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September 15, 2015

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Joel H. Peck, Clerk
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State Corporation Commission
1300 E. Main Street
Richmond, VA 23219

Re: *In re: Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq.*
Case No. PUE-2015-00035

Dear Mr. Peck:

Attached please find the Direct Testimony & Exhibits of D. Scott Norwood, filed on behalf of the Office of the Attorney General's Division of Consumer Counsel in the above-captioned proceeding.

Thank you for your assistance in this matter.

Sincerely,

/s/ William T. Reisinger

William T. Reisinger
Assistant Attorney General

cc: Service List

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

VIRGINIA ELECTRIC AND POWER COMPANY CASE NO. PUE-2015-00035

Integrated Resource Plan filing pursuant
to Va. Code § 56-597 et seq.

DIRECT TESTIMONY

OF

SCOTT NORWOOD

ON BEHALF OF

OFFICE OF THE ATTORNEY GENERAL

DIVISION OF CONSUMER COUNSEL

SEPTEMBER 15, 2015

DIRECT TESTIMONY OF SCOTT NORWOOD
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EXHIBITS

- SN-1 Background and Experience of Scott Norwood
- SN-2 DVP's Confidential Response to OAG 2-87 in Case No. PUE-2015-00027 (Redacted)
- SN-3 DVP Witness Stevens' Schedule 19 from Case No. PUE-2015-00027
- SN-4 Estimated Life of Plant Revenue Requirement of North Anna 3
- SN-5 DVP's Response to OAG 2-7
- SN-6 Estimated Revenue Requirement and Residential Rate Impact of NA3
- SN-7 DVP's Response to OAG 2-2

SUMMARY OF TESTIMONY

D. Scott Norwood

The purpose of my testimony is to present my evaluation and recommendations regarding Dominion Virginia Power's ("DVP" or "Company") 2015 IRP filing. The focus of my testimony is on the Company's proposed resource plans that include the continued development of the North Anna Unit 3 nuclear generating facility ("NA3"), in view of the requirement in § 56-599 that the Commission shall make a determination as to whether an IRP is reasonable and in the public interest.

Dominion has not estimated the average annual retail rate impacts that would result from construction of NA3. However, assuming that the NA3 project is completed without further cost increases, I estimate that the first year revenue requirement for the project (including related replacement fuel cost savings) would be almost \$2.4 billion. This would result in an average rate increase of approximately 25.7% over current Virginia retail residential rates.

The analysis presented in DVP's 2015 IRP Report does not demonstrate that the Company's plan to continue development of NA3 is reasonable in consideration of the increasing costs of NA3 relative to other resource options identified in DVP's IRP analyses. In fact, the NA3 project is more costly than the Least Cost Plan ("LCP") in all 19 scenarios evaluated by DVP in the 2015 IRP, and is not the lowest cost option for complying with the EPA's Clean Power Plan. DVP has not completed analysis of other issues of concern regarding the NA3 project that were ordered by the Commission in the Company's 2013 IRP proceeding; however, the analyses that have been completed generally indicate that there are much lower cost alternatives to NA3. Moreover, the forecasted capital cost of NA3 is far higher than the EIA's current generic cost estimate for nuclear generating units. For all of these reasons, DVP's 2015 IRP strategy to continue development of NA3 does not appear to be reasonable.

1 **I. INTRODUCTION**

2

3 **Q. PLEASE STATE YOUR NAME, TITLE AND BUSINESS ADDRESS.**

4 A. My name is Scott Norwood. I am President of Norwood Energy Consulting, L.L.C. My
5 business address is 4700 North Capital of Texas Highway, Apartment 1125, Austin, TX
6 78746.

7

8 **Q. WHAT IS YOUR OCCUPATION?**

9 A. I am an energy consultant specializing in the areas of electric utility regulation, resource
10 planning and energy procurement.

11

12 **Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND**
13 **PROFESSIONAL EXPERIENCE.**

14 A. I have over 35 years of experience in the electric utility industry. After graduating from
15 the University of Texas in 1980 with a Bachelor of Science degree in electrical
16 engineering, I began my career as a power plant engineer for the City of Austin's Electric
17 Utility Department where I was responsible for electrical maintenance and design
18 projects for the City's three gas-fired power plants. In January 1984, I joined the staff of
19 the Public Utility Commission of Texas as Manager of Power Plant Engineering. In that
20 capacity, I was responsible for addressing resource planning, fuel and purchased power
21 cost issues presented in regulatory filings before the Texas Commission. In 1986, I
22 joined GDS Associates, Inc., a Marietta, Georgia-based consulting firm that specializes in
23 electric utility regulatory consulting and resource planning. I was elected a Principal of

1 GDS in 1990 and directed the firm's Deregulation Services Department until January
2 2004, when I left GDS to form Norwood Energy Consulting, LLC. The focus of my
3 current consulting practice is energy planning, procurement and regulation. Exhibit SN-1
4 provides a more detailed summary of my background and experience.

5
6 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?**

7 A. I am testifying on behalf of the Office of the Attorney General, Division of Consumer
8 Counsel ("Consumer Counsel").

9
10 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE STATE CORPORATION**
11 **COMMISSION?**

12 A. Yes. I have testified on behalf of Consumer Counsel in numerous past regulatory
13 proceedings before the State Corporation Commission ("Commission") on power plant
14 certification, base rate, and fuel recovery matters, including the most recent biennial
15 review case filed by Virginia Electric and Power Company, d/b/a Dominion Virginia
16 Power ("DVP" or "Company"), Case No. PUE-2015-00027, and in DVP's 2013
17 Integrated Resource Plan ("IRP") proceeding, Case No. PUE-2013-00088.

18 Outside of Virginia, I also have testified in proceedings involving base rate, fuel,
19 and power plant certification matters before state regulatory commissions in Arkansas,
20 Florida, Georgia, Illinois, Iowa, Michigan, Missouri, New Jersey, Louisiana, Ohio,
21 Oklahoma, Texas, Washington and Wisconsin.

22
23 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

1 A. The purpose of my testimony is to present my evaluation and recommendations regarding
2 DVP's 2015 IRP filing. The focus of my testimony is on the Company's proposed
3 resource plans that include the continued development of the North Anna Unit 3 nuclear
4 generating facility ("NA3"), in view of the requirement in Va. Code § 56-599 that the
5 Commission shall make a determination as to whether an IRP is reasonable and in the
6 public interest.

7
8 **Q. HAVE YOU PREPARED ANY EXHIBITS TO SUPPORT YOUR TESTIMONY?**

9 A. Yes. I have prepared 7 exhibits, which are attached to my testimony.

10
11 **II. NORTH ANNA 3 DEVELOPMENT COSTS**

12
13 **Q. WHAT DOES DVP'S 2015 IRP PROPOSE WITH REGARD TO FUTURE
14 DEVELOPMENT OF THE NORTH ANNA 3 NUCLEAR GENERATING
15 FACILITY?**

16 A. The Company is in the process of developing a potential new nuclear unit, North Anna 3,
17 at its existing North Anna Power Station located in Louisa County in central Virginia.
18 Based on the Company's expectation that it will obtain from the Nuclear Regulatory
19 Commission ("NRC") a Combined Operating License ("COL") for NA3 sometime in
20 2017, DVP's estimates of the time required for the SCC certification and approval
21 process, and the construction timeline for the facility, the earliest possible in-service date
22 for North Anna 3 is September 2027. Under this timeline, NA3 capacity would be

1 available to meet the Company's 2028 summer peak. This in-service date has not
2 changed from the 2014 Plan.

3
4 **Q. HAS DVP MADE A FINAL DECISION TO SEEK APPROVAL TO ACTUALLY**
5 **CONSTRUCT NA3?**

6 A. No. The Company indicates in the IRP Report that it has not committed to build North
7 Anna 3 and will not make a final decision until after the NRC's issuance of a COL.

8
9 **Q. WHAT IS DVP'S CURRENT CAPITAL COST FORECAST FOR NA3?**

10 A. As shown in Table 1, DVP currently forecasts that the capital cost of NA3 will approach
11 \$14.8 billion, excluding the write-offs resulting from the 2014 amendments to Va. Code §
12 56-585.1 A 6 and financing costs during construction. (See Exhibit SN-2.) After
13 including a conservative estimate of construction interest costs, the current capital cost
14 forecast for NA3 would be approximately \$19.3 billion, or \$13,283/kW.

15

1

2

Table I

DVP's Forecast of NA 3 Capital Costs (\$1000s)

<u>Year</u>	<u>Annual Capital</u>	<u>Est. Interest, 5%</u>	<u>Total Cumulative</u>
Before 2011	\$191,562	\$9,578	\$201,140
2011	\$154,126	\$13,431	\$368,698
2012	\$20,076	\$17,786	\$406,560
2013	\$98,335	\$20,747	\$525,642
2014	-\$232,267	\$17,398	\$310,773
2015	\$73,627	\$13,432	\$397,833
2016	\$178,618	\$19,738	\$596,189
2017	\$403,897	\$34,301	\$1,034,388
2018	\$774,432	\$63,760	\$1,872,579
2019	\$1,434,434	\$118,981	\$3,425,994
2020	\$1,675,612	\$196,732	\$5,298,339
2021	\$2,185,152	\$293,251	\$7,776,742
2022	\$2,426,547	\$408,544	\$10,611,833
2023	\$2,012,787	\$519,527	\$13,144,147
2024	\$1,849,149	\$616,076	\$15,609,371
2025	\$1,103,593	\$689,894	\$17,402,859
2026	\$337,850	\$725,930	\$18,466,639
2027	<u>\$89,736</u>	<u>\$736,620</u>	\$19,292,995
Total	\$14,777,266	\$4,515,728	

Source: DVP's confidential response to OAG 2-87 in PUE-2015-00027.

3

4

The above forecast suggests that the Company will have expended approximately \$1.87

5

billion for NA3 development by the end of 2018, the likely earliest date when a final

6

order on a certificate of public convenience and necessity ("CPCN") application for NA3

7

could be ruled on by the Commission.

8

1 **Q. HOW WOULD THE PLANNED CAPITAL INVESTMENT FOR NA3 IMPACT**
2 **DVP'S EXISTING RATE BASE?**

3 A. According to information filed in DVP's schedules in the Company's pending biennial
4 review case, for the earnings test period ending December 31, 2014, the Company's
5 Virginia Jurisdiction Generation rate base was approximately \$8.2 billion and the total
6 Virginia Jurisdiction average rate base was approximately \$15.1 billion. (See Exhibit
7 SN-3.) This means that the Virginia Jurisdiction share of the estimated \$19.3 billion
8 capital investment for NA3 (approximately \$15.4 billion) would increase the Company's
9 average Generation rate base by approximately 188%, and would increase the total rate
10 base for the Virginia Jurisdiction by approximately 100%.

11
12 **Q. WHAT IS THE ESTIMATED TOTAL CUMULATIVE REVENUE**
13 **REQUIREMENT FOR NA3 ASSUMING THE PROJECT CAN BE**
14 **CONSTRUCTED FOR THE \$ 14.8 BILLION COST CURRENTLY ESTIMATED**
15 **BY DVP AND OPERATED OVER A 40-YEAR LIFE?**

16 A. The total revenue requirement for the life of NA3, including interest expenses, would be
17 approximately \$73 billion on a nominal basis over a 40-year service life. (See Exhibit
18 SN-4.)

19
20 **Q. HAS DVP ESTIMATED THE RATE IMPACT OF THE PROPOSED NA3**
21 **PROJECT?**

22 A. No. (See Exhibit SN-5, DVP's response to OAG 2-7.) However, assuming the NA3
23 project is completed without further cost increases, the first year revenue requirement for

1 the project (including related replacement fuel cost savings) would be almost \$2.4 billion.
2 (See Exhibit SN-6.) This would result in an average rate increase of approximately
3 25.7% over current Virginia retail residential rates. (See Exhibit SN-6.)
4

5 **Q. DOES DVP'S 2015 IRP ANALYSIS INDICATE THAT THE NA3 PLAN IS THE**
6 **LOWEST REASONABLE COST ALTERNATIVE TO MEET THE COMPANY'S**
7 **FORECASTED CAPACITY NEEDS IN THE 2028 TIMEFRAME?**

8 A. No. In fact, DVP's IRP analyses do not analyze the specific costs and benefits of NA3,
9 but instead evaluate NA3 as part of various selected alternative portfolios of new
10 generating resources. However, as summarized in Table 2 below, DVP's 2015 IRP, and
11 all other IRP analyses since 2012, have indicated that NA3 is significantly more costly
12 than the least cost plans ("LCP") identified through the IRP analyses of other available
13 generating resource alternatives:
14

15 Table 2

Results of DVP's IRP Analyses of NA 3

<u>IRP Year</u>	<u>COD Year</u>	<u>NA 3 Cost Est. (\$/kW)</u>	<u>Over/(Under) Least Cost Plan</u>
2008	2017	\$5,495	N/A
2009	2018	\$6,000	-0.21%
2010	2019	\$5,568	-0.03%
2011	2022	\$5,542	-1.12%
2012	2024	\$5,963	3.53%
2013	2025	\$8,205	10.12%
2014	2028	\$8,442	7.73%
2015	2028	\$8,593	9.70%

Source: DVP's response to OAG 2-79 in Case No. PUE-2015-00027.

1

2 **Q. WHY IS NA3 FORECASTED TO BE MORE COSTLY THAN OTHER SUPPLY**
3 **SIDE ALTERNATIVES?**

4 A. As shown in Table 2 above, the forecasted capital cost of NA3 (excluding interest costs
5 during construction) has increased by more than 55% (from \$5,542/kW up to \$8,593/kW)
6 since 2011. This increase in DVP's capital cost estimates for NA3, along with the
7 forecasted decline in natural gas and market energy prices, has made resource plans with
8 NA3 significantly more costly than plans without NA3. For example, with construction
9 interest costs included, the current forecasted capital cost of NA3 (\$13,283/kW) is nearly
10 ten times the estimated capital cost of DVP's new Brunswick gas-fired combined cycle
11 generating plant.

12

13

14

1 Q. GIVEN THE HIGH COST OF NA3, WHY DOES DVP PROPOSE IN ITS 2015
2 IRP TO CONTINUE DEVELOPING THE PROJECT?

3 A. The 2015 IRP Report indicates that DVP plans to continue to develop NA3 due to “the
4 proven operational, economic, and environmental benefits of nuclear power, and to
5 assure that this supply-side resource option remains available to its customers for fuel
6 diversity and as an option to comply with the EPA’s CPP.” In addition, the IRP Report
7 cites several “key reasons” for DVP’s decision to continue the development of NA 3.

8

9 First, DVP asserts that NA3 will provide much needed baseload capacity to the region in
10 the latter portion of the Planning Period while enhancing system reliability. Second, the
11 Company notes that nuclear units such as NA3 provide emissions-free generation, which
12 is particularly important as the Company plans for effective and anticipated EPA carbon
13 regulations. Third, DVP states that NA3 will enhance fuel diversity within the
14 Company’s generation portfolio, which will in turn promote fuel price stability for
15 customers.

16

17 **A. REASONABLENESS OF NA3 DEVELOPMENT COSTS IN THE IRP**

18

19 Q. PLEASE EXPLAIN YOUR CONCERNS REGARDING THE
20 REASONABLENESS OF DVP’S 2015 IRP STRATEGY TO CONTINUE THE
21 DEVELOPMENT OF NA3.

22 A. As noted earlier in my testimony, DVP’s IRP analyses since 2012 have indicated that
23 portfolios including NA3 are not the LCP for meeting the Company’s forecasted peak

1 demand and energy supply requirements. The Commission expressed concerns regarding
2 NA3 development costs in its Final Order in the Company's 2013 IRP proceeding, and
3 directed DVP to conduct additional analysis in the 2015 IRP to address such concerns.
4 My primary concern regarding NA3 is that DVP's plan to continue development of the
5 project is becoming exceedingly costly for customers with uncertain benefits based on the
6 current forecasted costs of the project.

7
8 **Q. ARE YOU AWARE THAT THE COMMISSION HAS PREVIOUSLY RULED**
9 **THAT THE PRUDENCE OF SPECIFIC RESOURCES IS NOT AN ISSUE TO BE**
10 **ADDRESSED DURING IRP PROCEEDINGS?**

11 A. Yes. However, I am advised by counsel that, pursuant to Va. Code § 56-599 C, the
12 Commission must determine whether DVP's 2015 IRP is reasonable and in the public
13 interest, and continued development of NA3 is a key component of the IRP.

14
15 **Q. WHAT ADDITIONAL ANALYSIS OF NA3 DID THE COMMISSION DIRECT**
16 **DVP TO PERFORM IN ITS 2015 IRP?**

17 A. In its Final Order in DVP's 2013 IRP proceeding (Case No. PUE-2013-00088), the
18 Commission directed DVP to conduct the following six analyses in the 2015 IRP to
19 address certain concerns regarding NA3 that had been identified by Consumer Counsel
20 and other parties in that case:

1 • DVP shall include an analysis of the trade-off between operating cost risk
2 and project development cost risk associated with the Base Plan and Fuel
3 Diversity Plan (including NA3);

4
5 • DVP shall conduct an optimum timing analysis for NA3;

6
7 • DVP shall analyze and compare the cost of constructing NA3 to the cost
8 of renewing the licenses of the four existing nuclear units, and should also
9 compare the cost of retiring the four existing nuclear units to the cost of renewing
10 the licenses for those units;

11
12 • DVP shall conduct analyses providing a more detailed comparison of
13 market alternatives that may provide price stability to proposed self-build
14 generating resources, such as NA3;

15
16 • DVP should evaluate the potential future impacts of the EPA's Clean
17 Power Plan ("CPP") on future IRPs; and

18
19 • DVP should compare the cost of demand-side management options on a
20 cost per megawatt-hour saved basis to the forecasted cost per megawatt-hour of
21 proposed new generating resource alternatives.
22

1 Q. HAS DVP ADDRESSED THE ABOVE ANALYSES IN ITS 2015 IRP REPORT
2 OR DIRECT TESTIMONY IN THIS CASE?

3 A. Yes, to some extent. However, the analyses conducted by DVP do not appear to fully
4 evaluate the issues and concerns specified by the Commission as they relate to continued
5 development of NA3.

6

7 Q. DOES DVP'S 2015 IRP EVALUATE THE POTENTIAL FUTURE IMPACTS OF
8 THE EPA'S CLEAN POWER PLAN ON NA3 AND OTHER ASPECTS OF THE
9 COMPANY'S 2013 IRP?

10 A. Yes. As summarized in Table 3 below, DVP's IRP analysis suggests that the average
11 carbon emissions rate resulting from the Company's Least Cost Non-Compliant Plan is
12 approximately 14% higher than the EPA's original *draft* CPP emissions target for
13 Virginia.

14

15

Table 3

Average Carbon Emissions for IRP Plans and Original CPP (lbs/MWh)

	<u>2020-29</u>	<u>2030-2040</u>	<u>Over/(Under)</u>
CPP Emission Targets	884	810	
Least Cost Non-Compliant Plan	974	923	14.0%
Plan A: Solar	852	791	-2.3%
Plan B: Co-fire	839	797	-1.6%
Plan C: Nuclear	851	744	-8.1%
Plan D: Wind	858	799	-1.4%

16 Source: OAG 2-12.

17

1 Q. DO THE RESULTS PRESENTED IN TABLE 3 ABOVE INDICATE THAT THE
 2 NA3 NUCLEAR PLAN IS A REASONABLE PLAN FOR COMPLIANCE WITH
 3 THE FINAL CPP?

4 A. No. The EPA's final CPP carbon emission rate targets for Virginia were issued on
 5 August 3, 2015, only a few weeks after the Company filed its 2015 IRP Report with the
 6 Commission. These final CPP emissions targets (1,047 lbs/MWh for 2022-29 and 934
 7 lbs/MWh for 2030 and thereafter) are more than 15% higher (i.e., less stringent) than the
 8 EPA's original draft CPP emission targets as presented in Table 3 above. This suggests
 9 that the LCP in DVP's 2015 IRP may no longer be non-compliant with CPP, or may only
 10 require modest revisions to achieve compliance with the final CPP.

11 Moreover, as shown in Table 4 below from page 113 of DVP's 2015 IRP Report,
 12 the compliance cost of the "Nuclear" portfolio including NA3 is much higher than the
 13 compliance costs of the "Solar" and "Co-fire" portfolios.

14
 15 Table 4

NPV of CPP Compliance Costs (\$1000s) and Cost above Least Cost Plan

	<u>Compliance Cost</u>	<u>Amt Above LCP</u>
Plan A: Solar	\$4,272,696	10.3%
Plan B: Co-fire	\$4,992,580	11.8%
Plan C: Nuclear	\$7,161,500	16.2%
Plan D: Wind	\$15,279,196	32.7%

Sources: 2015 IRP Report, pages 113 and 123.

1 The results in Table 4 indicate that NA3 is not the least cost alternative for
2 achieving compliance with the CPP, even if it were not possible to modify the LCP to
3 comply with the Final CPP. This also means that one of DVP's key reasons for
4 considering the NA3 project – i.e., as a reasonable strategy for compliance with the CPP
5 carbon emissions targets – is not valid.

6
7 **Q. HAS DVP EVALUATED THE OPTIMAL TIMING FOR COMPLETION OF NA3**
8 **IN ITS IRP ANALYSIS AS DIRECTED BY THE COMMISSION?**

9 A. DVP did conduct certain analyses that indicate that delaying the in-service date of NA3
10 from 2027 to 2030 and 2033 would save \$762 million and \$975 million, respectively, on
11 a present value basis. (Kelly direct testimony, page 3.) However, this analysis does not
12 demonstrate the *optimal timing* of completion of NA3, or whether it is even reasonable to
13 construct the project at all, but rather simply indicates that the longer the in-service date
14 of NA3 is delayed, the more customers would benefit.

15
16 **Q. HAS DVP ANALYZED THE COST OF CONSTRUCTING NA3 IN**
17 **COMPARISON TO THE COST OF RENEWING THE LICENSES OF THE**
18 **FOUR EXISTING NUCLEAR UNITS AS REQUESTED BY THE COMMISSION?**

19 A. DVP's 2015 IRP Report indicates that the Company is "early in the evaluation process"
20 of assessing nuclear relicensing as an alternative to NA3. However, the preliminary
21 analysis of relicensing costs presented on page 89 of the 2015 IRP Report indicates that
22 license extension and gas-fired combined cycle alternatives are forecasted to have a far
23 lower cost than NA3.

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Q. HAS DVP CONDUCTED DETAILED ANALYSIS OF POTENTIAL THIRD PARTY MARKET ALTERNATIVES TO NA3?

A. DVP's 2015 IRP Report indicates that results of a recent supply-side request for proposals ("RFP") for new or existing intermediate or baseload generation resources located in or adjacent to the DOM Zone issued in November 2014, resulted in bids that were higher than costs of the Company's proposed Greenville County combined cycle project. While the IRP Report does not address how the bids compared to NA3, presumably they would have a much lower cost in light of the fact that the forecasted capital cost of NA3 is roughly ten times the cost of new combined cycle facilities.

Q. HAS DVP EVALUATED THE COST OF DEMAND-SIDE MANAGEMENT OPTIONS ON A COST PER MEGAWATT-HOUR SAVED BASIS IN COMPARISON TO THE FORECASTED COST PER MEGAWATT-HOUR OF NA3 AND OTHER PROPOSED NEW GENERATING RESOURCE ALTERNATIVES?

A. Yes, The results of this analysis, which are summarized in Figure 5.5.6.3 on page 103 of the IRP Report, show that there are 12 DSM programs with forecasted cost savings per megawatt-hour that are far lower than the \$126.48/MWh forecasted levelized cost of NA3 power.

1 Q. HAS DVP PRESENTED ANY OTHER INFORMATION IN THE 2015 IRP
2 REPORT TO DEMONSTRATE THE REASONABLENESS OF THE
3 COMPANY'S DECISION TO CONTINUE DEVELOPING NA3?

4 A. No. In fact, as discussed in my testimony in DVP's pending biennial review case, the
5 Company's 2015 IRP analysis demonstrates that it is not reasonable for the Company to
6 continue to expend hundreds of millions – or billions – of dollars for engineering,
7 licensing, and other planning activities to develop NA3. As shown in Figure 6.6.1 on
8 page 123 of the IRP Report, the NA3 portfolio has the second highest cost of any
9 scenario evaluated in the 2015 IRP, and has a higher cost than the LCP in all 19 scenarios
10 that were evaluated by DVP, including high fuel cost sensitivity cases that reflect the fuel
11 diversity benefit of each plan.

12
13
14 Q. HOW DOES THE ESTIMATED CAPITAL COST OF NA3 COMPARE TO THE
15 CAPITAL COST ESTIMATES REPORTED FOR OTHER NUCLEAR
16 GENERATING PROJECTS THAT ARE CURRENTLY UNDER
17 DEVELOPMENT IN THE UNITED STATES?

18 A. According to DVP discovery responses, there are presently three other nuclear generating
19 projects under construction in the United States. (See Exhibit SN-7.) As summarized in
20 Table 5, the reported capital costs for these other nuclear projects are significantly lower
21 than the current capital cost estimate for NA3.

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Table 5
U.S. Nuclear Generating Projects Under Construction

U.S. Nuclear Generating Units Under Construction

	Rated Capacity <u>MW</u>	Cost Estimate <u>\$Billions</u>	Cost Estimate <u>\$/kW</u>	<u>Owners</u>	Ownership <u>Share</u>	Owner Cost <u>\$Billions</u>
VC Summer Units 2 and 3	2,500	\$11.0	\$4,400	Santee Cooper SCG&E	45.0% 55.0%	\$4.95 \$6.05
Vogtle Units 3 and 4	2,500	\$14.0	\$5,600	Georgia Power Oglethorpe PC MEAG City of Dalton	45.7% 30.0% 22.7% 1.6%	\$6.40 \$4.20 \$3.18 \$0.22
Watts Bar Unit 2	1,150	\$4.2	\$3,652	TVA	100.0%	\$4.2
North Anna 3	1,543	\$19.3	\$12,508	DVP	100.0%	\$19.3

Source: World Nuclear Association; <http://www.world-nuclear.org>.

Moreover, it is important to note that DVP's estimated \$19.3 billion investment in NA3 would be more than three times the investment level of any other utility in the U.S. with new nuclear units under construction.

III. SUMMARY OF FINDINGS AND RECOMMENDATION

Q. PLEASE SUMMARIZE YOUR FINDINGS AND RECOMMENDATIONS REGARDING THE REASONABLENESS OF DVP'S 2015 IRP.

A. The analysis presented in DVP's 2015 IRP Report does not demonstrate that the Company's plan to continue development of NA3 is reasonable and in the public interest in consideration of the increasing costs of NA3 relative to other resource options

1 identified in DVP's IRP analyses. In fact, the NA3 project is more costly than the LCP in
2 all 19 scenarios evaluated by DVP in the 2015 IRP, and is not the lowest cost option for
3 complying with the CPP. DVP has not completed analysis of other issues of concern
4 regarding the NA3 project that were ordered by the Commission in the Company's 2013
5 IRP proceeding; however, the analyses that have been completed generally indicate that
6 there are much lower cost alternatives to NA3. Moreover, the forecasted capital cost of
7 NA3 is far higher than the EIA's current generic cost estimate for nuclear generating
8 units. For all of these reasons, DVP's 2015 IRP strategy to continue development of
9 NA3 does not appear to be reasonable.

10
11 **Q. ARE YOU AWARE THAT VA. CODE § 56-585.1 (A)(6) PROVIDES THAT**
12 **PLANNING AND DEVELOPMENT ACTIVITIES FOR A NEW NUCLEAR**
13 **GENERATION FACILITY ARE IN THE PUBLIC INTEREST?**

14 **A.** Yes. But it is my understanding that this statutory language does not sanction such
15 activities at *any* cost. In Case No. PUE-2007-00066, for example, both the Company and
16 the Commission recognized that a "public interest" declaration in statute with respect to a
17 generation facility does not mean "at any cost, but so far as costs are reasonable and
18 prudent."¹

19
20

¹ *Application of Virginia Electric and Power Co., For a certificate of public convenience and necessity to construct and operate an electric generation facility in Wise County, Virginia, and for approval of a rate adjustment clause under §§ 56-585.1, 56-580 D, and 56-46.1 of the Code of Virginia, SCC Case No. PUE-2007-00066, Final Order, 2008 S.C.C. Ann. Rep. 385, 390 (Mar. 31, 2008) (quoting Applicant's March 14, 2008 post-hearing brief at 70-71).*

1 Q. DOES THAT CONCLUDE YOUR TESTIMONY?

2 A. Yes.

SN-1

Background and Experience of Scott Norwood

RESUME OF DON SCOTT NORWOOD

Norwood Energy Consulting, L.L.C.

P. O. Box 30197
Austin, Texas 78755-3197
scott@scottnorwood.com
(512) 297-1889

SUMMARY

Scott Norwood is an energy consultant with over 30 years of experience in electric utility regulatory consulting, resource planning and energy procurement. Mr. Norwood has presented expert testimony in electric utility regulatory proceedings in Arkansas, Florida, Georgia, Iowa, Illinois, Michigan, Missouri, New Jersey, Oklahoma, South Dakota, Texas, Virginia, Washington and Wisconsin. His clients include government agencies, municipalities, industrial consortiums and various other electric consumer interests.

Since January of 2004 Mr. Norwood has served as President and sole proprietor of Norwood Energy Consulting, L.L.C. During this period he has provided electric utility regulatory consulting services focused primarily on the areas of electric resource planning, power supply system dispatch and operations, transmission planning analyses, and evaluations of electric utility fuel supply and purchased power issues. Before founding Norwood Energy Consulting, Mr. Norwood was employed for 18 years as a Principal and Director of the Deregulation Services Department of GDS Associates, Inc., an electric utility consulting firm based in Georgia. From 1984 to 1986 Mr. Norwood was employed as Manager of Power Plant Engineering for the Staff of the Public Utility Commission of Texas, and from 1980 to 1984 he was employed by Austin Energy as a Power Plant Engineer, in which capacity he directed electrical maintenance and design projects at three gas-fired power plants.

Mr. Norwood earned a Bachelor of Science degree in Electrical Engineering from the University of Texas in December of 1980.

EXPERIENCE

Energy Planning and Procurement Services

Dell Computer Corporation – Negotiated retail power supply agreement for Dell's Round Rock, Texas facilities producing annual savings in excess of \$2 million.

Texas Association of School Boards Electric Aggregation Program – Serve as TASB's consultant in the development, marketing and administration of a retail electric aggregation program consisting of 2,500 Texas schools with a total load

of over 300 MW. Program produced annual savings of more than \$30 million in its first year.

Oklahoma Industrial Energy Consumers - Analyzed and drafted comments addressing integrated resource plan filings by Public Service Company of Oklahoma and Oklahoma Gas and Electric Company.

S.C. Johnson - Analyzed and presented testimony addressing Wisconsin Electric Power Company's \$4.1 billion CPCN application to construct three coal-fired generating units in southeast Wisconsin.

Oklahoma Industrial Energy Consumers - Analyzed wind energy project ownership proposals by Oklahoma Gas and Electric Company and presented testimony addressing project economics and operational impacts.

City of Chicago, Illinois Attorney General, Illinois Citizens' Utility Board - Analyzed Commonwealth Edison's proposed divestiture of the Kincaid and State Line power plants to SEI and Dominion Resources.

Georgia Public Service Commission - Analyzed and presented testimony on Georgia Power Company's integrated resource plan in a certification proceeding for an eight unit, 640 MW combustion turbine facility.

South Dakota Public Service Commission - Evaluated integrated resource plan and power plant certification filing of Black Hills Power & Light Company.

Shell Leasing Co. - Evaluated market value of 540 MW western coal-fired power plant.

Community Energy Electric Aggregation Program - Served as Community Energy's consultant in the development, marketing and start-up of a retail electric aggregation program consisting of major charitable organizations and their donors in Texas.

Austin Energy - Conducted competitive solicitation for peaking capacity. Developed request for proposal, administered solicitation and evaluated bids.

Austin Energy - Provided technical assistance in the evaluation of the economic viability of the City of Austin's ownership interest in the South Texas Project.

Austin Energy - Assisted with regional production cost modeling analysis to assess production cost savings associated with various public power merger and power pool alternatives.

Sam Rayburn G&T Electric Cooperative - Conducted competitive solicitation for peaking capacity. Developed request for proposal, administered solicitation and evaluated bids.

Rio Grande Electric Cooperative, Inc. - Directed preparation of power supply solicitation and conducted economic and technical analysis of offers.

Electric Restructuring Analyses

Electric Power Research Institute - Evaluated regional resource planning and power market dispatch impacts on rail transportation and coal supply procurement strategies and costs.

Arkansas House of Representatives – Critiqued proposed electric restructuring legislation and identified suggested amendments to provide increased protections for small consumers.

Virginia Legislative Committee on Electric Utility Restructuring – Presented report on status of stranded cost recovery for Virginia’s electric utilities.

Georgia Public Service Commission – Developed models and a modeling process for preparing initial estimates of stranded costs for major electric utilities serving the state of Georgia.

City of Houston – Evaluated and recommended adjustments to Reliant Energy’s stranded cost proposal before the Public Utility Commission of Texas.

Oklahoma Attorney General – Evaluated and advised the Attorney General on technical, economic and regulatory policy issues arising from various electric restructuring proposals considered by the Oklahoma Electric Restructuring Advisory Committee.

State of Hawaii Department of Business, Economics and Tourism – Evaluated electric restructuring proposals and developed models to assess the potential savings from deregulation of the Oahu power market.

Virginia Attorney General - Served as the Attorney General’s consultant and expert witness in the evaluation of electric restructuring legislation, restructuring rulemakings and utility proposals addressing retail pilot programs, stranded costs, rate unbundling, functional separation plans, and competitive metering.

Western Public Power Producers, Inc. - Evaluated operational, cost and regional competitive impacts of the proposed merger of Southwestern Public Service Company and Public Service Company of Colorado.

Iowa Department of Justice, Consumer Advocate Division - Analyzed stranded investment and fuel recover issues resulting from a market-based pricing proposal submitted by MidAmerican Energy Company.

Cullen Weston Pines & Bach/Citizens’ Utility Board - Evaluated estimated costs

and benefits of the proposed merger of Wisconsin Energy Corporation and Northern States Power Company (Primergy).

City of El Paso - Evaluated merger synergies and plant valuation issues related to the proposed acquisition and merger of El Paso Electric Company and Central & Southwest Company.

Rio Grande Electric Cooperative, Inc. - Analyzed stranded generation investment issues for Central Power & Light Company.

Regulatory Consulting

Oklahoma Industrial Energy Consumers - Assisted client with technical and economic analysis of proposed EPA regulations and compliance plans involving control of air emissions and potential conversion of coal-to-gas conversion options.

New York Public Service Commission - Conducted inter-company statistical benchmarking analysis of Consolidated Edison Company to provide the New York Public Service Commission with guidance in determining areas that should be reviewed in detailed management audit of the company.

Oklahoma Industrial Energy Consumers - Analyzed and presented testimony on affiliate energy trading transactions by AEP in ERCOT.

Georgia Public Service Commission - Presented testimony before the Georgia Public Service Commission in Docket 3840-U, providing recommendations on nuclear O&M levels for Hatch and Vogtle and recommending that a nuclear performance standard be implemented in the State of Georgia.

Oklahoma Industrial Energy Consumers - Analyzed and presented testimony addressing power production and coal plant dispatch issues in fuel prudence cases involving Oklahoma Gas and Electric Company.

Georgia Public Service Commission - Analyzed and provided recommendations regarding the reasonableness of nuclear O&M costs, fossil O&M costs and coal inventory levels reported in GPC's 1990 Surveillance Filing.

New York Public Service Commission - Conducted inter-company statistical benchmarking analysis of Rochester Gas & Electric Company to provide the New York Public Service Commission with guidance in determining areas which should be reviewed in detailed management audit of the company.

Oklahoma Attorney General - Analyzed and presented testimony regarding fuel and purchased power, depreciation and other expense items in Oklahoma Gas & Electric Company's 2001 rate case before the Oklahoma Corporation Commission.

City of Houston - Analyzed and presented testimony regarding fossil plant O&M expense levels in Houston Lighting & Power Company's rate case before the Public Utility Commission of Texas.

City of El Paso - Analyzed and presented testimony regarding regulatory and technical issues related to the Central & Southwest/El Paso Electric Company merger and rate proceedings before the PUCT, including analysis of merger synergy studies, fossil O&M and purchased power margins.

Residential Ratepayer Consortium - Analyzed Fermi 2 replacement power and operating performance issues in 1994 and 1995 fuel reconciliation proceedings for Detroit Edison Company before the Michigan Public Service Commission.

Residential Ratepayer Consortium - Analyzed and prepared testimony addressing coal plant outage rate projections in the Consumer's Power Company fuel proceeding before the Michigan Public Service Commission.

City of El Paso - Analyzed and developed testimony regarding Palo Verde operations and maintenance expenses in El Paso Electric Company's 1991 rate case before the Public Utility Commission of Texas.

City of Houston - Analyzed and developed testimony regarding the operations and maintenance expenses and performance standards for the South Texas Nuclear Project, and operations and maintenance expenses for the Limestone and Parish coal-fired power plants in HL&P's 1991 rate case before the PUCT.

City of El Paso - Analyzed and developed testimony regarding Palo Verde operations and maintenance expenses in El Paso Electric Company's 1990 rate case before the Public Utility Commission of Texas. Recommendations were adopted.

Power Plant Management

City of Austin Electric Utility Department - Analyzed the 1994 Operating Budget for the South Texas Nuclear Project (STNP) and assisted in the development of long-term performance and expense projections and divestiture strategies for Austin's ownership interest in the STNP.

City of Austin Electric Utility Department - Analyzed and provided recommendations regarding the 1991 capital and O&M budgets for the South Texas Nuclear Project.

Sam Rayburn G&T Electric Cooperative - Developed and conducted operational monitoring program relative to minority owner's interest in Nelson 6 Coal Station operated by Gulf States Utilities.

KAMO Electric Cooperative, City of Brownsville and Oklahoma Municipal Power Agency - Directed an operational audit of the Oklaunion coal-fired power plant.

Sam Rayburn G&T Electric Cooperative - Conducted a management/technical assessment of the Big Cajun II coal-fired power plant in conjunction with ownership feasibility studies for the project.

Kamo Electric Power Cooperative - Developed and conducted operational monitoring program for client's minority interest in GRDA Unit 2 Coal Fired Station.

Northeast Texas Electric Cooperative - Developed and conducted operational monitoring program concerning NTEC's interest in Pirkey Coal Station operated by Southwestern Electric Power Company and Dolet Hills Station operated by Central Louisiana Electric Company.

Corn Belt Electric Cooperative/Central Iowa Power Cooperative - Perform operational monitoring and budget analysis on behalf of co-owners of the Duane Arnold Energy Center.

PRESENTATIONS

Quantifying Impacts of Electric Restructuring: Dynamic Analysis of Power Markets, 1997 NARUC Winter Meetings, Committee on Finance and Technology.

Quantifying Costs and Benefits of Electric Utility Deregulation: Dynamic Analysis of Regional Power Markets, International Association for Energy Economics, 1996 Annual North American Conference.

Railroad Rates and Utility Dispatch Case Studies, 1996 EPRI Fuel Supply Seminar.

Quantifying Potentially Stranded Costs: Modeling and Policy Issues, 1996 NASUCA Annual Meeting.

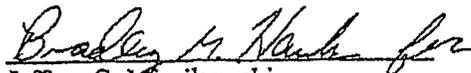
SN-2

**DVP's Confidential Response to OAG 2-87 in Case No. PUE-
2015-00027**

(Confidential Data Redacted)

Virginia Electric and Power Company
Case No. PUE-2015-00027
Office of the Attorney General – Division of Consumer Counsel
Second Set

The following response to Question No. 87 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Office of the Attorney General – Division of Consumer Counsel received on July 8, 2015 has been prepared under my supervision as it relates to project costs.


Jeffrey G. Miscikowski
Director Generation Construction Financial
Management & Generation Construction
Dominion Resources Services, Inc.

Question No. 87

Provide the Company's current capital cost forecast for NA3 with a detailed breakdown of project costs and included projected construction interests costs.

Response:

See Confidential Attachment AG Set 2-87 (JGM) for a detailed breakdown of the estimated North Anna 3 development costs by year through the projected commercial operations date in 2028 should the Company elect to construct the new unit following the receipt of the combined operating license ("COL"). This data is consistent with the overnight installed cost of \$8,593/kW in 2015 USD for the construction of the new unit as shown in the 2015 Integrated Resource Plan ("2015 Plan") filed by the Company on July 1, 2015.

Confidential Attachment AG Set 2-87 (JGM) contains confidential information as indicated by yellow highlighting and is being provided to Consumer Counsel pursuant to the protections set forth in 5 VAC 5-20-170 and the Hearing Examiner's Protective Ruling issued on April 21, 2015 in Case No. PUE-2015-00027.

The Company will provide a supplemental response addressing the projected construction interest costs.

Nuclear Plant Data (Stratigist IRP)

CONFIDENTIAL INFORMATION INDICATED BY YELLOW HIGHLIGHTING

REGULATED

Category	Description	Unit	Value
General Data			
Location	General Location	City, State	North Anna
Schedule			
Start Date	Includes permitting, land, construction	Month/Year	01-Jul-07
Efficient OOD	Commercial Operations Date	Month/Year	2011-09-27
Construction Cycle	Time to site, permit, and build (Project Start to In-Service Date)	Years	20.2
Operating Life	Operating life of unit	Years	60.0
Book Life	Typically same as Operating Life	Years	60.0
Useful Life	Typically same as Operating Life	Years	60.0
Project CAPX			
Category CAPX	Owner/Support	\$1000's	
Nominal dollars	Site Separation	\$1000's	
AFUDC not included	Operations	\$1000's	
100% ownership	EPC/Construction	\$1000's	
	Other Construction	\$1000's	
	Start-Up Costs	\$1000's	
	Electrical Interface	\$1000's	
	Other	\$1000's	
	Fuel Core	\$1000's	
	Contingency	\$1000's	
	Total	\$1000's	14,777,268
Annual CAPX			
Prior Years		\$1000's	\$ 191,562
Nominal dollars	2011	\$1000's	\$ 154,126
AFUDC not included	2012	\$1000's	\$ 20,070
100% ownership	2013	\$1000's	\$ 98,335
	2014	\$1000's	\$ (232,267)
	2015	\$1000's	\$ 73,027
	2016	\$1000's	\$ 178,818
	2017	\$1000's	\$ 403,897
	2018	\$1000's	\$ 774,432
	2019	\$1000's	\$ 1,434,434
	2020	\$1000's	\$ 1,675,612
	2021	\$1000's	\$ 2,185,152
	2022	\$1000's	\$ 2,426,547
	2023	\$1000's	\$ 2,012,787
	2024	\$1000's	\$ 1,849,149
	2025	\$1000's	\$ 1,103,693
	2026	\$1000's	\$ 337,850
	2027	\$1000's	\$ 89,738
	2028	\$1000's	
	2029	\$1000's	
	2030	\$1000's	
	2031	\$1000's	
	2032	\$1000's	
	2033	\$1000's	
	2034	\$1000's	
	2035	\$1000's	
	2036	\$1000's	
	2037	\$1000's	
	Total	\$1000's	\$ 14,777,268
Overnight Costs (2015)			
Discount Rate			2.47%
NPV of Total CAPX		\$1000's	\$ 12,631,600
Installed Cost			
Capacity-Annual Monthly Average		MW	1,470
Nominal installed Cost		\$/KW	\$ 10,053
Overnight Installed Cost		\$/KW	\$ 8,593
Project OPEX			
Fixed OPEX (2015)			
Annual Fixed O&M Labor		\$1000's	\$ 401,428
Annual Fixed O&M Materials		\$1000's	\$ 1,749
Annual Fixed O&M Total		\$1000's	\$ 403,176
Variable OPEX (2015)			
Variable O&M (Single Rate)		\$/MWh	1.80
Property Tax	Annual Property Tax Rate	%	2.05%
Staffing	Annual staff for operations	FTEs	504
Operating Parameters			
Capacity-Annual Monthly Average	Net output	MW	1,470
Capacity-Summer	Net output (85 deg F, 43% RH)	MW	1,453
Capacity-Winter	Net output (20 deg F, 43% RH)	MW	1,514
Heat Rate-Summer	Base load (85 deg F, 43% RH)	MMBtu/MWh	10,500
Heat Rate-Winter	Base load (20 deg F, 43% RH)	MMBtu/MWh	10,067
Equivalent Forced Outage Rate	Expected outage and curtailments	%	0.04
Fuel Data			
Refueling Cycle	Average duration of refueling cycle	Months	18
Refueling Outage	Average duration of refueling outage	Days	30

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SN-3

**DVP Witness Stevens' Schedule 19 from Case No. PUE-
2015-00027**

VIRGINIA ELECTRIC AND POWER COMPANY
RATE OF RETURN STATEMENT - PER BOOKS
FOR TEST YEAR ENDED 12/31/2014
USING END OF PERIOD RATE BASE AND COMMON EQUITY
(Thousands of Dollars)

Line No		(Col 1) Total Company	(Col 2) Non-Residential	(Col 3) Virginia Cost of Service Amount (Col 1) - (Col 2)	(Col 4) Transmission Per Books (Col 1) - (Col 4)	(Col 5) Generation Per Books	(Col 6) Distribution Per Books	(Col 7) Adjusted Cost of Service (Col 3) - (Col 6)
1	OPERATING REVENUE	\$ 7,563,099	\$ 1,527,755	\$ 6,035,344	\$ 436,873	\$ 4,428,148	\$ 1,120,602	\$ 5,810,025
2	OPERATING REVENUE DEDUCTIONS							
3	Operating & Maintenance Expense	4,726,044	843,078	3,782,966	18,773	3,471,089	292,103	3,780,192
4	Depreciation & Amortization	873,128	183,611	689,517	64,812	331,818	273,076	601,445
5	Federal Income Taxes	457,268	81,384	375,884	87,485	142,302	146,247	228,549
6	State Income Taxes	60,758	8,530	52,228	3,723	38,856	9,640	48,498
7	Taxes Other Than Income Taxes	251,702	55,655	196,047	21,748	121,945	51,756	170,681
8	(3) Adjustments on Disposition of Property	2	184	(182)	-	(182)	-	(182)
9	TOTAL OPERATING REVENUE DEDUCTIONS	\$ 6,268,612	\$ 1,272,642	\$ 5,095,970	\$ 217,309	\$ 4,185,219	\$ 772,752	\$ 4,818,571
10	OPERATING INCOME	\$ 1,294,487	\$ 255,143	\$ 939,344	\$ 219,478	\$ 382,229	\$ 358,135	\$ 740,464
11	PLUS: AFUDC	47,053	18,098	28,955	21,944	7,111	-	7,111
12	LESS: Change in Donations	1,211	241	970	5	680	75	985
13	Interest Expense On Customer Deposits	388	15	373	27	217	69	348
14	Net Interest On Tax Delinquencies	40	9	31	6	18	8	25
15	Other Interest Expense/Income	-	-	-	0	-	-	-
16	ADJUSTED OPERATING INCOME	\$ 1,260,457	\$ 272,876	\$ 887,581	\$ 241,292	\$ 369,237	\$ 357,902	\$ 740,238
17	PLUS: Other Income/Expense	39,239	39,238	-	-	-	-	39,238
18	LESS: Interest Expense-Booked	444,747	127,142	317,605	61,128	171,588	-	246,474
19	Preferred Dividends	10,888	10,888	-	-	-	-	-
20	JOE Capital Expenses	N/A	N/A	-	-	-	-	-
21	INCOME AVAILABLE FOR COMMON EQUITY	\$ 844,210	\$ 174,238	\$ 669,971	\$ 180,166	\$ 216,721	\$ 273,084	\$ 489,765
22	Adjustments for Working Capital	729,366	135,107	594,259	48,303	645,551	(5,988)	640,563
23	PLUS: Net Utility Profit	23,448,082	5,082,532	18,365,550	3,618,918	9,512,005	5,224,589	14,726,984
24	LESS: Other Rate Base Deductions	4,831,514	1,015,751	3,815,762	657,470	1,985,341	1,172,982	3,159,293
25	TOTAL AVERAGE RATE BASE	\$ 19,342,914	\$ 4,211,807	\$ 15,131,107	\$ 2,912,143	\$ 8,173,215	\$ 4,045,649	\$ 12,210,868
26	Total Average Capital (1)	\$ 20,013,587	\$ 4,882,350	\$ 15,131,237	\$ 2,912,143	\$ 8,173,215	\$ 4,045,649	\$ 12,210,864
27	Average Common Equity Capital (4)	\$ 10,004,582	\$ 2,440,754	\$ 7,563,828	\$ 1,455,748	\$ 4,085,702	\$ 2,022,377	\$ 6,108,079
28	Rate of Return on Rate Base							8.11%
29	Rate of Return on Common Equity							8.02%

Notes:
 (1) Va. Jurisdictional Interest Expense - Va. Jurisdictional Adjusted Rate Base - Debt Weighted Cost of Capital Percentage
 42.95% - \$ 17,10,864
 42.95% - \$ 17,10,864
 (2) Va. Jurisdictional Preferred Dividend Expense - Va. Jurisdictional Rate Base - Preferred Stock Weighted Cost of Capital Percentage
 4.00% - \$ 2,718,861
 (3) Located on Filing Schedule (19) in Column 2 - Column 1 - Column 5
 (4) Expected ten year Capital Structure

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Exhibit No. _____
 Witness: MCS
 Attachment D
 Schedule 19
 Page 1 of 1

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SN-4

**Estimated Life of Plant Revenue Requirement of North
Anna 3**

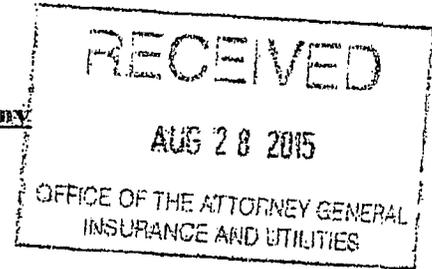
Estimated Total NA3 Revenue Requirement (2028-2067)

	Rate base	Depreciation	Debt	Equity + Tax	Fuel	O&M	A&G	Property taxes	Insurance	Total Rev Req'd
1	\$19,300,000	\$482,500	\$202,650	\$789,689	\$86,984	\$213,378	\$42,676	\$586,000	\$48,750	\$2,257,126
2	\$18,817,500	\$482,500	\$197,584	\$769,947	\$84,774	\$219,779	\$43,956	\$376,350	\$47,044	\$2,225,883
3	\$18,335,000	\$482,500	\$192,518	\$750,205	\$90,498	\$226,373	\$45,275	\$365,700	\$45,838	\$2,199,905
4	\$17,852,500	\$482,500	\$187,451	\$730,462	\$92,308	\$233,164	\$46,633	\$357,050	\$44,631	\$2,174,200
5	\$17,370,000	\$482,500	\$182,385	\$710,719	\$94,154	\$240,159	\$48,032	\$347,400	\$43,425	\$2,148,775
6	\$16,887,500	\$482,500	\$177,319	\$690,978	\$96,037	\$247,364	\$49,473	\$337,750	\$42,219	\$2,123,639
7	\$16,405,000	\$482,500	\$172,253	\$671,236	\$97,958	\$254,784	\$50,957	\$328,100	\$41,013	\$2,098,800
8	\$15,922,500	\$482,500	\$167,186	\$651,493	\$99,917	\$262,428	\$52,486	\$318,450	\$39,806	\$2,074,267
9	\$15,440,000	\$482,500	\$162,120	\$631,751	\$101,916	\$270,301	\$54,060	\$308,800	\$38,600	\$2,050,048
10	\$14,957,500	\$482,500	\$157,054	\$612,009	\$103,954	\$278,410	\$55,682	\$299,150	\$37,394	\$2,026,152
11	\$14,475,000	\$482,500	\$151,988	\$592,267	\$106,033	\$286,762	\$57,352	\$289,500	\$36,188	\$2,002,589
12	\$13,992,500	\$482,500	\$146,921	\$572,525	\$108,154	\$295,365	\$59,073	\$279,850	\$34,981	\$1,979,369
13	\$13,510,000	\$482,500	\$141,855	\$552,782	\$110,317	\$304,226	\$60,845	\$270,200	\$33,775	\$1,956,500
14	\$13,027,500	\$482,500	\$136,789	\$533,040	\$112,523	\$313,353	\$62,671	\$260,550	\$32,569	\$1,933,994
15	\$12,545,000	\$482,500	\$131,723	\$513,298	\$114,773	\$322,753	\$64,551	\$250,900	\$31,363	\$1,911,860
16	\$12,062,500	\$482,500	\$126,656	\$493,556	\$117,069	\$332,436	\$66,487	\$241,250	\$30,156	\$1,890,110
17	\$11,580,000	\$482,500	\$121,590	\$473,813	\$119,410	\$342,409	\$68,482	\$231,600	\$28,950	\$1,868,754
18	\$11,097,500	\$482,500	\$116,524	\$454,071	\$121,798	\$352,681	\$70,536	\$221,950	\$27,744	\$1,847,805
19	\$10,615,000	\$482,500	\$111,458	\$434,329	\$124,234	\$363,262	\$72,652	\$212,300	\$26,538	\$1,827,272
20	\$10,132,500	\$482,500	\$106,391	\$414,587	\$126,719	\$374,160	\$74,832	\$202,650	\$25,331	\$1,807,170
21	\$9,650,000	\$482,500	\$101,325	\$394,845	\$129,254	\$385,384	\$77,077	\$193,000	\$24,125	\$1,787,509
22	\$9,167,500	\$482,500	\$96,259	\$375,102	\$131,839	\$396,946	\$79,389	\$183,350	\$22,919	\$1,768,303
23	\$8,685,000	\$482,500	\$91,193	\$355,360	\$134,475	\$408,854	\$81,771	\$173,700	\$21,713	\$1,749,565
24	\$8,202,500	\$482,500	\$86,126	\$335,618	\$137,165	\$421,120	\$84,224	\$164,050	\$20,506	\$1,731,309
25	\$7,720,000	\$482,500	\$81,060	\$315,876	\$139,908	\$433,753	\$86,751	\$154,400	\$19,300	\$1,713,548
26	\$7,237,500	\$482,500	\$75,994	\$296,133	\$142,706	\$446,766	\$89,353	\$144,750	\$18,094	\$1,696,296
27	\$6,755,000	\$482,500	\$70,928	\$276,391	\$145,560	\$460,169	\$92,034	\$135,100	\$16,888	\$1,679,569
28	\$6,272,500	\$482,500	\$65,861	\$256,649	\$148,472	\$473,974	\$94,795	\$125,450	\$15,681	\$1,663,382
29	\$5,790,000	\$482,500	\$60,795	\$236,907	\$151,441	\$488,193	\$97,639	\$115,800	\$14,475	\$1,647,750
30	\$5,307,500	\$482,500	\$55,729	\$217,164	\$154,470	\$502,839	\$100,568	\$106,150	\$13,269	\$1,632,689
31	\$4,825,000	\$482,500	\$50,663	\$197,422	\$157,559	\$517,924	\$103,585	\$96,500	\$12,063	\$1,618,216
32	\$4,342,500	\$482,500	\$45,596	\$177,680	\$160,711	\$533,462	\$106,692	\$86,850	\$10,856	\$1,604,347
33	\$3,860,000	\$482,500	\$40,530	\$157,938	\$163,925	\$549,466	\$109,893	\$77,200	\$9,650	\$1,591,102
34	\$3,377,500	\$482,500	\$35,464	\$138,196	\$167,203	\$565,950	\$113,190	\$67,550	\$8,444	\$1,578,496
35	\$2,895,000	\$482,500	\$30,398	\$118,453	\$170,547	\$582,928	\$115,586	\$57,900	\$7,238	\$1,566,550
36	\$2,412,500	\$482,500	\$25,331	\$98,711	\$173,958	\$600,416	\$120,083	\$48,250	\$6,031	\$1,555,281
37	\$1,930,000	\$482,500	\$20,265	\$78,969	\$177,437	\$618,429	\$123,686	\$38,600	\$4,825	\$1,544,711
38	\$1,447,500	\$482,500	\$15,199	\$59,227	\$180,986	\$636,987	\$127,396	\$28,950	\$3,619	\$1,534,858
39	\$965,000	\$482,500	\$10,133	\$39,484	\$184,606	\$656,091	\$131,218	\$19,300	\$2,413	\$1,525,745
40	\$482,500	\$482,500	\$5,066	\$19,742	\$188,298	\$675,774	\$135,155	\$9,650	\$1,206	\$1,517,391
Cum Total (Nominal)	\$395,650,000	\$19,300,000	\$4,154,325	\$16,188,625	\$5,254,001	\$16,088,966	\$3,217,793	\$7,913,000	\$989,125	\$73,105,836
Cum NPV, 7.1% (2015\$)	\$182,223,313	\$6,358,595	\$1,913,870	\$7,457,992	\$1,463,299	\$4,112,206	\$822,441	\$3,645,466	\$455,683	\$26,229,552

SN-5

DVP's Response to OAG 2-7

Virginia Electric and Power Company
Case No. PUE-2015-00035
Office of the Attorney General
Second Set



The following response to Question No. 7 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Division of Consumer Counsel, Office of the Attorney General received on August 19, 2015 has been prepared under my supervision.

Ted Fasca

Ted Fasca
 Manager – Generation System Planning
 Virginia Electric and Power Company

The following response to Question No. 7 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Division of Consumer Counsel, Office of the Attorney General received on August 19, 2015 has been prepared under my supervision as it pertains to legal matters:

Charlotte P. McAfee

Charlotte P. McAfee
 Senior Counsel
 Dominion Resources Services, Inc.

Question No. 7

Provide the current estimated annual total system average retail rate impacts arising from the construction and operation of North Anna 3 for the first five years of commercial operations of the project, along with underlying assumptions and calculations.

Response:

The Company objects to this request on the basis that it requires original work and is unduly burdensome to the extent that it seeks information that is not presently projected or calculated by the Company. Notwithstanding and subject to the foregoing objections, the Company has not performed any such calculations to date.

SN-6

**Estimated Revenue Requirement and Residential Rate
Impact of NA3**

Estimated VA Residential Rate Impact of NA 3 in 2030

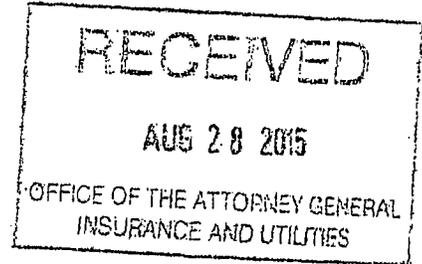
Line No.		Formula	Source
1	NA 3 Capacity (MW)		2015 IRP, pg 91
2	Annual Cap Factor		Assumption
3	Annual Net Gen, MWh	$Ln1 \times 8760 \times Ln2$	Calculated
4	Fuel Cost (2030), \$/MWh		2015 IRP, App 4B
5	Fuel Cost (2030)	$Ln4 \times Ln3$	Calculated
5b	Replacement Fuel (2030), \$/MWh		2015 IRP, pg A-85
5c	Replacement Fuel Savings (2030)	$Ln5b \times Ln3$	Calculated
6	Capital Cost		Assumption
7	Capital Cost, \$/KW	$Ln6 / Ln1 / 1000$	Calculated
8	Non-fuel O&M (2030)		Assumption, \$100/KW esc 3%/yr
9	A&G, 20%	$Ln8 \times 0.2$	Assumption
10	Wtd Avg Cost of Capital		Propst Sch RLP-1, PUE-2015-00075
11	Net Op Income	$Ln10 \times Ln6$	Calculated
12	Wtd Avg Cost of Debt		Propst Sch RLP-1, PUE-2015-00075
13	Interest on Debt	$Ln12 \times Ln6$	Calculated
14	Net Income	$Ln11 - Ln13$	Calculated
15	Income Tax Gross-up Factor		Propst Sch RLP-1, PUE-2015-00075
16	Net Income Incl Income Taxes	$Ln14 / Ln15$	Calculated
17	Capital Rev Req	$Ln13 + Ln16$	Assumption
18	Depreciation, 2.5%	$Ln6 \times 0.025$	Assumption
19	Prop Taxes at 2%	$Ln6 \times 0.02$	Assumption
20	Insurance at 0.25%	$Ln6 \times 0.0025$	Assumption
21	Total NA 3 Yr 1 Revenue Req	$Ln5 - Ln5c + Ln8 + Ln9 + Ln17 + Ln18 + Ln19 + Ln20$	Calculated
22	Total NA 3 Revenue Req, \$/MWh	$Ln21 / Ln3$	Calculated
23			
24	Virginia Juris Allocator		Propst Sch RLP-1, PUE-2015-00075
25	NA3 Virginia Juris Rev Rqt (2030)	$Ln21 \times Ln24$	Calculated
26	Residential Class Allocator		Anderson Sch EIA-1, PUE-2015-00075
27	Va Residential Class Rev Rqt	$Ln25 \times Ln26$	Calculated
28	Va Residential Class Sales, MWh		2015 IRP, App 2B
29	Va Residential Class NA3 RevRqt, \$/Kwh	$Ln27 / Ln28 / 1000$	Calculated
30	Va Resid Summer Rate, 1000 kWh, \$/Kwh		Anderson Sch EIA-3, PUE-2015-00075
31	Va Resid Base Mo Rate, 1000 kWh, \$/Kwh		Anderson Sch EIA-3, PUE-2015-00075
32	Va Resid Avgann Rate, 1000 kWh, \$/Kwh	$(Ln30 \times 4 + Ln31 \times 8) / 12$	Calculated
33	Va Resid Mo Increase due to NA3	$Ln29 \times 1000$	Calculated
34	Va Resid Ann Increase due to NA3	$Ln33 \times 12$	Calculated
35	Va Resid Avg Ann Rate Increase due to NA3	$Ln29 / Ln32$	Calculated

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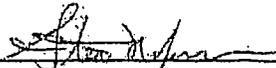
SN-7

DVP's Response to OAG 2-2

Virginia Electric and Power Company
Case No. PUE-2015-00035
Office of the Attorney General
Second Set

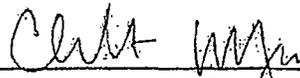


The following response to Question No. 2 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Division of Consumer Counsel, Office of the Attorney General received on August 19, 2015 has been prepared under my supervision.



 Steven K. Jones
 Manager Energy Market Analysis
 Dominion Resources Services, Inc.

The following response to Question No. 2 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Division of Consumer Counsel, Office of the Attorney General received on August 19, 2015 has been prepared under my supervision as it pertains to legal matters.



 Charlotte P. McAfee
 Senior Counsel
 Dominion Resources Services, Inc.

Question No. 2

Name all utility companies, of which the Company is aware, that are currently developing or planning to develop new nuclear generation facilities in the United States. In answering, provide the name of the nuclear generation facility or potential facility associated with each such utility.

Response:

The Company objects to this request as overly broad, potentially voluminous and unduly burdensome to the extent it seeks information of which the Company, its officers, directors, employees, attorneys, agents, and all affiliates may be "aware." The Company further objects to the extent that this request requires original work to the extent it seeks for the Company to provide information regarding other utility companies that is not presently compiled and which is publicly available to the parties, just as it would be to the Company.

Notwithstanding and subject to the foregoing objections, the Company provides the following response.

A non-exhaustive list of utility companies that are currently developing or planning to develop a new nuclear generation facility in the United States are listed below.

Plant Name	Unit	Utility Company	Percent Owned %
V C Summer	2	Santee Cooper	45.00
V C Summer	2	South Carolina Electric & Gas Co	55.00
V C Summer	3	Santee Cooper	45.00
V C Summer	3	South Carolina Electric & Gas Co	55.00
Vogtle (GA)	3	Dalton GA (City of)	1.60
Vogtle (GA)	3	Georgia Power Co	45.70
Vogtle (GA)	3	Municipal Electric Authority of Georgia	22.70
Vogtle (GA)	3	Oglethorpe Power Corp	30.00
Vogtle (GA)	4	Dalton GA (City of)	1.60
Vogtle (GA)	4	Georgia Power Co	45.70
Vogtle (GA)	4	Municipal Electric Authority of Georgia	22.70
Vogtle (GA)	4	Oglethorpe Power Corp	30.00
Watts Bar Nuclear	NP2	Tennessee Valley Authority	100.00