Dominion Resources Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060

Web Address: www.dom.com

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Alison Sinclair
Virginia Department of Environmental Quality
Piedmont Regional Office
4949 Cox Road
Glen Allen, VA 23060

Re: Virginia Electric and Power Company, Registration No. 52525
Prevention of Significant Deterioration Permit and Stationary Source Permit to Construct and Operate the Proposed Greensville Power Station in Greensville County, Virginia

Dear Ms. Sinclair:

Virginia Electric and Power Company, doing business as Dominion Virginia Power ("Dominion"), is pleased to respond to the comments of the Sierra Club and Appalachian Voices in a letter from the Appalachian Mountain Advocates, dated March 30, 2016, on the air emissions permit for the Greensville Power Station ("Greenville" or "Station"). Greensville will provide needed additional capacity to the Dominion generating fleet. The Station is a result of a request for proposal for base-load/intermediate dispatchable power. Proposals were evaluated based on economic factors, fuel strategy, reliability enhancement and environmental risks. The Virginia State Corporation Commission approved the Project after a hearing and careful consideration of alternatives. SCC, in Re Virginia Electric and Power Company, Certificate of Convenience and Necessity Case No. PUE-2015-00075 (March 29, 2016) (Attachment 1).

Dominion's response to comments tracks the order of the comments which begin on page 4 of the Appalachian Mountain Advocates letter. A summary of each comment is provided in italics and Dominion's response is provided below it in normal font.

1 - The application fails to identify, describe, and analyze all pollutant-emitting activities of the source. The comment states that Dominion must account for emissions from the Atlantic Coast Pipeline (ACP) because they are part of the same source.

Dominion Response: Commenters assert that Dominion's application is incomplete because it does not include emissions associated with the Atlantic Coast Pipeline ("ACP"). The assertion is incorrect. The Greensville application is not required to evaluate the ACP. The Greensville plant and the ACP cannot be considered a single source under the Virginia SIP or the Clean Air Act ("CAA"). Treating the Greensville plant and the 600-mile long, multistate ACP as a single source would defy any reasonable person's "common sense notion of a plant." EPA and the courts have rejected Commenters overly broad interpretation of the CAA and implementing regulations.

The definition of "stationary source" is at the heart of CAA permitting. The federal regulations define "stationary source" to mean "any building, structure, facility, or installation which emits or may emit a regulated NSR pollutant." 40 C.F.R. § 52.21(b)(5). *See also* 9 VAC 5-80-1615 (Virginia SIP incorporating same definition). In the preamble to its 1980 rules defining these terms, EPA explained its purpose as follows: (1) to carry out reasonably the purposes of the PSD program; (2) to approximate a common sense notion of "plant"; and (3) to avoid aggregating pollutant-emitting activities that as a group would not fit within the ordinary meaning of "building," "structure," "facility," or "installation." *See* 45 Fed. Reg. 52676, 52693 (August 7, 1980). EPA adopted a three-part test for determining whether sources could be treated as a single stationary source: (1) they belong to the same industrial grouping (i.e., they share the same Standard Industrial Classification ("SIC") two-digit code); (2) they are located on one or more contiguous or adjacent properties; and (3) they are under the control of the same person. 40 C.F.R. § 52.21(b)(6); 40 C.F.R. § 71.2. The test has been incorporated into the Virginia SIP. *See* 9 VAC 5-80-1615. EPA has long recognized that the single source analysis is performed on a case-by-case basis. *See Summit Petroleum v. EPA*, 690 F.3d 733, 738 n.3 (6th Cir. 2012).

The three-part test for aggregating sources cannot be divorced from the statutory definition of source. The 1980 rulemaking was a response to the D.C. Circuit's seminal decision in *Alabama Power Company v. Costle*, which had criticized the agency's previous test for determining what constitutes a single stationary source for purposes of the CAA's Prevention of Significant Deterioration ("PSD") permitting program. 636 F.2d 323 (D.C. Cir. 1979). In *Alabama Power*, the D.C. Circuit directed EPA to develop regulatory definitions and create a new regulatory test that would "provide for the aggregation, where appropriate, of industrial activities according to considerations such as proximity and ownership." *Id.* at 397. The court emphasized the limitations on trying to expand the statutory definition of a source: "Because of the limited scope afforded the term 'source' in section 111(a)(3), however, EPA cannot treat contiguous and commonly owned units as a single source unless they fit within the four permissible statutory terms [*i.e.*, building, structure, facility, or installation.] ." *Id.*

Accordingly, in adopting the new source aggregation test, EPA expressly recognized that *Alabama Power* required the agency to develop a test that would "approximate the common sense notion of a plant" and would also "avoid aggregating pollutant-emitting activities that as a group would not fit within the ordinary meaning of 'building,' 'structure,' 'facility,' or 'installation.'" 45 Fed. Reg. at 52695. EPA also recognized, in response to public comments, that the definition of "building, structure, facility, or installation" would *not* encompass "activities that would be many miles apart along a long-line operation," such as "a pipeline or electrical power line." *Id*. Commenter's argument is thus defeated by both case law and the regulatory background concerning the very test on which they rely. They are seeking to untether the definition of "source" from its statutory moorings.

In a current rulemaking, EPA has confirmed the continued vitality of *Alabama Power*'s admonitions. *See* Proposed Rule, Source Determination for Certain Emission Units in the Oil and Natural Gas Sector, 80 Fed. Reg. 56579 (Sep. 18, 2015). The "common sense notion of a plant" remains at the core of the determination of what constitutes a single source. As EPA itself reiterates, activities along the length of a pipeline violate that notion: "In the same [1980] rulemaking, we said that we did not intend 'source' to include activities that are many miles apart along something like a pipeline or transmission line as a single source…." *Id*. at 56581 (quoting 45 Fed. Reg. 52695 (Aug. 7, 1980)). If it is improper to aggregate all the activities

along a pipeline, then certainly it is improper to combine all those activities *and* those at a power plant served by the pipeline. Commenter's position distorts the plain meaning of the CAA and its implementing regulations.

Other facts provide additional support for the conclusion that the ACP and Greensville plant do not meet the common sense notion of a single plant. For instance, the ACP is not the only source of natural gas for the Greensville plant. The Transco pipeline (owned by Williams Partners) will also supply the plant. Moreover, the ACP will serve multiple utility customers along its 600-mile route. The Greensville plant is by no means the sole customer for the ACP. Thus, it cannot be reasonably said that the ACP and the Greensville plant represent a unified "building, structure, facility, or installation."

Commenters also overlook another fundamental consideration in the single source analysis. The pollutant-emitting activities of the Greensville plant and the ACP are *distant* from each other. EPA, the courts, and state agencies have all recognized the importance of physical proximity when determining whether sources should be treated as a single source.

EPA has long acknowledged that proximity is an essential factor in the single source analysis:

In the *Alabama Power* decision, the Court said that EPA cannot treat contiguous and commonly owned units as a single source unless they "fit within the four statutory terms . . ." (i.e., the terms building, structure, facility and installation). The Court said that we should

> ". . . provide for the aggregation, where appropriate, of industrial activities according to considerations such as *proximity* and ownership.

80 Fed. Reg. at 56581 (quoting *Alabama Power*, 636 F.2d at 397) (emphasis added).

Likewise, the courts have consistently emphasized that physical proximity is critical in the single source analysis. In the *Summit* decision in 2012, the Sixth Circuit Court held that EPA had misinterpreted the meaning of "adjacent" in the three-part test when it aggregated natural gas operations spread across a 43-square mile area as a single source for purposes of the Title V permitting program. The Sixth Circuit recognized that an aggregation test not focusing primarily on physical proximity is especially not suited for the oil and gas industry. *Summit*, 690 F.3d at 750. Commonly, the emissions-producing activities are connected to one another by pipeline and spread across a large geographic area. Such operations generally do not comport with "the common sense notion of a plant," and certainly do not fit within the ordinary meaning of "building, structure, facility, or installation." The court observed that, particularly for the oil and gas industry, if the concept of a "common sense notion of a plant" is construed to allow aggregation of "operationally related but physically distant activities, there is little foreseeable limit to the aggregation of emission points spread out literally across the country." *Id.* at 750. *See also See Citizens for Pennsylvania's Future v. Ultra Resources, Inc.*, No. 4:11-CV-1360 (M.D. Pa. Feb 23, 2015) (natural gas facilities more than three miles away from each other were too remote to be considered part of a single source).

Pennsylvania has been faced with many iterations of the single source issue in the natural gas industry, and it has recognized in guidance the importance of distance between sources.[1] *See* Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries,

[1] Pennsylvania guidance is obviously not binding in Virginia, but it can be instructive in showing how other state agencies have rejected the position advocated here by Commenters.

Document No. 270-0810-006, at 6-7 (Pa. D.E.P. Oct. 6, 2012) hereafter, "Pennsylvania Guidance") (Attachment 2). Pennsylvania uses a quarter-mile "rule of thumb" to determine whether sources are considered adjacent (and hence, a single source). Pennsylvania characterizes its quarter-mile presumption as a "rule of thumb" that takes a "common sense approach" to the definition of a single source for air permitting purposes. *Id*. at 7. It further expressly recognizes that "facilities should not be 'daisy-chained' together to establish a contiguous grouping." *Id. See also id.* ("[T]he proximity focus of the analysis should guide the permit reviewer in determining whether two sources should be treated as one plant. Moreover, such an approach would implement the air quality permitting program according to applicable statutory and regulatory requirements.").

Commenters here are trying to "daisy-chain" together – not a mere one-quarter mile of emissions units – but *hundreds* of miles of the ACP with the Greensville plant. The court in *Summit* warned precisely against this interpretation of a single source: "there is little foreseeable limit to the aggregation of emission points spread out literally across the country." *Id.* at 750. As *Summit* instructs, it would stretch the common sense meaning of "contiguous" or "adjacent" to find that a 600-mile pipeline serving several customers is a single source with one of those customers. *See also* Pennsylvania Guidance at 6 ("only sources that are in close proximity should be considered contiguous or adjacent properties."). Commenters cite a number of individual permitting decisions, but nothing in them suggests otherwise.

Commenters are applying the three-part test here to defeat the very purpose of the test. The goal is to determine what satisfies the common sense notion of a plant. Only those activities satisfying such a common sense notion must be permitted together. EPA has never applied the test as Commenters seek here. Indeed, EPA has always recognized that emissions sources along a pipeline (irrespective of common control, SIC codes, and contiguousness) do not represent a single source. To the extent Commenters are implying that the three-part test supersedes *Alabama Power*'s mandate to consider whether multiple activities comport with the common sense notion of a single plant, they are incorrect. *See, e.g., National Fuel Gas Midstream Corp., et al. v. Pa. Dept. of Envtl. Prot.*, EHB Dkt. No. 2013-206-B, at 18 (Pa. Envtl. Hearing Bd. Dec. 29, 2015) (even if three-part test is satisfied, sources must also meet the common sense notion of a plant to be considered a single source) (Attachment 3). "[I]t is important to keep in mind the plain meaning of the relevant terms and ensure that the ultimate decision supports the common sense notion of a plant and the terms "building," "structure," "facility," or "installation" as used in the "stationary source" definition." *Id.*

Commenter's position would also lead to nonsensical results. The ACP spans 600 miles and three states. Thus, if the Greensville power plant and the ACP must be permitted as a single source, then Virginia could dictate the permitting of individual emissions units along the ACP in West Virginia and North Carolina. Likewise, those states could assert permitting jurisdiction over the Greensville plant as part of the "single" source. A proper single source analysis does not lead to such irrational results.

In conclusion, the ACP and Greensville plant are not a single source under the CAA or the Virginia SIP. Each must be evaluated separately to determine whether it is a major source and subject to PSD permitting. As separate sources, the Greensville application is not required to include emissions from the ACP.

2 - The application lacks information necessary to determine whether the applicant will apply the best available control technology ("BACT"). The comment states that the application did not provide enough information on the sulfur content of natural gas that will be fueling the power station.

Dominion Response: Greensville will be fueled by pipeline quality natural gas from the Transco pipeline and the Atlantic Coast Pipeline ("ACP"). Natural gas in the Transco Pipeline originates from the Gulf Coast region while ACP gas will come from the Appalachian Basin. The fuel characteristics of the pipeline quality natural gas are similar. Differences between the combustion characteristics of Transco gas and ACP are negligible. Both pipelines will be subject to a tariff that controls the quantity of sulfur in the natural gas (i.e. < 20 grains/100 scf).

An annual average sulfur content of 0.4 gr sulfur/100 scf; well below the tariff limit, was used to calculate the BACT emission limits. The attached spreadsheet and sample data provides sampling data from the Transco pipeline taken for the Brunswick Power Station ranges from 0.076 to .429 gr/100 scf. (Attachment 4) That information confirms the use of .4 grains in calculating the BACT levels is reasonable.

Moreover, the comment raises a question but does not provide sufficient information to indicate the draft permit is incorrect. It is unclear from the comment how additional information on sulfur content would provide anything meaningful in determining BACT. A mere assertion that such is the case is not sufficient to warrant the conclusion reached.

3 - The application fails to include information obtained from the manufacturer or other vendors.

Dominion Response: The commenter states that the application claims to rely on manufacturers' data in determining the potential emissions for the Project yet the record does not include the vendor data. Vendor data is preferable over EPA emission factors whenever it is available, and vendor data was used when it was available. Specifically, the comment asks for information on the following:

a) Formaldehyde – footnote f of Table B-13 of the application (Hazardous Air Pollutant Emissions) (page 212 of 313 of the pdf) states that the formaldehyde emission factor (91 ppm) came from the manufacturer; Mitsubishi Testing done in 2012 on Possum Point Unit 6 confirms that the formaldehyde emission factor is reasonable. (Attachment 5)

b) Emissions for startup and shutdown – minute-by-minute startup data was provided in the application and it is based on vendor data. The minute by minute start-up data was created by Dominion's Owner's Engineer Worley Parsons. Worley Parsons used the manufacturer (MHPSA) proprietary emission profile curves (Expected Emissions (CO, CO2, VOC, NOx vs. Load). Worley Parson's also utilized a proprietary expected plant start-up curve for Hot, Warm, and Cold plant starts, and plant shutdowns. The plant start-up curves depict the load and time for each gas turbine during a start-up and shutdown. The time component of the MHPSA curve was expanded by AECOM to represent an actual start for a combined cycle plant. AECOM used the MHPSA data to develop emission rates from 0% to 50% load at intervals of 0.1%. AECOM then developed minute-by-minute load data based on the Worley Parsons data. For example, if the load

increased from 15% to 20% over 18 minutes, then AECOM used a load increase 0.28% per minute from 15% until the load reached 20% to calculate the load at each minute. The emission data vs. load data were then applied to the 1-minute load data. Similarly, durations of cold, warm and hot starts came from the vendor's proprietary information. The Cold, Warm, and Hot Start durations are based on the Steam Turbine start-up and cool down curves, plus allowance for pipe warming and meeting steam quality. The Gas Turbines must be placed on hold at lower loads to allow for the Steam Turbine to reach temperature.

c) SF6 leak rate – the SF6 leak rate of 0.5% came from vendor data provided for Brunswick permit. Letter from Richard Lynn, Mitsubishi to David Mitchell, Dominion dated March 25, 2015. See (Attachment 6)

d) The 1500 ppm TDS level assumed for the cooling tower drift calculations is the maximum expected TDS level of the water accounting for recycling of the water to be used in the cooling tower. TDS from water samples from the City of Emporia measured 81-145 ppm. Using a conservative recycle rate of 10 times yields a TDS level of approximately 1500 ppm. The reason the delugeable cooler TDS limit is lower is because it is a closed system and does not operate at 10 cycles of concentration.

4 - BACT for this facility requires analysis of solar-gas hybrid configurations.

Dominion Response: The Request for Proposal for the Greensville clearly articulates that it is for dispatchable power. Request for Proposal, 2014 Solicitation for Intermediate or Base Load Power Supply Generation November 3, 2014 p 3. (Attachment 7) A solar-gas hybrid facility would redefine the source. The plant is designed to be dispatchable by the Regional Transmission Organization, PJM Interconnect. This means it must provide power on demand. Solar cannot meet that requirement, for example, on a cold winter night when the sun is not shining. Thus, a solar-gas hybrid configuration is not consistent with the basic business purpose of the facility.

EPA has repeatedly confirmed that the process for determining BACT is "not a means to redefine the design of the source when considering available control alternatives." See, e.g., In re: Prairie State Generating Company LLC, 13 EAD 1, 21-24, (EAB 2006) ; affirmed Sierra Club v. EPA, 499 F.3d 653 (7th Cir. 2007) see also New Source Review Workshop Manual at B.13 (Oct. 1990) (draft) ("Draft NSR Manual") (INTV Ex. 22). This policy is consistent with the plain language of the CAA itself, which provides that a major emitting facility may not be constructed unless, among other things, the "***proposed facility*** is subject to the best available control technology for each pollutant . . . from ***such facility***." CAA § 165(a)(4) (emphasis added). In turn, the PSD regulations define "best available control technology" to mean, as relevant here:

> [an] emissions limitation . . . based on the maximum degree of reduction for each pollution subject to regulation under [the] Act which would be emitted from any **proposed** major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for **such source** or modification through application of production processes or available methods, systems, and techniques,

> including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.

40 C.F.R. § 52.21(b)(12) (emphasis added). In other words, as a general proposition, the BACT process is intended to determine the appropriate emissions limitations for the source that the applicant is proposing to build. It is not an opportunity for the permitting authority (or those opposed to the applicant's plans) to dictate that the applicant build something different from what has been proposed.

In a case specifically addressing the issue of whether an applicant is required to review solar in the BACT analysis for natural gas facility, the EAB stated that in general, forcing an applicant to consider a change in fuels is a redefinition of the source. The EAB stated,

> Sierra Club has failed to demonstrate that the Region abused its discretion in concluding that adding solar technology to this facility would "redefine the source." Under the circumstances of this case, the business purposes and site-specific constraints described in the administrative record support the Region's conclusion that the addition of supplemental solar power to this facility would constitute redesign of the source.

In re La Paloma Generating Company, 16 E.A.D., slip op. at 32; (EAB 2014) (Attachment 8).

5 - BACT requires consideration of restricting fuel to natural gas from processing and transmission infrastructure with effective fugitive emission controls. Commenter claims that Dominion must be required to accept gas only from pipelines that install BACT for fugitive methane emissions.

Dominion Response: This comment is somewhat of a corollary to Comment 1, above, and is incorrect for the same reasons. BACT is required of emission units at the source in question -- the Greensville Power Station. The pipeline is not part of that source, and a claim that BACT should include the operations of another facility is incorrect.

6 - The BACT analysis altogether ignores alternatives to duct firing.

Dominion Response: The comment is similar to Comment 4 because it claims that solar is a feasible alternative to duct firing. For the same reasons provided in response to Comment 4, requiring solar as BACT for the duct burners would impermissibly redefine the source. More specifically, duct firing is an inherent part of the facility design and necessary to achieve the maximum power required of 1600 MW. Duct firing is used because it is dispatchable; solar is not.

7 - The BACT analysis improperly eliminates carbon capture and sequestration. Comment states that storage basins closer to Greensville were not evaluated.

Dominion Response: The available carbon sequestration sites, including the ones listed in the comments, were evaluated.

> Application at 5-16 (pdf 68): "In 2010-11, the [Virginia Department of Mines, Minerals and Energy] Division of Geology and Mineral Resources (DGMR) in cooperation with the USGS conducted a preliminary assessment of the deep geologic formations in Virginia that might serve as

> permanent storage formations for CO2 as shown in Figure 5-1. Physical data pertinent to CO2 storage, such as porosity, formation salinity, and permeability were compiled where the information was available. The most extensive areas that might be suitable for CO2 storage are in Southwest Virginia. While there are other areas shown in Figure 5-1 as having some promise for CO2 storage, Southwest Virginia presents the best location for the Greensville facility due to the large number of potential storage sites and proximity to Greensville County. Figure 5-2 presents information on the thickness of the Brea sandstone deposits at depths greater than 3,000 ft in southwest Virginia. The thickness of the sandstone in southwest Virginia greatly increases in the Nora and Break-Haysi Gas Fields in Dickenson and Buchanan Counties."
>
> See Application at 5-15 to 5-17 (pdf 67-69).

Moreover, as further evidence that the formations in Central Virginia suggested in the comment are not suitable for CCS, they were mined out long ago and there has been no shallow mining in eastern and central Virginia in 150 years.

Commenter also states the BACT analysis must consider coordinating a CO_2 pipeline with the proposed ACP. For all of the reasons cited in the application, a CO_2 pipeline is not economically viable whether collocated with ACP, Transco or any other means. See page 77 of 300 of the Application, Table 5-1.

The comment speculates that other formations may be suitable for CCS and provides citations to academic literature suggesting research is needed to evaluate them. BACT is not a research project.

8 - The BACT analysis improperly eliminates biodiesel for limited use engines.

Dominion Response: The limited use engines are emergency engines and due to their purpose will not operate at a high capacity. Consequently, the fuel must be able to be stored for long periods of time without fouling. Biodiesel will foul if stored for extended periods of time and introducing additives to extend the life of the fuel is not practical.

Thus, biodiesel is not an available option for the emergency engines, and thus can be eliminated at Step 1 of the analysis. Fuel for emergency equipment must be reliable and biodiesel has not been demonstrated for this application. NRC Information Notice 2009-02 – finding biodiesel in fuel oil could adversely impact engine performance. (Attachment 9) Speculation as to the ability to store biodiesel for long periods of time with an additive is insufficient to conclude that it is an available alternative until it has been demonstrated in practice.

9 - The BACT analysis improperly eliminates a spark-ignited natural gas engine for emergency generation.

Dominion Response: A requirement to use natural gas fueled emergency equipment would not meet the unit's intended purpose (*i.e.*, impermeably redefine the source) and would violate the principles of risk management and common sense. The emergency equipment requires on site fuel storage (i.e. diesel) because the equipment might be needed even if gas service is interrupted.

10 - The BACT analysis improperly eliminates an oxidation catalyst for the auxiliary boiler.

Dominion Response: The application appropriately considered the economic impact of installing an oxidation catalyst on the aux boiler under step 4 of the BACT analysis. See Application Table 5-10. A cost $42,300 /ton of CO removed is not economically feasible and therefore is not BACT. The high cost per ton removed results from the limits on the boiler's capacity factor. It cannot consume more than 158.9 x 10^6 scf of natural gas per year (Draft Permit Condition 27), thus it will have low annual emissions and a catalyst is not economically feasible.

Moreover, the commenter has not shown that the cost that would be borne by Dominion for oxidation is on the same order as the cost borne by Marshall County, Iowa, such that it would be economically feasible for Greensville. The Marshall project is a smaller boiler that has a higher capacity factor. In addition, the Marshall project has not been completed and therefore, this emission limit has not been demonstrated to be achievable in practice.

11 - The draft permit lacks emission limitations on fugitive GHG emissions from the plant itself.

Dominion Response: Fugitive GHG emissions are estimated at 249 tpy CO2e, or 0.004% of the potential GHG emissions for the facility shown in Table 3-8 of the permit application (or 5,783,498 tpy). There are no LDAR requirements for this type of facility. Moreover, LDAR is not economically feasible as BACT. The cost of an LDAR program is estimated to cost $75,000 annually. (Attachment 10) Even if such a program could eliminate all of the fugitive emissions, which it will not, the cost per ton, assuming 249 tons removed (corresponds to 100% of all components leaking) is $302/ton. Based on Dominion's experience we have found that the actual number of components that leak is far less than 1%. The cost per ton, assuming 2.5 tons removed (corresponds to 1% of all components leaking), is $30,159/ton. BACT, if included, should be an Audio, Visual, and Olfactory (AVO) program that would be conducted in conjunction with routine equipment inspections conducted by station personnel. Dominion will also be installing

multiple natural gas detectors for safety at Greensville that will be located in the areas of the combustion turbines, fuel gas heaters, duct burner skids, and the M&R yard.

12 - The draft permit lacks ammonia slip limitations.

Dominion Response: Ammonia is not a Clean Air Act PSD regulated air pollutant; thus it is not subject to PSD BACT as claimed in the comment. Moreover, ammonia is typically limited at facilities that might have regional haze issues or located near Class I areas. Thus, for example, the Warren permit has an ammonia slip limit because it is located near the Shenandoah National Park Class I area. Brunswick County Power Station is not located near a Class I area nor is it expected to cause visibility concerns and therefore, does not have an ammonia slip limit. Like Brunswick, Greensville is not expected to cause adverse impacts to visibility and it is not located near a Class I Area.

13 - BACT for auxiliary boiler emissions requires annual boiler tune-ups.

Dominion Response: GHG BACT for the Auxiliary Boiler is an emission limit of 9,489 tpy CO2e (12-month rolling). Because there is a specific minimum emission limit that can be measured, a specific best management practice is not required. CAA § 169. Under definition of BACT, work practices (e.g., best management practice) are used when a numeric emission limit is practical; not in addition to such a limit.

14 - Numeric limitations for NOx from the gas turbines do not reflect the best available control technology.

Dominion Response: The NOx BACT limit of 2 ppm on a 1-hour average is consistent with recently issued permits and the vendor's guarantee. The mere fact that permits were issued in 2002 with the same limit does not negate the validity of the BACT analysis.

The Commenter's suggestion that permit limits should be equivalent to actual emission levels is incorrect. As explained in numerous permit decisions, actual emissions will necessarily be lower than the permit limit to ensure continuous compliance.

Permit limits are written with an appropriate margin of safety to reflect variability in emission formation and control. The permit limit has to be met not on best or average day but under reasonably foreseeable worst case operating conditions. Thus, while an emission unit may perform at emission levels lower than its emission limit, this is proper permit design. The commenter has not provided any data to support their contention that a lower limit is achievable and thus should be BACT.

15 - Numeric limitations for carbon monoxide from the gas turbines do not reflect the best available control technology. Comment suggests that emission limits should be set equal to actual unit performance.

Dominion Response: CO emissions from the Mitsubishi M501J will be controlled with CO catalyst with a minimum guaranteed control efficiency of 85%. The uncontrolled CO emissions from the Mitsubishi M501J are 10 ppm, resulting in an emission rate of 1.5 ppm without duct firing. The guaranteed control efficiency of 85% reflects the expected efficiency of the catalyst at end of life, approximately 5 years. Catalyst performance degrades over time and has to be periodically replaced to maintain the minimum removal efficiency.

The turbines identified in the comments with lower emission rates are either from different manufacturers or are different models from the Mitsubishi M501J selected for Greensville, which may have lower uncontrolled CO emission rates leading to lower controlled emission rates. Some of the lower emission rates may also be the result of assuming 90% control by the oxidation catalyst. To achieve a 90% control for the life of the catalyst would require either a larger catalyst bed or more frequent replacement. Increasing the size of the catalyst bed could require a catalyst system redesign. This potential change could increase the backpressure of the turbine reducing its output, which decreases steam flow and efficiency for a combined cycle resulting in increased CO2e lb/MW emission rate. Based on the current design the cost of CO removal is $629/ton. A preliminary cost estimate from the catalyst vendor to increase the end of life CO removal efficiency to 90%, results in a CO removal cost of $790/ton. This preliminary cost estimate does not include any allocation for system redesign, which may be required. If Dominion was to utilize the original design catalyst and replace the catalyst more frequently to achieve 90% at end of catalyst life, it is estimated that this would decrease the catalyst life to 3 years. The incremental cost of this approach is $6,015/ton. (Attachment 11) An incremental increase of $6,015/ton of CO removed is not cost effective.

16 - Numeric limitations for greenhouse gases from the gas turbines do not reflect the best available control technology.

Dominion Response: BACT is a case-by-case determination that represents what is achievable by the facility being permitted under worst-case normal operating conditions. Given the case-by-case nature of BACT determinations, what is established as a BACT limit for one facility may not be the appropriate BACT limit for another facility, even if the same equipment is installed. *See, e.g., In re Northern Michigan University*, PSD Appeal No. 08-02, slip op. at 12 (EAB Feb. 18, 2009) ("the BACT definition requires permit issuers to "proceed) on a case-by-case basis, taking a careful and detailed look, attentive to the technology or methods appropriate for the particular facility, to seek the result *tailor-made for that facility* and that pollutant") (emphasis added). A BACT limit established for one facility does not mean it is appropriate for another particularly for combustion turbines and GHG BACT where the emissions are dependent on the efficiency of the turbine which in turn depends on the operating conditions such as ambient temperature and load. *See, e.g., In re Pio Pico Energy Center*, PSD Appeal Nos. 12-04 through 12-06, slip op. at 78-79 (EAB August 2, 2013).

Dominion has reviewed the list of permits included in the comment and researched those facilities. In comparing those facilities to the proposed Greensville County Power Station, it is important to account for the differences such as compliance methodology, emission factors used, presence of duct burners, and the type of cooling. All of these factors affect turbine efficiency. The following page has a table of the facilities identified by the Sierra Club and the factors that impact efficiency.

The heat rates identified in the comment reflect the lowest achieved heat rates during single tests and are shown in terms of lower heating value (LHV). The draft permit limit is calculated in terms of higher heating value (HHV). HHV is approximately 11% higher than LHV. The heat rate of 5,530 BTU/kW-hr LHV is 6,140 BTU/kW-hr HHV and is achievable for this facility at the beginning of its life, under ideal conditions. A permit limit must account for all operating

conditions (including lower efficiency modes such as startups and shutdowns, low load, and duct firing) and account for the facility's life cycle (degradation over time). Consequently, an emission limit based on the lowest achievable heat rate is not appropriate.

To address degradation over time, DVP understands that the permit will be issued with a GHG BACT limit that will increase from 795 to 872 lbs CO_{2e}/MW-hr net over the life of the turbine. As for the statements by Glenn Kelly of Dominion referenced in the comment, the facility will be able to achieve 770 lbs CO2e/MW-hr at the beginning of its life, under optimal conditions.

Facility	Description	Gross (lbs CO2e/MW)	Net (lbs CO2e/MW) (gross x 1.02%)	Duct Burners (Yes/No) (No= +4.0%)	SU/SD Emissions Excluded (Yes= +3.0%)	Different GHG Emission Factor (Yes = +1.0%) (Yes = +0.1%)	12-Month Rolling Compliance (No= +5.0%)	Type of Cooling (Wet = +2.5%)	Equivalent Rate [NET] (lbs CO2e/MW)	Adjustment for 2x1 (2x1 = -4.0%)
Dominion Greensville (VA)	3X1 MHPSA 501J		903	Yes	No	No	Yes	Dry	903	903
Footprint Energy (MA)	2xGE 107F Series 5		895	Yes	No	896	Yes	Dry	896	861
Carroll County Energy Center (OH)	2X1 GE 7FA		859	893	No	902	Yes	Dry	902	867
Oregon Clean Energy Center (OH)	2X1 Mitsubishi	859	876	Yes	No	884	Yes	907	907	872
Colorado Bend Energy Station (TX)	2x1 1160 MW GE7H.	879	897	--	--	No	--	919	919	884
Hess Newark Energy Center (NJ)	2x1 GE207FA.05	887	905	Yes	No	No	Yes	927	927	892
FP&L Okeechobee (FL)	3X1 GE 1600 MW	850	867	Yes	893	No	Yes	915	915	915
Dominion Brunswick (VA)	3X1 MHPSA 501G		920	Yes	No	No	Yes	Dry	920	920
FGE Texas Project (TX)	4x1 1620 MW	889	907	Yes	No	No	Yes	929	929	929
Polk Power Station (FL)	4x1 1420 MW GE 7FA - (Compliance with Limit is demonstrated through an annual test).	877	895	Yes	921	No	967	992	992	992

denotes permit limit
denotes correction required to normalize permit limit

17 - Numeric limitations for fuel sulfur content do not reflect the best available control technology.

Dominion Response: As discussed in response to Comment 2, BACT is a limit of 0.4 grains/100 scf of natural gas based on available data for the natural gas available to be used at the facility. BACT typically is pipeline quality natural gas based on the tariff rate of 20 grains/100 scf. Dominion has no control over the sulfur content of the pipeline natural gas. Add-on technology to remove the sulfur from pipeline natural gas has never been determined to be BACT for a NGCC facility. It would be economically infeasible for this application given the low levels of sulfur.

Fuel sampling at nearby Brunswick County Power Station shows variability in the sulfur content with monthly data ranging from 0.076 to 0.429 grains/100 scf. (Attachment 4) The facility must have operational flexibility for a fuel sulfur content that may vary and for which Dominion cannot control.

18 - Numeric limitations for sulfur dioxide and sulfuric acid mist from the gas turbines do not reflect the best available control technology.

Dominion Response: As discussed in response to Comment 2 and 18, BACT limits for SO2 and sulfuric acid mist are based on the natural gas sulfur limit of 0.4 grains/100 scf, which is BACT for the facility as discussed in response to Comment 17. The fact that another source accepted a lower limit does not negate the validity of the Greensville BACT limit given its basis and the potential variability in the fuel. A lower sulfur natural gas is not available to Greensville.

19 - Numeric limitations for volatile organic compounds from the gas turbines do not reflect the best available control technology.

Dominion Response: VOC BACT limits for the turbines are 0.7 ppm VOC without duct firing and 1.4 ppm VOC with duct firing. In reviewing documentation from the Greensville turbine manufacturer and the EPC contractor, it was discovered that the 1.0 ppm VOC value in the application was based on the turbine VOC guarantee (at the exhaust of the turbine, prior to the catalyst) and should have been based on the EPC guarantee of 0.7 ppm VOC (at the stack with the 30% reduction from the catalyst). Thus, the appropriate limits for Greensville should be 0.7 ppm VOC without duct firing and 1.4 ppm VOC with duct firing. A 0.7 ppm without duct firing limit is consistent with the Brunswick and Warren permits, referenced in the comments.

The comments also reference the Chouteau Power Plant permit, claiming it has a VOC limit of 0.3 ppmvd at 15% O2. While the vendor provided data showing 0.3 ppmvd as the VOC concentration, the VOC permit limit is 5.27 lb/hr (Page 29 of the Word

document, Page 2 of the permit). At 1,882 MMBtu/hr, the 5.27 lb/hr emission rate is equivalent to 0.0028 lb/MMBtu, or to 2.2 ppmvd as methane at 15% O2.[†]

20 - Numeric limitations for nitrogen oxides from the auxiliary boiler do not reflect the best available control technology.

Dominion Response: BACT for NOx emissions from the auxiliary boiler is 9 ppmvd at 15% O_2 or 0.011 lb/MMBtu (the vendor guarantee) and a fuel usage restriction resulting in a 10% capacity factor. Annual emissions are limited to 0.9 tpy.

The RBLC data presented in Appendix B lists 3 permits with limits lower than 0.011 lb/MMBtu. The lowest listed emission rate is 0.0058 lb/MMBtu for the Berks Hollow project. Review of the RBLC data indicates that the actual permit limit is 1.01 ton/yr, which is higher than the annual rate for Greensville of 0.9 tpy. The rate listed in Appendix B was calculated by AECOM based on an assumption that the auxiliary boiler is permitted to operate at a 100% capacity factor, which is probably incorrect. The other Pennsylvania auxiliary boiler listed in Appendix B (Hickory Run Generation) is permitted at 0.011 lb/MMBtu, consistent with Greensville, supporting that the Berks Hollow auxiliary boiler is subject to a capacity factor limit and the correct NOx emission rate is likely 0.011 lb/MMBtu. Regardless, the Berks Hollow annual emission rate is higher than Greensville.

The next lowest emission rate is the Corpus Christi Condensate Splitter at 0.0060 lb/MMBtu. This is not a similar project to Greensville as it is a process heater not a boiler. Process heaters have many small burners typically in the 2 MMBtu to 6 MMBtu/hr range and are fundamentally different from a boiler. This project has no relevance to BACT for the proposed auxiliary boiler.

The Stockton Cogeneration auxiliary boiler limit of 0.0085 lb/MMBtu is based on the use of SNCR. SNCR was evaluated and eliminated for the Greensville auxiliary boiler. An SNCR requires excellent gas mixing, which requires large furnace volumes and residence time. It also requires a precise and stable temperature window in the furnace at which to inject the ammonia or urea. Because the proposed auxiliary boiler may serve a wide range of loads, which will create wide firing and temperature distribution variations within a furnace volume that is inherently too small for ammonia and NOx to effectively contact, an SNCR is not for feasible for NOx control. This conclusion is supported by the USEPA document, "Alternative Control Techniques Document – NOx Emissions from Industrial/Commercial/Institutional (ICI) Boilers" (ACT), that states: "…SNCR is not considered applicable to small packaged watertube and firetube boilers and units with large fluctuations in steam load." (p. 5-68). The proposed boiler is a relatively small, watertube boiler. Additionally, there have been 22 projects with higher emission rates issued since the Stockton September 16, 2011 permit. Two of these projects were in New

[†] To convert VOC (as methane) from ppm, corrected to 15% O2 to lbs/MMBtu:
2.2 ppm VOC X 4.1637E-08 lbs VOC/dscf per ppm X = 9.16E-08 lbs VOC/dscf
9.16E-08 lbs VOC/dscf X 8710 dscf/MMBtu X (20.9/(20.9-15%O2)) = 0.0028 lbs/MMBtu

Jersey and were required to achieve LAER. Clearly the Stockton project did not represent an advance in the available technology and did not establish a new BACT emission rate.

21 - Numeric limitations for carbon monoxide from the auxiliary boiler do not reflect the best available control technology.

Dominion Response: CO BACT for the auxiliary boiler is a numeric limitation of 6.9 lb/hr (0.037 lb/MMBtu) and a fuel usage restriction resulting in a 10% capacity factor. Annual emissions are limited to 3.0 tpy. As discussed in response to Comment 10, the use of an oxidation catalyst on the auxiliary boiler to reduce CO emissions is not economically feasible. Numerous boilers have been permitted at a CO emission rate of 50 ppmvd corrected to 15% O2, which equates to 0.037 lb/MMBtu. CO emission limits listed in the RBLC in the 0.035 lb/MMBtu to 0.0039 lb/MMBtu range are consistent with the proposed BACT emission limit, with the slight differences being attributable to conversion factors and rounding. Additionally, the auxiliary boilers cited in the comment are significantly smaller than the proposed auxiliary boiler for GPS, and therefore not appropriate for comparison.

There are only 4 projects listed in Appendix C of the permit application with emission limits significantly lower than the proposed BACT emission limit. The three projects with the lowest emission limits are in Iowa, including the Marshalltown project cited in Comment 10. The CF Industries project is not subject to an annual capacity factor limit, like Greensville. In addition, none of the Iowa projects, including the Marshalltown project, have completed construction. Therefore, the permit limits have not been demonstrated as achievable. Likewise, the permit limits for the CPV St. Charles project have not been demonstrated to be achievable as operation is not expected to begin until 2017.

The permit limit of 0.028 lb/MMBtu is from an August 2009 permit issued in Nevada. Each boiler is permitted to operate 8760 hours per year, while as a group there operation is limited. The source is a synthetic minor for CO emissions, thus the limit was not established through BACT determination. The permits issued since at higher emission rates show that 0.028 lb/MMBtu has been rejected as BACT by a number of agencies.

22 - Numeric limitations for volatile organic compounds from the auxiliary boiler do not reflect the best available control technology.

Dominion Response: VOC BACT for the auxiliary boiler is a numeric limitation of 0.005 lb/MMBtu and a fuel usage restriction resulting in a 10% capacity factor. Annual emissions are limited to 0.5 tpy. As discussed in response to comment 10, the use of an oxidation catalyst on the auxiliary boiler is not economically feasible. Since the emissions of CO exceed those of VOC, the removal efficiency for VOC (35%) is lower than that for CO (84%) and the cost of the catalyst is equivalent, the cost per ton of VOC removed would be even higher than that for CO.

The Black Hills Power, Cheyenne Prairie Generating Station auxiliary boiler cited in Comment No. 22 is a 25.06 MMBtu/hr unit with potential emissions of 0.20 tpy. No other information regarding operation of the auxiliary boiler is readily available, nor was any provided by the comment. Given the size of the auxiliary boiler is about 1/8th the size of the Greensville auxiliary boiler, the total difference in emissions of approximately 0.3 tpy is expected.

V. Additional analysis is required to determine whether the project is a major source of HAP

Dominion Response: The primary HAP emitted is formaldehyde. DVP appropriately used manufacturer's data to calculate the formaldehyde PTE. Those data are more representative of the Greensville facility as compared to generic factors in AP-42, which should only be used if better, site-specific data are not available. Additionally, testing at another NGCC facility [Possum Point] confirms the reasonableness of the formaldehyde emission factor used to calculate PTE for Greensville. Lastly, it is our understanding that the final permit will require testing for formaldehyde.

23 - The draft permit fails to incorporate applicable monitoring standards under the NSPS for greenhouse gas emissions from electric utility generating units.

Dominion Response: The NSPS is an applicable requirement independent of the construction permit. To the extent it is not addressed in the construction permit, it will be incorporated into the Title V operating permit as applicable requirements.

24 - The draft permit fails to incorporate applicable monitoring standards under the NSPS for sulfur dioxide emissions from stationary combustion turbines.

Dominion Response: The NSPS is an applicable requirement independent of the construction permit. To the extent it is not addressed in the construction permit, it will be incorporated into the Title V operating permit as applicable requirements. Specifically, commenters contend that the permit must require daily fuel monitoring per 40 CFR 60.4370(b), instead of the monthly monitoring required in the draft. Daily monitoring, however, is not applicable to Greensville because DVP has elected to use the options in 40 CFR 60.4365, which includes the use of valid purchase contract, tariff sheet or transportation contract to demonstrate compliance with the NSPS. The monthly monitoring required by the permit is for demonstrating compliance with the BACT fuel sulfur limitation of 0.4 grains/100 scf.

25 - The draft permits one-time testing requirement for particulate matter is insufficient.

Dominion Response: For natural gas facilities it is not unusual for construction permits to require one time testing for particulate matter. *See* Brunswick County Permit. To the

extent additional monitoring is necessary and it not addressed in the construction permit, it will be incorporated into the Title V operating permit. Moreover, DEQ can request a performance test at any time per 9 VAC 5-50-30 G.

26 - The draft permit's testing of heat rate is insufficient.

Dominion Response: While testing is required once every 5-years for the heat rate, the heat input and megawatt production (gross and net) are monitored continuously. To the extent additional monitoring is necessary and it not addressed in the construction permit, it will be incorporated into the Title V operating permit. In addition, since the facility has a lb CO2e/MW-hr emission limit applicable at all times, a heat rate limit and testing are redundant.

27 - The draft permit omits continuous monitoring for greenhouse gas emissions.

Dominion Response: There is no regulatory requirement to continuously monitor GHG emissions. GHG emissions will be determined using an F factor with fuel rate, which is continuously monitored, consistent with draft Permit Condition 54 which utilizes 40 CFR 75, Appendix G. To the extent additional monitoring is necessary and it not addressed in the construction permit, it will be incorporated into the Title V operating permit.

28 - The draft permit omits continuous monitoring for ammonia.

Dominion Response: There is no ammonia limit and, even if there were, there is no legal requirement to install a CEMS to monitor for it. Commenter does not identify a single combined cycle facility that has been required to install an ammonia CEMS to support that they are appropriate for this application.

We appreciate the opportunity to provide these comments. If you have any questions or need additional information, please contact Jeff Zehner at Jeffrey.r.zehner@dom.com or at (804) 273-3145.

Sincerely,

Paula A. Hamel
Director, Generation Environmental Services

Attachments