of methane coming from those facilities.[33] In one example, the study authors found:

> This data indicates that the areas downwind of compressor stations …will be exposed to methane plumes, and any other co-emitted pollutants released by compressor stations. Residents and properties downwind under prevailing wind conditions will likely be subjected to a disproportionate burden of contaminants from compressor stations, especially those closer to the station under light prevailing wind conditions.[34]

The Air Board should also consider that, even if the new emissions of pollutants such as fine particulate matter (PM2.5) and other ozone-producing pollutants, such as Nitrogen Dioxide, are within NAAQS guidelines, there is no scientifically accepted safe level of exposure for this pollution. In addition, the increases over the background levels are significant. For example, the permitted annual increase in PM2.5 pollution from the Buckingham Compressor Station over the background level is 44 percent.[35] The resulting increased pollution approaches the World Health Organization's threshold of 25 μg/m3 in a twenty-four hour period.[36] At these levels, long-term exposure can cause an increase in mortality and increased serious health problems, such as respiratory ailments and cardiovascular disease.[37] Even short-term exposure can cause health problems, particularly in sensitive populations like those with respiratory problems or heart disease—like many of those who live near the proposed compressor station.[38]

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[33] Bryce Payne, Jr., et al, *Characterization of methane plumes downwind of natural gas compressor stations in Pennsylvania and New York*, Science of the Total Environment, Vol. 580, pp. 1214–1221 (Feb. 2017).

[34] *Id.*

[35] *see* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 12.

[36] World Health Organization, Fact sheet: Ambient (outdoor) air quality and health (Sept. 2016), http://www.who.int/mediacentre/factsheets/fs313/en/ ("WHO Fact Sheet") ("There is a close, quantitative relationship between exposure to high concentrations of small particulates (PM_{10} and $PM_{2.5}$) and increased mortality or morbidity, both daily and over time").

[37] Frank J. Kelly and Julia C. Fussell, *Air Pollution and Public Health: Emerging Hazards and Improved Understanding of Risk*, Environ Geochem Health, Vol. 37(4) 631–649 (2015), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4516868/.

[38] *Id.*

Fine particles also cause health problems such as heart attacks, aggravated asthma, decreased lung function, and irregular heartbeats.[39] Exposure to fine particle concentrations as low as ten micrograms per cubic meter ($\mu g/m^3$)—which is lower than the current federal standard—is associated with a two percent increase in premature deaths for exposures as brief as two days, and a seven to nine percent increase in the long term.[40] Decreases in fine particle concentrations add months, if not years, onto people's lives.[41]

There is no evidence of a safe level of exposure for either ozone or fine particulate matter, and both have health effects even below the current National Ambient Air Quality Standards (NAAQS).[42] In response to evidence of health problems caused by these pollutants at lower and lower levels, EPA has repeatedly strengthened both the fine-particle and ozone NAAQS in recent years.[43]

As the Air Board considers the site suitability and environmental justice issues set forth in more detail below, it should consider the significant overall increases to local air pollution from this facility.

1. Virginia Advisory Committee on Environmental Justice Calls for Suspending Permit.

In 2017, the Governor of Virginia issued Executive Order Number 73, establishing an Advisory Committee on Environmental Justice.[44] This order sought to ensure that "no segment

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[39] *See generally* EPA, *Particulate Matter (PM) Health*, https://www3.epa.gov/pm/health.html.

[40] Liuhua Shi et al., *Low-Concentration $PM_{2.5}$ and Mortality: Estimating Acute and Chronic Effects in a Population-Based Study*, Envtl. Health Persp. (Jan. 2016), http://ehp.niehs.nih.gov/1409111/.

[41] *See* C. Arden Pope III et al., *Fine-Particulate Air Pollution and Life Expectancy in the United States*, 360(4) New Eng. J. Med. 2009 376, 382–84 (Jan. 22, 2009), http://www.nejm.org/doi/pdf/10.1056/NEJMsa0805646.

[42] *See Am. Trucking Ass'ns., Inc. v. EPA*, 283 F.3d 355, 360 (D.C. Cir. 2002) (internal quotation marks and alterations omitted) (recognizing the "lack of a threshold concentration below which [particulate matter and ozone] are known to be harmless."); EPA, *NAAQS for Particulate Matter*, 78 Fed. Reg. 3086, 3098 (Jan. 15, 2013) (explaining that there is "no population threshold, below which it can be concluded with confidence that $PM_{2.5}$ related effects do not occur").

[43] *See* National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086, 3088 (Jan. 15, 2013); National Ambient Air Quality Standards for Ozone, 80 Fed. Reg. 65,291, 65,292 (Oct. 26, 2015) https://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf; Environmental Protection Agency, *NAAQS Table*, https://www.epa.gov/criteria-air-pollutants/naaqs-table#3.

[44] Commonwealth of Virginia, Office of the Governor, Executive Order 73, Establishment of an Advisory Council on Environmental Justice (Oct. 31, 2017), https://www.naturalresources.virginia.gov/media/governorvirginiagov/secretary-of-natural-resources/pdf/eo-73-establishment-of-an-advisory-council-on-environmental-justice.pdf.

of the population, especially individuals most impacted and vulnerable," would "bear disproportionately high or adverse effects from pollution." To that end, the Governor sought the help of the Advisory Council to incorporate environmental justice into Executive Branch agency decision-making. The Governor noted that "some state agencies incorporate environmental justice into their review process," but that there is no consistency in how these issues are considered. It appears that DEQ has not yet instituted a consistent method for incorporating environmental justice issues in its permitting process.

The Advisory Committee on Environmental Justice has itself, however, examined the concerns surrounding the ACP and proposed compressor station in the Union Hill community.[45] Following its review, the Advisory Committee called on the Governor to request that DEQ "suspend the permitting decision for the air permit for the Buckingham compressor station pending further review of the station's impacts on the heath and the lives of those living in close proximity."[46] The Advisory Committee considered many independent and mutually reinforcing concerns with siting the compressor station in the Union Hill community, for example concerns with: (1) the use and abuse of eminent domain to take private property for a project that is not in the public interest along with the threats to property values of surrounding properties; (2) the significant levels of harmful pollution that will be emitted by the compressor station and the disproportionate impact of that pollution on a predominantly (roughly 85%) African-American community; (3) disturbing cultural and archeological sites of importance to Native-American tribes and African-American communities; (4) the inadequate 401 Clean Water Act certification for the many stream and wetland crossings; and (5) the significant climate impacts from the compressor station and the ACP generally, particularly in light of the failure by ACP-Dominion to demonstrate market need for the project.

The Advisory Committee noted that "decisions for infrastructure with significant social and ecological risks, like compressor stations, should not be made hastily, particularly in places

[45] *See Environmental Justice Review of Virginia's Gas Infrastructure*, Memo to Governor Northam (Aug. 16, 2018), **included as Attachment 2.**

[46] *Id.* at 2.

like Union Hill where the everyday experiences of residents are shaped by historical experience of racial injustice for a population whose ancestry is rooted in slavery."[47]

The Advisory Committee's recommendations are consistent with the public policy of Virginia. Virginia law requires that the Commonwealth develop "energy resources and facilities in a manner that does not impose a disproportionate adverse impact on economically disadvantaged or minority communities."[48] No Virginia agency has, to our knowledge, yet applied this standard to the ACP's proposed, new energy infrastructure.

VDEQ and the Air Pollution Control Board should consider the Advisory Committee's recommendations in light of the obligation to consider site suitability.

2. Unlawful Zoning Determination by Buckingham Board of Supervisors

As an additional part of its site suitability analysis, VDEQ noted that the Buckingham County Board of Supervisors approved a Special Use Permit for the compressor station and concluded that the "ACP must operate in compliance with the County's approval as well as any other ordinances or regulations related to land use."[49] VDEQ failed to note, however, that the Board of Supervisors' zoning decision is the subject of ongoing litigation.[50] The land where Atlantic plans to build the Buckingham Compressor Station is zoned A-1 Agricultural. Many in the community continue to use their land for agricultural purposes, such as farming, orchards, and livestock. Pollution from the compressor station is not compatible with those activities and is not suitable to the area where it would be located.[51] Union Hill's unbroken history as an agricultural district is threatened by the proposed compressor station.

A-1 Agricultural Zones were established "for the purpose of preserving and promoting rural land uses."[52] The A-1 district of the Buckingham County Zoning Ordinance is an inclusive zoning district, which means that the Ordinance only permits land uses that are "specifically

[47] *Id.* at 5.

[48] Va. Code Ann. § 67-101(12).

[49] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 13.

[50] *See, e.g.*, Arostegui v. Buckingham County Board of Supervisors, CL17000015-00 (Feb. 2, 2017); a companion case challenging the zoning determination was filed in the Supreme Court of Virginia in the summer of 2018. *Blue Ridge Environmental Defense League et al v. Buckingham County Board of Supervisors*, Supreme Court of Virginia SCV No. 180933 (2018).

[51] Va. Code Ann. § 10.1-1307(E).

[52] Buckingham County Zoning Ordinance at 9.

named."[53] Land uses that are not listed are not permitted even with a special use permit. The Buckingham Board of Supervisors established the M-2 Heavy Industrial District for industrial uses, including gas distribution facilities (which require a special use permit).[54] Under the A-1 Agricultural designation, industrial facilities like the compressor station are completely prohibited. As challenged by many local residents, the Board of Supervisors erred when they used a "public utility" exception for the compressor station, which is not a utility as defined by applicable law.[55] Atlantic itself indicated that the Compressor Station is a non-utility facility.[56]

VDEQ therefore erred when it concluded that the compressor station can be located at its proposed location in compliance with existing local ordinances related to land use. The Air Board should, at a minimum, postpone any action until litigation is complete for purposes of determining site suitability in relation to local zoning requirements.

3. Union Hill is More Densely Populated than the County Average.

As part of its site suitability analysis, VDEQ determined that the area around the proposed Buckingham Compressor Station is "sparsely populated" and primarily surrounded by forests.[57] This conclusion is not consistent with the denser than average Union Hill community that inhabits the area within a one-mile radius of the site. To reach this flawed conclusion, it appears that VDEQ relied on Atlantic's use of countywide population density data of 29.6 people per square mile.[58] But this county-level population density data does not reflect the actual characteristics of the neighboring community. As noted above, Friends of Buckingham has identified nearly 100 households in the 1.1 mile radius of the proposed compressor stations. The 75 households surveyed to date are made up of 199 residents.

As seen in Figure 1 below, there are significant clusters of households in the area surrounding the proposed compressor station:

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[53] *See Board of Supervisors of Madison County v. Gajjhey,* 244 Va. 545, 550, 422 S.E. 2d 760, 763 (1992).

[54] Buckingham County Zoning Ordinance at 35.

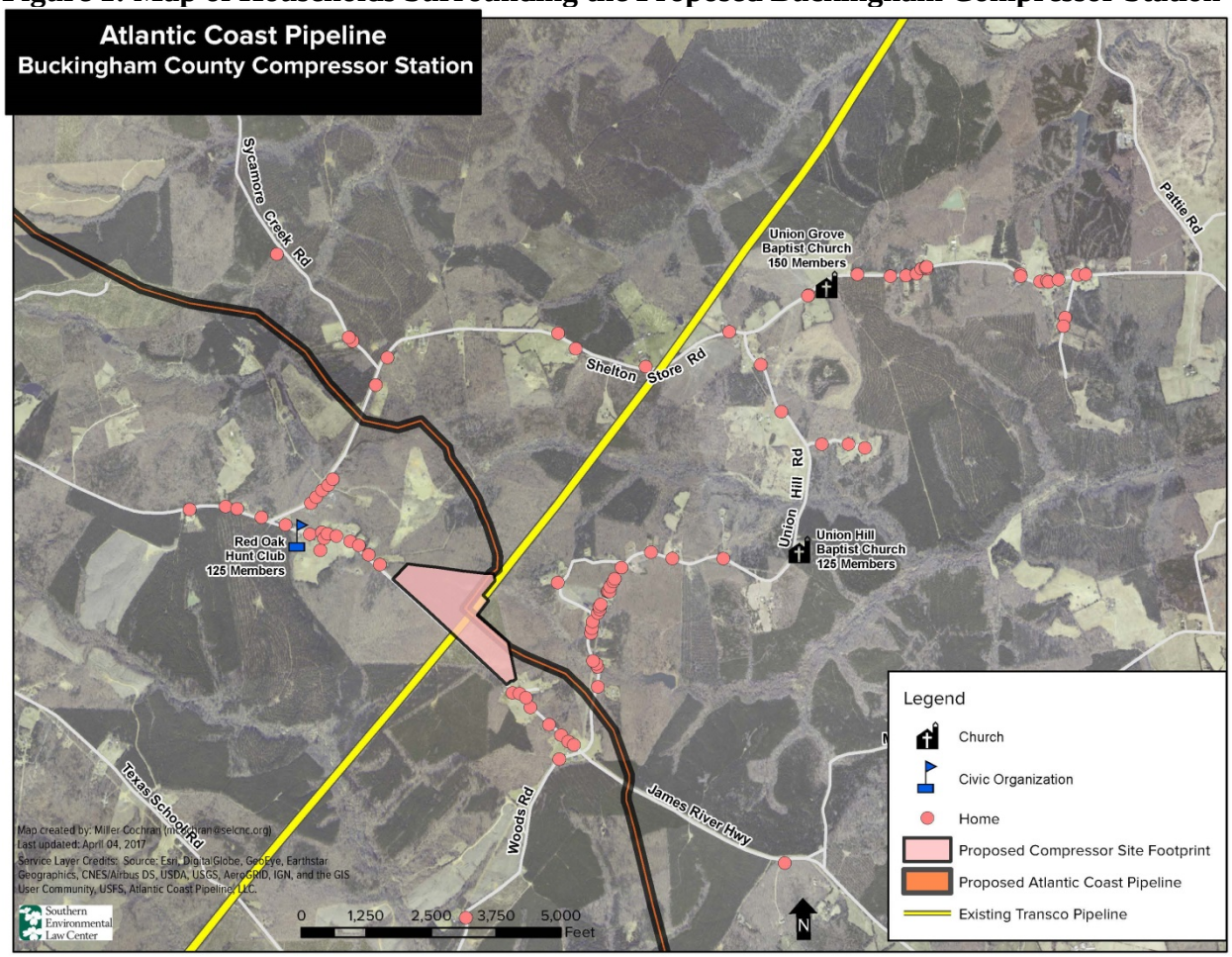
[55] VA Code § 56-265.1

[56] Updated Permit Application at p. 23 (May 25, 2018).

[57] *see* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 13

[58] Final Environmental Impact Statement for the Atlantic Coast Pipeline and Supply Header Project under FERC Docket No. CP-15-554 et al. (July 21, 2017) (eLibrary No. 20170721-4000) at p. 4-485.

Figure 1: Map of Households Surrounding the Proposed Buckingham Compressor Station



This disparity is significant, and the large number of households that in fact lie close to the proposed compressor station contradict VDEQ's site suitability conclusion that the area around the Buckingham compressor station is primarily surrounded by forests and sparsely populated. The Air Board must independently consider the unsuitability of this proposed location for a new source of industrial air pollution.

4. Endangered Historic Place

Preservation Virginia listed the Union Hill community as a "Most Endangered Historic Place" in May 2016.[59] Many of the African American members of this community trace their heritage back to the Freedmen who settled this area following emancipation after the Civil War. Preservation Virginia noted the importance of "[p]ost-Emancipation African American

[59] Preservation Virginia, *2016 Virginia's Most Endangered Historic Places* (May 2016), https://preservationvirginia.org/press_release/2016-virginias-most-endangered-historic-places/.

settlements and burial sites, like those at Union Hill in Buckingham County," which "reveal the successes and struggles of generations of African Americans in Virginia."[60] Many of the landowners in closest proximity to the proposed compressor station are descendants of people enslaved here, where once the number of slaves was twice that of whites. The compressor station itself is slated to be built on the property of a former plantation called Variety Shade.[61]

The communities built by freed slaves before and after Emancipation and during Reconstruction, post-Reconstruction, and the era of Jim Crow segregation that followed contain important cultural resources. Racial segregation and discrimination have resulted in the undervaluing of these historic communities throughout the south. Loss of buildings on the ground by fire, discriminatory historic recording practices, and loss of burial sites and cemeteries by development all contribute to the need to protect and preserve what remains of communities that were founded by Freedmen following the Civil War. In the case of Union Hill, its unbroken history as an agricultural district is particularly threatened by Atlantic's proposed compressor station.

Historic structures established following Emancipation by African-Americans in the Union Hill area include Union Hill Church, Union Grove Church, Shelton's Store, numerous houses, and many mapped and unmapped cemeteries. All of these are located on previous plantation lands. Three African American churches are located within the proposed historic district: Saint Joy Baptist Church, Union Hill Baptist Church, and Union Grove Baptist Church. Union Hill and Union Grove have congregations that date to 19th century. Mulberry Grove Baptist Church, a white church organized in 1786, served African-American members and is the second-oldest surviving church in Buckingham County. Union Hill Baptist was established in 1868 after Freedmen separated from Mulberry Grove. At least twenty-one slave, or African-

[60] *Id.*

[61] Union Hill/Wood's Corner Rural Historic District: Most Endangered Historic Place in Virginia Application (filed Feb. 16, 2016), prepared by Lakshmi Fjord, Ph.D. Previous historic research of this community for the application to Preservation Virginia for Most Endangered Historic Place in Virginia" listing in 2016 included locating existing family deeds post-1869 after the Buckingham Courthouse was burned, destroying records of enslavement; plantation family blogs; newspaper articles of the time; plantation family documents in the University of Virginia Special Collections; and self-published histories by Charles White, Sr., *The Hidden and Forgotten: Contributions of Buckingham Blacks to American History* (1985) and *The Courthouse Burned*, Vol I, Margaret Pennington and Lorna S. Schott, McClung Publishers (1977).

American, cemeteries are located within the proposed district boundaries.[62] Community members have voiced concerns that additional unmarked grave sites may be in the path of the ACP or the compressor station in Buckingham County. Caesar Perkins, a formerly enslaved man who became a member of Virginia's General Assembly, lived in the district boundaries, and some of his descendants remain in the Union Hill area.[63]

VDEQ and the Air Pollution Control Board should not follow the mistakes made by the Federal Energy Regulatory Commission ("FERC") when it ignored the historical and cultural significance of the cohesive Union Hill community. When FERC completed its draft environmental impact statement ("draft EIS") for the ACP, it ignored the Union Hill community. FERC's failure to see Union Hill was in stark contrast to the consideration given to the Norwood-Wingina Rural Historic District—a predominantly white area in neighboring Nelson County. Following concerns raised by that community, Atlantic planned alternative pipeline routes to steer away from that historic district. The draft EIS notes that, following comments, Atlantic "incorporated a route modification that would avoid the Norwood-Wingina Rural Historic District" so that there would be no effects on cultural resources in the district.[64] The Commission considered other alternatives to avoid any additional impact on the district.[65] The census tract (Nelson County, CT 9501) where the Norwood-Wingina Rural Historic District is located is less racially diverse than the Commonwealth as a whole.[66]

In contrast, when summarizing comments received about impacts on historic districts and related cultural resources, the draft EIS makes no mention of the Union Hill community.[67] When considering an alternative location for the compressor station, one that would have been about 2 miles away from the center of the Union Hill community, FERC only considered how the alternative site would affect the other neighboring historic districts, making no mention of the

[62] *Id.*

[63] *Id.*

[64] Draft Environmental Impact Statement for the Atlantic Coast Pipeline Project and Supply Header Project under FERC Docket No. CP15-554 et al. (Dec. 30, 2016) (eLibrary No. 20161230-4000) at 4-425 ("DEIS")

[65] Final Environmental Impact Statement for the Atlantic Coast Pipeline and Supply Header Project under FERC Docket No. CP-15-554 et al. (July 21, 2017) (eLibrary No. 20170721-4000) at 3-26 ("Final EIS").

[66] This census tract is approximately 80 percent white, and only about 18.5 percent African American. U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates, Data Set S1701, https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.

[67] DEIS at 5-21, 4-425.

Union Hill community.[68] The Commission's conclusion that the Buckingham "compressor station is located near previously developed residential and commercial areas and is consistent with the existing visual conditions in the area" is not accurate.[69] Nor is the summary dismissal of the concerns from the Union Hill community in the final environmental impact statement adequate to cover the site suitability concerns raised here.[70]

This industrial facility is proposed for a largely residential, predominantly African American, historic, and agricultural community that is ill-suited to a polluting compressor station. The Air Board should consider these relevant factors when making its independent site suitability assessment and deny the permit.

II. Technical Comments on Deficiencies in the Draft Permit

The following technical comments were prepared by Vicki Stamper[71] and pertain to the Virginia Department of Environmental Quality's (VDEQ's) proposed permit for Atlantic's proposed Buckingham Compressor Station, Registration Number 21599.

The Buckingham Compressor Station is proposed to consist of four gas-fired Solar compressor turbines (emission unit IDs CT-01, CT-02, CT-03, and CT-04), a Hurts S45 Boiler (WH-01), four ETI WB line heaters (LH-01, LH-02, LH-03, and LH-04), one Caterpillar emergency generator (EG-01), one accumulator tank (TK-1), one pipeline fluids tank (TK-2), one aqueous ammonia storage tank (TK-3), and various operational natural releases associated with station components (FUG-01) and piping fugitive emissions (FUG-01).[72] VDEQ describes the operation of the compressor station as follows:

> 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)

[68] Final EIS at 3-58.

[69] DEIS at 4-341.

[70] Final EIS at 4-538.

[71] Resume of Vicki Stamper, **included as Attachment 3.**

[72] *Id.* at 5.

> 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.[73]

Pursuant to Virginia's regulations for new and modified stationary sources, new stationary sources must apply best available control technology (BACT) for each regulated pollutant for which uncontrolled emissions would equal or exceed the emission thresholds listed in 9VAC5-80-1105 C.[74] The proposed Buckingham Compressor Station is subject to a determination of BACT for nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (both PM10 and PM2.5).[75]

In addition, Virginia regulations for toxic pollutants from new and modified sources provide that, if a stationary source is not exempt under 9VAC5-60-300 C, D, or E, then it is subject to Virginia's air toxic new source review requirements in 9VAC5-60-320. Those requirements include a provision that no owner of a new source shall cause or contribute to any significant ambient air concentration that may cause or contribute to the endangerment of human health and that the new source shall employ BACT for the control of toxic pollutants.[76] VDEQ has found that the Buckingham Compressor Station will emit formaldehyde and hexane at levels in excess of the exemption thresholds in 9VAC5-60-300.[77]

Below, we provide comments on the VDEQ's proposed BACT determinations for certain pollutants to be emitted by the Solar combustion turbines and on the air modeling analyses.

A. The NO_x Limits for the Solar Compressor Turbines at the Proposed Buckingham Compressor Station Are Not Reflective of BACT.

The Draft Permit is inadequate because neither DEQ nor Atlantic have evaluated, as required by BACT, the "maximum degree" of NO_x emission reduction from the turbines that can be achieved with the proposed NO_x BACT controls. Atlantic has proposed to equip each of the four Solar compressor turbines with a dry low-NO_x combustion system ($SoLoNO_x$) and selective

[73] VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 4.

[74] *See* 9VAC5-50-260 B.

[75] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 9.

[76] 9VAC5-60-320 1. and 2.

[77] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 6.

catalytic reduction (SCR) to control NO_x.[78] Although the company initially proposed a NO_x BACT limit of 5.0 parts per million ("ppm"), VDEQ has proposed a limit of 3.75 ppm based on a Draft Permit for a compressor station in Baltimore County, Maryland.[79] VDEQ proposed a NO_x emission limit of 3.75 ppm at 15 percent oxygen ("@15%O_2") applicable on a three-hour average basis, but not applicable during periods of startup, shutdown, or when ambient temperatures are below zero degrees Fahrenheit.[80]

The proposed emission limit and associated permit conditions do not satisfy BACT for the compressor turbines to be installed at the Buckingham Compressor Station. BACT is defined in Virginia regulations to require an emissions limitation "based on the *maximum degree* of emission reduction for any pollutant which would be emitted from a new stationary source …which the board, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable…through the application of production processes or available methods, systems and techniques…for control of such pollutant."[81] The BACT standard cannot allow emissions of any pollutant that would exceed limits otherwise imposed by law.[82] In conducting a BACT analysis, "consideration shall be given to the nature and amount of the emissions, emission control efficiencies achieved in the industry for the source type, total cost effectiveness, and where appropriate, the cost effectiveness of the incremental emissions reduction achieved between control alternatives."[83]

Neither Atlantic nor VDEQ have evaluated the "maximum degree" of NO_x emission reduction from the Solar turbines that can be achieved with the proposed NO_x BACT controls of SoLoNO_x and SCR. As acknowledged by the company, the proposed NO_x BACT limit of 3.75

[78] *Id.*

[79] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 9.

[80] Draft Permit for Buckingham Compressor Station, Conditions 20, 21, 22 and 23.

[81] *See* 9VAC5-50-250 A (emphasis supplied).

[82] *Id.* (citing to Article 5 (9VAC5-50-400 et seq.) of this part or Article 1 (9VAC5-60-60 et seq.) or Article 2 (9VAC5-60-90 et seq.) of Part II of 9VAC5-60 (Hazardous Air Pollutant Sources).

[83] *Id*.

parts per million by volume, dry[84] ("ppmvd") @15%O_2 reflects only a 58 percent reduction of NO_x from the 9 ppmvd @15% O2 pre-control NO_x emission rate of the combustion turbines.[85]

Atlantic appropriately determined that SCR systems were technically feasible for its compressor turbines given that SCR systems have been installed on other simple-cycle combustion turbines.[86] Though Atlantic did not conclude that an SCR system would be a cost-effective way of meeting BACT requirements, the company nonetheless proposed to install SCR along with SoLoNO$_x$ at the compressor turbines.[87] VDEQ found that SCR has been proposed at two other compressor stations, and therefore, VDEQ proposed to require SCR along with SoLoNO$_x$ at the four gas-fired compressor engines to meet BACT.[88]

SoLoNO$_x$ along with SCR are justified to meet BACT for NO_x, but neither Atlantic nor VDEQ evaluated the "maximum degree" of NO_x emission reduction that could be achieved with SCR at the Buckingham compressor turbines. SCR can achieve very high levels of NO_x reduction, generally much higher than the 58 percent NOx control assumed by VDEQ and Atlantic. There are numerous examples of SCR being required as BACT or as a way to meet lowest achievable emission rate ("LAER") at simple-cycle turbines to achieve a NO_x emission limit in the range of 2.0 to 2.5 ppm, which for the Buckingham compressor turbines would reflect about 72-78 percent NOx control across the SCR systems.

BASF makes several SCR catalysts that it claims can achieve up to 97 percent NO_x reduction.[89] The NO_xCat ETZ catalyst is specifically designed for simple-cycle power generating turbines and other high temperature turbine applications.[90] The NO_xCat VNX and ZNX catalysts can achieve up to 99 percent NO_x reduction and are most effective at a

[84] It is assumed that the limits proposed by the VDEQ would apply on a parts per million by volume, dry basis (ppmvd), and if so, VDEQ should so indicate.

[85] May 25, 2018 Minor New Source Review Permit Application for Buckingham Compressor Station at 8.

[86] *Id.* at 38.

[87] *Id.* at 39-40.

[88] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 9.

[89] *See* BASF, SCR Catalysts for Power Generation, at http://www.basf-qtech.com/p02/USWeb-Internet/catalysts/en/content/microsites/catalysts/prods-inds/stationary-emissions/scr-cat-pow-gen.

[90] *See* BASF, NO_xCat ETZ, available at http://www.basf-qtech.com/p02/USWeb-Internet/catalysts/en/content/microsites/catalysts/prods-inds/stationary-emissions/nOx-Cat-_ETZ.

temperature range of 550 to 800 degrees Fahrenheit.[91] A related catalyst called NO_xCat VNX-HT is designed for use in aero derivative simple-cycle turbines that can achieve 99 percent NO_x removal and can reach optimal performance at 800 to 850 degrees Fahrenheit.[92] Based on the stack parameter data provided by Atlantic for the Buckingham compressor turbines, it appears that the units will operate at a lower temperature range, with stack exit temperatures ranging from 700 to 760 degrees Fahrenheit.[93] This is still well within the operating range of the NO_xCat VNX and ZNX catalysts.

SCR systems have been required to be installed to meet BACT and LAER at several gas-fired simple-cycle turbines. For example, in a permit analysis for the Mariposa Energy Project to be located in Alameda County, California, the Bay Area Air Quality Management District (BAAQMD) provided numerous examples of simple-cycle gas turbines permitted in the District with one-hour average NO_x limits of 2.5 ppmvd @15%O_2 and required the new simple-cycle gas turbines to meet a NO_x BACT limit of 2.5 ppmvd.[94] These BACT determinations can also be found in the California Air Resources Board (CARB) BACT Clearinghouse.[95] Those example simple-cycle turbine NO_x limits with SCR are given in Table 1 below.

[91] *See* BASF, NO_xCat VNX & ZNX for Power Generation, available at http://www.basf-qtech.com/p02/USWeb-Internet/catalysts/en/content/microsites/catalysts/prods-inds/stationary-emissions/nox-cat-VNX-ZNX-pow-gen.

[92] *Id.*

[93] *See* July 10, 2018 Air Quality Modeling Report, Appendix D, Table D-2.

[94] *See* Bay Area Air Quality Management District, Preliminary Determination of Compliance, Mariposa Energy Project, August 2010, at 38-39, http://www.energy.ca.gov/sitingcases/mariposa/documents/others/2010-08-18_Preliminary_Determination_of_Compliance.pdf, **included as Attachment 4.**

[95] https://www.arb.ca.gov/bact/bactnew/rptpara.htm.

Table 1. Examples of Simple-Cycle Turbines in California with NO_x Limits with SCR of 2.5 ppmvd@15%O2[96]

Facility	**NO_x Limit Averaging Time**
Panoche Energy Center	1-hour avg
Walnut Creek Energy Park	1-hour avg
Sun Valley Energy Project	1-hour avg
CPV Sentinal Energy Project	1-hour avg
Lambie Energy Center	1-hour avg
Riverview Energy Center	1-hour avg
Wolfskill Energy Center	1-hour avg
Goosehaven Energy Center	1-hour avg

Further, a review of the EPA's RACT (Reasonably Available Control Technology)/BACT/LAER Clearinghouse shows numerous other simple-cycle combustion turbines with NO_x BACT limits of 2.5 ppmvd, as shown in the table below.

[96] *Id.* at 38.

Table 2. Examples of Simple-Cycle Turbines in EPA's RACT/BACT/LAER Clearinghouse with NO_x Limits with SCR of 2.5 ppmvd @15%O_2

Facility	RBLC ID Number[97]	NO_x Limit Averaging Time
Bayonne Energy Center LLC	NJ-0086	three-hour avg
Troutdale Energy Center	OR-0050	three-hour avg
Vineland Municipal Electric Utility	NJ-0077	three-hour avg
Bayonne Energy Center LLC	NJ-0075	Not given
PSEG Fossil LLC Kearny Generating Station	NJ-0076	three-hour rolling avg
El Cajon Energy LLC	CA-1174	one-hour avg
Orange Grove Project	CA-1176	one-hour avg
Escondido Energy Center LLC	CA-1175	one-hour avg

A 2.5 ppmvd @15%O_2 NO_x BACT limit for the Buckingham compressor engines reflects 72.2% NO_x control from the 9 ppmvd NOx rate that will be achieved with the SoLoNO_x controls, and 72.2 percent NO_x control should be readily achievable with the SCR systems to be installed at the Buckingham compressor turbines.

The fact that NO_x limits of 2.5 ppmvd to be achieved with SCR have been required on numerous simple-cycle turbines means that numerous permitting agencies have considered SCR systems achieving that level of control to be cost effective to require as BACT for simple-cycle turbines. Given that the Solar turbines to be installed at the Buckingham Compressor Station are simple-cycle turbines that will likely be operated similar to or even more frequently than simple-cycle power turbines (which typically operate as peaking generators), it is very reasonable to consider the Solar turbines to be installed at the Buckingham Compressor Station to be a similar source category to the simple-cycle power turbines listed in Tables 1 and 2 above. Further, as noted by VDEQ, SCR has been required in air permits for two other compressor stations associated with ACP. Based on the numerous permitted simple-cycle turbines subject to NO_x

[97] The specific information on these RBLC entries can be found by searching on the RBLC ID number at https://cfpub.epa.gov/rblc/index.cfm?action=Search.SearchByRBLCIdentifier.

limits with SCR of 2.5 ppmvd, the Solar turbines to be installed at Buckingham Compressor Station should be able to meet the same level of NO_x control as has been required as BACT for these other simple-cycle turbines.

For all of the reasons discussed above, NO_x BACT for the four compressor turbines at the Buckingham Compressor Station should be a lower NO_x limit of 2.5 ppmvd @15%O2, based on $SoLoNO_x$ and SCR controls. Further, VDEQ must consider adoption of a one-hour averaging time, rather than a three-hour averaging time, for the NO_x BACT emission limit, given the numerous BACT decisions for simple cycle turbines listed in Tables 1 and 2 above of 2.5 ppmvd @15%O_2 that apply on a one-hour averaging time. A one-hour averaging time is more stringent than a three-hour averaging time and such an averaging time will ensure protection of the short term Nitrogen Dioxide NO_2 NAAQS which applies on a one-hour average basis.

VDEQ has not established any limits on ammonia slip with the SCRs to be installed at the 4 Buckingham compressor turbines. An SCR system injects ammonia into the gas stream, which reacts with NO_x in the presence of the SCR catalyst to remove NO_x from the exhaust gases. However, some the added ammonia will not react with the NO_x and will "slip" out with the gas stream. Ammonia slip can then react with nitric acid to form fine particulate matter. A 5.0 ppmvd @15%O_2 ammonia limit has been required as an appropriate ammonia slip level for SCR systems at simple cycle gas turbines, and should be required in the permit for the Buckingham compressor turbines to ensure ammonia slip and secondary fine particulate matter is minimized.[98]

Because the NO_x BACT for the four compressor turbines at the Buckingham Compressor Station should be a lower NO_x limit of 2.5 ppmvd @15%O2, rather than the 3.75 ppmvd proposed in the Draft Permit, the Board should remand the proposed permit to DEQ for reconsideration of NO_x BACT emission limits.

[98] *See, e.g.*, Bay Area Air Quality Management District, Preliminary Determination of Compliance, Mariposa Energy Project, *supra* n.94, at 88.

B. VDEQ Should Evaluate Electric Compressor Turbines as BACT for All Air Pollutants.

VDEQ's BACT analysis is incomplete because it did not consider the non-emissions alternative of using electric-motor driven compressors instead of gas-fired turbines. Electric motors as prime movers for compressor stations have been recognized as a more efficient and cleaner—with zero emissions at the point of use—alternative to gas turbines.[99] Electric motors have been found to be a feasible alternative, given that they are "more reliable and more efficient as stand-alone pieces of equipment than either gas engines or gas turbines….[and] are able to ramp up more rapidly than gas-driven prime movers."[100] Though gas turbines have typically been used, "environmental (mainly air quality) concerns are causing electric motors to become more prevalent."[101] Though a final analysis depends on the energy mix of the electric grid, "the system efficiency of electric motors can be higher than that of gas-based technology, and even if efficiency is lower, electric motors may sometimes reduce GHG emissions."[102]

EPA guidelines do not prohibit a state permitting agency from considering inherently less polluting alternatives. An-oft cited EPA manual states that "there may be instances where, in the permit authority's judgment, the consideration of alternative production processes is warranted and appropriate for consideration in the BACT analysis."[103] VDEQ has not pointed to any state law or regulation that would prohibit the consideration of electric motors for a compressor station as part of BACT.

In this instance, consideration of electric motors is entirely consistent with the permit applicant's defined purpose for the facility. "[T]he permit applicant initially defines the proposed facility's end, object, aim, or purpose — that is the facility's basic design, although the applicant's definition must be for reasons independent of air permitting."[104] The purpose of the Buckingham

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[99] Jeffery B. Greenblatt, *Opportunities for Efficiency Improvements in the U.S. Natural Gas Transmission, Storage and Distribution System*, Lawrence Berkeley National Laboratory, LBNL-6990E (May 2015), at 12.

[100] *Id.*

[101] *Id.* at 13 (citing Compressed Air & Gas Institute, *Compressed Air and Gas Handbook* (2012) at pp. 433–434).

[102] *Id.* at 46.

[103] Environmental Protection Agency, New Source Review Workshop Manual (Oct. 1990), at B-13.

[104] *In re: Desert Rock Energy Co., LLC*, PSD Appeal No. 08-03 et al., Slip. Op. at 64 (EAB Sept. 24, 2009).

facility is to maintain sufficient pressure in the ACP to keep gas moving through the pipeline.[105] This purpose can be equally achieved with electric motors as with gas-fired turbines. Nothing in this record suggests that the use of electric motors in place of gas-fired turbines would disrupt the applicant's basic business purpose for the proposed facility.

The BACT standard under Virginia law is clear. VDEQ and the Air Board are required to consider "the *maximum degree* of emission reduction for any pollutant" …which the board, "on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable…through the application of production processes or available methods, systems and techniques…for control of such pollutant."[106] Electric motors in place of gas-fired turbines are an available method or technique that would remove the pollutant at the source altogether and should have been considered as part of the BACT review.

C. VDEQ Should Require Continuous Emission Monitoring Systems for NO_x Emissions from the Four Compressor Turbines.

The Draft Permit is inadequate because it does not require sufficiently frequent monitoring to ensure that the compressor station turbines are complying with the BACT emission limits established by the permit. Specifically, the Draft Permit for the Buckingham Compressor Station only requires stack testing once every two years to determine compliance with the BACT emission limits in Conditions 20 through 23 of the Draft Permit, including the NO_x BACT limit.[107] That is not a sufficient stack testing frequency to ensure compliance with the NO_x BACT limits on a continuous basis. While this is an issue with all of the BACT emission limits, our comment focuses on NO_x because there are no other conditions in the permit that will ensure continuous compliance with the NO_x BACT limit. SCR systems can be operated to varying levels of NO_x removal efficiency. While Condition 1 of the Draft Permit requires the SCR system to be in operation at all times the compressor turbine is operating, except during startup and shutdown, there is no requirement in the permit that would ensure that the SCR is being operated in a manner to achieve the necessary NO_x reduction to meet the NO_x BACT limits. Installation of continuous emission monitoring systems (CEMS) for NO_x should thus be

[105] Atlantic Coast Pipeline, LLC Permit Application at p. 1 (May 25, 2018) (setting forth that the purpose of the Buckingham Compressor Station is "to provide compression to support the transmission of natural gas.").

[106] *See* 9VAC5-50-250 A (emphasis added).

[107] Conditions 29 and 31 of Draft Permit for Buckingham Compressor Station.

required to ensure continuous compliance with the NO_x BACT limits. With the installation of NO_x CEMs, Atlantic will be readily able to adjust the ammonia injection rate and other SCR parameters to optimize NO_x removal efficiency across the SCR and ensure continuous compliance with BACT emission limits.

Not only would NO_x CEMs ensure continuous compliance with the NO_x BACT limits applicable to the compressor turbines, but NO_x CEMs are the only method that can be used to ensure continuous compliance with the pound per hour (three-hour average) and ton per year NO_x limits of the Draft Permit. The pound per hour NO_x limits apply during normal operation (i.e., not including startup and shutdown) and when temperatures are below zero degrees Fahrenheit during which NO_x emissions from the compressor turbines are expected to rise significantly.[108] The ton per year limits apply to all operations, including startup, shutdown, and periods when temperatures are below zero degrees Fahrenheit.[109] There are no provisions in the permit that would ensure continuous compliance with these NO_x limits during times when temperatures fall below zero degrees Fahrenheit, because the stack testing required by the permit would not be conducted during all these varying periods of operation. Typically, stack testing is done when the unit is operating at maximum capacity (or close to it). While Condition 35.e. of the permit requires the company to maintain on-site records of monthly emissions of NO_x and other pollutants to demonstrate compliance with the ton per year emission limits, the permit provides absolutely no indication as to how those calculations of compliance with the annual ton per year limits are to be determined, nor are any of those calculations required to be submitted to VDEQ.

Further, the VDEQ Permit Analysis indicates that this permit is a "synthetic minor after permit action" permit.[110] With respect to the compressor turbines, it appears that the ton per year limits on NO_x, which apply to all periods of operation, are intended to be synthetic minor limits. Otherwise, if annual allowable emissions were calculated based on the pound per hour limits in the Draft Permit, the Buckingham Compressor Station would be considered a major source

[108] The pound per hour NOx limits in Conditions 20-23 of the Draft Permit are marked with a double asterisk, which states the limit does not apply during periods of startup and shutdown, whereas the 3.75 ppm @15%O_2 NO_x limits do not apply during startup, shutdown, or when ambient temperatures are below zero degrees Fahrenheit.

[109] No exemptions for startup, shutdown, or ambient temperature are listed for the ton per year NO_x emission limits in Conditions 20-23 of the Draft Permit.

[110] VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 1.

subject to Title V operating permit requirements. Specifically, the potential to emit NO_x from the four compressor engines, based on the pound per hour emission limits in Conditions 20-23 of the Draft Permit, would be 131.36 tons per year.[111] This figure exceeds the 100 ton per year major source emission threshold for Title V permitting.[112] However, the permit also limits annual NO_x emissions from the four compressor engines to 28.51 tons per year via the annual ton per year NO_x limits in Conditions 20-23 of the Draft Permit. Therefore, the ton per year NO_x limits in Conditions 20-23 of the Draft Permit are intended to be synthetic minor limits intended to keep the Buckingham Compressor Station out of Title V operating permit requirements. Yet the Draft Permit fails to require sufficient monitoring to ensure compliance with the ton per year limits. Because stack testing will not be done during all periods of operation that are subject to the ton per year limit, NO_x CEMs that will continuously monitor NO_x emissions every hour of every day are the only monitoring method that will ensure that annual emissions of NO_x will remain below the ton per year NO_x emission limits as necessary to keep the Buckingham Compressor Station a synthetic minor source.

For all of these reasons, the Draft Permit requirements are inadequate. VDEQ must reject and remand the Draft Permit and direct VDEQ to require CEMs for NO_x to continuously monitor the NO_x emissions from the compressor turbines. Not only is such monitoring necessary to create practically enforceable annual NO_x emission limits sufficient to exempt the Buckingham Compressor Station from Title V permitting, but also the continuous NO_x emission measurements will enable Atlantic to better implement its SCR system to maximum NO_x emission reductions as well as to minimize NO_x emissions during startup and shutdown.

D. BACT for Fugitive Emissions at the Buckingham Compressor Station.

In the Draft Permit, VDEQ has not specifically identified BACT requirements for fugitive emissions for this facility that would bind Atlantic outside of federal regulations. Given the possibility that those regulations could change or be weakened, VDEQ should add a provision that the conditions relating to fugitive emissions apply independently of the relevant federal regulation. According to Atlantic's Permit Application, the proposed compressor station

[111] This was calculated for the 4 compressor turbines based on the pound per hour NO_x limits in Conditions 20-23 of the Draft Permit, assuming maximum hours of operation per year (i.e., 8760 hours).

[112] 9VAC5-80-50.

will include fugitive components including valves, flanges, pumps, etc.[113] Atlantic states "[t]his facility will comply with New Source Performance Standard ("NSPS") Subpart OOOOa (subject to subsequent modification) which incorporates fugitive emissions monitoring program."[114] VDEQ states in its permit analysis that, while the fugitive leak requirements in the permit may be similar to or identical with the requirements in Subpart OOOOa, the Commonwealth's regulatory authority for these requirements is the Commonwealth's BACT requirements.[115] As such, VDEQ should specifically identify in the permit all requirements that it is imposing as BACT for fugitive emissions, rather than refer to the NSPS regulations. Specifically, rather than citing to the definition of "fugitive emissions component" in 40 CFR 60.5430a, Permit Condition 7.a should specifically state the definition of "fugitive emissions component" in the permit. This will ensure permanence of the permit requirements applicable to fugitive emissions components in the event that the federal NSPS Subpart OOOOa is revised (something that Atlantic alludes to as a possibility in its permit application). Further, this permit acknowledges that 40 CFR Part 60, Subpart OOOOa applies and that the owner/operator is "responsible for complying with the monitoring, notification, reporting, and recordkeeping requirements of these regulations."[116] To ensure the permanence and integrity of its BACT determination for fugitive emissions to the public in the event the federal NSPS standard in Subpart OOOOa is revised, VDEQ should add a provision clearly stating that the requirements of this permit apply independently from and in addition to the applicable requirements of the NSPS Subpart OOOOa.

The Draft Permit requires the development and implementation of a fugitive emissions component monitoring and repair plan.[117] While the Draft Permit has specific information regarding timing of leak detection surveys and deadlines for repair of fugitive emission leaks, the Draft Permit does not require records of such surveys, repair of fugitive emission leaks, and reasons for delay in repair of fugitive emissions leaks to be submitted to VDEQ. Instead the

[113] May 25, 2018 Permit Application for Buckingham Compressor Station at 14.

[114] *Id.*

[115] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 10. *See also* 9VAC5-80-1105 C and 9VAC5-60-320.2.

[116] Draft Permit at 2 (top paragraph).

[117] Draft Permit, Condition 7a.

Draft Permit requires records to be kept on site.[118] VDEQ must require that Atlantic submit quarterly and annual reports to VDEQ on its fugitive emissions detection and repair work, so that VDEQ can ensure that this BACT requirement is complied with. Submission of regular reports would also help to ensure that fugitive emission leaks are repaired promptly and would thus be minimized to the maximum degree possible. Further, with such information submitted to VDEQ, the general public could have access to such data to assure that fugitive emissions are being reduced to the maximum degree possible.

E. The NAAQS Modeling Analyses for the Buckingham Compressor Station Are Flawed.

The Draft Permit is inadequate because the NAAQS modeling analyses supporting the permit are flawed. The Board should remand the Draft Permit to DEQ to remedy the shortcomings in Atlantic's modeling. 9VAC5-80-1180 of Virginia's air permitting rule provides that "[n]o minor NSR permit will be granted unless it is shown to the satisfaction of the Board that the source will comply with the following standards...3. The source shall be designed, built and equipped to operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard. . . ." Accordingly, VDEQ required modeling analyses to demonstrate that the Buckingham Compressor Station would comply with the NAAQS.[119] However, Atlantic's NAAQS air modeling analyses are flawed for several pollutants due to failure to model the highest allowable emission rates and the failure to adequately account for emissions during startup and shutdown. These issues are discussed in detail further below.

1. Neither Atlantic Nor VDEQ Modeled the Maximum Short Term Allowable NO_x Emission Rates.

First, Atlantic's air modeling analysis failed to model the maximum allowable emission rates allowed under the terms of the Draft Permit for the one-hour average NO_2 NAAQS. Specifically, Conditions 20-23 of the Draft Permit identify pound per hour emission rates for NO_x applicable on a three-hour average basis for all periods of operation excluding startup and

[118] Draft Air Permit, Condition 7.b.

[119] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, Section VII.

shutdown, but the NO_x emissions modeled by Atlantic are much lower than the pound per hour limits of the permit. This is shown in Table 3 below.

Table 3. Allowable NO_x Pound per Hour Emission Rates and Maximum Hourly NO_x Emission Rates Modeled by ACP

Unit	NO_x limit, lb/hr (3-hr avg)[120]	Highest NOx Rate Modeled by ACP, lb/hr[121]
CT-01	9.09	1.95
CT-02	6.01	1.29
CT-03	11.03	2.36
CT-04	3.86	0.83

While both ppm and pound per hour NO_x limits apply under Conditions 20-23 of the permit, the ppm limit does not give a clear indication of what the comparable allowable pound per hour NO_x rate would be. Specifically, the ppm limit is given in terms of parts per million (presumably this is by dry volume basis, but the permit is unclear on this point) corrected to 15 percent oxygen. However the fuel in the compressor turbines will not necessarily be operated @15%O_2. Further, there very well could be moisture in the fuel in excess of the level assumed in the limits that presumably apply on a dry volume basis. Thus, it is difficult to correlate the ppm @15% oxygen limits to a maximum allowable pound per hour NO_x emission rate to be used in the air modeling. Consequently, one cannot find with certainty that the ppm NO_x limits are more restrictive than the pound per hour NO_x limits, and therefore VDEQ must ensure that the pound per hour NO_x emission limits are protective of the one-hour average NO_2 NAAQS.

To the extent VDEQ may claim that the pound per hour NO_x limits only apply to periods of operation below zero degrees Fahrenheit (for which periods Atlantic claims it should not have to show compliance with the one-hour NO_2 NAAQS due to such periods being intermittent[122]), then VDEQ should label those pound per hour limits as applicable during periods of operation below zero degrees Fahrenheit, and VDEQ should impose pound per hour NO_x limits that apply during all other periods of normal operation that are modeled for compliance with the one-hour

[120] Draft Air Permit, Conditions 20-23.

[121] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D, Table D-3.

[122] *Id.* at 11.

average NO_2 NAAQS. As the modeling currently stands, the modeling for the one-hour average NO_2 NAAQS fails to ensure that the maximum allowable hourly NO_x emissions will not cause or contribute to a violation of the one-hour NO_2 NAAQS.

2. The one-hour Average NO_2 Modeling Fails to Reflect Emissions When Ambient Temperatures Are Lower than Zero Degrees Fahrenheit.

Second, Atlantic's air modeling is incomplete because it fails to present modeling of compliance with the one-hour average NO_2 NAAQS for emissions when temperatures are below zero degrees Fahrenheit. However, Atlantic claims to have modeled allowable emissions during such weather conditions for all other NAAQS averaging periods including the annual average NO_2 NAAQS.[123] To justify not presenting the modeling analyses for the one-hour average NO_2 NAAQS under such cold conditions, Atlantic cites to an EPA memorandum which states in part as follows:

> ...we are concerned that assuming continuous operations for intermittent emissions would effectively impose an additional level of stringency beyond that intended by the levels of the [one-hour average NO_2] standard itself. As a result, we feel it would be inappropriate to implement the one-hour NO_2 standard in such a manner and recommend that compliance demonstrations for the one-hour NO_2 NAAQS be based on emissions scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum one-hour concentrations.[124]

Notwithstanding EPA's March 1, 2011 memorandum, it is reasonable to consider that, for at least an hour per year on average,[125] the compressor turbines will operate at much higher NO_x emissions due to temperatures being below zero degrees Fahrenheit. When temperatures fall below zero degrees Fahrenheit, NO_x as well as carbon monoxide emissions and unburnt hydrocarbons increase because the turbine engines increase pilot fuel to improve flame stability and the SoLoNO$_x$ combustion controls will not work effectively.[126] Indeed the permit does not definitively require operation of the SoLoNO$_x$ controls during periods of temperatures below

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[123] *Id.*

[124] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 11 (citing EPA Memorandum with Subject "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard," March 1, 2011).

[125] *Id.* at 11 (Atlantic indicates that over five meteorological years examined, there were only five hours with temperatures below zero degrees Fahrenheit, which is one hour per year on average).

[126] As discussed in Solar Turbines Product Information Letter 167, SoLoNO$_x$ Products: Emissions in Non-SoLoNOx Models, which was attached to ACP's May 25, 2018 Permit Application for the Buckingham Compressor Station.

zero degrees.[127] It also is not clear how the significantly increased NO_x emissions will affect NO_x removal efficiency of the SCR system during such low temperature periods. Given that the SCR will be designed to have a much lower input NO_x emission rate, it seems likely that the SCR would not remove NO_x to the same control efficiency as it will during temperatures above zero degrees Fahrenheit. Thus, emissions of NO_x during these cold temperature timeframes, even if very infrequent, will be much higher than the worst case emissions during other periods. In fact, Atlantic's Modeling Protocol indicted that NO_x emissions during temperatures below zero degrees Fahrenheit could be as follows[128]:

CT-01: 26.4 lb/hr
CT-02: 42.4 lb/hr
CT-03: 62.4 lb/hr
CT-04: 76.0 lb/hr

These rates are much higher than the maximum pound per hour NO_x limits in Conditions 20-23 of the Draft Permit and presumably do not reflect any control by the $SoLoNO_x$ combustion controls or the SCR. In its subsequently submitted modeling report, Atlantic assumed maximum hourly NO_x rates for operations below 0 degrees Fahrenheit at the same pound per hour limits in Conditions 20-23 of the Draft Permit.[129] The exact basis for those emission limits has not been explained, and we ask VDEQ and Atlantic to provide the assumptions that went into those pound per hour NO_x emission limits including the assumed uncontrolled NO_x rate and the level of NO_x removal presumed to occur across the SCR when temperatures are below zero degrees Fahrenheit.

It appears that Atlantic has performed modeling for one-hour NO_2 concentrations at the higher NO_x emission rates allowed in the pound per hour limits of Conditions 20-23 of the Draft Permit, but those modeling results are not presented in its July 10, 2018 Air Modeling Report. According to Atlantic's Modeling Protocol, the company planned to evaluate ambient air impacts for a range of operating conditions, including conditions below zero degrees Fahrenheit.[130] While Atlantic may be relying on EPA's March 1, 2011 Memorandum as a reason

[127] Draft Permit, Condition 1.

[128] April 6, 2018 Revised Air Quality Modeling Protocol for Buckingham County Compressor Station, Appendix C, Table C-4.

[129] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D, Table D-2.

[130] April 6, 2018 Revised Air Quality Modeling Protocol for Buckingham County Compressor Station at 6.

for ignoring that modeling, that is not what EPA's March 2011 guidance provides for. Instead, EPA's guidance states that EPA did not find it appropriate to assume in the modeling that intermittent emissions occur every hour of the year. There are other ways VDEQ could account for emissions during cold temperatures in the one-hour NO_2 NAAQS analysis. Atlantic said that it found over five meteorological years, that there were 5 hours of below 0 degree Fahrenheit temperatures and that they all occurred in one year.[131] The most obvious way to account for this scenario in the one-hour NO_2 NAAQS analysis would be to assume that that the maximum hourly NO_2 concentration modeled in a year would be due to operations when temperatures are below zero degrees Fahrenheit (i.e., assuming that on average, one hour per year the temperatures are below zero degrees Fahrenheit [132]), and then to determine the expected NO_2 concentration based on the average of the 7th highest (rather than the 8th highest) modeled NO_2 concentration per year to predict the three-year average 98th percentile NO_2 concentration expected as a result of the Buckingham Compressor Station.[133] Another method would be to take the 3rd highest NO_2 concentration predicted for 2015 from the modeling of maximum normal source operations (taking the 3rd highest predicted NO_2 concentration, rather than the 8th highest, to reflect the fact that there were five hours in 2015 of ambient temperatures below zero degrees Fahrenheit, when the maximum NO_2 emissions and thus maximum NO_2 concentrations would occur) and average that value with the 8th highest modeled NO_2 concentration for the other two years modeled in predicting the expected three-year average 98th percentile NO_2 concentration for comparison to the one-hour average NO_2 NAAQS. Either one of these options would be consistent with EPA's 2011 memo and not consider the worst case below zero emissions as occurring every hour of the year, but would still realistically account for the fact that actual emissions from the compressor engines may be much higher and cause much higher hourly NO_2 concentrations for 1 to 5 hours per year.

The public deserves to know the maximum predicted ambient air impacts that could occur due to the Buckingham Compressor Station, and VDEQ has an obligation to ensure that the NAAQS will not be violated as a result of allowing the Buckingham Compressor Station to

[131] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 11.

[132] Based on the actual finding that over five years of weather data at the Lynchburg Regional Airport, there were five hours (all in 2015) that were below zero degrees Fahrenheit.

[133] As described in ACP's modeling report, the form of the one-hour NO_2 NAAQS is based on the three-year average of the 98th percentile (i.e., 8th highest) hourly NO_2 concentration. July 10, 2018 Modeling Report at 11.

be constructed. Thus, VDEQ should not ignore the much higher NO_x emissions that could occur, even if infrequently, during times when temperatures fall below zero degrees Fahrenheit.

3. Atlantic Did Not Adequately Account for Emissions in Its Modeling of Startup and Shutdown Emissions.

Third, Atlantic's modeling is insufficient because it vastly underestimates the level of emissions that would occur during startup and shutdown operations. According to Atlantic, to account for ambient air impacts of the compressor turbines during startup and shutdown, which are projected to last about ten minutes each, it developed a blended-emission rate to be modeled for the startup and shutdown scenarios.[134] Specifically, Atlantic determined a blended-emission rate to model based on the emission rates expected during startup and shutdown provided by the turbine manufacturer and the emissions during normal operations that produce the highest pollutant concentration.[135] However, a comparison of the emissions assumed in terms of pound per event to the emissions data provided by the turbine manufacturer[136] shows that Atlantic greatly understated the emissions expected per startup and shutdown event in its modeling. This is demonstrated in Tables 4 and 5 below.

[134] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 8, 23, and Table D-4 in Appendix D.

[135] *Id.* at 8 and Table D-4 of Appendix D.

[136] Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNO$_x$ Combustion Productions, which was attached to ACP's May 2018 Permit Application.

Table 4. Startup Emission Rates per Event for the Four Buckingham Compressor Engines from the Turbine Vendor[137] Compared to the Startup Emission Rates per Event Assumed by Atlantic in its Air Modeling Analyses[138].

Unit ID #	Model	NO_x per startup (lb/event)	CO per startup (lb/event)	UHC[139] per startup (lb/10 min)	NO_x Startup (lb/event) assumed by ACP	CO Startup (lb/event) assumed by ACP	PM10 & PM2.5 Startup (lb/event) assumed by ACP
CT-01	Solar Mars 100	1.4	123.5	7.1	1	46	0.06
CT-02	Solar Taurus 70	0.8	73.1	4.2	1	88	0.06
CT-03	Solar Titan 130	1.9	176.9	10.1	1	55	0.11
CT-04	Solar Centaur 50L	0.8	69.1	4.0	0.3	21	0.03

[137] *Id.* at Table 3 "Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx CS/MD [Compressor Set/Mechanical Drive] Applications."

[138] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

[139] UHC refers to unburned hydrocarbons, and it is assumed such unburned hydrocarbons are in the PM2.5 particulate size range.

Table 5. Shutdown Emission Rates per Event for the Four Buckingham Compressor Engines from the Turbine Vendor[140] Compared to the Shutdown Emission Rates per Event Assumed by ACP in its Air Modeling Analyses.[141]

Unit ID #	Model	NO_x per shutdown (lb/event)	CO per shutdown (lb/event)	UHC[142] per shutdown (lb/event)	NO_x Shutdown (lb/event) assumed by ACP	CO Shutdown (lb/event) assumed by ACP	PM10 & PM2.5 Shutdown (lb/event) assumed by ACP
CT-01	Solar Mars 100	1.7	149.2	8.5	1	6.56	0.1
CT-02	Solar Taurus 70	1.1	93.4	5.3	1	4.96	0.07
CT-03	Solar Titan 130	2.4	207.6	11.9	2	7.28	0.15
CT-04	Solar Centaur 50L	0.4	35.4	2.0	1	2.96	0.05

It must be noted that these startup and shutdown emission rates provided by the turbine vendor are not warranted "under any circumstances,"[143] which means that the vendor is not guaranteeing that emissions during startup and shutdown events will be able to remain below these emissions levels. Thus, emissions during startups and shutdowns could be higher than stated in the vendor information. Further, the emission rates are based on ambient temperature of 59 degrees Fahrenheit and other standard conditions.[144] As shown in Atlantic's evaluation of emissions scenarios at various ambient temperatures, emission rates of NO_x, CO, and

[140] Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Productions, at Table 3 "Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx CS/MD [Compressor Set/Mechanical Drive] Applications." This document was attached to ACP's May 2018 Permit Application.

[141] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

[142] UHC refers to unburned hydrocarbons, and it is assumed such unburned hydrocarbons are in the PM2.5 particulate size range.

[143] [143] Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Productions, at Table 3 "Estimation of Start-up and Shutdown Emissions (lbs/event) for SoLoNOx CS/MD [Compressor Set/Mechanical Drive] Applications."

[144] *Id.*

PM2.5/PM10 are highest in the lowest temperature scenarios.[145] Thus, the vendor's emission rates for startup and shutdown events would likely be higher during periods of temperatures below 59 degrees Fahrenheit.

Atlantic stated that it blended the vendor provided emissions per startup or shutdown event with the worst-case emissions scenarios for normal source operation in modeling startup and shutdown emissions. However, because Atlantic greatly understated the amount of emissions per startup and shutdown event, the company's blended emission rate for its startup/shutdown modeling were significantly understated. We calculated proper blended hourly emission rates, using the pound per event emission rates provided by the turbine vendor (reflected in the 3rd, 4th, and 5th columns from Tables 4 and 5 above) and using Atlantic's worst-case emissions scenario for each pollutant from Table D-4 of Appendix D of its July 10, 2018 modeling report. We calculated the blended hourly emission rate assuming the startup or shutdown emissions occurred over 10 minutes and the worst case normal operations emissions scenario occurred over 50 minutes. The results of our calculations are provided in Tables 6 and 7 below and are compared to the emission rates modeled by Atlantic in its startup and shutdown modeling.

[145] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-2 of Appendix D.

Table 6. Calculated Hourly Blended Emission Rates for the Buckingham Compressor Engines Based on Vendor Emission Rates for Startup[146] and Worst Case Hourly Normal Operation Emission Rates[147], Compared to the Startup Blended Emission Rates Modeled by ACP[148]

Unit ID #	Model	NO_x Blended Emission Rate for Startups (lb/hr)	CO Blended Emission Rate for Startups, one-hour Avg CO Modeling, (lb/hr)	PM10/2.5 Blended Emission Rate for Startups (lb/hr)	ACP's NO_x Emission Rate Modeled for Startups (lb/hr)	ACP's CO Emission Rate Modeled for Startups, one-hour Avg CO Modeling, (lb/hr)	ACP's PM10/2.5 Emission Rate Modeled for Startups (lb/hr)
CT-01	Solar Mars 100	2.85	125.38	9.48	2.45	47.88	2.83
CT-02	Solar Taurus 70	1.74	74.33	5.77	1.94	89.22	1.87
CT-03	Solar Titan 130	3.63	179.13	12.98	2.72	57.23	3.44
CT-04	Solar Centaur 50L	1.40	69.88	5.01	0.90	21.77	1.20

[146] *See* Table 4 above and Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Productions, at Table 3.

[147] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

[148] *Id.* at Table D-5.

Table 7. Calculated Hourly Blended Emission Rates for the Buckingham Compressor Engines Based on Vendor Emission Rates for Shutdown[149] and Worst Case Hourly Normal Operation Rates[150], Compared to the Shutdown Blended Emission Rates Modeled by ACP[151]

Unit ID #	Model	NO_x Blended Emission Rate for Shutdowns (lb/hr)	CO Blended Emission Rate for Shutdowns,1-hour Avg CO Modeling, (lb/hr)	PM10/2.5 Blended Emission Rate for Shutdowns (lb/hr)	ACP's NO_x Emission Rate Modeled for Shutdowns (lb/hr)	ACP's CO Emission Rate Modeled for Shutdown, 1-hour Avg CO Modeling, (lb/hr)	ACP's PM10/2.5 Emission Rate Modeled for Shutdowns (lb/hr)
CT-01	Solar Mars 100	3.15	151.08	10.88	2.45	8.44	2.84
CT-02	Solar Taurus 70	2.04	94.63	6.87	1.94	6.18	1.87
CT-03	Solar Titan 130	4.13	209.83	14.78	3.72	9.51	3.44
CT-04	Solar Centaur 50L	1.00	36.18	3.01	1.60	3.73	1.20

As Tables 6 and 7 show, Atlantic's blended-emission rates for the startup and shutdown modeling are understated, significantly so for carbon monoxide and PM10/PM2.5 With respect to the PM10/PM2.5 emission rates assumed by Atlantic for the 24-hour average PM10 and PM2.5 NAAQS analyses, another reason for the large discrepancy is because the company calculated a blended-hourly-emission rate for the modeling that reflects 10 minutes of operation in startup or shutdown mode and 23 hours and 50 minutes of operation in normal source

[149] *See* Table 5 above and Solar Turbines Product Information Letter 170, Emissions Estimates at Start-up, Shutdown, and Commissioning for SoLoNOx Combustion Productions, at Table 3.

[150] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Table D-4 of Appendix D.

[151] *Id.* at Table D-5.

operation mode.[152] However, this is not reflective of the maximum allowable emission rate during startup and shutdown under the terms of the permit. While there are limits on total hours of time spent per year in startup and in shutdown,[153] there are no limits on how many startups or shutdowns can occur in a 24-hour period, nor are there any numerical emission limits that apply during startup and shutdown.[154] Under the terms of the permit, each compressor engine would not be subject to any emissions limit for up to 16.7 hours per year for startups and up to 16.7 hours per year for shutdowns.[155] Yet, Atlantic assumed only one startup or one shutdown would occur in a 24-hour period for its PM2.5 evaluation. In actuality, several startup and shutdowns would be allowed to occur in a 24-hour period. While that may not be likely, the evaluation of compliance with the NAAQS is supposed to be based on the worst-case allowable emission rates. EPA's Guideline on Air Quality Models requires that the emissions modeled for a new source for the short term NAAQS (i.e., NAAQS with 24-hour or shorter averaging time) be based on the maximum-allowable-hourly-emission rate and assuming continuous operation at that emission rate.[156] The approach that Atlantic assumed for hourly PM2.5 emission rates (i.e., assuming one startup or one shutdown per 24 hours) does not comport with EPA's modeling guidelines and it is not consistent with the scenario the company modeled for the one-hour average NAAQS. It is also inconsistent with what Atlantic claimed to have modeled in its modeling report. Specifically, Atlantic claimed "...the combustion turbine startup and shutdown scenarios and normal operation scenario have been modeled for all hours of the day."[157] It was also VDEQ's understanding that the blended startup and shutdown emission rates were modeled for all hours of the year.[158] This issue also applies to the 8-hour average CO NAAQS modeling, for which Atlantic developed a blended emission rate assuming startup emissions for 10 minutes and assuming normal source operation emission rates for 7 hours and 50 minutes.

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[152] *Id.*, note c.

[153] Condition 4.g. of Draft Permit.

[154] *Id.*

[155] *Id.*

[156] 40 C.F.R. Part 51, Appendix W, Table 8-2.

[157] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 10.

[158] Email to David Neal, Southern Environmental Law Center, Aug. 30, 2018.

VDEQ must require Atlantic to revise its startup and shutdown modeling analyses to properly assess worst-case ambient-air impacts due to the startup and shutdown emissions allowed under the terms of the permit. Such revised modeling must be grounded in the emission rates provided by the turbine vendor that occur during startup and shutdown from the various turbines, and must ensure that the maximum allowable short term average emission rates will comply with all NAAQS as required by EPA's Guidelines on Air Quality Models. Until new modeling is performed and made available for public review, VDEQ cannot definitively find that the Buckingham Compressor Station will not interfere with attainment or maintenance of the NAAQS.

4. Atlantic Did Not Adequately Model All Contributing Emissions in its Cumulative NAAQS Compliance Analysis.

Fourth and finally, Atlantic's NAAQS compliance analysis is inadequate because Atlantic failed to model actual short-term emission rates for contributing sources for the short-term average NAAQS modeling, and failed to include all nearby sources that could produce a significant concentration gradient near the compressor station. According to Atlantic's July 2018 modeling report, the company included nearby source emissions as listed in Appendix G of its modeling report to determine the total modeled concentrations of relative pollutants.[159] A review of the sources and emission rates listed in Appendix G reveal the following deficiencies in Atlantic's cumulative modeling analysis:

a. Atlantic Did Not Model Maximum Actual Short Term Average Emission Rates for Contributing Sources for the Short Term Average NAAQS Modeling.

A review of the pound per hour emission rates modeled for the contributing sources shows that Atlantic determined hourly emission rates based on the annual emission rates assuming the sources operated 8,760 hours per year. For every source and emission unit listed in Appendix G of ACP's July 2018 modeling report, the pound per hour emission rate reflects the annual emission rate modeled, assuming those emissions are spread evenly across all 8,760 hours in a year.[160] This very likely understates hourly emission rates and thus calls into question the

[159] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report at 23.

[160] For example, for Greif Packaging, BLR05, the annual NOx is listed as 260.4 tpy and the hourly NOx rate is listed as 59.45 lb/hr, which reflects 260.4 tpy x (2000 lb/ton)x (1 yr/8760 hours). This is the same for every source listed in Appendix G of APC's July 10, 2018 modeling report and for every pollutant.

cumulative modeling for the short term average (24-hour or shorter averaging time) NAAQS. Furthermore, it is not consistent with the EPA's Guideline on Air Quality Models, which requires nearby sources be modeled using temporarily representative operating levels when the emissions unit is actually operating, reflective of the most recent two years of operation. Thus, the cumulative analysis of compliance with the short term average NAAQS conducted for the Buckingham Compressor Station fails to adequately reflect cumulative impacts with the allowable emissions from the Buckingham Compressor Station and other nearby sources.

b. Atlantic Did Not Include All Nearby Sources that Could Produce a Significant Concentration Gradient in the Vicinity of the Buckingham Compressor Station.

It is not clear how VDEQ decided those sources that should be included in the cumulative modeling assessment of the Buckingham Compressor Station. There is at least one other source in the vicinity of the proposed Buckingham Compressor Station that was not included in the cumulative NAAQS modeling—the Dominion–Bear Garden Generating Station.

The Dominion–Bear Garden Generating Station is a 590 megawatt gas-fired power plant in Buckingham County. It appears to be roughly eight or nine miles from the proposed Buckingham Compressor Station. Atlantic failed to include emissions from this large power plant (owned by an affiliated company of Dominion Energy) in its cumulative emissions analysis. VDEQ should have required including all nearby sources, meaning those that could cause a significant pollutant concentration gradient in the area impacted by the Buckingham Compressor Station.

F. Atlantic Has Not Adequately Demonstrated that the Buckingham Compressor Station Will Not Cause or Contribute to Any Concentration Exceeding or Which May Exceed a Significant Ambient Air Concentration for Air Toxics.

The Draft Permit violates Virginia law by failing to demonstrate that the proposed compressor station will not cause or contribute to any concentration exceeding, or that may exceed, significant ambient air concentration for two air toxics: formaldehyde and hexane. Virginia's regulation for toxic pollutants from new and modified sources provides that if a stationary source is not exempt under 9VAC5-60-300 C, D, or E, then it is subject to Virginia's air toxic new source review requirements in 9VAC5-60-320. Those requirements include a provision that no owner of a new source shall cause or contribute to any significant ambient air concentration that may cause or contribute to the endangerment of human health and that the

new source shall employ BACT for the control of toxic pollutants.[161] VDEQ has found that the Buckingham Compressor Station will emit formaldehyde and hexane at levels in excess of the exemption thresholds in 9VAC5-60-300.[162] As such, the Buckingham Compressor Station is subject to the following Virginia standard for formaldehyde and hexane:

> Regardless of any provision of any other regulation of the board, no owner or other person shall cause or permit to be discharged into the atmosphere from any affected facility any emissions of toxic pollutants in such quantities as to cause, or contribute to, any significant ambient air concentration that may cause, or contribute to, the endangerment of human health.[163]

Consequently, Atlantic conducted air dispersion modeling for the formaldehyde and hexane emissions.

Virginia's regulations require that "[a]mbient air concentrations shall be determined using air quality analysis techniques (modeling) based on emission rates equal to the facility's potential to emit for the applicable averaging time or any other method acceptable to the board" and that "[a]mbient air concentrations shall include all emissions from the stationary source, including those from sources exempted under 9 VAC 5-60-300 C."[164]

"Potential to emit" is defined in Virginia's air toxics regulation as "an emission rate based on the maximum capacity of a stationary source to emit a toxic pollutant under its physical or operational design. Any physical or operational limitation on the capacity of the source to emit a toxic pollutant, including air pollution control equipment, and restrictions on the hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design only if the limitation or its effect on emissions is state or federally enforceable. Fugitive emissions shall be included in determining a stationary source's potential to emit."[165]

1. Comments on Modeling of Formaldehyde

In its air modeling report, Atlantic identifies the pound per hour formaldehyde rates that it assumed for the 50 percent, 75 percent, and 100percent operating emissions scenarios during normal source operations. But the formaldehyde hourly emission rates identified by Atlantic are

[161] 9VAC5-60-320 1. and 2.

[162] *See* VDEQ Buckingham Compressor Station Draft Analysis Registration Number 21599, at 6.

[163] 9 VAC5-60-320.1.

[164] 9VAC5-60-350 B. and C.

[165] 9VAC5-60-310 C.

the same for all three levels of operation.[166] Based on the formaldehyde emission factor identified in the permit application of 2.88 x 10^{-3} pounds formaldehyde per million British Thermal Unit heat input (lb/MMBtu)[167], it is clear that Atlantic modeled emissions at the 50 percent operating capacity for all three operating scenarios of 50 percent, 75 percent, and 100 percent operating capacity.[168] This does not make sense. The pound per hour formaldehyde emission rates at 100 percent operating factor should be twice that of the pound per hour emission rate at 50 percent operating factor. Thus, Atlantic's normal source operation modeling is significantly flawed and understates worst case impacts because it failed to model the hourly potential to emit of the compressor turbines. The maximum emissions scenario for normal operations should have been as follows, with the rate modeled by Atlantic in parenthesis[169]:

CT-01: 129.64 MMBtu/hr * 2.88 x 10^{-3} lb/MMBtu = 0.37 lb/hr (0.19 lb/hr)
CT-02: 85.62 MMBtu/hr * 2.88 x 10^{-3} lb/MMBtu = 0.25 lb/hr (0.12 lb/hr)
CT-03: 157.2 MMBtu/hr * 2.88 x 10^{-3} lb/MMBtu = 0.45 lb/hr (0.23 lb/hr)
CT-04: 54.98 MMBtu/hr * 2.88 x 10^{-3} lb/MMBtu = 0.16 lb/hr (0.08 lb/hr)

With respect to the startup and shutdown formaldehyde emission rates, it appears that Atlantic blended the startup and shutdown formaldehyde emission rates per startup and shutdown event with the maximum capacity normal operations emission rate calculated above.[170] However, it appears unlikely that Atlantic included other sources of formaldehyde emissions at the Buckingham Compressor Station in the modeling of startup and shutdown emissions of the compressor turbines. Specifically, as shown in Table D-5, the formaldehyde emission rates of

[166] July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D, Table D-3.

[167] May 25, 2018 Minor New Source Review Permit Application for Buckingham Compressor Station, Appendix C, Table C-11. *See also* Solar Turbines Product Information Letter 168, Volatile Organic Compound, Sulfur Dioxide, and Formaldehyde Emission Estimates, Table 1, in May 25, 2018 Permit Application for Buckingham Compressor Station. This Solar Turbines document identifies the formaldehyde emission rate of 2.88 x 10^{-3} pounds per million British Thermal Unit heat input as the 95% upper confidence of data emission rate for all engine loads.

[168] For example, the heat input capacity of CT-01 is 129.64 MMBtu/hr. Multiplying that by the formaldehyde emission factors of 2.88 x 10^{-3} lb/MMBtu and a 50 percent capacity factor equates to a formaldehyde emission rate of 0.19 lb/hr, which is the emission rate ACP listed for CT-01 for all three load scenarios in Table D-3 of its July 2018 modeling report.

[169] Based on the maximum heat input identified for each compressor turbine and the formaldehyde emission rate listed in ACP's May 25, 2018 Minor New Source Review Permit Application for Buckingham Compressor Station, Appendix C, Table C-11.

[170] We calculated the blended emission rates using the 100% operational factors and the formaldehyde emissions per startup and shutdown event, and were able to verify that the pound per hour rates listed in Table D-5 (Modeled Startup/Shutdown Emissions) represent a blending of startup or shutdown emissions with the 100% operational emission rate calculated above, despite Table D-4 of ACP's Modeling Report showing a lower normal operational formaldehyde emission factor being blended with the startup and shutdown emissions per event.

the startup scenario are significantly higher than the formaldehyde emission rates modeled for normal source operations by Atlantic, and yet there was not a significant increase in the modeled formaldehyde concentration. This is demonstrated in the table below.

Table 8. Comparison of Atlantic's Modeled Formaldehyde Compressor Engine Emission Rates and Predicted Formaldehyde Concentration for Normal Operations and for Startups Blended with Normal Operations.

	ACP Modeled Formaldehyde Emission Rate Normal Operation[171]	**ACP Modeled Formaldehyde Emission Rate Startup Blended with Normal Operation**[172]
CT-01	0.19 lb/hr	2.56 lb/hr
CT-02	0.12 lb/hr	4.70 lb/hr
CT-03	0.23 lb/hr	3.09 lb/hr
CT-04	0.08 lb/hr	1.17 lb/hr
Total	**0.62 lb/hr**	**11.52 lb/hr**
Max Hourly Formaldehyde Concentration for Modeled Scenario[173]	38.9 ug/m3	40.5 ug/m3

It is difficult to understand how the modeling of normal operations emissions would equate to a maximum formaldehyde concentration of 38.9 ug/m3, but the modeling of startup emissions that are about 18 times higher than the normal operations emission rates would only increase the maximum formaldehyde concentration by 4.1 percent. Given that it does not appear that any nearby sources of formaldehyde emissions were included in the modeling[174] and it does not appear that any background formaldehyde concentration was included in the modeled results[175],

[171] Table D-3 of July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D.

[172] Table D-5 of July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report, Appendix D.

[173] *See* Table 4-3 of July 10, 2018 ACP Buckingham Compressor Station Air Quality Modeling Report.

[174] The emissions inventory of nearby sources provided in Appendix __ of ACP's July 10, 2018 modeling report does not list any formaldehyde emission rates. Further, Section 3.9 of ACP's April 6, 2018 modeling protocol only indicated that offsite sources of NO_2, PM2.5, PM10, and CO may be included in cumulative modeling analyses.

[175] ACP's July 10, 2018 Modeling Report does not provide any background concentrations for formaldehyde.

it is logical to assume that the modeled formaldehyde concentration for normal operations of 38.9 ug/m3 reflects solely Buckingham Compressor Station sources. Thus, given the significant increase in emission rates modeled for the startup scenario, the only explanation for the startup modeling result being only 4.1 percent higher than the normal operation modeling result is that the startup modeling did not include any other Buckingham Compressor Station sources other than the compressor turbines. Yet, Virginia's air toxics permitting rule requires air modeling to be "based on emission rates equal to the facility's potential to emit for the applicable averaging time" and that "[a]mbient air concentrations shall include all emissions from the stationary source, including those from sources exempted under 9 VAC 5-60-300 C."[176] Thus, to comply with Virginia's air toxics permitting rule, VDEQ must ensure that Atlantic has modeled all sources of formaldehyde emissions at the Buckingham Compressor Station to assess maximum hourly formaldehyde concentrations. This must include the emergency generator which appears to be the primary other emission unit with comparable formaldehyde emissions as the compressor engines, with a formaldehyde emission rate of 2.49 pounds per hour.[177] It also must be noted that it is a very likely scenario that a startup of the compressor engines would occur concurrently with the operation of the emergency generator. If the Buckingham Compressor Station lost power, then the compressor engines would shut down and need to be started up again once the emergency generator was started up and running. Thus, assuming that the startup and shutdown modeling does not include the emergency generator and other sources of formaldehyde emissions, VDEQ must require new modeling of all of the sources of formaldehyde at the Buckingham Compressor Station to properly determine increase in formaldehyde concentration due to the potential to emit of the compressor station.

VDEQ also must require a cumulative modeling analysis of the Buckingham Compressor Station with other sources of formaldehyde in the area. Virginia's air toxics permitting rule requires that Atlantic ensure that the Buckingham Compressor Station will not "cause, *or contribute to*, any significant ambient air concentration that may cause, or contribute to, the endangerment of human health."[178] As stated above, it does not appear that Atlantic conducted any cumulative assessment of whether formaldehyde concentrations in the area will exceed the

[176] 9VAC5-60-350 B. and C.

[177] Table C-10 of July 10, 2018 Modeling Report.

[178] 9 VAC5-60-320.1 (emphasis added).

ambient air concentrations that VDEQ has determined to be significant ambient air concentrations (determined as provided in 9VAC5-60-330).

2. Comments on Modeling of Hexane

In estimating emissions and modeling these events, Atlantic understated hexane emissions and/or took into account conditions that the permit would not allow. (Hexane emissions primarily are due to the venting of gas, such as during blowdown events and pigging events.) Therefore the Draft Permit rests on inadequate hexane analysis that must be corrected in a revised permit.

First, in its determination of uncontrolled emissions from blowdowns, Atlantic states that it did not take credit for the use of a planned vent gas reduction system to reduce system pressure prior to venting, meaning that its uncontrolled emissions reflect a blowdown from maximum station operating pressure (1400 pounds per square inch-gauge ("PSIG")) versus 30 PSIG.[179] However, the Draft Permit states as a permit condition that a compressor turbine may not vent gas unless the compressor turbine case pressure is less than or equal to 44.7 pounds per square inch-absolute ("PSIA").[180] Atlantic estimated a much higher volume of gas and thus a higher amount of hexane emissions by assuming a blowdown from maximum station operation pressure rather than assuming a 44.7 PSIA gas pressure limit. However, by assuming a much higher gas pressure than allowed in the permit, Atlantic presumably also assumed a comparatively higher gas discharge velocity than is allowed by the permit in its modeling, which would then essentially assume a higher level of discharge in the air and allow for more dispersion of the gas and hexane emissions in the air. Modeling hexane at a higher gas discharge velocity would result in the model predicting lower hexane concentrations than may actually occur with a blowdown event at the Buckingham Compressor Station. Given the permit limit of not discharging gas at a pressure of any higher than 44.7 PSIA for blowdown events, VDEQ must ensure that the modeling of hexane for blowdown events is based on gas flow assumptions that are consistent with the terms of the permit.

Second, as with the formaldehyde modeling, it does not appear that Atlantic has conducted any cumulative analysis of hexane concentrations expected with the Buckingham

[179] May 25, 2018 Permit Application for Buckingham Compressor Station at 15, 28.

[180] Condition 6.a. of Draft Permit.

Compressor Engine and any other sources of hexane in the area. VDEQ must require a cumulative modeling analysis of the Buckingham Compressor Station with other sources of hexane in the area. Virginia's air toxics permitting rule requires that Atlantic ensure that the Buckingham Compressor Station will not "cause, *or contribute to*, any significant ambient air concentration that may cause, or contribute to, the endangerment of human health."[181]

CONCLUSION

Because of the errors in the Draft Permit, as well as the unanswered questions about risks to human health, greenhouse gas pollution, and environmental justice, the Virginia DEQ should withdraw the Draft Permit and require supplemental information from Atlantic. In the event VDEQ nevertheless submits the Draft Permit to the Air Pollution Control Board, we respectfully ask that the Board deny the permit.

Sincerely,

David Neal

Charmayne Staloff

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[181] 9 VAC5-60-320.1 (emphasis added).