

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
DIVISION OF ENERGY REGULATION**

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**PREFILED TESTIMONY OF  
NEIL JOSHIPURA  
ON THE  
APPLICATION OF  
VIRGINIA ELECTRIC AND POWER COMPANY  
FOR APPROVAL AND CERTIFICATION OF  
ELECTRIC TRANSMISSION FACILITIES:  
HAYMARKET 230 kV DOUBLE-CIRCUIT TRANSMISSION LINE  
AND 230-34.5 kV HAYMARKET SUBSTATION**

**CASE NO. PUE-2015-00107**

**June 2, 2016**

## SUMMARY

1 This Commission Staff ("Staff") Report presents the results of Staff's investigation  
2 of Virginia Electric and Power Company's ("Company") application to the State  
3 Corporation Commission for approval and issuance of a certificate of public convenience  
4 and necessity to construct and operate electric facilities for a new 230-34.5 kV  
5 Haymarket Substation and a new 230 kV double transmission line from a tap point on a  
6 converted Line #124 to the new Haymarket Substation in Prince William County  
7 (collectively, "Haymarket Project"). The results of Staff's review are summarized below.

- 8 • The Company received a request to provide electrical service to a large data center  
9 campus. Due to the limited capacity of the distribution facilities in the area, the need  
10 for the Haymarket Project has been confirmed.
- 11 • The Staff reviewed five routes for the Haymarket Loop, four proposed to be  
12 constructed entirely overhead and one proposed to be constructed with an overhead  
13 segment and an underground segment ("I-66 Hybrid"). All potential routes require  
14 new right-of-way. The Company prefers the I-66 Overhead Route. The I-66 Hybrid  
15 alternative route costs \$166.7 million, which is \$115.7 million more expensive than  
16 the I-66 Overhead Route.
- 17 • There is some level of ambiguity relative to the applicability of Company's line  
18 extension policy to the Project and its subsequent cost allocation and recovery.

19 It is Staff's conclusion that the Company has reasonably demonstrated the need for  
20 the proposed Haymarket Project and therefore Staff does not oppose the issuance of a  
21 certificate.

**PREFILED TESTIMONY**  
**OF**  
**NEIL JOSHIPURA**  
  
**APPLICATION OF**  
**VIRGINIA ELECTRIC AND POWER COMPANY**  
  
**CASE NO. PUE-2015-00107**

1 **Q1. PLEASE STATE YOUR NAME AND POSITION AT THE VIRGINIA**  
2 **STATE CORPORATION COMMISSION.**

3 **A1. My name is Neil Joshipura. I am a Utilities Engineer in the Division of Energy**  
4 **Regulation.**

5 **Q2. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

6 **A2. The purpose of my testimony is to sponsor the Staff Report on the Application of**  
7 **Virginia Electric and Power Company to construct the proposed Haymarket**  
8 **230 kV transmission line and 230-34.5 kV Haymarket substation. The Staff**  
9 **Report is attached to this testimony.**

10 **Q3. DOES THIS CONCLUDE YOUR TESTIMONY?**

11 **A3. Yes.**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
DIVISION OF ENERGY REGULATION**

**STAFF REPORT  
ON THE  
APPLICATION OF  
VIRGINIA ELECTRIC AND POWER COMPANY  
FOR APPROVAL AND CERTIFICATION OF  
ELECTRIC TRANSMISSION FACILITIES:  
HAYMARKET 230 kV DOUBLE-CIRCUIT TRANSMISSION LINE  
AND 230-34.5 kV HAYMARKET SUBSTATION**

**PREPARED BY  
NEIL JOSHIPURA**

**CASE NO. PUE-2015-00107**

**June 2, 2016**

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## INTRODUCTION

On November 6, 2015, Virginia Electric and Power Company, d/b/a Dominion Virginia Power ("Virginia Power" or "Company") filed its Application No. 272 and supporting documents ("Application") with the State Corporation Commission ("Commission") requesting a Certificate of Public Convenience and Necessity for the proposed Haymarket 230 kilovolt ("kV") double circuit transmission line and 230 kV Haymarket Substation.

According to the Application, the Company proposes to:

- construct a new 230-34.5 kV Haymarket Substation ("Haymarket Substation") in Prince William County,
- convert its existing 115 kV Gainesville-Loudoun Line #124, located in Prince William and Loudoun Counties, to 230 kV operation ("Line #124 conversion"), and
- construct a 5.1 mile overhead 230 kV double circuit transmission line ("Haymarket Loop") from a tap point ("Haymarket Junction") on the converted Line #124 to the proposed Haymarket Substation in Prince William County and the Town of Haymarket. (Haymarket Junction is located near the end of Cushing Road (State Route 781) approximately 0.5 mile north of the Company's existing Gainesville Substation.)

The Line #124 conversion, Haymarket Loop, and Haymarket Substation are referred to collectively herein as the "Project."



1 transmission lines. The Bristers-Gainesville Line #2101 and Remington CT-Gainesville  
2 Line #2114 enter Gainesville Substation from the south, while the Loudoun-Gainesville  
3 Line #2030 enters from the north. Additionally, the 115 kV Loudoun-Gainesville Line  
4 #124 also enters Gainesville Substation from the north.

5 The Company's Warrenton Substation is located in Fauquier County,  
6 approximately 10.4 miles (straight line) southwest of the proposed Haymarket Substation.  
7 It is sourced by the two 230 kV transmission lines: Remington CT-Warrenton Line  
8 #2086 and Remington CT-Warrenton Line #2155.<sup>3</sup>

9 The Company's Middleburg Substation is located in Loudoun County,  
10 approximately 10.5 miles (straight line) northwest of the proposed Haymarket Substation.  
11 It is sourced by a radial single circuit 115 kV transmission line: New Road-Middleburg  
12 Line #49.

13 The Company's New Road Switching Station ("New Road Station") is located in  
14 Loudoun County, approximately 8.1 miles (straight line) north of the proposed  
15 Haymarket Substation. It is sourced by the two 230 kV transmission lines: Loudoun-  
16 New Road Line #2117 and Loudoun-New Road Line #2123. Two 115 kV lines are  
17 sourced by New Road Station: Line #49 to the Company's Middleburg Substation and  
18 Line #113 to Northern Virginia Electric Cooperative's ("NOVEC") New Road Delivery  
19 Point ("DP") directly adjacent to New Road Station.

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<sup>3</sup> *Application of Virginia Electric and Power Company d/b/a Dominion Virginia Power for approval and certification of electric transmission facilities: Remington CT-Warrenton 230 kV Double-Circuit Transmission Line, Vint Hill-Wheeler & Wheeler-Loudoun 230 kV Transmission Lines, Vint Hill Switching Station & Wheeler Switching Station, Case No.PUE-2014-00025, Final Order (Feb. 11, 2016).*

1 The Company's Wheeler Switching Station ("Wheeler Station") is located in  
2 Prince William County, approximately 4.5 miles (straight line) south of the proposed  
3 Haymarket Substation. It will be sourced by the two 230 kV transmission lines:  
4 Gainesville-Wheeler Line #2161 and Vint Hill-Wheeler Line #2174.<sup>4</sup>

## 5 PROJECT DESCRIPTION

6 According to the Application, the need for the Project originates from a request by  
7 a retail electric service customer (the "Customer") to obtain service to a proposed data  
8 center campus ("Haymarket Campus") to be located west of the Town of Haymarket  
9 approximately 0.4 mile west of James Madison Highway (U.S. Route 15) along John  
10 Marshall Highway (State Route 55). The Haymarket Campus is expected to have three  
11 data center buildings with a projected combined total load of 120 megavolt-amperes  
12 ("MVA")<sup>5</sup> by 2018. The total loading at Haymarket Substation, including the Customer's  
13 load, is projected to be approximately 160 MVA at full build-out.

14 In order to facilitate the Customer's load, the existing 115 kV Line #124 would be  
15 converted to 230 kV operation by creating a 230 kV terminal position at Gainesville  
16 Substation and Loudoun Switching Station ("Loudoun Station"). The proposed  
17 Haymarket Loop would cut into the newly converted Line #124 at the Haymarket  
18 Junction and extend a double-circuit 230 kV transmission line approximately 5.1 miles to  
19 the proposed Haymarket Substation, creating two new 230 kV lines to be designated 230  
20 kV Gainesville-Haymarket Line #2176 and 230 kV Haymarket-Loudoun Line #2169. A

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<sup>4</sup> Approved in PUE-2014-00025 but not yet constructed.

<sup>5</sup> While the terms are technically different, megawatts ("MW") and megavolt-amperes ("MVA") are used interchangeably in this report.

1 one-line diagram of the proposed Project is provided as Attachment 2 to my testimony.  
2 The Haymarket Loop would be constructed entirely on a new 100-foot right-of-way using  
3 double circuit single-shaft galvanized steel poles and terminate at the proposed  
4 Haymarket Substation. The proposed Haymarket Substation would consist of four  
5 230 kV breakers arranged in a ring bus, two 230-34.5 kV transformers, and other  
6 associated equipment. The Project is estimated to cost \$51.0 million and be placed into  
7 service by May 2018.

#### 8 **NEED FOR THE PROJECT**

9 As earlier indicated, the Haymarket Campus is expected to consist of three  
10 buildings for a projected total load of 120 MVA. According to the Company, the  
11 Haymarket Substation would serve surrounding area load ("Haymarket Load Area") in  
12 addition to the Haymarket Campus. This includes an existing data center building, which  
13 has a projected load of approximately 40 MVA, located adjacent to the Haymarket  
14 Campus.

#### 15 Distribution Network

16 In order to accommodate the Customer's load ramp-up schedule, the Company  
17 would extend three 34.5 kV distribution circuits ("DC") (Gainesville DC #378, #379, and  
18 #695) to the Haymarket Campus. Distribution circuits #378, #379, and #695 are 7.17  
19 miles, 7.61 miles, and 5.79 miles respectively between the Gainesville Substation and the  
20 Haymarket Campus. Gainesville DC #379 and #695 are rated for 36 MVA and  
21 Gainesville DC #378 is rated for 54 MVA (for a total of 126 MVA) with differing  
22 amounts of existing outside load currently served by each circuit. The existing data

1 center building located adjacent to the Haymarket Campus is currently served by  
2 Gainesville DC #379 and #695.

3 In its Application, the Company states that due to the Customer's load and the  
4 increased exposure to environmental detriments caused by the line mileage of the  
5 distribution circuits, prudent utility practice would recommend the use of transmission  
6 facilities. The long-term continued use of the lengthy distribution circuits may affect  
7 reliability. Due to the large amount of load identified by the Customer, operational  
8 flexibility would be limited with continued use of distribution circuits. In the event of an  
9 outage on any of the three circuits, the ability to switch the Customer's load onto another  
10 feed would be constrained due to the limited available capacity on neighboring  
11 distribution circuits.

12 The Staff agrees with the Company that a distribution solution is not feasible due  
13 to the large amount of projected load to be supplied to the Customer. Accordingly, the  
14 Staff agrees that transmission facilities are required, and thus, the Project is needed.  
15 Nevertheless, according to the Company, once the Project is constructed, the three  
16 distribution circuits would remain in place to serve existing load, future load, and provide  
17 contingency support for customers within the Haymarket Load Area, including the  
18 Haymarket Campus.

19 Radial Line

20 Consequent to the requested 120 MVA bulk load, the Haymarket Substation  
21 would exceed 100 MW in demand by the summer of 2018. According to the Company's  
22 Application, in order to comply with the North American Electric Reliability Corporation

1 ("NERC") mandatory transmission planning reliability standards, the Company maintains  
2 NERC-compliant "Facility Connection Requirements," which include the Company's  
3 Planning Criteria. The following system planning criterion, pertaining to the loading on a  
4 radial transmission line, is found on page A-4 of the Company's Planning Criteria:

5 "[l]oad on transmission radial lines without alternate supply  
6 should be limited to approximately 100 [megawatts  
7 ("MW)]."

8 Accordingly, to eliminate the potential Company-established planning criteria  
9 violation of loading a radial line in excess of 100 MW, the proposed Project creates a  
10 network feed to the Haymarket Substation by providing a double-circuit transmission line  
11 and making two 230 kV circuits, 230 kV Gainesville-Haymarket Line #2176 and 230 kV  
12 Haymarket-Loudoun Line #2169.

13 Ancillary Benefits of the Project

14 According to the Company, absent the Customer's request to serve the Haymarket  
15 Campus, it did not plan to construct the proposed Project. As such, the primary driver for  
16 the proposed Project is to provide electrical service to the Customer's Haymarket  
17 Campus. However, in addition to serving the Haymarket Campus, the proposed  
18 Haymarket Substation would serve the Haymarket Load Area. As such, the arrangement  
19 would enhance reliability for customers in the area. With additional capacity, the  
20 Company has a greater opportunity to switch load to other available distribution circuits  
21 in the event of an outage on any given circuit, which could result in faster restoration  
22 times. Furthermore, by constructing new distribution circuits to the proposed Haymarket

1 Substation, the length of circuits serving customers within the Haymarket Load Area  
2 would be significantly reduced.

3 Based on the information provided by the Company, the Staff agrees that the  
4 proposed Project is needed to serve the Haymarket Campus in a manner consistent with  
5 the Company's transmission planning criteria. The Staff notes that if the Haymarket  
6 Campus was not being built, there would be no need for the Project.

#### 7 **RIGHT-OF-WAY CROSS SECTION WIDTHS AND LINE MATERIALS**

8 The Company's existing Line #124 between Gainesville Substation and Loudoun  
9 Station is designed and constructed for 230 kV operation. As such, the work involved in  
10 converting the existing Line #124 from 115 kV to 230 kV operation would require  
11 minimal line disturbance. Thus, the proposed viewshed between Gainesville Substation  
12 and Haymarket Junction and Haymarket Junction and Loudoun Station would remain  
13 similar to existing conditions.

14 Attachment 3 to my testimony is the Company's representation of the proposed  
15 structures at the Haymarket Junction. In order to cut into Line #124 at Haymarket  
16 Junction, the Company proposes two galvanized steel 3-pole structures. The proposed  
17 structures have an approximate height of 120 feet and require a right-of-way width of  
18 240 feet.

19 Attachment 4 to my testimony is the Company's representation of the proposed  
20 structures as viewed along the 5.1-mile right-of-way between Haymarket Junction and  
21 the proposed Haymarket Substation. The proposed structures are single-shaft galvanized  
22 steel structures with an average height of approximately 100 feet and require a right-of-

1 width of 100 feet. Since Line #124 would be split at Haymarket Junction, Line #2169  
2 would be on the right side and the new Line #2176 would be on the left side of the  
3 structures (looking toward Haymarket Substation).

4 The proposed 230 kV circuits for the Haymarket Loop would each have three,  
5 twin-bundled 795 aluminum conductor steel-reinforced ("ACSR") 26/7 phase conductors  
6 with a maximum transfer capability of 1,255 MVA. However, since the existing  
7 Line #124 is constructed with twin-bundled 636 ACSR 24/7 phase conductors with a  
8 transfer capability of 1,047 MVA, Line #2169 and Line #2176 would have a transfer  
9 capacity of 1,047 MVA.

#### 10 CONSTRUCTION OF THE NEW HAYMARKET SUBSTATION

11 The major equipment to be initially installed at the proposed Haymarket  
12 Substation includes four 230 kV breakers arranged in a ring bus, two 230 kV line  
13 terminals, two 84 MVA, 230-34.5 kV transformers and nine 34.5 kV circuits. Two  
14 230 kV backbone structures and three shielding structures with shield wire would also be  
15 installed. Additionally, a control house would be installed to house the communications  
16 and protective relay panels. The ultimate arrangement would include an additional  
17 84 MVA, 230-34.5 kV transformer and two 34.5 kV circuits.

#### 18 MAJOR WORK AT THE EXISTING GAINESVILLE SUBSTATION

19 The proposed Project requires the installation of a new 230 kV line terminal to  
20 accommodate the converted Line #124.

1                   **MAJOR WORK AT THE EXISTING LOUDOUN STATION**

2                   The proposed Project requires that an existing 115 kV straight bus be upgraded for  
3 230 kV operation to accommodate the converted Line #124. A new 115 kV bus would  
4 be installed to connect Line #156, 115 kV Cap Bank, a tap for the adjacent Mosby  
5 Switching Station, and two 230-115 kV transformers.

6                   **CONSTRUCTION PERIOD**

7                   The Company states that the Project requires a pre-construction activity period of  
8 12 months for engineering, material procurement, right-of-way acquisition, and  
9 construction permitting. The estimated construction time is 12 months. The proposed in-  
10 service date is May 2018.

11                   **PROJECT COST**

12                   The estimated Project cost is approximately \$51.0 million, which is comprised of  
13 approximately \$30.2 million for transmission line work, and approximately \$20.8 million  
14 for station work. The cost estimate for the Haymarket Substation work is approximately  
15 \$16.7 million, Gainesville Substation work is approximately \$2.0 million, and Loudoun  
16 Station work is approximately \$2.1 million.

17                   **UNDERGROUND ELECTRICAL TRANSMISSION ALTERNATIVE – I-66**

18                   **HYBRID**

19 Transmission Alternative 1 (I-66 Hybrid Alternative Route): *Loop a new 230 kV double*  
20 *circuit overhead line from Haymarket Junction to a new Switching Station and loop two*  
21 *new 230 kV underground lines from the new Switching Station to the proposed*  
22 *Haymarket Substation.*  
23

1 Attachment 5 provides a one-line diagram of this alternative. This alternative  
2 would:

- 3 • cut into the converted Line #124 at the Haymarket Junction and loop a  
4 new 230 kV double circuit overhead transmission line approximately  
5 2.6 miles on new right-of-way from Haymarket Junction to a new  
6 switching station,
- 7 • construct a new switching station, Heathcote Station (transition station)  
8 located near I-66 and Catharpin Road where an overhead to  
9 underground transition would occur, and
- 10 • loop two new 230 kV underground lines approximately 3.2 miles on  
11 new right-of-way along I-66 from the Heathcote Station to the proposed  
12 Haymarket Substation.

13 The double circuit 230 kV overhead line would utilize double circuit, single-shaft  
14 galvanized steel poles with three twin-bundled 795 ACSR 26/7 phase conductors and  
15 require a right-of-way width of 100 feet. The two 230 kV underground lines would be  
16 constructed in a concrete encased duct bank consisting of eight, 8-inch PVC conduits and  
17 would be comprised of six parallel 3500 thousands of circular mils ("kcmil") copper,  
18 cross-linked polyethylene ("XLPE") solid dielectric cables and require a right-of-way  
19 width of 40 feet.

20 Heathcote Station would contain two single circuit full dead end structures, a four-  
21 breaker 230 kV ring bus, two underground line terminals, two 50-100 MVAR reactor

1 banks, and associated equipment. The estimated total cost of this alternative is \$166.7  
2 million.<sup>6</sup>

3 According to the Company, the constraints imposed by the I-66 route, due to  
4 several Virginia Department of Transportation ("VDOT") projects currently underway in  
5 the area, would require a construction period approximately 12 months longer than the  
6 proposed Project. Additionally, any right-of-way the Company obtains within VDOT  
7 right-of-way is considered by permit, which would require the Company to relocate the  
8 facility to a new location if VDOT needed its right-of-way for further expansions of I-66  
9 in the future.

10 While this alternative is electrically feasible, it was not selected by the Company  
11 due its estimated cost being approximately \$115.7 million more than the proposed Project  
12 (\$166.7 million versus \$51.0 million), extended construction timing, and potential  
13 relocation issues. The Staff agrees that this alternative is more expensive and may  
14 require more time to construct but deems this option as a viable alternative because it is  
15 electrically feasible and similar to the proposed Project.

## 16 OVERHEAD ELECTRICAL TRANSMISSION ALTERNATIVES

17 Transmission Alternative 2: (Wheeler Alternative Route): Construct an overhead  
18 Wheeler-Haymarket 230 kV double circuit loop.

19

20 Attachment 6 provides a one-line diagram of this alternative. This alternative  
21 would loop a new 230 kV double circuit overhead transmission line approximately 8.6  
22 miles on new right-of-way from the Wheeler Station to the proposed Haymarket Station.

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<sup>6</sup> Updated in the Company's response to Heritage Interrogatory No. 2-1.

1 At the Wheeler Station, one of the new lines would terminate to create a Wheeler to  
2 Haymarket line while the other new line would tie into the Gainesville-Wheeler Line  
3 #2161 bypassing Wheeler Station to create a Gainesville to Haymarket line. The double  
4 circuit 230 kV transmission line would utilize double circuit, single-shaft galvanized steel  
5 poles with three twin-bundled 795 ACSR 26/7 phase conductors. The estimated cost for  
6 this alternative is \$58.7 million.

7 According to the Company, the loading on the 230 kV lines between Vint Hill  
8 Station, Wheeler Station, Haymarket Substation, and Gainesville Substation is projected  
9 to be approximately 289.1 MW in 2023, which is within approximately 11 MW of the  
10 Company's 300 MW loading threshold.<sup>7</sup> An additional transmission project may be  
11 required in the future with the introduction of approximately 11 MW of new load.

12 This alternative was rejected by the Company because of the higher cost (\$58.7  
13 million versus \$51.0 million), potential network reliability issues, and more  
14 environmental impacts due in part to its additional length of 8.6 miles as compared to the  
15 5.1 miles of the proposed Project. The Staff agrees with the Company that this alternative  
16 should be rejected due to the higher cost, greater environmental impact and increased  
17 reliability concerns as compared to the Project.

18 Transmission Alternative 3 (New Road Alternative): Construct an overhead Wheeler-  
19 Haymarket 230 kV single circuit line and a Haymarket-New Road 230 kV single circuit  
20 line.

21 Attachment 7 provides a one-line diagram of this alternative. This alternative  
22 would construct a new single circuit 230 kV overhead transmission line approximately

---

<sup>7</sup> Set forth in Appendix A as one of the Company's Transmission Planning Criteria is the 300 MW threshold for allowable load loss associated with a NERC Category C (N-1-1) criteria violation.

1 8.6 miles on new right-of-way from the Wheeler Station to the proposed Haymarket  
2 Substation and another single circuit 230 kV overhead transmission line approximately  
3 12.6 miles on new right-of-way from the Haymarket Substation to New Road Station.  
4 Both new lines would be constructed using double circuit, single shaft galvanized steel  
5 poles with three twin-bundled 795 ACSR 26/7 phase conductors. One side of the double  
6 circuit structures on each line would remain vacant for future use. The estimated cost for  
7 this alternative is \$130.7 million.

8 While this alternative is electrically feasible, it was rejected by the Company  
9 because of its estimated cost being approximately \$79.7 million more than the proposed  
10 Project (\$130.7 million versus \$51.0 million) and the higher environmental impacts  
11 associated with the approximately 21.2-mile total solution compared to the 5.1 miles for  
12 the proposed Project. The Staff agrees with the Company that this alternative should be  
13 rejected due to the higher cost and environmental impact as compared to the Project.

14 Transmission Alternative 4 (Double-Circuit Portion of New Road Alternative Route):  
15 *Construct an overhead New Road-Haymarket 230 kV double circuit loop.*

16 Attachment 8 provides a one-line diagram of this alternative. This alternative  
17 would loop a new double circuit 230 kV overhead transmission line approximately 12.6  
18 miles on new right-of-way from the New Road Station to the proposed Haymarket  
19 Substation. The double circuit 230 kV transmission line would utilize double circuit,  
20 single-shaft galvanized steel poles with three twin-bundled 795 ACSR 26/7 phase  
21 conductors. The estimated cost for this alternative is \$84.9 million.

1 According to the Company, the loading on the 230 kV lines between Loudoun  
2 Station, New Road Station, and Haymarket Substation is projected to be approximately  
3 297.9 MW by 2023, which approaches the Company's 300 MW loading threshold.<sup>8</sup> An  
4 additional transmission project may be required in the future with the introduction of  
5 approximately 2.1 MW of new load.

6 This alternative was rejected by the Company because of the higher cost (\$84.9  
7 million versus \$51.0 million), potential network reliability issues, and more  
8 environmental impacts due in part to its additional length of 12.6 miles as compared to  
9 the 5.1 miles of the proposed Project. The Staff agrees with the Company that this  
10 alternative should be rejected due to the higher cost, greater environmental impact and  
11 increased reliability concerns as compared to the Project.

## 12 COST COMPARISON OF THE ROUTES

13 In its Application, the Company established a proposed route along with four  
14 alternative routes: I-66 Overhead (Proposed Route); I-66 Hybrid Alternative Route;  
15 Carver Road Alternative Route; Madison Alternative Route; and Railroad Alternative  
16 Route (referred collectively herein as the "Routes"). Attachment 9 provides a map of the  
17 Routes. A detailed description of the Routes is provided in a separate report filed  
18 concurrently by Wayne D. McCoy, the Staff's environmental consultant.<sup>9</sup> It is important  
19 to note that each of the Routes is electrically similar. In response to Heritage

---

<sup>8</sup> Set forth in Appendix A as one of the Company's Transmission Planning Criteria is the 300 MW threshold for allowable load loss associated with a NERC Category C (N-1-1) criteria violation.

<sup>9</sup> Staff has hired Mid Atlantic Environmental L.L.C. ("MAE") to conduct an independent environmental assessment of the Routes.

1 Interrogatory No. 2-1,<sup>10</sup> the Company provided several tables that included a cost  
 2 breakdown of each of the Routes, itemizing the cost of transmission line work and  
 3 substation work. The table below is a summarized version of the cost breakdown.

Cost Breakdown for Routes					
	Proposed (millions)	Hybrid (millions)	Carver (millions)	Madison (millions)	Railroad (millions)
Transmission Line (OH and UG) Work	\$ 30.2	\$ 111.3	\$ 41.1	\$ 47.0	\$ 34.3
Haymarket Substation Work	\$ 16.7	\$ 29.1	\$ 16.7	\$ 16.7	\$ 16.7
Gainesville Substation Work	\$ 2.0	\$ 2.0	\$ 2.0	\$ 2.0	\$ 2.0
Loudoun Station Work	\$ 2.1	\$ 2.1	\$ 2.1	\$ 2.1	\$ 2.1
Heathcote Station Work	\$ -	\$ 22.2	\$ -	\$ -	\$ -
Total Cost	\$ 51.0	\$ 166.7	\$ 61.9	\$ 67.8	\$ 55.1

4  
 5 Based on the cost comparison, the proposed Project along the proposed route is the  
 6 least expensive as compared to the other overhead route options. Additionally, the cost  
 7 of the partially underground I-66 Hybrid Alternative Route is \$166.7 million, which is  
 8 \$115.7 million (approximately three times) more expensive than the proposed Project.

9 Because the need for the Project is driven by a single large customer requesting  
 10 new service, as opposed to being driven by system network needs, the Staff gives  
 11 considerable weight to the concerns of the respondents and impacted property owners, in  
 12 addition to just looking at costs alone. Accordingly, the aforementioned report prepared  
 13 by Staff witness Wayne D. McCoy and filed concurrently in this docket focuses on the  
 14 environmental impacts of the Routes.

<sup>10</sup> Attachment 10 to my testimony.

## COST ALLOCATION AND RECOVERY

### The Company's Line Extension Policy

While recognizing that the Project provides ancillary benefit to the surrounding Haymarket Load Area, Staff does not believe that the Company could justify the need for this Project without the Customer's request for service to the Haymarket Campus. As such, the Project may also be viewed as a line extension for electrical service to a new customer, and thus, may be subject to cost allocation in accordance with Section XXII "Electric Line Extensions and Installations" ("Section XXII") of the Company's Commission-approved Terms and Conditions.<sup>11</sup>

According to the Company's responses to Staff interrogatories, the Company believes that Section XXII is only applicable to distribution facilities and not transmission facilities.<sup>12</sup> As such, the costs of the proposed transmission facilities (i.e., all facilities extended from the Company's Line #124 and all of the 230 kV facilities within the proposed Haymarket Substation up to and including the high-side protection of the 230-34.5 kV transformers, along with other associated equipment, collectively the "Haymarket Transmission Facilities") would not fall under the line extension policy and would be recoverable from all ratepayers. However, according to the Company, the costs associated with the proposed distribution facilities (i.e. all facilities on the load side of the high-side protection of the 230-34.5 kV transformers and all of the distribution circuits, collectively the "Haymarket Distribution Facilities") would fall under the line extension policy under the Company's interpretation of Section XXII.

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<sup>11</sup> Attachment 11 to my testimony.

<sup>12</sup> Company's Response to Staff Interrogatories 1-14 and 4-36. See Attachment 12 to my testimony.

1 Virginia Power's Proposed Treatment of Haymarket Transmission Facilities Costs

2           According to the Company, the proposed Haymarket Transmission Facilities  
3 would be integrated transmission facilities subject to PJM<sup>13</sup> operational control. If the  
4 Project is constructed, PJM will operate the facilities and charge the cost to Virginia  
5 Power as the Load Serving Entity transmission customer. PJM has designated the  
6 Haymarket Transmission Facilities as a Supplemental Project<sup>14</sup> under the PJM Open  
7 Access Transmission Tariff ("PJM Tariff"). Accordingly, if approved, the cost of the  
8 Haymarket Transmission Facilities will be assigned by PJM to Network Integration  
9 Transmission Service ("NITS") customers in the Dominion Transmission Zone on a load  
10 ratio share basis and, as such, will be paid for by ratepayers of all transmission customers  
11 in the Dominion Zone.

12           The Company recovers costs for transmission service from Virginia jurisdictional  
13 retail customers through base transmission charges as approved in each retail rate  
14 schedule and through Rider T1. A primary issue in this case is whether the Company  
15 should construct the Project along one of the overhead routes or using the I-66 Hybrid  
16 Alternative Route. Assuming the Company's interpretation of the line extension policy,  
17 the same cost recovery method under the PJM Tariff would be used for either overhead  
18 construction or underground construction. To provide the Commission further context of  
19 the impacts to customers of the significant cost difference between the overhead and

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<sup>13</sup> PJM Interconnection, L.L.C.

<sup>14</sup> Supplemental projects are projects initiated by the transmission owner to satisfy local transmission owner criteria. These projects are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM. The Haymarket Transmission Facilities has been designated as Supplemental Project # S0918.

1 underground alternatives, Attachment 13 to my testimony provides the bill impacts to  
2 residential customers when isolating the costs associated with the Project. In short, if the  
3 Company's proposed Project is approved, a typical residential customer using 1,000 kWh  
4 would see a bill increase of \$0.09/kWh. If the Commission approves the I-66 Hybrid  
5 Alternative Route, the same customer would see a bill increase of \$0.37/kWh.

6 Staff's Interpretation of the Company's Line Extension Policy

7 Attachment 14 to my testimony is an excerpt from the Direct Testimony of Steven  
8 Eisenrauch filed on March 28, 2013, in the Company's 2013 biennial review (Case No.  
9 PUE-2013-00020) sponsoring the revisions to Section XXII relating to underground  
10 installation. Mr. Eisenrauch states in his biennial review testimony that the proposed  
11 underground revisions do not apply to transmission level voltage (above 50 kV). While  
12 Mr. Eisenrauch's testimony in the biennial review may have stated that the underground  
13 revisions do not apply to transmission facilities, nothing in the actual Commission-  
14 approved language of Section XXII, or any part therein, explicitly states that these terms  
15 and conditions apply to distribution facilities only. Furthermore, other sections of the  
16 Company's Terms and Conditions contemplate certain services at transmission level  
17 voltage. In fact, according to the Company's [original] Response to Staff Interrogatory  
18 No. 2-22 in Case No. PUE-2015-00053,<sup>15</sup> dated November 17, 2015,<sup>16</sup> the Company  
19 initially believed and represented to Staff that Section XXII applied to transmission  
20 facilities. It was only in a subsequent, revised response delivered to Staff in April 2016

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<sup>15</sup> *Application of Virginia Electric and Power Company, For approval and certification of electric transmission facilities: Poland Road 230 kV Double Circuit Transmission Line Loop and 230-34.5 kV Poland Road Substation, Case No. PUE-2015-00053, filed May 20, 2015.*

<sup>16</sup> Attachment 15 to my testimony.

1 that the Company changed its position on the applicability of Section XXII to  
2 transmission facilities. Accordingly, at a minimum, the Staff considers Section XXII to  
3 be ambiguous with respect to its applicability to transmission facilities. As such, for  
4 purposes of cost allocation and recovery, Section XXII may be applicable to certain  
5 transmission lines which may be viewed as line extensions for service to an individual  
6 customer.

7 Treatment of Project Costs under Section XXII

8       Should the Commission approve the proposed Project and determine that Section  
9 XXII does apply for cost allocation purposes, in accordance with Section XXII Paragraph  
10 D, the Customer would pay the amount by which the estimated cost of extending  
11 overhead facilities required to serve the customer exceeds four times the continuing  
12 annual non-fuel revenue that can reasonably be expected from the extension. While the  
13 estimated four-year non-fuel revenue was not provided for the Customer's Haymarket  
14 Campus, based on revenue figures provided to the Staff in previous cases that involved  
15 data centers, it is anticipated that the estimated four-year non-fuel revenue from the  
16 Haymarket Campus would exceed the estimated \$51.0 million<sup>17</sup> cost of constructing the  
17 overhead facilities.

18       Should the Commission approve the I-66 Hybrid Alternative Route and determine  
19 that Section XXII does apply for cost allocation purposes, the Customer would be  
20 required to pay the transitional cost or the amount by which the estimated cost of  
21 providing underground facilities exceeds the estimated cost of providing comparable

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<sup>17</sup> Estimated cost of the I-66 Overhead Route.

1 overhead facilities. If the facilities of the I-66 Overhead Route were to be used as the  
2 theoretic equivalent overhead facilities, then the transitional cost of the I-66 Hybrid  
3 Alternative Route would be \$115.7 million, which is the cost difference between the two  
4 options. As such, the Customer would be required to make a payment of approximately  
5 \$115.7 million. It should be noted that under this scenario, the entire Project, including  
6 the development of the Haymarket Campus, may be in jeopardy because of the  
7 substantially large payment required from the Customer.

#### 8 **ECONOMIC DEVELOPMENT BENEFITS**

9 There would be minimal work associated with maintaining and operating the line  
10 and associated facilities, and thus a negligible impact on long-term direct job creation  
11 after the proposed Project is completed. The same is true of new employment  
12 opportunities at the Haymarket Campus, since data centers generally utilize small  
13 workforces. The tax revenues associated with the Haymarket Campus project, however,  
14 will likely have a significant positive impact on Prince William County. Conversely, a  
15 negative economic impact on property owners is possible due to the existence of a  
16 transmission line located in proximity to their properties.

#### 17 **DEQ COORDINATED ENVIRONMENTAL REVIEW**

18 In accordance with the Department of Environmental Quality-State Corporation  
19 Commission Memorandum of Agreement Regarding Coordination of Reviews of the  
20 Environmental Impacts of Proposed Electric Generating Plants and Associated Facilities,  
21 dated August 14, 2002, and at the request of the Staff, the Virginia Department of  
22 Environmental Quality ("DEQ") coordinated an environmental review of the Project by

1 the various state and local agencies responsible for reviewing the environmental impacts  
2 of electric utility projects. The results of DEQ's review are contained in a report dated  
3 January 20, 2016 ("DEQ Report"), which was filed with the Commission on January 21,  
4 2016. The DEQ Report summarizes the Project's potential impacts on natural resources,  
5 makes recommendations for minimizing those impacts, and outlines the Company's  
6 responsibilities for compliance with legal requirements governing environmental  
7 protection. The DEQ Report also includes copies of the comments provided to DEQ by  
8 the reviewing agencies.

#### 9 **WETLAND IMPACTS CONSULTATION**

10 In accordance with § 62.1-44.15:21 of the Code and the DEQ-State Corporation  
11 Commission Memorandum of Agreement Regarding Wetland Impacts Consultation dated  
12 July 2003, the DEQ, acting on behalf of the State Water Control Board, provided a  
13 wetland impacts consultation for the Project. DEQ's review is summarized in a letter  
14 from Hannah Schul of DEQ to Diana Faison of Dominion Virginia Power, dated  
15 November 30, 2015. This letter appears in the DEQ Report.

#### 16 **CONCLUSIONS AND RECOMMENDATIONS**

17 The Staff concludes that the Company has reasonably demonstrated the need for  
18 the proposed Project and Staff does not oppose the issuance of the requested CPCN.  
19 However, the Project is needed to provide service to a new customer, rather than to  
20 enhance overall system reliability, and the Staff notes that without the request for service  
21 to the Haymarket Campus, the Project would not be needed. There is some level of

1 ambiguity relative to the applicability of Company's line extension policy to the Project  
2 because the need for the Project is driven by the need for electrical service to a new  
3 customer. If the Commission determines that the Project is essentially a line extension to  
4 service the Customer and subject to Section XXII, then the cost allocation and recovery  
5 for the Project would follow in accordance with Section XXII. However, if the  
6 Commission concurs with the Company that since the Project comprises a networked line  
7 that will eventually be used by other customers, the socialization of the Project's costs  
8 through the Company's NITS rate is appropriate.

9       Ultimately the selection of the appropriate route requires a balancing of the  
10 impacts and the costs. According to the MAE Report, the overhead routes have  
11 significant impacts that cannot be eliminated; however, the cost of the I-66 Hybrid  
12 Alternative Route is significantly higher than any of the overhead routes. If the  
13 Commission determines that the impacts associated with the overhead routes are too  
14 great, then the Staff recommends the I-66 Hybrid Alternative Route. If however, the  
15 significantly higher cost associated with the I-66 Hybrid Alternative Route is  
16 unacceptable, then the Staff recommends the Commission approve the Company's  
17 proposed Project (I-66 Overhead Route).

1                   **APPENDIX A: TRANSMISSION PLANNING STANDARDS**

2           Virginia Power plans the expansion of its transmission system in response to  
3 forecasted load growth and other system conditions in a manner that assures compliance  
4 with the NERC transmission planning standards, as mandated by FERC in accordance  
5 with the Energy Policy Act of 2005. As a member of PJM Interconnection, LLC  
6 ("PJM"), Virginia Power transmission planning is conducted in concert with PJM's  
7 planning. The PJM Regional Transmission Expansion Plan combines the PJM planning  
8 criteria with the planning criteria of each Transmission Owner and conducts one  
9 assessment that is measured against the NERC transmission planning reliability  
10 standards.

11           NERC requires that the interconnected transmission system be studied for  
12 reliability compliance from the perspective of two time horizons, near term (years 1-5)  
13 and long term (years 6-10). When planning studies reveal a NERC planning standard  
14 violation for a future year within the Company's planning horizon, Virginia Power  
15 initiates the process to build and operate a suitable bulk power reinforcement, which may  
16 take the form of a new transmission circuit, an upgraded transmission circuit, a new large  
17 power transformer at a substation, a new substation, or a combination of these.

18           Key to NERC's standards is that a transmission system be planned to operate  
19 within an acceptable voltage range, without damage to equipment from overloading, and  
20 with specified limited dropping of load, following system contingencies. A contingency  
21 is the unexpected failure of a critical component of the bulk power system, such as a  
22 transmission circuit, a double-circuit transmission line, a large power transformer, or a

1 generating unit. NERC standards also permit a utility to add system stressors to the  
2 contingency. In the case of Virginia Power, a typical system stressor is the unavailability  
3 of the largest generating unit located electrically near the contingency.

4 The NERC standards require that under a Category A condition (no contingency),  
5 or base line case, and under a Category B condition (single contingency), which is the  
6 loss of a single component such a generator, transmission circuit, or transformer  
7 (commonly referred to as an n-1 condition), the system is expected to remain stable and  
8 that both thermal and voltage limits remain within applicable ratings. The system must  
9 also be analyzed for Category C conditions, which are contingencies resulting from the  
10 failure or faulting of multiple elements. A Category C condition may also occur by the  
11 loss of a single component, followed by manual system adjustments, and then followed  
12 by the loss of another single component, which is commonly referred to as an N-1-1  
13 condition. Following a Category C condition, the Company's planning criteria permit a  
14 controlled dropping of no more than 300 MW of load. For either a Category B or  
15 Category C condition, the bulk power system must remain stable and have no cascading  
16 outages. Category D conditions, which are extreme, may include, among other things,  
17 the following types of losses: a triple-circuit towerline, all transmission lines on a  
18 common right-of-way, a substation, a switching station, or a generating station. Category  
19 D conditions may result in the loss of substation customer load and must be evaluated for  
20 risks and consequences.

Attachment 1

Map of Existing Facilities



Attachment 2

One-line Diagram of Proposed Project

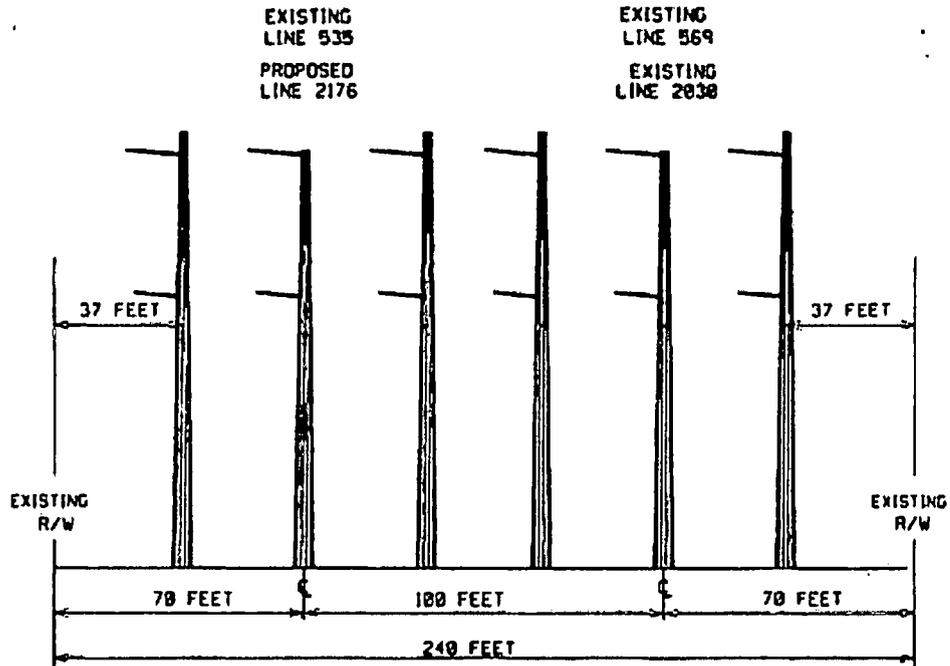


Attachment 3

Right-of-Way Cross Section at Haymarket Junction

1500010150

GAINESVILLE - HAYMARKET JUNCTION



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOUDOUN

TYPE OF STRUCTURE :	STEEL 3-POLE
FOUNDATION :	CONCRETE
APPROXIMATE AVERAGE HEIGHT :	120 FEET
WIDTH AT CROSSARM :	85 FEET
WIDTH AT BASE :	74 FEET
APPROX. AVERAGE SPAN LENGTH :	876 FEET
CONDUCTOR TYPE :	ALUMINUM
RIGHT-OF-WAY WIDTH :	240 FEET
APPROXIMATE LENGTH OF LINE :	0.48 MILES

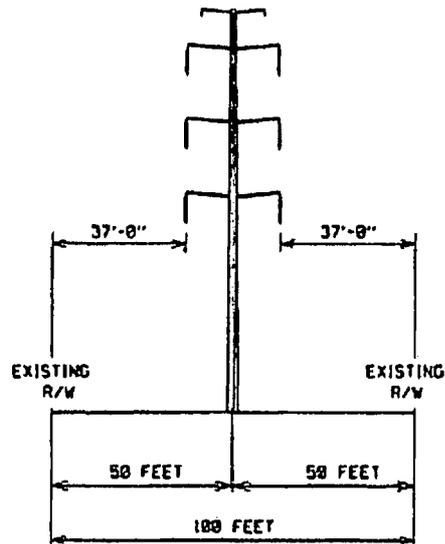
Attachments 4

Right-of-Way Cross Section for Haymarket Loop

HAYMARKET JUNCTION - HAYMARKET

PROPOSED  
230KV CIRCUIT  
(LINE #2176)

PROPOSED  
230KV CIRCUIT  
(LINE #2169)



PROPOSED CONFIGURATION  
TYPICAL RIGHT OF WAY LOOKING TOWARD HAYMARKET

TYPE OF STRUCTURE:	STEEL POLE
FOUNDATION :	CONCRETE
APPROXIMATE AVERAGE HEIGHT:	112 FEET
WIDTH AT CROSSARM:	26 FEET
WIDTH AT BASE:	4 FEET
APPROX. AVERAGE SPAN LENGTH:	593 FEET
CONDUCTOR TYPE:	ALUMINUM
RIGHT OF WAY WIDTH:	100 FEET
APPROXIMATE LENGTH OF LINE :	5.06 MILES

Attachment 5

One-Line Diagram of I-66 Hybrid Alternative



Attachment 6

One-Line Diagram of Wheeler Alternative



Attachment 7

One-Line Diagram of New Road Alternative



Attachment 8

One-Line Diagram of Double-Circuit New Road Alternative



Attachment 9  
Map of Routes

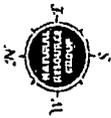
150610169



**Dominion**

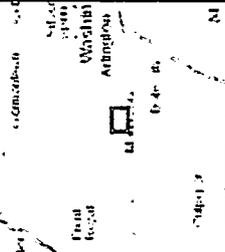
### Gainesville to Haymarket 230kV Transmission Line and Substation Project

- Proposed Route
- 1-68 Hybrid Alternative
- Carver Road Alternative
- Madison Alternative
- Railroad Alternative
- Existing Dominion Transmission Lines
- Proposed Haymarket Substation
- Existing Substation
- Agricultural Value
- Class V: Prime Farmland
- Class IV: Statewide Importance



0 1,250 2,500 Feet

1:27,000



DATE: 11/15/2011 11:58:11 AM PROJECT: 230KV TRANSMISSION LINE FROM HAYMARKET TO GAINESVILLE