

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

APPLICATION OF

VIRGINIA ELECTRIC AND POWER COMPANY

SCC-CLERK'S OFFICE
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CASE NO. PUR-2017-00002

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For approval and certification of electric transmission facilities under Va. Code § 56-46.1 and the Utility Facilities Act, Va. Code § 56-265.1 *et seq.*

REPORT OF HOWARD P. ANDERSON, JR., HEARING EXAMINER

August 9, 2017

HISTORY OF THE CASE

On January 12, 2017, Virginia Electric and Power Company (“Dominion Energy Virginia” or “Company”) filed with the State Corporation Commission (“Commission”) an application for approval and for a certificate of public convenience and necessity to construct and operate electric transmission facilities in Fairfax County, Virginia (“Application”). Dominion Energy Virginia filed the Application pursuant to § 56-46.1 of the Code of Virginia (“Code”) and the Utility Facilities Act, Code § 56-265.1 *et seq.*

Dominion Energy Virginia proposes to rebuild, relocate, and replace a number of facilities and lines in and around the Company’s existing Idylwood Substation (“Idylwood Substation” or “Substation”) in Falls Church, Virginia (collectively, the “Rebuild Project”). According to the Application, the Company proposes to shift the existing Substation footprint within Company-owned property in order to rebuild and rearrange the Idylwood Substation from a straight bus arrangement to a breaker-and-a-half arrangement using Gas Insulated Substation (“GIS”) bus and breakers.¹

As part of, and in connection with, the Rebuild Project, the Company also proposes to: (i) relocate overhead lines Clark-Idylwood Line #202, Braddock-Idylwood Line #207, Glen Carlyn-Idylwood Line #251, Clifton-Glen Carlyn Line #266, CIA-Idylwood Line #2035, and Ox-Idylwood Line #2097; (ii) rearrange, rename, and renumber Line #266, which currently bypasses Idylwood Substation, to terminate at the Substation by splitting existing Line #266 into Idylwood-Glen Carlyn Line #266 and rename and renumber Clifton-Idylwood Line #2164; (iii) remove nine existing structures on Idylwood Substation property and install twelve structures and conductors with new materials inside the Substation; (iv) remove four existing structures and install five structures on Company-owned property outside Idylwood Substation; (v) temporarily relocate an existing cellular antenna and equipment to a structure across Shreve Road from Idylwood Substation, then at a future point, permanently locate the cellular antenna and equipment on one of the new structures on Company-owned property adjacent to the Substation; (vi) replace and relocate three distribution transformers, relocate twelve distribution circuits and relocate the distribution air insulated bus with new distribution GIS equipment; and (vii) install temporary 230 kV bus facilities to enable

¹ Ex. No. 2, at 2.

Idylwood Substation to remain electrified and in-service during the Rebuild Project.² Conductor for portions of the lines identified above would also be replaced.³

On January 30, 2017, the Commission issued an Order for Notice and Hearing (“Order”) that, among other things: (i) docketed this matter; (ii) directed the Company to publish notice of the Application; (iii) established a procedural schedule; (iv) scheduled a local public hearing for April 3, 2017, and an evidentiary hearing for May 10, 2017; (v) set a deadline of March 15, 2017, for the filing of notices of participation; and (iv) assigned a Hearing Examiner to conduct all further proceedings in this matter on behalf of the Commission and file a final report.

Timely notices of participation were filed by Maryl Kerley and the Fairfax County Board of Supervisors (“Fairfax Board”).

On March 27, 2017, Fairfax Board filed a Motion for Extension (“Motion”) requesting an extension of the procedural schedule and the evidentiary hearing date. In support, Fairfax Board stated that it had been working diligently to review the Company’s Application and investigate the impact that the proposed Rebuild Project would have, if any, on the citizens of Fairfax County. Fairfax Board pointed out that the deadline for it to file testimony and exhibits was set in the Commission’s Order for April 5, 2017, which would be only two (2) days after the public hearing. Specifically, Fairfax Board requested additional time to address new areas of concern that could be raised at the local hearing.⁴

By Hearing Examiner Ruling dated March 28, 2017, Fairfax Board’s Motion was granted, the procedural schedule revised and the evidentiary hearing rescheduled for June 27, 2017, in a Commission Courtroom.

The hearing convened as scheduled on June 27, 2017. Counsel appearing were Vishwa B. Link, Esquire, Lisa R. Crabtree, Esquire, David J. DePippo, Esquire, and Jennifer D. Daglio, Esquire, for the Company; Joanna L. Faust, Esquire, for Fairfax Board; and D. Mathias Roussy, Jr., Esquire and William H. Harrison IV, Esquire, for Commission Staff. No public witnesses appeared.

SUMMARY OF THE HEARING RECORD

Public Comments

Four public comments were received from residents adjoining or living near the Substation. These concerns pertained to the protection and preservation of the stream and floodplain just outside the Substation’s western edge. Specifically, Ms. Terri Chang stated that trees located on a steep stream bank provide structural stability to the bank and should not be removed. Mr. Andrew Laine stated that the Company’s construction activities “will end their back yard activities and negatively affect [their] lives.” Mr. Laine was especially concerned about “arc flash” which he describes as a danger at substations with high bus bridges such as the one the Company proposes to construct just a few feet from his property. Mr. Laine also expressed concern about EMF levels and

² *Id.* Appendix I. A at 2.

³ *Id.* at 41.

⁴ Motion, at 2, 3.

the Company's failure to provide an estimate of field levels. Mr. Laine stated that "home values [would] decrease significantly, and good neighbors would look to move at the earliest convenience."

Public Witnesses

Seven public witnesses spoke at the public hearing held in Fairfax County on April 3, 2017. Their comments are summarized below.

Lori Jeffrey, president of the Holly Crest Community Association ("HOA"), stated that Holly Crest is a community of eighty-four (84) homes, with many homeowners living adjacent to the Idylwood Substation. Ms. Jeffrey began by noting that she spoke directly with the Commission and was advised that the Commission had no jurisdiction over the Substation redevelopment. Ms. Jeffrey stated that she reviewed the Commission's application guidelines and a number of other applications and wanted to address some of the information that she feels is not provided in the Company's Application. Ms. Jeffrey pointed to the fact that transmission tower dimensions in the Company's Application are approximate and there is no diagram showing the relation of the towers to each other, the right-of-way ("ROW"), or the ground. Ms. Jeffrey maintained the Commission and the public should be provided with more detailed drawings and exact measurements. Ms. Jeffrey questioned why an underground solution was not considered for the transmission lines involved in this Application.⁵

Ms. Jeffrey pointed out that, while section 4A of the Commission's guidelines for applications requires the submission of maximum EMF levels expected to occur at the edge of the ROW, the Company was not able to provide information or projections regarding EMF. The Company has not even provided information as to whether the EMF levels will exceed levels deemed harmful to human health. Ms. Jeffrey questioned whether the current Application sufficiently addressed future expansion projects, and whether the Company's proposals do more than necessary to address NERC requirements.⁶

Ms. Jeffrey pointed out that the proposed 230 kV bus structure would be located ten (10) feet from adjacent properties and wanted to know if this structure comes within the Commission's purview. Ms. Jeffrey further requested EMF projections for the bus once it is energized.⁷

Ms. Jeffrey agreed that reliable electric service is necessary and that the homes in the Holly Crest Subdivision obtain their electricity from the Idylwood Substation. However, Ms. Jeffrey contended the residents had not received information necessary to make an informed evaluation of the changes the Company is proposing. Further, the residents fear the prospect of future expansion that is either exempt from local or Commission oversight. Ms. Jeffrey advised that until the residents of Holly Crest receive information that no alternatives are feasible to address the current need, as well as better protect the interests of the community, they oppose the Company's Application.⁸

⁵ Tr. at 5-12.

⁶ *Id.* at 13-17.

⁷ *Id.* at 18, 19.

⁸ *Id.* at 20, 21.

Gina Jagim, a Holly Crest resident living adjacent to the Substation, spoke of the many benefits of living in the area such as bike trails, schools, and the metro. Ms. Jagim stated they attended sessions sponsored by the Company pertaining to living next to an electrical substation and accepted that reality. Ms. Jagim attended the Company's open house sessions to learn about the Company's plans for the Substation, but still expressed concerns about what was actually going to happen at the Substation, especially with what the Company characterized as "Phase II." Specifically Ms. Jagim expressed concern regarding a future high voltage transmission line being located at the Substation. Ms. Jagim stated that she would like for the Company to explain what the "end state" would be for the Substation.⁹ Ms. Jagim also expressed concern about EMF with the potential for a 230 kV transmission line being so close to their homes.¹⁰

Collin Agee, treasurer of the HOA, wanted to know about "sequencing and mitigation." That is, what are the long term plans for Idylwood Substation, and what would be the mitigation in the form of trees, sound walls, and fencing for this and other projects. Mr. Agee noted that the Company has been very forthcoming in their willingness to meet with interested parties and answer questions with experts and visual aids. Mr. Agee produced two photographs representing the Substation's frontage along Shreve Road. Mr. Agee stated that the only fencing present at the site is a four-foot plastic fence and a temporary wall designed as a noise barrier. Mr. Agee reported that the property values in their neighborhood have dropped by \$20,000.¹¹

Chris Locey, a resident who lives adjacent to Ms. Jagim and to the Substation, testified that he grew a wall of bamboo to shield the view of the Substation, but now there are going to be new structures and lines that would turn the view from his backyard into a "pseudo-industrial area."¹² Mr. Locey pointed out that the purpose of the Rebuild Project is designed to address a future problem and that the Company should be required to seek alternative sites in a commercial or industrial area and not destroy a residential neighborhood.¹³

Jean-Paul Pinzon, MD, a resident and member of the HOA with two small children, testified that he and his wife were attracted to the area because of the character of the Holly Crest Subdivision and the local schools. Dr. Pinzon stated that he was dismayed to learn of the Rebuild Project and the potential damage it could do to the neighborhood and property values. Dr. Pinzon explained that, prior to attending medical school, he spent two years in graduate school in the field of public health and it was there that he learned of the issues pertaining to EMF. Dr. Pinzon expressed concern that high voltage transmission lines were going to be constructed ten feet away from peoples' homes. Dr. Pinzon questioned why these lines could not be placed underground and wondered how a price could be placed on peoples' health. Dr. Pinzon further questioned whether other alternatives had been considered and/or fully evaluated.¹⁴

⁹ *Id.* at 23-31.

¹⁰ *Id.* at 35.

¹¹ *Id.* at 38-42.

¹² *Id.* at 43, 44.

¹³ *Id.* at 46, 47.

¹⁴ *Id.* at 47-50.

Darrell Young, an engineer with Raytheon and a resident of Holly Crest Subdivision, testified that he had reviewed the rules governing transmission lines and electrical substations and complemented the Company on their grounding of fences and security wire around the Substation. Mr. Young maintained that placing the transmission line(s) underground would preserve the beauty of the neighborhood and prevent potential shocks from stray voltage. Finally, Mr. Young contended that if the Company were required to post a surety bond that the Rebuild Project would be finished on time, it would give the homeowners some compensation.¹⁵

Katie Dobbins, a resident of Holly Crest Subdivision and a child neurologist, expressed concern about children's health and stated that they went through their home measuring EMF levels to ensure their safety. Dr. Dobbins advised that with the Company's current plans, a transmission line would be constructed within sixty-eight (68) feet of her daughter's bedroom. Dr. Dobbins acknowledged real concerns about whether their daughter could continue to play safely in their back yard with a transmission line so close. Dr. Dobbins pointed out that EMF is classified as a Category 2B possible human carcinogen and the fact that there are studies that found a correlation between EMF and childhood leukemia.¹⁶

Company Direct Testimony

In support of its Application, the Company presented the direct testimony of Mark R. Gill, a consulting engineer in the electric transmission planning department for Dominion Energy Virginia; Jacob G. Heisey, a transmission line engineer II in the electric transmission line engineering department for Dominion Energy Virginia; Wilson Velazquez, supervisor in the substation engineering section of the electric transmission group of the Company; and Courtney R. Fisher, an environmental consultant for the Company.

Mr. Gill testified that the proposed Rebuild Project is necessary to comply with mandatory North American Electric Reliability Corporation ("NERC") reliability standards and PJM Interconnection, L.L.C. ("PJM") reliability standards, to improve operational performance, and to maximize available land used to accommodate potential future transmission terminations and transformation at its existing Idylwood Substation. Mr. Gill sponsored Sections I.B, I.C, I.E, I.F, I.H, I.I, and co-sponsored Section I.A of the Appendix to the Application.¹⁷

As described in Appendix I.B, Idylwood Substation is located approximately at the intersection of two major overhead transmission corridors and is an electrical transmission hub and major distribution substation. A total of five 230 kV lines terminate on two straight busses within Idylwood Substation, and the 230 kV Clifton-Glen Carlyn Line #266 currently passes over the Substation in a south-to-north direction. As part of the Rebuild Project, it will be necessary, due to height restrictions, to terminate Line #266 at Idylwood Substation by cutting the line and terminating each end on a bus section within the new breaker-and-a-half arrangement. This will create renamed and renumbered Clifton-Idylwood Line #2164 and Idylwood-Glen Carlyn Line

¹⁵ *Id.* at 51-56.

¹⁶ *Id.* at 57-59.

¹⁷ Ex. No. 4, at 1, 2.

#266. A benefit of bringing Line #266 into Idylwood Substation is the added reliability of reducing the number of customers affected by an outage of the line.¹⁸

From an operational performance perspective, the existing straight-bus arrangement at Idylwood Substation is inferior to the proposed breaker-and-a-half arrangement. Currently, with the straight-bus arrangement, if there is a breaker failure event, it will cause all the other line breakers on that bus and the bus tie breaker to open. Such an event would cause all of the 230 kV lines connected to the bus with a failed breaker to be operated in a radial condition until the failed breaker could be isolated and the bus restored, which would disrupt the network flows for any line terminating on that bus and put any of the customers served from the radial lines at risk of an extended outage for another event that involves the radial line. Further, the distribution transformers served from the bus with a failed breaker would be in an outage situation until the bus was restored. Continuing to terminate lines and add load to Idylwood Substation with a straight-bus arrangement would increase the severity of a breaker failure event.¹⁹

By contrast, a breaker failure event within the breaker-and-a-half arrangement proposed for the Rebuild Project would isolate the effect to a single additional element, a transmission line bus section, which would have the effect of minimizing disruption to the network flows by reducing the number of lines in a radial condition. Additionally, breaker maintenance activities for a breaker-and-a-half arrangement can be performed without disrupting network connectivity, unlike a straight-bus which requires lines to be operated in a radial condition while their line breaker is taken out of service. Moreover, the proposed Rebuild Project eliminates the existing condition (described above) where a single breaker failure of the bus tie would cause an interruption for all customers served from Idylwood Substation by causing an outage of all of the distribution transformers until the busses are returned to service.²⁰

The Company's transmission facilities are not projected to meet PJM and NERC Reliability Standards unless Idylwood Substation is rebuilt and rearranged to resolve an identified Generator Deliverability violation. PJM's generator deliverability test for the reliability analysis ensures that the transmission system is capable of delivering the aggregate system generating capacity at peak load with all firm transmission service modeled. In 2011, PJM Generation Deliverability analysis identified several network violations projected to occur beginning in 2016, including a Generator Deliverability violation. Specifically, an outage on Idylwood-CIA Line #2035, among other lines in the vicinity, would overload the Idylwood Substation 230 kV bus. For temporary relief, the Company increased the capacity of the existing 230 kV bus and replaced the tie breaker until the Rebuild Project is in service. As a result of PJM moving the target date for the Rebuild Project from 2016 to 2015, the Company planned to place a temporary bus reinforcement to increase the bus rating in service by the summer of 2016. Thus, the Company maintained that these reliability violations, if not relieved, would impact service reliability to its customers.²¹

Assuming a Commission order approving the Rebuild Project was issued on or before June 30, 2017, the anticipated in-service date for the Rebuild Project would have been

¹⁸ Ex. No. 2, Appendix I.B at 11.

¹⁹ *Id.* Appendix I.B at 12.

²⁰ *Id.*

²¹ *Id.* Appendix I.B at 13, 14.

May 31, 2020, with an estimated total cost of approximately \$107 million. The estimated cost for the Substation work is approximately \$100.8 million and the estimated cost for transmission line work is approximately \$6.2 million, based on 2016 dollars.²²

Mr. Heisey provided a description of the design characteristics of the transmission facilities for the proposed Rebuild Project and discussed the electric and magnetic field (“EMF”) levels. Mr. Heisey sponsored sections I.D, II.A.3, II.B and IV of the Appendix.²³ With the exception of three structures located with the existing right-of-way, Mr. Heisey stated the transmission rearrangements associated with the Rebuild Project occur within the current Idylwood Substation property.²⁴

The new portions of Lines #202, #207, #251, #266, #2035, #2097, and the renamed and renumbered Line #2164 would have a design voltage of 230 kV and would utilize three phase 2-636 ACSR 24/7 conductors arranged vertically and have a transfer capability of 1047 MVA. Each line would have a shield wire.²⁵

Mr. Heisey advised that the EMF calculations that the Company typically provides for linear projects are not available for the Rebuild Project due to the close proximity to the rearrangement of transmission facilities to Substation facilities and equipment which inhibited the Company’s ability to compute EMF levels on an individual line basis at the edge of the ROW independent of Substation equipment. Mr. Heisey maintained that, because the Company proposes to rename and renumber Line #2164 from the split of Line #266, and locate three structures and a conductor within the existing ROW, these structures and the conductor do not change the characteristics of the transmission lines that currently exist within the ROW. Therefore, they should not be considered new transmission facilities for EMF purposes.²⁶

Mr. Velazquez testified that, in order to comply with mandatory NERC and PJM Reliability Standards, to improve operational performance, and to maximize available land use to accommodate potential future transmission terminations and transformation, the Company is proposing to shift the existing Substation footprint within Company-owned property from a straight-bus to a breaker-and-a-half arrangement using GIS bus and breakers.²⁷

The proposed Substation layout will provide twelve 230 kV breakers in a breaker-and-a-half configuration to accommodate the five lines that currently terminate at the Substation, the split Line #266, and the renamed and renumbered Line #2164. As the existing Substation fenced area is not adequate to install the required number of 230 kV breakers using conventional equipment, 230 kV GIS breakers will be used for the Rebuild Project.²⁸ The proposed distribution area is between the existing northernmost Substation fence and Shreve Road. As this area is not large enough to

²² *Id.* Appendix I.F and G at 46, 47.

²³ Ex. No. 5, at 2.

²⁴ Ex. No. 2, Appendix II.A.3 at 53.

²⁵ Ex. No. 2, Appendix II.B.1 and 2 at 67, 68.

²⁶ Ex, No. 5, at 2.

²⁷ Ex. No. 6, at 1, 2.

²⁸ GIS equipment allows the electrical equipment to be located in closer proximity to each other due to the superior cooling qualities of gas insulation. The GIS technology greatly reduces the space required for the 230 kV bus work because it uses an insulating gas in a closed pipe, rather than open air to insulate the bus from other components.

accommodate conventional 38 kV equipment, GIS switchgear will be installed to ensure adequate space.²⁹

Further, as the existing relay and control enclosure is not adequate for the proposed 230 kV equipment, a new 24 foot by 80 foot control enclosure will be installed to the north of the existing control enclosure. All of the communication relays and control panels required for the 230 kV equipment would be installed at the proposed control enclosure. The distribution relay and control equipment currently located in the existing control enclosure would be replaced and relocated to the new 38 kV GIS enclosure. The existing control enclosure will be removed once the proposed enclosures are fully operational and the old enclosure is no longer needed.³⁰

Ms. Fisher advised that, with the exception of three structures located within the existing ROW adjacent to the Company's property, the rearrangements associated with the Rebuild Project will occur within the Company's current Idylwood Substation property.³¹ The Company proposes to shift the existing Idylwood Substation footprint within the Company-owned property and will make use of existing property and ROW easements. No new easements will be required for the Rebuild Project.³² The general character of the Rebuild Project area can be described as a predominantly suburban residential area that is densely populated.³³

Ms. Fisher stated that the Virginia Department of Environmental Quality ("DEQ") will conduct an environmental and permitting review of the Company's Application and file a report ("DEQ Report").³⁴

The Department of Environmental Quality Coordinated Review

In the DEQ Report, DEQ indicated that the following entities either joined in the review or were invited to provide comments:

- DEQ;
- Department of Conservation and Recreation ("DCR");
- Department of Historic Resources;
- Department of Game and Inland Fisheries;
- Department of Transportation ("VDOT");
- Department of Aviation;
- Department of Health;
- Fairfax County; and
- Northern Virginia Regional Commission.³⁵

²⁹ Ex. No. 2, Appendix II.C at 76, 77.

³⁰ *Id.* at 77.

³¹ *Id.* Appendix II.A.3 at 53.

³² *Id.* Appendix II.A.4 at 56.

³³ *Id.* Appendix III.A at 83.

³⁴ As directed by the General Assembly and pursuant to its Memorandum of Agreement Regarding Coordination of Reviews of the Environmental Impacts of Proposed Electric Generating Plants (August 2002), DEQ coordinated a review of the Rebuild Project by a number of governmental agencies and prepared the DEQ Report. Ex. No. 8.

³⁵ Ex. No. 8, at 1.

At the beginning of its Report, DEQ also listed the permits or approvals that “are likely to be necessary”³⁶ in connection with the Rebuild Project and made various recommendations associated with the Rebuild Project which were based on the information and analyses submitted by the reviewing agencies. A summary of findings and recommendations contained in the DEQ Report are as follows:

- Follow DEQ’s recommendations regarding erosion and sediment control and storm water management;
- Follow DEQ’s recommendations regarding air quality protection;
- Reduce solid waste at the source, reuse it and recycle it to the maximum extent practicable;
- Coordinate with DCR’s Division of Natural Heritage for updates to the Biotics Data System database if six months have passed before the project is implemented or if the scope of work changes;
- Follow the Department of Aviation’s recommendation to coordinate with the Federal Aviation Administration to ensure compliance with federal aviation regulations and determine whether further study of impacts from this project is necessary;
- Follow the principles and practices of pollution prevention to the maximum extent practicable;
- Limit the use of pesticides and herbicides to the extent practicable; and
- Coordinate with VDOT regarding its questions related to the “Special Exception Plat and 2232 Plan” included in the application.³⁷

Fairfax Board

The Fairfax Board provided the testimony of Peter Lanzalotta of Lanzalotta & Associates, LLC, a registered professional engineer whose areas of expertise include electric utility system planning and operation, electric service reliability, cost of service, and utility rate design; and Jay Banks, an urban forester II with the Fairfax County Department of Public Works and Environmental Services, Forest Conservation Branch.

Mr. Lanzalotta made the following points concerning the Company’s proposed Rebuild Project:

- Decreases in future forecasted peak loads for the Company raise the possibility that the NERC violation previously projected to occur in 2015 or 2016 will not occur until much further out in the future. The Company and PJM should firm up the date by which the rebuild and reconfiguration of the Substation are needed to avoid any NERC transmission planning violations.
- In order to lessen the visual impacts of having seven 230 kV transmission lines terminate at Idylwood Substation, he recommended that the proposed reconfigured

³⁶ *Id.* at 2.

³⁷ *Id.* at 5.

230 kV transmission line #266/#2164 be placed underground in the vicinity of the Substation.³⁸

- In recognition of the level of development around the Substation and the large number of transmission lines that would ultimately be terminating at the Substation, he recommended that the Company forgo use of GIS technology at the Rebuild Project, thereby saving the additional cost of such technology and forgoing possible future use of Idylwood Substation as the termination point for a 500 kV transmission line. If this is not possible, then consideration should be given to undergrounding additional existing transmission lines at the Substation.³⁹

Mr. Lanzalotta pointed out that in 2011, PJM had projected NERC transmission planning violations involving overloading of the Idylwood Substation starting as soon as 2016. Subsequently, PJM accelerated this date to 2015. To provide temporary relief, the Company increased the capacity of the 230 kV busses and replaced the bus tie circuit breaker in the Substation in the spring of 2015.⁴⁰

Mr. Lanzalotta maintained that the need for transmission system reinforcement has changed since 2011, when the need for reinforcement at Idylwood Substation was initially recognized.⁴¹ Mr. Lanzalotta pointed out that in the PJM 2017 Load Forecast Report, the Company's future projected peak load growth has been reduced to the point that the Company's summer peak load level that was projected to occur in 2016, (based on the 2011 PJM Load Forecast Report) now has been pushed out so far into the future that it does not even occur in the fifteen years reflected in the PJM 2017 Load Forecast Report.⁴² Mr. Lanzalotta maintained that, given the greatly reduced peak load forecast for the Company, it is not clear when Idylwood Substation would need to be reconfigured to meet NERC and PJM standards.⁴³

Mr. Lanzalotta pointed out that the Company did not consider any alternatives to its Rebuild Project based on the Company's stated need to free up space at Idylwood Substation for future load growth. Mr. Lanzalotta noted that in order to increase space, the Company decided to utilize GIS technology to build its proposed breaker-and-a-half system at the Substation. According to PJM documents, Mr. Lanzalotta noted the use of GIS technology adds at least \$20 million to the cost of rebuilding the Substation. Mr. Lanzalotta argued that, in light of the decreasing forecast of future peak loads in the Company's service area, it is questionable that new transmission lines would be needed at the Idylwood Substation.⁴⁴

Jay Banks began his testimony by explaining that a "tree save" area is an area of existing trees that have been designated to be retained on a parcel/project site that are protected from construction activities. Mr. Banks explained that, according to the Company's Special Exception

³⁸ Mr. Lanzalotta explained that his term "in the vicinity" is intended to reflect a distance roughly equivalent to 5-10 overhead spans.

³⁹ Ex. No. 9, at 3, 4.

⁴⁰ *Id.* at 6. See Company response to Fairfax County interrogatory 1-5.

⁴¹ Ex. No. 9, at 6, 7, Exhibit PJL-5.

⁴² Ex. No. 9, at 7, Exhibit PJL-6.

⁴³ Ex. No. 9, at 8.

⁴⁴ *Id.* at 9.

permit from Fairfax County, there is a “tree save” area located near the entrance of the Substation fronting on Shreve Road and consisting primarily of red cedars. Mr. Banks stated that all of the trees in the “tree save” area have been subjected to repeated, severe pruning by the utility companies due to overhead utilities along the front of the Substation. In addition, Mr. Banks noted that due to grading and underground lines, the roots of the existing trees have been severely impacted. Further, Mr. Banks reported that signs required by the Special Exception permit are not present and the fence required by the permit is inadequate and has collapsed in several locations.⁴⁵

Mr. Banks stated that the western side of the Substation has had soils completely disturbed over a large portion of the side, and that none of the steps approved by Fairfax County have been implemented. Mr. Banks further reported that significant soil degradation has occurred along the eastern side of the Substation.⁴⁶

Mr. Banks maintained the Company has provided inadequate information regarding its prior and future actions. He recommended that the Company commit to: (i) re-inventorying existing trees to determine if they can be retained or should be removed, (ii) evaluating and remediating any degraded soil conditions prior to planting the transitional screening plant material, (iii) monitoring of plant health for off-site trees that may be retained and new landscaping material, (iv) maintaining existing and future trees, and (v) consulting with and obtaining approval from Fairfax County for all future corrective measures.⁴⁷

Staff Report

The Staff Report provided a detailed overview of the Rebuild Project including its major components, the Company’s proposed Substation improvements, construction schedule, and the estimated cost of approximately \$107 million, including \$100.8 million for work at the Substation and \$6.2 million for transmission line work outside the Substation.⁴⁸ The Staff Report also analyzed the need for the Rebuild Project,⁴⁹ the impact of economic development,⁵⁰ and the environmental impact of the Rebuild Project.⁵¹ Staff agreed with the Company’s analysis and decision not to propose alternatives to the Rebuild Project.⁵² Staff proposed a hybrid bus (“Hybrid Bus”) which was analyzed by the Company as an alternative to the temporary 230 kV high bus (“High Bus”) at the Substation.⁵³

Overall, Staff concluded that the Company has reasonably demonstrated the need for the Rebuild Project and that it would resolve certain NERC and PJM reliability standard violations. Staff verified the Company’s load flow analyses and confirmed that the Rebuild Project resolves the existing single and tower line overload contingencies that result in violations of NERC reliability criteria. Further, using the 2011 PJM Load Forecast, Staff verified that at least two contingencies

⁴⁵ Ex. No. 10, at 5.

⁴⁶ *Id.* at 7, 9.

⁴⁷ *Id.* at 7-9

⁴⁸ Ex. No. 2, Appendix at 47; Ex. No. 11, at 12-24.

⁴⁹ Ex. No. 11, at 3-12.

⁵⁰ *Id.* at 26.

⁵¹ *Id.* at 26-29.

⁵² *Id.* at 25.

⁵³ These issues will be addressed in the Discussion section of this Report.

continue to exist in violation of NERC reliability criteria, and that the use of the proposed gas insulated substation GIS bus and facilities resolves operational issues and improve reliability for customers.⁵⁴ Staff does not oppose the Company's request that the Commission issue the necessary certificate of public convenience and necessity for the proposed Rebuild Project.⁵⁵

Company Rebuttal

The Company presented the rebuttal testimony of Mark R. Gill, Jacob G. Heisey, Wilson O. Velazquez, Courtney R. Clements, environmental consultant for the Company, and Gabor Mezei M.D., Ph.D., senior managing scientist in the health sciences center of Exponent, Inc.

Mr. Gill confirmed that Burns & McDonnell ("B&McD" or "Burns & McDonnell") was performing an independent review of the construction High Bus at the request of the HOA for the Fairfax County Special Exception Amendment ("SEA"). Mr. Gill noted that the High Bus is necessary for Idylwood Substation to remain energized during construction of the Rebuild Project.⁵⁶

Mr. Gill explained that in the fall of 2016, the Fairfax Board directed the Company to submit a SEA application for specific review and approval of the High Bus. After the Company submitted the SEA, members of the HOA requested information about layout, EMF levels, electrical clearances, and structural adequacy of the High Bus. The HOA requested that an independent engineering firm perform the review. The Company engaged B&McD and B&McD began its review of the High Bus in May of 2017. Later in May, the Company, in a discovery response to Staff, confirmed that the Hybrid Bus was an electrically feasible option.⁵⁷

Mr. Gill acknowledged Staff's concern that certain components of the Rebuild Project relate to a future project ("Idylwood North," a future Idylwood to Tysons transmission line) that has yet to be filed with the Commission. While Mr. Gill stated it may be possible to defer construction of one backbone structure, two spans of conductors and shield wire, it is still necessary to include the breaker that relates to the Idylwood North project in this Rebuild Project.⁵⁸

In response to Fairfax Board witness Lanzalotta, Mr. Gill pointed to the three drivers of the Company's decision to propose this Rebuild Project: (i) to comply with mandatory NERC and PJM reliability standards; (ii) to improve operational performance of the Idylwood Substation; and (iii) maximize available land use to accommodate potential future transmission terminations and transformations. Mr. Gill confirmed that the proposed Rebuild Project will both improve operational performance of the Idylwood Substation and create space for potential future uses consistent with prudent transmission planning for the Northern Virginia area, which has dynamic load growth.⁵⁹

⁵⁴ Ex. No. 11, at 6, 7.

⁵⁵ *Id.* at 29.

⁵⁶ Ex. No. 12, at 3.

⁵⁷ *Id.* at 4.

⁵⁸ *Id.* at 5.

⁵⁹ *Id.* at 6, 7.

Mr. Gill pointed out that Mr. Lanzalotta's analysis, which used the entire Dominion Load Zone as opposed to just the Company's Fairfax Load Zone, misrepresented the time frame within which the NERC reliability criteria violation is expected to occur. Although the projected summer peak loads for the Fairfax Zone was reduced in the 2017 PJM Load Forecast, Mr. Gill stated that the projected summer peak load that contributes to the NERC reliability criteria violation is still expected to occur in the relatively near future.⁶⁰

Mr. Gill maintained that even with the reduction in load forecast, the improved operational performance at Idylwood Substation provided by the Rebuild Project will limit the extent of an outage. This is due to the fact that the current straight-bus configuration is inferior to the proposed breaker-and-a-half arrangement in the Rebuild Project.⁶¹ Specifically, a breaker failure within the breaker-and-a-half arrangement would isolate the effect to a single additional element, a transmission line bus section, which would minimize disruption to the network flow. Further, breaker maintenance activities for a breaker-and-a-half arrangement can be performed without disrupting network connectivity. In contrast, maintenance on a straight-bus arrangement disrupts network flow because lines must be operated in a radial condition while their line breaker is taken out of service.⁶² Mr. Gill pointed out that the Company no longer installs straight-bus arrangements in its substations.⁶³

Mr. Gill explained that the Fairfax Zone is one of three zones in the Northern Virginia load area which comprise the heaviest concentration of load in the entire Dominion Energy Virginia service area. These three zones contain approximately 36% of the company's total summer load demand. Mr. Gill testified that the 2017 PJM Load Forecast for the Fairfax Zone shows a projected annual growth rate from 2017 to 2026 of approximately 1.5%, more than triple the projected annual growth rate of the Dominion Zone as a whole.⁶⁴

Mr. Gill reported that the Idylwood Substation is located in an area of dense development in Fairfax County that continues to grow. It is an electrical transmission hub located approximately at the intersection of two major overhead transmission corridors and, as such, is vitally important to the networked transmission system supporting the Company's Northern Virginia load area.⁶⁵

Mr. Gill responded to Fairfax Board's witness Lanzalotta's assertion that no additional lines should terminate at the Idylwood Substation because of the impact on adjoining neighborhoods and the declining PJM load forecasts. Mr. Gill noted that as an electrical transmission hub, Idylwood Substation is presently the terminus for five 230 kV transmission lines and a key component to supplying the energy necessary to meet load growth in Northern Virginia. Mr. Gill advised that a sixth 230 kV transmission line, from Tysons Substation to Idylwood Substation, has been approved by PJM and an application will be filed with the Commission. A 2008 study, prepared by the George Mason University for Regional Analysis for Fairfax County, determined that residential and commercial development in Tysons Corner would increase over a forty (40) year period (2010-

⁶⁰ *Id.* at 9, 10.

⁶¹ Ex. No. 12, at 10.

⁶² *Id.* at 10.

⁶³ *Id.* at 12, 13.

⁶⁴ *Id.* at 13.

⁶⁵ *Id.* at 13.

2050) from approximately 47.1 million square feet to a range of 87.7 million – 124 million square feet over 2010 levels. According to a 2016 Fairfax Board report, there are currently 27 approved major rezoning applications representing over 46 million square feet of new residential and commercial development. Mr. Gill testified that, based on supporting load flow studies, a robust transmission hub at Idylwood Substation is critical to support the existing and future load in the Company's Northern Virginia area.⁶⁶

Mr. Heisey stated the main goals of the Rebuild Project were to provide proper transmission line terminations within the rebuilt Substation, maintain the reconfigured transmission lines and structures within the existing ROW or on Substation property, and vacate the lower yard for future defined transmission line needs, while minimizing to the maximum extent practicable the impact to neighboring residences.⁶⁷

With regard to Staff's concerns that the Application includes components that are not needed in the current Rebuild Project,⁶⁸ Mr. Heisey pointed out that the Company prudently considers future needs so that current projects do not inhibit known future project designs. Mr. Heisey pointed out that in instances where the available space is already limited and/or constructability and safety is a concern, it is even more crucial to design for these site conditions.⁶⁹

The Company included in this Rebuild Project (i) a 75-foot backbone structure, (ii) approximately two spans (0.03 miles) of 3-phase conductors and a shield wire at an estimated cost of approximately \$319,119, and (iii) a 230 kV GIS breaker at an estimated cost of \$1.6 million for the upcoming Idylwood North project.⁷⁰ Upon review of Staff's Report, Mr. Heisey testified that the 75-foot backbone structure, two spans of conductors and shield wire could be removed from the current Rebuild Project and deferred to be considered in the future Idylwood North application. However, Mr. Heisey continued to emphasize the necessity of including the 230 kV breaker in the current Rebuild Project at a cost of \$1.6 million.⁷¹

Mr. Heisey agreed with Staff's observation that the galvanized steel structures purchased for use in the Rebuild Project in 2016 are dulling naturally. No further dulling measures should be required as the structures will continue to dull naturally prior to installation.⁷²

Mr. Heisey explained that terminating Line #266, which currently passes directly over the Substation, into Idylwood Substation provides many engineering benefits. First, it would minimize the number of required transmission structures because the Line #266 conductors would share structures with other existing transmission lines. Second, the reconfiguration avoids crossing transmission lines which currently span the Substation. Third, terminating Line #266 inside Idylwood Substation would reduce structure heights with the installation of the two 75-foot backbone structures to terminate into the GIS. The current transmission structures are

⁶⁶ *Id.* at 14-16.

⁶⁷ Ex. No. 13, at 2.

⁶⁸ Staff expressed some concerns that the Rebuild Project contained components that are not needed unless the Company receives approval from the Commission for the yet to be filed Idylwood North project. Ex. No. 11, at 10.

⁶⁹ Ex. No. 13, at 3.

⁷⁰ *Id.* at 4.

⁷¹ *Id.* at 5.

⁷² *Id.* at 7.

approximately 145 and 150 feet in height to provide the required clearance for Line #266 to span the Substation.⁷³

Mr. Heisey responded to Fairfax witness Lanzalotta's proposal to place Line #266 underground for several span lengths as it approaches the Substation. He advised that transition facilities necessitating new ROW of one to three acres would be required, thereby increasing impacts and costs.⁷⁴

Mr. Velazquez described the High Bus as a steel, linear structure of approximately 35 -57 feet in height that is expected to remain in place for approximately three years and would be de-energized and removed before the Rebuild Project is completed. Mr. Velazquez explained that the purpose of the High Bus is to provide the new distribution transformers with a reliable 230 kV source of power during construction of the Rebuild Project and that there is no alternative to having the temporary bus. Mr. Velazquez pointed out the benefits of the High Bus as being easy to construct, minimal impact on the remainder of the Substation, faults are easily identified and repair times, which are seldom necessary, are short.⁷⁵

Mr. Velazquez advised that the Hybrid Bus, an alternative to the High Bus, combines segments of the temporary overhead High Bus with a segment of 230 kV underground cable that would require the installation of a concrete encased duct-bank near the sound wall on the eastern side of the Substation. Mr. Velazquez explained that the underground segment of the Hybrid Bus would require a trench for the duct-bank measuring approximately 40-inches wide by 350-foot long, and located 48 to 60 inches below grade level.⁷⁶

While Mr. Velazquez stated the Hybrid Bus appears feasible, it offers no electrical advantages over the High Bus, has the potential for increased impacts, construction and reliability issues, and increased costs. Mr. Velazquez pointed out that the Hybrid Bus could potentially impact the roots of the trees located on the eastern side of the Substation, which serve as a sound barrier and visual screen. The Substation ground grid would also be impacted by the trenching and duct-bank installation, and would require repairs. Jersey barriers would be erected to protect cable terminations from accidental impact by vehicles or construction equipment during the Rebuild Project and the existing four foundations for the High Bus would have to be removed, all of which could extend the overall construction time of the Rebuild Project. Mr. Velazquez described the reliability issues which are present with the undergrounding of any transmission line. These issues include the restoration time for clearing and re-energizing after a fault due to additional testing of components. Finally, the estimated additional cost of the Hybrid Bus would be \$1.7 million.⁷⁷

Mr. Velazquez responded to Staff's concern about including the 230 kV GIS breaker for the future Idylwood North project in this Rebuild Project. He pointed out that eliminating the 230 kV GIS breaker from this Rebuild Project would complicate matters in the future for several reasons. First, the manufacturer could stop making the style of breaker the Company proposes to use in this

⁷³ *Id.* at 7, 8.

⁷⁴ *Id.* at 8.

⁷⁵ Ex. No. 14, at 2, 3.

⁷⁶ *Id.* at 3, 4.

⁷⁷ *Id.* at 4, 5.

Rebuild Project. If that were to happen, Mr. Velazquez explained, the Company would have to make major modifications to the existing GIS facilities in order to insert the breaker. Second, the GIS breakers have multiple operating interlocks for safety. Mr. Velazquez noted that wiring the interlocks in the future is cumbersome and would require multiple outages. Third, the design of the GIS breaker would have to be modified to ensure that enough zones are added. Mr. Velazquez advised the additional gas zones are needed to be able to manage outages and keep the GIS facility safely energized at the time the new breaker is inserted.⁷⁸

Mr. Velazquez responded to Fairfax Board witness Lanzalotta's suggestion that the Company forego the use of GIS technology in its installation of a breaker-and-a-half-scheme at Idylwood Substation to achieve cost saving and forgo any new transmission line terminations. Mr. Velazquez pointed out that there would not be space for current the Rebuild Project without use of a breaker-and-a-half and GIS technology. An additional advantage of GIS equipment lies in that fact that it is enclosed and the noise of a breaker opening or closing would be significantly reduced.⁷⁹

Mr. Velazquez responded to Mr. Lanzalotta's query as to why the temporary relief measures the Company employed at the Substation in 2015, which raised the capacity rating of the Substation buses from 789 MVA to more than 2,300 MVA, could not be a permanent solution. Mr. Velazquez pointed out that construction has too many mechanical connections that would loosen over time and create hot spots on the transmission bus. He noted that hot spots on any part of an electrical system are undesirable and require prompt corrective action that, in this case, would require a forced outage at both the bus and one of the distribution transformers. Such an outage would interrupt the network power flows on two transmission lines, and impede the use of the existing 50-100 MVAR shunt reactor supporting the reactive power in the area.⁸⁰

In response to issues raised regarding the location of the High Bus near several residences, Mr. Velazquez explained that it would not be possible to locate the High Bus on the western side of the Substation. If it is installed on the western side, the High Bus would obstruct and interfere with the installation of the 230 kV GIS enclosure and transmission structures. Further, at the time of re-stringing transmission conductors to the new backbones, additional bus outages would take the three new transformers out of service which is not tolerable at this Substation. Further, the foundations of the High Bus would have to be constructed in a flood plain requiring larger and deeper foundations. If the Hybrid Bus were installed on the western side of the Substation, construction equipment could crush the underground cables unless they were placed deeper than the normal 48 to 60 inches. Finally, Mr. Velazquez pointed out that large drainage pipes are to be installed on the western side of the Substation.⁸¹

In response to a comment by Mr. Laine, a nearby resident, about the possibility of arc flashing, Mr. Velazquez emphasized that it is a priority for the Company to promote a safe environment for its employees and the general public. Mr. Velazquez explained that the use of high speed circuit breakers and adherence to the requirements of electrical clearances, as established by

⁷⁸ *Id.* at 6.

⁷⁹ *Id.* at 7-9.

⁸⁰ *Id.* at 9.

⁸¹ *Id.* at 10, 11.

the National Electric Safety Code, mitigate the risk of arc flash in the Substation. He stated that it would be unlikely for Mr. Laine's property to be affected by arc flashing.⁸²

Ms. Clements stated that the Company reviewed the DEQ Report and had three general comments on the recommendations of DEQ, DCR and VDOT:

- The DEQ Norther Regional Office recommended that the Company consider using permeable paving for parking areas and walkways were appropriate. Ms. Clements pointed out that the Company considers its long-standing practice of using non-compacted stone cover within substations as pervious or permeable. While the crushed stone cover serves as a safety feature by reducing shock currents, it also provides a level of surface stabilization and vegetation control that is easily maintained;
- The DEQ Report recommends coordination with DCR for updates to the Biotics Data System database and resubmission of project information and a map to DCR's Division of Natural Heritage, if the scope of the Rebuild Project changes and/or six months has passed. The Company requested that coordination with DCR for updates to the Biotics Data System database should only be required if (i) there are material changes to the Rebuild Project, not for any change in the project scope; or (ii) twelve months, as opposed to six months, pass after the Commission issues its Final Order before construction commences; and
- VDOT specifies five requirements that will be addressed in the final site plan which will be approved by Fairfax County's Department of Public Works & Environmental Services and will provide additional details regarding curbs, gutters, and sidewalk locations and specifications. Ms. Clements pointed out that work within the VDOT ROW will not commence without an approved land use permit and will remain in compliance with the Land Use Regulations.

In conclusion, Ms. Clements maintained the Company continues to support the Rebuild Project identified in the Application and described in detail in the DEQ Supplement as one that reasonably minimizes adverse impact to the environment.⁸³

In response to Fairfax Board witness Banks, Ms. Clements stated the Company has retained the limits of the tree save area that are depicted on the approved Special Exception plat. All other vegetation near the tree save area was designated to be removed in anticipation of the Rebuild Project and distribution work planned at the site. The removal of trees and vegetation along the western side of the site and along the property frontage on Shreve Road, prior to site plan approval, was part of a distribution project and was not subject to local zoning review. However, Ms. Clements maintained that the tree save area was properly retained and protected with orange fencing. As the SEA process proceeds, Ms. Clements emphasized the Company remains committed

⁸² *Id.* at 11-13.

⁸³ Ex. No. 16, at 4-9.

to discussing necessary corrective measures for the tree save area or any other protective measures for vegetation along the boundaries of the Substation site.⁸⁴

Ms. Clements advised that an up-dated tree survey dated May 15, 2017, had been furnished in the latest submission of the SEA and two trees that may have been impacted by directional drilling appeared to be healthy. Ms. Clements explained that because the western side of the Substation is bordered by an existing transmission line ROW, a minimal amount of trees exist on this side of the property. Ms. Clements noted that the “tree save” area was an important component of the original SEA supported by surrounding neighbors. Ms. Clements emphasized the Company’s commitment to preserving the “tree save” area as outlined in the permit. The Company would support a development condition including a one-time clean-up of the “tree save” area and supplemental landscaping in the overall bond if desired by the surrounding communities.⁸⁵

Ms. Clements further stated that the re-inventory of existing trees was completed and re-submitted as part of the SEA package of May 31, 2017. The Company wanted to clarify that the recommendation to “maintain the existing and future trees” should apply only to the landscaping planted on the Substation property, and not to any portion of the Substation property on which encroachments exist now or in the future. Ms. Clements stated the Company is posting a bond with Fairfax County to replace any offsite trees that could be impacted by the Rebuild Project.⁸⁶

Ms. Clements pointed out that the Substation has existed at this site for over 60 years and operations and maintenance activities have been ongoing during this period. Ms. Clements advised that, as part of the Rebuild Project, the Company is making improvements to the property, including transitional screening yards along each perimeter. In order to establish future plantings and transitional screening, the Company will remove gravel and restore soils in any area necessary.⁸⁷

According to a survey taken by the Company, the public indicated the three most important considerations regarding electric facilities are (i) maximizing the distance from residences, (ii) minimizing visibility, and (iii) minimizing the amount of tree clearing. In the course of the Rebuild Project, Ms. Clements maintained the Company took these considerations into account to the maximum extent practical. Specifically, Ms. Clements pointed out the Company’s efforts to minimize, but not eliminate, visibility of the electrical facilities is mitigated due to the increased space for buffering afforded by the use of breaker-and-a-half and GIS technology. Further, Ms. Clements noted the Company has offered property owners adjacent to the Substation consultation to have landscaping installed on their property.⁸⁸

Dr. Mezei⁸⁹ addressed comments and concerns from the public regarding EMF field levels and the potential effects in relation to the Rebuild Project. He pointed out that research studying

⁸⁴ *Id.* at 10, 11.

⁸⁵ *Id.* at 12-14.

⁸⁶ *Id.* at 15.

⁸⁷ *Id.* at 16.

⁸⁸ *Id.* at 17, 19.

⁸⁹ Dr. Mezei has over twenty-five years of experience in health research including epidemiologic studies of both clinical outcomes and environmental and occupational health issues. Much of Dr. Mezei’s current work and expertise relates to human studies on EMF. Prior to holding his current position, Dr. Mezei led the multidisciplinary EMF Health

potential adverse health effects of exposure to EMF follows three general approaches: (i) epidemiologic studies of people who may be exposed to EMF in their homes, workplaces, or other areas; (ii) experimental laboratory (*in vivo*) studies of animals; and (iii) experimental laboratory (*in vitro*) studies of cells and tissues. Dr. Mezei cautioned that valid conclusions cannot be drawn based on a single study in isolation or based on an arbitrarily selected subset of studies.⁹⁰

Dr. Mezei pointed out that a number of scientific, health and government agencies⁹¹ have conducted evaluations of the scientific evidence on potential health effects of EMF. None of these evaluations have concluded that the overall evidence confirms there are any adverse long-term health effects from environmental exposure to EMF at levels below scientifically established exposure guidelines. Dr. Mezei acknowledged that, while some limited evidence based on a statistical association in some of the childhood leukemia epidemiologic studies is recognized by these organizations, they all concluded that chance, bias, and confounding could not be excluded as an explanation for the reported associations. The epidemiologic evidence for all other cancer and non-cancer health outcomes among children or adults were considered inadequate by all recent reviews.⁹²

Dr. Mezei maintained that, in the area of childhood leukemia epidemiologic studies, several large-scale and methodologically improved studies have been published in recent years from France, the United Kingdom, Denmark, and the United States. These studies did not report an overall association between estimates of EMF exposure from high voltage transmission lines and childhood leukemia development (*e.g.*, Sermage-Faure *et al.*, 2013; Bunch *et al.*, 2014; Pedersen *et al.*, 2014; Crespi *et al.*, 2016).⁹³

Dr. Mezei concluded that EMF fields associated with the Rebuild Project, at the edges of the ROW and beyond, and at the boundaries of the Substation are expected to be within the range commonly encountered from other sources. This level of EMF exposure is below applicable limits set forth in guidelines designed to protect public health. Dr. Mezei further maintained that the health risk assessments and evaluations of EMF research conducted by expert panels did not confirm the existence of any adverse effects at the expected exposure levels at the Rebuild Project,

Assessment Research Program at the Electric Power Research Institute, where the scientific work focused on potential health effects associated with residential and occupational exposure to EMF. Ex. No. 17, at 2.

⁹⁰ *Id.* at 4, 5.

⁹¹ These agencies include the National Institute of Environmental Health Sciences, the International Agency for Research on Cancer, the National Radiological Protection Board of the United Kingdom, the World Health Organization, the International Commission on Non-ionizing Radiation Protection, and the European Union's Scientific Committee on Emerging and Newly Identified Health Risks. *Id.* at 6.

⁹² *Id.* at 6.

⁹³ Sermage-Faure C, Demoury C, Rudant J, Goujon-Bellec S, Guyot-Goubin A, Deschamps F, Hemon D, Clavel J. *Childhood Leukemia Close to High-Voltage Power Lines – The Geocap Study, 2002-2007*. BR J CANCER 108: 1899-906, 2013; Bunch KJ, Keegan TJ, Swanson J, Vincent TJ, Murphy MF. *Residential Distance at Birth from Overhead High-Voltage Power Lines: Childhood Cancer Risk in Britain 1962-2008*. BR J CANCER 110: 1402-8, 2014; Pedersen C, Raaschou-Nielsen O, Rod NH, Frei P, Poulsen AH, Johansen C, Schuz J. *Distance from Residence to Power Line and Risk of Childhood leukemia: A Population-Based Case-Control Study in Denmark*. CANCER CAUSES CONTROL 25: 171-7, 2014; Crespi CM, Vergara XP, Hooper C, Oksuzyan S, Wu S, Cockburn M, Kheifets L. *Childhood Leukemia and Distance from Power Lines in California: A Population-Based Case-Control Study*. BR J CANCER 115: 122-8, 2016. *Id.* at 14 n.9; *Id.* at 14.

nor did the assessments and evaluations find there to be any likely adverse impact on public health.⁹⁴

Company Supplemental Rebuttal

The Company provided the supplemental rebuttal testimony of Matthew S. Ehler, senior electrical engineer with Burns & McDonnell, Joseph P. Cannon, project manager with Burns & McDonnell, Matthew W. Bauer, professional engineer with Burns and McDonnell,⁹⁵ Wilson Velazquez, and Jacob G. Heisey.

Mr. Ehler explained that the members of the HOA requested information regarding layout, EMF levels, electrical clearances, and structural adequacy of the initial construction bus option (the High Bus). Mr. Ehler explained the High Bus includes building two new 230 kV bus sections (side-by-side) on tall steel structures and insulator assemblies. The dual main bus configuration would allow for the connection of existing 230 kV lines and transformers to the proper bus section, which maintains the existing flexibility and reliability of the current 230 kV bus configuration. Mr. Ehler noted that the Company had conceptually designed another construction bus option, the Hybrid Bus. This option would utilize portions of the High Bus but replaces the north-south section, located inside the fence on the east side of the Substation, with 230 kV underground cables. Mr. Ehler advised that the B&McD Report was provided to the members of the HOA on or about June 15, 2017.⁹⁶

Mr. Cannon sponsored the charts contained in the B&McD Report pertaining to estimated EMF levels⁹⁷ that would emanate from the High Bus⁹⁸ and the Hybrid Bus.⁹⁹ Mr. Cannon testified that the predicted EMF levels for the residences closest to the fence of the Substation are well below the permissible filed levels set by IEEE¹⁰⁰ C95-6 Standards for Safety Levels with respect to Human Exposure to Electromagnetic Fields, which includes electric power lines and substations.¹⁰¹

Mr. Bauer¹⁰² provided a technical overview of the bus construction to be employed during the Rebuild Project. Mr. Bauer stated that design calculations for the proposed construction bus structures and foundations at the Idylwood Substation were reviewed and inconsistencies with current standard electric utility practice were found. The inconsistencies pertained to the development of load cases and member deflection limitations for structure design. Further, Mr. Bauer advised that a site specific geotechnical investigation was not performed for the foundation design. Mr. Bauer pointed out that the foundation design does not meet the

⁹⁴ *Id.* at 15.

⁹⁵ Messrs. Ehler, Cannon, and Bauer collectively sponsored the Burns & McDonnell Report (“B&McD Report”) which is attached to Mr. Ehler’s testimony. Ex. No. 18, at Schedule 1.

⁹⁶ *Id.* at 2, 3.

⁹⁷ *Id.* at Schedule 1, 3-1; Ex. No. 20, at 1.

⁹⁸ Ex. No. 18, at Schedule 1, 3-2.

⁹⁹ *Id.* at Schedule 1, 3-4.

¹⁰⁰ Institute of Electrical and Electronics Engineers.

¹⁰¹ Ex. No. 18, Schedule 1 at 3-9.

¹⁰² Mr. Bauer sponsored Section 5.0 of Ex. No. 18, Schedule 1 (B&McD Report).

recommendations of the Company's engineering manual, nor is it consistent with standard electrical utility practice.¹⁰³

Mr. Velazquez responded to the part of the B&McD Report that addressed the phase-to-phase spacing employed in the Company's design for the 230 kV High Bus. He explained that the Company developed the minimum centerline-to-centerline clearance for the High Bus based on the IEEE recommended minimum electrical clearances as well as Company standards, including the addition of a 12-inch safety factor. Mr. Velazquez also explained that the centerline-to-centerline clearance for the High Bus does not require bus parts because it is temporary in nature, thereby reducing by 31 inches the centerline-to-centerline clearance for the High Bus.¹⁰⁴

Mr. Heisey pointed out that the Company's foundation design is consistent with standard utility practice and that, while it is true that modeling software "optimizes" foundation design, the intent of doing so is typically to reduce costs by limiting a foundation's design to exactly the minimum required to satisfy the model. Mr. Heisey advised that the Company's calculations for load cases and member deflection limitations for structure design are not based on any one guide or standard. Mr. Heisey maintained that the Company models certain structural aspects but also relies on good engineering practice and operating experience to develop what they consider to be the most reasonable design for the Company's systems. The Company's models tend to be above the minimum design that modeling software produces.¹⁰⁵

With regard to a specific geotechnical investigation for foundation design, Mr. Heisey pointed out that no site specific investigation was performed because the Company performed subsurface research using existing soil borings from a previous project on the Substation site. Based on information obtained during comparisons with recent geotechnical reports obtained after the foundation design was completed, the Company used conservative design values for the soil assumptions for this design.¹⁰⁶

DISCUSSION

Applicable Statutory Provisions

Section 56-265.2 of the Code provides that "it shall be unlawful for any public utility to construct . . . facilities for use in public utility service . . . without first having obtained a certificate from the Commission that the public convenience and necessity require the exercise of such right or privilege." Furthermore, § 56-46.1 A of the Code states in part as follows:

Whenever the Commission is required to approve the construction of any electrical utility facility, it shall give consideration to the effect of that facility on the environment and establish such conditions as may be desirable or necessary to minimize adverse environmental impact . . . In every proceeding under this subsection, the Commission shall receive and give consideration to all reports that

¹⁰³ Ex. No. 18, Schedule I at 5-3.

¹⁰⁴ Ex. No. 14, at 2, 5.

¹⁰⁵ Ex. No. 22, at 1, 2.

¹⁰⁶ *Id.* at 3-5.

relate to the proposed facility by state agencies concerned with environmental protection; and if requested by any county or municipality in which the facility is proposed to be built, to local comprehensive plans that have been adopted pursuant to Article 3 (§15.2-2223 *et seq.*) of Chapter 22 of Title 15.2.

Additionally, the Commission (a) shall consider the effect of the proposed facility on economic development within the Commonwealth . . . and (b) shall consider any improvements in service reliability that may result from the construction of such facility.

Need

The Idylwood Substation has been in existence since the early 1950's, and it has undergone several expansions and piecemeal improvements since its original construction. The current facility encompasses over 7.15 acres near the corner of Shreve Road and Holly Manor Drive.¹⁰⁷ The residences adjacent to the Substation were constructed between 1959 and 1994.¹⁰⁸

Based on the 2011 Fairfax Load Forecast, the Company would reach a summer peak load of 3851 MW in 2016. The 2017 Fairfax Load Forecast shows the Company would reach that summer peak between 2023 and 2024.¹⁰⁹ However, as Company witness Gill pointed out, a NERC reliability criteria violation still exists in 2022 and must be resolved.¹¹⁰ Assuming a Commission order approving the Rebuild Project issued by June 30, 2017, the Rebuild Project in-service date was anticipated to be May 31, 2020.¹¹¹

With regard to station performance, the existing straight-bus arrangement is inferior to the proposed breaker-and-a-half arrangement. For example, with the straight-bus arrangement, if any of the transmission lines terminating at Idylwood Substation experience a fault that is not properly cleared by its respective line breaker, it would cause all of the other line breakers on that bus and the bus tie breaker to open. Such an event would cause all of the 230 kV lines connected to the bus with a failed breaker to be operated in a radial condition until the failed breaker could be isolated and the bus restored. This would disrupt the network flows for any line terminating on that bus and put any of the customers served from the radial lines at risk of an extended outage for another event that involves the radial line. Continuing to terminate lines and add load to Idylwood Substation with a straight-bus arrangement would increase the severity of a breaker failure event. In contrast, the breaker-and-a-half arrangement proposed for the Rebuild Project would isolate the effect of an outage to a single additional element, a transmission line bus section, which would have the effect of minimizing disruption to the network flows by reducing the number of lines in a radial condition.¹¹²

¹⁰⁷ Ex. No. 3, Attachment 2.H.1 at i.

¹⁰⁸ Ex. No. 11, at 24, 25.

¹⁰⁹ Ex. No. 12, Schedule 2.

¹¹⁰ *Id.* at 10.

¹¹¹ Ex. No. 2, Appendix at 14.

¹¹² *Id.* Appendix at 12.

Staff agrees with the need for the Rebuild Project and does not oppose the Company's request for the issuance of a Certificate of Public Convenience and Necessity for the Rebuild Project.¹¹³

I find the Idylwood Substation Rebuild Project is needed because:

- Based on the 2017 PJM Load Forecast, a NERC reliability criteria violation would occur in 2022 without the Rebuild Project;
- It will enable the Company to maintain the overall long-term reliability of its transmission system; and
- The Rebuild Project would allow the Company to maximize available land at Idylwood Substation to accommodate potential future transmission terminations and transformation.

The Company maintained that it would be significantly more difficult to install the GIS breaker for a future transmission line in the Idylwood Substation after the Rebuild Project is completed. This additional GIS breaker would be needed for the Idylwood to Tysons 230 kV transmission line project for which the Company plans to file an application in the fourth quarter of 2017.¹¹⁴ The Company points to the case of *Application of Virginia Electric and Power Company, For approval and certificates of public convenience and necessity for facilities in Arlington County: Glebe-Radnor Heights 230 kV Transmission Line; Davis-Radnor Heights 230 kV Transmission Line; Ballston-Radnor Heights 230 kV Transmission Line; and Radnor Heights Substation*, Case No. PUE-2010-00004, Final Order (July 21, 2010) as precedent for the installation of GIS breakers for a future transmission line.¹¹⁵

The Company explained that, unlike air insulated substations where a breaker or a switch can easily be added to a bay in the future, GIS substations are designed as an integrated system that is comprised of multi-component assemblies (parts) inside a dedicated grounded metal housing. The energized parts are sealed inside the metal housing filled with pressurized sulfur hexafluoride gas ("SF-6") as the insulation medium. In order to add a breaker, or any other part, to a GIS substation that has been installed and already in operation, the metal housing must be partially disassembled which would require eliminating all of the SF-6 gas in the disassembled portion. To date, the Company has never executed this process. The process would require outages which would have to be scheduled and there would be additional costs. Further, GIS parts are modified approximately every 10 years and there is no guarantee that compatible GIS parts would be available in the future.¹¹⁶ Moreover, the lack of workable space in the Substation would present further safety issues with construction equipment set up near energized facilities. Finally, the 230 kV GIS breaker would be required regardless of whether the Idylwood North transmission line is constructed overhead or underground.¹¹⁷ For the reasons stated above, and without pre-judging the

¹¹³ Ex. No. 11, at 29.

¹¹⁴ Tr. at 50, 51; Ex. No. 15, at 3.

¹¹⁵ Ex. No. 12, at 6. The Company referenced the Staff Report in this case, which was filed on June 7, 2010.

¹¹⁶ Ex. No. 15, at 2.

¹¹⁷ Ex. No. 13, at 3, 4.

need for the future Idylwood to Tysons 230 kV transmission line, I find that it is prudent to approve the installation of the 230 kV GIS breaker for that transmission line in this proceeding.

While the addition of the final breaker should be installed when the GIS system is constructed for the reasons set forth above, the same cannot be said of the Company's proposal to install a 75-foot backbone structure, two phase conductors and shield wires associated with the future Idylwood North project.¹¹⁸ These elements can be constructed in the future and would not be required if the Idylwood North line were placed underground. Therefore I find the backbone structure, two phase conductors, and shield wire associated with the Idylwood North project should not be included in this Rebuild Project.

I further find that the High Bus should be utilized instead of the Hybrid Bus for the Rebuild Project. This bus will be temporary, with a duration of two to three years, during the construction phase of the project. The Hybrid Bus would cost an additional \$1.7 million and only one of the three segments would be underground. Further the underground segment of the Hybrid Bus would be located in an area where a tree buffer is to be preserved. The concrete underground casings of the Hybrid Bus would most likely have an adverse impact on these trees.

Alternatives

Mr. Gill stated that, after the Company's real estate consultant performed an extensive study of property along the Braddock to Idylwood transmission corridor and failed to identify any suitable parcels for an additional substation location, the Company decided to use GIS technology to provide additional space at the Idylwood Substation.¹¹⁹ Staff agreed with the Company's assessment regarding alternatives to the Rebuild Project.¹²⁰ Another consideration regarding an alternative site is that the substations would still have to be connected. In this case, it would mean yet more transmission lines that would have to be sited and constructed in areas that are no less dense than the area around Idylwood Substation.

Non-Glare Components

The Company's proposed Rebuild Project would include the removal of thirteen existing structures, including three steel lattice towers and installation of seventeen new structures, including nine galvanized steel monopoles. The Company purchased the new structures in 2016 and they have been exposed to the elements and have begun the natural dulling process. Further, the construction process is not anticipated to be completed for approximately three years and the dulling process will continue during that time. I find that additional measures to artificially dull the structures are not warranted.

Economic Development

I find the proposed Rebuild Project will have a positive impact on economic development in the Fairfax County area. I also find the Rebuild Project will have a positive impact on Virginia's

¹¹⁸ *Id.* at 3, 4.

¹¹⁹ Ex. No. 12, at 17; Ex. No. 2, at Appendix II A. 7.

¹²⁰ Ex. No. 11, at 25.

economy by facilitating reliable electric service. The Idylwood Substation serves an area that is rapidly growing and includes infrastructure that is essential to the economic welfare of the Commonwealth.

Environmental Impact

I find the recommendations contained in the DEQ Report are reasonable and should be implemented by the Company with the following qualifications:

- The stone used by the Company for parking areas and walkways should be considered permeable and the Company should not be required to use permeable paving for the Substation area; and
- The Company's coordination with DCR for updates to the Biotics Data System should only be required if twelve months (instead of six months) have passed from the date of the Commission's final order before the project commences construction or if the scope of the project involves material changes.

EMF

Certainly the concerns of nearby residents to EMF radiating from the electrical facilities associated with the Rebuild Project are understandable, especially where young children are involved. However, there is simply no conclusive evidence that exposure to EMF emanating from nearby high voltage electrical facilities is causally associated with an increased incidence of cancer or other detrimental health effects in humans. Measurements and calculations of historical and projected EMF values associated with the operation of the Substation, and associated transmission facilities, at the edge of the ROW and boundaries of the Substation are expected to be within the range that is below applicable guideline limits developed to protect public health. Potential health effects of exposure to EMF have been extensively researched worldwide during the past four decades, and there is no scientific evidence that exposure to EMF results in adverse health effects in humans.

FINDINGS AND RECOMMENDATIONS

Based on the evidence and for the reasons set forth above, I find that:

1. The Rebuild Project is justified by the public convenience and necessity;
2. The High Bus (as opposed to the Hybrid Bus) should be approved;
3. The breaker for the future Idylwood North project should be included in this Rebuild Project;
4. The backbone structure, two phase wires and shield wire associated with the future Idylwood North project should not be included in this Rebuild Project;

5. The Rebuild Project will maximize the use of existing rights-of-way and no new right-of-way will be required;
6. The recommendations contained in the DEQ Report are, with the qualifications set forth above, reasonable and should be adopted by the Commission as conditions of approval;
7. The Rebuild Project is essential to support ongoing economic development and to provide reliable electric service in Fairfax County and Northern Virginia;
8. The Rebuild Project is not suitable for underground construction; and
9. There are no feasible alternatives to the Company's proposed Rebuild Project.

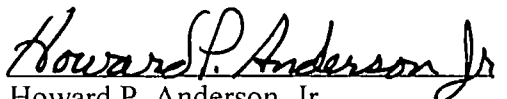
In accordance with the above findings, **I RECOMMEND** the Commission enter an order that:

1. **ADOPTS** the findings set forth above;
2. **GRANTS** the Company's Application for the Rebuild Project; and
3. **DISMISSES** this case from the Commission's docket of active cases.

COMMENTS

The parties are advised that any comments (Section 12.1-31 of the Code of Virginia and Commission Rule 5 VAC 5-20-120 C) to this Report must be filed with the Clerk of the Commission in writing, in an original and fifteen (15) copies, within seven (7) days from the date hereof. The mailing address to which any such filing must be sent is Document Control Center, P.O. Box 2118, Richmond, Virginia 23218. Any party filing such comments shall attach a certificate to the foot of such document certifying that copies have been mailed or delivered to all counsel of record and any such party not represented by counsel.

Respectfully submitted,


Howard P. Anderson, Jr.
Hearing Examiner

Document Control Center is requested to mail a copy of the above Ruling to all persons on the official Service List in this matter. The Service List is available from the Clerk of the State Corporation Commission, c/o Document Control Center, 1300 East Main Street, Tyler Building, First Floor, Richmond, VA 23219.