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**VIA ELECTRONIC DELIVERY**

March 24, 2016

William H. Chambliss, Esq.  
Alisson P. Klaiber, Esq.  
Andrea Macgill, Esq.  
Office of General Counsel  
Tyler Building – 10<sup>th</sup> Floor  
1300 East Main Street  
Richmond, Virginia 23219

**Application of Virginia Electric and Power Company for approval and certification of  
electric facilities: Haymarket 230 kV Double Circuit Transmission Line  
and 230-34.5 kV Haymarket Substation  
Case No. PUE-2015-00107**

Dear Counsel:

Enclosed are the responses of Virginia Electric and Power Company to Question Nos. 9 and 15 through 18 of the Interrogatories and Requests for Production of Documents by the Staff of the State Corporation Commission (First Set).

Should you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

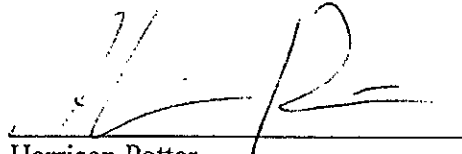
  
Charlotte P. McAfee  
Senior Counsel

Enclosure

cc: Mr. Neil Joshipura  
Will Reisinger, Esq.  
Vishwa Link, Esq.  
Jennifer Valaika, Esq.  
Cliona Robb, Esq.  
Michael Quinan, Esq.  
James Ritter, Esq.

**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

The following response to Question No. 9 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision.

A handwritten signature in black ink, appearing to read 'H. Potter', is written over a horizontal line.

Harrison Potter  
Engineer III  
Dominion Virginia Power

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**Question No. 9**


Does the customer's current projected ramp schedule remain consistent with the schedule provided in the Application?

**Response:**

See Confidential Attachment Staff Set 1-8 (3). This load ramp lags behind the ramp schedule provided in the Application. See the Company's response to Question Nos. 4 and 8 of the Staff's First Set regarding the adjusted ramp schedule.

**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

The following response to Question No. 15 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision as it pertains to transmission line engineering.

  
Robert J. Shevenock II  
Consulting Engineer  
Dominion Technical Solutions, Inc.

The following response to Question No. 15 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision as it pertains to substation engineering.

\_\_\_\_\_  
Wilson O. Velazquez  
Supervisor Substation Engineering  
Dominion Technical Solutions, Inc.

The following response to Question No. 15 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision as it pertains to underground line engineering.

\_\_\_\_\_  
Thomas W. Reitz, Jr.  
Consulting Engineer  
Dominion Technical Solutions, Inc.

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**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

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Robert J. Shevenock II  
Consulting Engineer  
Dominion Technical Solutions, Inc.

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Wilson O. Velazquez  
Supervisor Substation Engineering  
Dominion Technical Solutions, Inc.

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Thomas W. Reitz, Jr.  
Consulting Engineer  
Dominion Technical Solutions, Inc.

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**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

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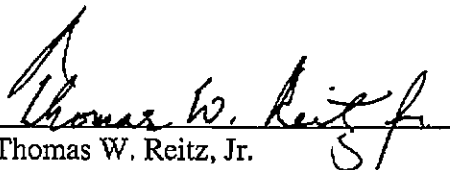
Robert J. Shevenock II  
Consulting Engineer  
Dominion Technical Solutions, Inc.

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Wilson O. Velazquez  
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Thomas W. Reitz, Jr.  
Consulting Engineer  
Dominion Technical Solutions, Inc.

**Question No. 15**

Please provide detailed breakdown of the estimated costs of construction for the proposed and alternative routes below.

- a. Proposed Route (I-66 Overhead)
- b. Railroad Alternative Route.
- c. I-66 Hybrid Alternative Route.

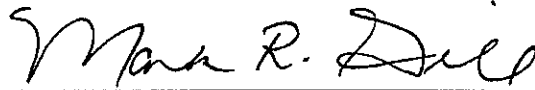
Show material quantities, material costs, and labor costs. The following items should be among those individually subtotaled: engineering, project management, substation work, geologic services, easements of right-of-way, right-of-way clearing, cable/conductor, cable pulling, cable splicing, cable terminating, splice vault construction, duct bank construction, trench opening/closing/surface restoration, and line structures.

**Response:**

See Attachments Staff Set 1-15(1)-(10) for cost reports.

**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

The following response to Question No. 16 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision as it pertains to electric transmission planning.



Mark R. Gill  
Consulting Engineer  
Dominion Virginia Power

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**Question No. 16**

Describe the feasibility of a "Railroad Hybrid Alternative." This alternative would theoretically follow the route for the Railroad Alternative but would be placed underground after the Company's transition station. Include the cost, reliability, environmental impact, and ease of acquiring right-of-way.

**Response:**

From an electrical perspective, a "Railroad Hybrid Alternative" would be similar to Transmission Alternative (4) described in the Section I.C of the Appendix.

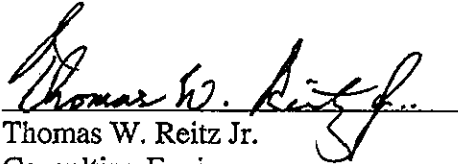
**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

The following response to Question No. 16 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision.



\_\_\_\_\_  
Jeff Thommes  
Routing Specialist  
Natural Resource Group, LLC

The following response to Question No. 16 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision as it pertains to underground transmission line engineering.



\_\_\_\_\_  
Thomas W. Reitz Jr.  
Consulting Engineer  
Dominion Technical Solutions, Inc.

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**Question No. 16**

Describe the feasibility of a "Railroad Hybrid Alternative." This alternative would theoretically follow the route for the Railroad Alternative but would be placed underground after the Company's transition station. Include the cost, reliability, environmental impact, and ease of acquiring right-of-way.

**Response:**

The overhead portion of a "Railroad Hybrid Alternative" would follow the same alignment as the I-66 Hybrid Alternative. The underground segment would begin at the Heathcote transition station for a Railroad Hybrid Alternative and follow substantially the same alignment as the current Railroad Alternative. The Railroad Alternative alignment was developed for overhead construction, so minor alignment adjustments would be required in some locations to accommodate different construction methods (e.g., trenching and horizontal directional drilling versus overhead construction).

If an underground segment for a Railroad Hybrid Alternative were approved, it would be installed using a combination of trenching and horizontal directional drilling construction



methods. The segments installed using trenching construction methods would require the installation of two concrete duct banks. The segments installed using the horizontal directional drilling construction method would involve the installation of four ducts and precast concrete manholes. Manholes will be required approximately every 2,000 feet for each duct. Along the segments that would be installed using trenching techniques, the construction right-of-way would be 50 feet wide, of which 40 feet would be retained as permanent easement. For the segments installed using the horizontal directional drill construction technique, the construction and permanent right-of-way would be 80 feet wide to allow for a permanent access road.

To support horizontal directional drilling operations, approximately eight individual construction areas, each roughly one acre in size, must be cleared and built along the access road every approximately 1,800 feet apart, including along the North Fork of Broad Run. In each of these workspaces, drilling operations and conduit pull back operations would occur for the four required drill paths for the line – two for each circuit. The Company estimates that 36,000 feet of horizontal direction drill would be required for a Railroad Hybrid Alternative, which represents approximately 6.8 miles of directional drilling, or approximately 3.4 miles for each circuit. Bundled conduits 2,000 feet in length would then be pulled through the drilled tunnel. Once the conduits are in place, splicing vaults would then be installed for cable splicing.

The total distance of road borings on a Railroad Hybrid Alternative is 1,200 feet (in contrast to 3,600 feet of road borings for the I-66 Hybrid Route). Micro-tunneling under the railroad tracks would also be required for a Railroad Hybrid Alternative in two locations, with two tunnels each for a total distance of approximately 240 feet (no micro tunneling is expected for the I-66 Hybrid Route).

Since there is no other access to a large portion of a Railroad Hybrid Alternative, the construction of a permanent access road would be required in this area in order to deliver construction material including splice vaults, conduits, and cable (on reels) weighing in excess of 40,000 pounds. The only access to these splice vault locations is by means of the right-of-way. Construction equipment and cable pulling equipment would also have to maneuver along the permanently constructed access road. After construction of a Railroad Hybrid Alternative is completed, the permanent access road and splice vault areas would need to be maintained for operational and maintenance purposes. Access to the splice vaults would be required to conduct vault and splice joint inspections, as well as cable jacket testing.

The construction time anticipated for a Railroad Hybrid Alternative would be approximately 30 months, and it is not possible to complete construction of such an alternative by the needed in-service date for the Project.

A Railroad Hybrid Alternative would cross intact forested areas, forested wetlands, and two conservation easements. The construction of the permanent access road would require filling wetlands and constructing bridges over the North Fork Broad Run and its tributaries. Additional details relating to environmental impacts of the route alternative are provided in the Company's response to Question No. 17 of the Staff's First Set.

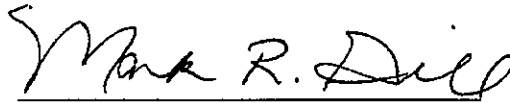
Acquiring portions of the right-of-way with regards to the two conservation or open space easements is uncertain at this time. These easements would require the approval of a governmental entity that has expressed opposition to allowing an overhead line, and it is not

apparent if an underground route through these areas would be approved. Condemnation of these easements is not possible.

Due to the higher expected environmental impacts and costs (*e.g.*, wetland mitigation) associated with constructing an underground line along the Railroad Route, increased engineering challenges, its longer length, and longer construction duration, the Company does not support a Railroad Hybrid Alternative. In addition, due to questions over the ability to condemn right-of-way for the entire route, the route may not be feasible. For these reasons, costs have not been calculated.

**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

The following response to Question No. 17 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on March 10, 2016 has been prepared under my supervision as it pertains to electric transmission planning.



Mark R. Gill  
Consulting Engineer  
Dominion Virginia Power

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**Question No. 17**

Compare the Company's I-66 Hybrid option versus the Railroad Hybrid Alternative described in the previous question. Include comparisons of cost, environmental impact, and projected construction time.

**Response:**

See the Company's response to Question No. 16 of the Staff's First Set regarding electric transmission planning.

**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
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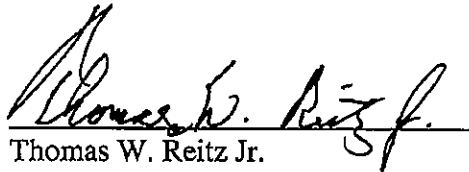
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Jeff Thommes  
Routing Specialist  
Natural Resource Group, LLC

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Thomas W. Reitz Jr.  
Consulting Engineer  
Dominion Technical Solutions, Inc.

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**Question No. 17**

Compare the Company's I-66 Hybrid option versus the Railroad Hybrid Alternative described in the previous question. Include comparisons of cost, environmental impact, and projected construction time.

**Response:**

See the Company's response to Question No. 16 of the Staff's First Set. As with a "Railroad Hybrid Alternative," the underground segment of the I-66 Hybrid Alternative would be installed using a combination of trenching and horizontal directional drilling construction methods. Drilling would be required for road crossings, wetland areas, and avoidance of storm water basins. Unlike the Railroad Hybrid Alternative, however, the majority of the I-66 Hybrid Alternative would be installed using the trenching technique rather than the drilling technique. Underground segments installed using trenching construction methods would require the

installation of two concrete duct banks. The segments installed using the horizontal directional drilling construction method would involve the installation of four ducts. For the I-66 Hybrid Alternative, workspaces smaller in size to those of a Railroad Hybrid Alternative will also be required to accommodate a drill rig and the length of the drilling path. The anticipated workspaces can be set up in areas that are already cleared. The number of manholes will be fewer for the I-66 Hybrid Alternative due to the number of ducts required to accommodate the underground cables.

An environmental comparison of the key environmental differences between a Railroad Hybrid Alternative and the I-66 Hybrid Alternative is provided in Table Staff Set 1-17.

TABLE Staff Set 1-17 Environmental Comparison of the Railroad Hybrid Alternative to the I-66 Hybrid Alternative			
Environmental Feature	Unit	Railroad Hybrid Alternative	I-66 Hybrid Alternative
Length	Miles	5.6	5.3
Construction right-of-way	Acres	66.6	45.6
Forestland crossed	Miles	44.8	23.5
Wetlands Crossed	Acres	24.2	5.9
Palustrine Emergent	Acres	1.1	1.4
Palustrine Forested	Acres	20.6	3.9
Palustrine Scrub Shrub	miles (acres)	1.7	0.0
Palustrine Unconsolidated	miles (acres)	0.8	0.6
Waterbodies Crossed	Number	9	5
Conservation Easements Crossed	acres (number)	10.2 (2)	1.2 (2)

A Railroad Hybrid Alternative would be approximately 0.3 mile longer, impact 21.3 acres more forestland, and impact 21 acres more land during construction than the corresponding segment of the I-66 Hybrid Alternative. A Railroad Hybrid Alternative would require building a permanent access road along the alignment located south of the existing railroad tracks. In contrast, the I-66 Hybrid Alternative would be sited in an area accessible by existing roads.

A Railroad Hybrid Alternative would also impact more wetlands (18.3 acres) and waterbodies (four) than the I-66 Hybrid Alternative. Moreover, the majority of the wetlands impacted by a Railroad Hybrid Alternative are forested wetlands (20.6 acres). Clearing forested wetlands results in long-term impacts due to the removal of trees within construction workspaces; it also requires compensatory mitigation through Clean Water Act permitting requirements. In addition to the forested wetland clearing, permanent wetland fill would be required in order to construct the permanent access road. The access road would also require constructing bridges over the North Fork Broad Run and its tributaries. No similar bridge construction would be required for the I-66 Hybrid Alternative.

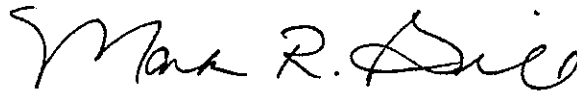
A Railroad Hybrid Alternative would impact 10.2 acres of conservation easements, including 9.8 acres of Open Space and Trail easement administered by Prince William County and 0.4 acres of open space easement administered by the Northern Virginia Conservation Trust. In contrast, the I-66 Hybrid Alternative would impact 1.2 acres of Prince William County Open Space easement adjacent to I-66. Dominion would be required to obtain approval from these organizations to construct and operate either alternative.

The construction of a Railroad Hybrid Alternative is anticipated to take six months longer to construct than the I-66 Hybrid Alternative (30 months versus 24 months) due to the additional length, construction of the permanent access road, and the additional horizontal directional drilling operations. Because construction of a Railroad Hybrid Alternative is estimated to take approximately 30 months, it is not possible to complete construction of that alternative by the needed in-service date for the Project.

Due to the higher expected environmental impacts and costs (*e.g.*, wetland mitigation) associated with constructing an underground line along the Railroad Route, increased engineering challenges, its longer length, and longer construction duration, the Company does not support a Railroad Hybrid Alternative. In addition, due to questions over the ability to condemn right-of-way for the entire route, the route may not be feasible. For these reasons, costs have not been calculated.

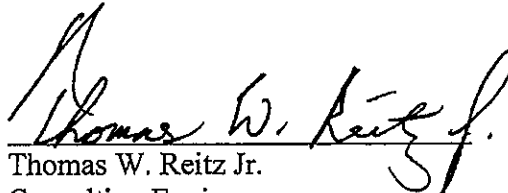
**Virginia Electric and Power Company**  
**Case No. PUE-2015-00107**  
**Virginia State Corporation Commission Staff**  
**First Set**

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Mark R. Gill  
Consulting Engineer  
Dominion Virginia Power

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Thomas W. Reitz Jr.  
Consulting Engineer  
Dominion Technical Solutions

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**Question No. 18**

Describe the feasibility of a "Single-Circuit I-66 Hybrid Alternative." This alternative would follow the same electrical configuration as the I-66 Hybrid Alternative (double-circuit 230 kV loop) to the transition station and then, from the transition station, extend a single-circuit 230 kV transmission line underground to the proposed Haymarket Substation along the same route as the I-66 Hybrid Alternative. Include the cost, reliability, and environmental impact.

**Response:**

For the same reasons that a double circuit Haymarket Loop was proposed instead of a single circuit tap, as stated in Section I.A of the Appendix, a "Single-Circuit I-66 Hybrid Alternative" would not be acceptable since the Customer's proposed load ramp schedule is projected to

exceed 100 MW. This would create loading on a radial line in excess of 100 MW, which is a violation of the Company's NERC-compliant Transmission Planning Criteria, specifically Section C.2.6, which limits loading on a radial feed in excess of 100 MW without "an alternate transmission supply." See also the Company's response to Question No. 13 of the Staff's First Set.

Because the Single-Circuit I-66 Hybrid Alternative is not electrically feasible, the Company has not conducted additional analysis.