

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

APPLICATION OF VIRGINIA ELECTRIC)
AND POWER COMPANY)

Case No. PUR-2018-00065

*In Reference Virginia Electric and Power)
Company's Integrated Resource Plan filing)
pursuant to Va. Code § 56-597 et seq.)*

**DIRECT TESTIMONY OF
JAMES F. WILSON
ON BEHALF OF
ENVIRONMENTAL RESPONDENTS**

August 10, 2018

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CONTENTS

| | <u>Page</u> |
|--|--------------------|
| I. Introduction and Qualifications | 1 |
| II. Summary and Recommendations | 2 |
| III. Dominion Zone Peak Load Trends and Forecasts | 12 |
| IV. Data Center Load Forecast and Forecast Adjustment..... | 27 |
| V. Dominion Load-Serving Entity Peak Load..... | 36 |
| VI. Reserve Margins and Total Resource Requirements | 40 |
| VII. Conclusions and Recommendations | 44 |

1 **I. INTRODUCTION AND QUALIFICATIONS**

2 **Q 1: Please state your name, position and business address.**

3 A: My name is James F. Wilson. I am an economist and independent consultant doing
4 business as Wilson Energy Economics. My business address is 4800 Hampden Lane
5 Suite 200, Bethesda, Maryland 20814.

6 **Q 2: On whose behalf are you testifying in this proceeding?**

7 A: I am testifying on behalf of the Environmental Respondents: Appalachian Voices.

8 **Q 3: Please describe your experience and qualifications.**

9 A: I have thirty-five years of consulting experience, primarily in the electric power and
10 natural gas industries. Many of my assignments have pertained to the economic and
11 policy issues arising from the interplay of competition and regulation in these industries,
12 including restructuring policies, market design, market analysis and market power. Other
13 recent engagements have involved resource adequacy and capacity markets, contract
14 litigation and damages, forecasting and market evaluation, pipeline rate cases and
15 evaluating allegations of market manipulation. I also spent five years in Russia in the
16 early 1990s advising on the reform, restructuring, and development of the Russian
17 electricity and natural gas industries for the World Bank and other clients.

18 With respect to the load forecasting and capacity requirements issues I will address in this
19 testimony, I have been actively involved in these issues in the PJM Interconnection,
20 L.L.C. (“PJM”) region for many years, participating in PJM stakeholder processes,
21 performing and presenting analysis of these issues, and submitting affidavits in various
22 regulatory proceedings.

23 I have submitted affidavits and presented testimony in proceedings of the FERC, state
24 regulatory agencies, and U.S. district court. I hold a B.A. in Mathematics from Oberlin

1 College and an M.S. in Engineering-Economic Systems from Stanford University. My
2 curriculum vitae, summarizing my experience and listing past testimony, is attached as
3 Attachment JFW-1.

4 **Q 4: Have you previously submitted testimony in Virginia State Corporation**
5 **Commission (“Commission”) proceedings?**

6 A: Yes. I submitted direct testimony on behalf of Environmental Respondents in Case No.
7 PUE-2017-00051 last year (Virginia Electric and Power Company’s 2017 Integrated
8 Resource Plan) and in Case No. PUE-2016-00049 the prior year (Virginia Electric and
9 Power Company’s 2016 Integrated Resource Plan). I also submitted direct testimony on
10 behalf of Commission staff in Case No. PUE-2009-00043 in 2009 (Application of PATH
11 Allegheny Virginia Transmission Corporation for Certificates of Public Convenience and
12 Necessity).

13 **Q 5: What is the scope and purpose of your testimony in this case?**

14 A: This proceeding involves the 2018 Integrated Resource Plan (“2018 Plan”) for Virginia
15 Electric and Power Company (“Dominion” or the “Company”). My assignment was to
16 evaluate the forecasts of peak loads and Total Resource Requirements included in the
17 2018 Plan and provide any recommendations.

18
19 **II. SUMMARY AND RECOMMENDATIONS**

20 **Q 6: How are the Company’s forecasts of peak loads and Total Resource Requirements**
21 **from the 2018 Plan used?**

22 A: The Total Resource Requirements (“TRR”) are the Company’s estimates of the amount
23 of capacity that will be assigned to the Company by PJM for purposes of allocating
24 capacity costs. The TRRs are calculated as the forecast peak load for the Dominion
25 Load-Serving Entity (“DOM LSE”) plus a reserve margin. As such, the TRRs represent

1 the Company's estimates of its customers' future generating capacity needs, and the 2018
2 Plan describes how the Company plans to meet these needs through owned and
3 contracted resources.

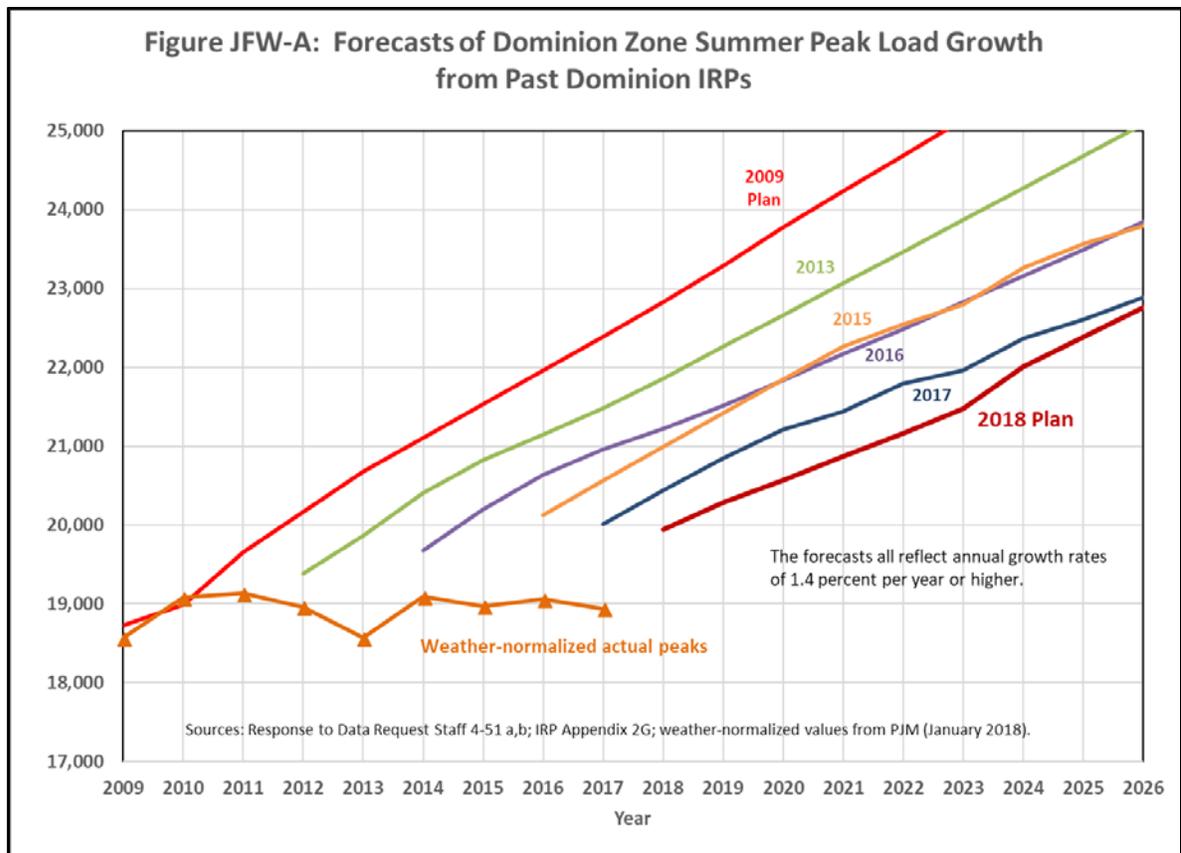
4 The Company also relies upon the load forecasts prepared for its Integrated Resource
5 Plans in other proceedings. For example, Glenn A. Kelly, Director of Generation System
6 Planning, relied upon the load forecast prepared for the Company's 2015 Integrated
7 Resource Plan in testimony supporting the Company's application for certificates of
8 public convenience and necessity to construct a 1,588 megawatt natural gas-fired
9 combined-cycle generation facility in Greensville County, Virginia. In that testimony,
10 Mr. Kelly noted that "[n]o party contested the Company's load projections supporting the
11 need for the Project in the 2015 Plan proceeding."¹

12 **Q 7: Please summarize how the Company determines the load forecasts and TRRs.**

13 A: The Company's approach entails the following steps.

- 14 1. Forecast the Dominion transmission zone ("DOM Zone") future peak loads (adding
15 in a separate forecast of data center peak loads);
- 16 2. Estimate the DOM LSE portion of the DOM Zone peak loads;
- 17 3. Determine the reserve margins needed above and beyond the DOM LSE peak loads;
- 18 4. Sum the peak loads and reserve margins to determine the TRRs.

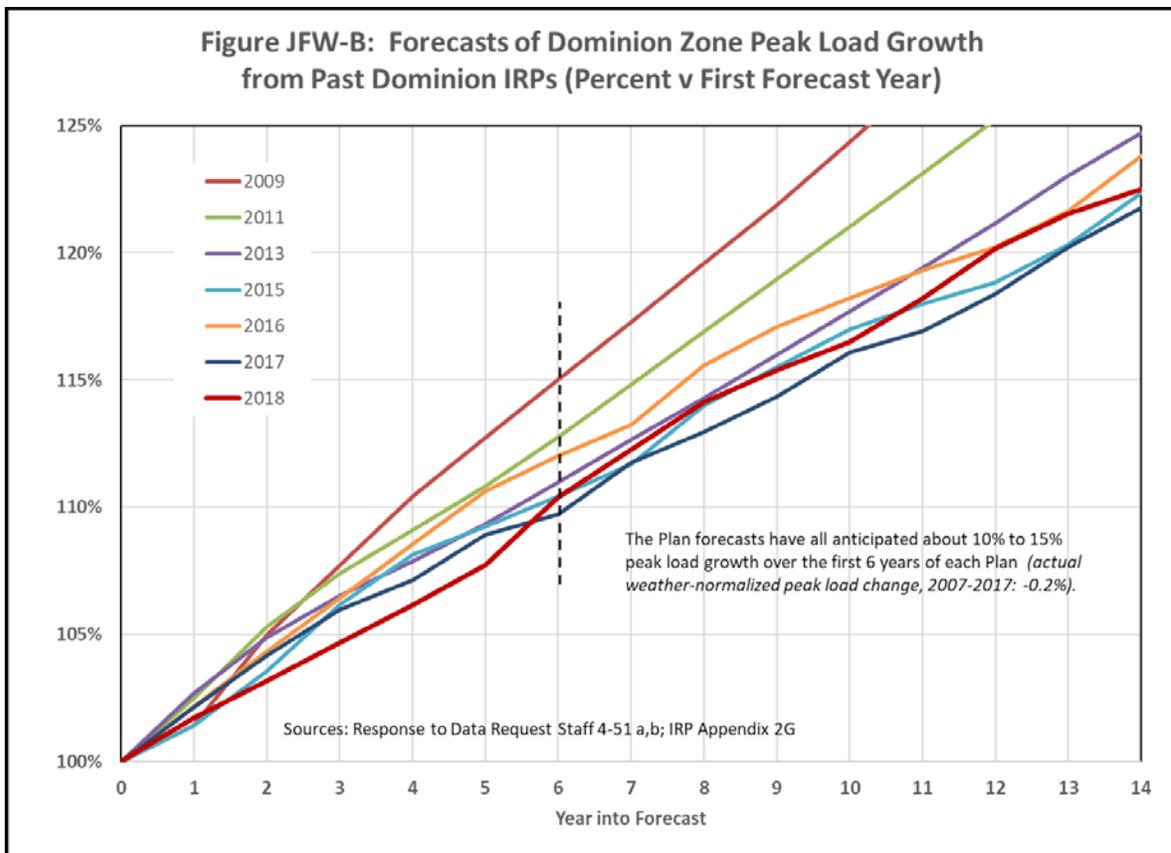
¹ Rebuttal Testimony of Glenn A. Kelly filed December 18, 2015 in Case No. PUR-2015-00075, pp. 2-3.



1 **Q 8: Please summarize your evaluation and conclusion regarding the Company’s DOM**
 2 **Zone peak load forecasts used in recent integrated resource plans.**

3 A: While peak loads in the DOM Zone (on a weather-normalized basis) have been flat over
 4 the past decade, year after year the Company persists in forecasting peak load growth
 5 well in excess of one percent per year, as shown in Figure JFW-A.

6 The forecasts for all of the Plans from 2009 through 2018 have anticipated 10% to 15%
 7 growth over the first six years of each plan, as shown in Figure JFW-B, while actual peak
 8 load growth over the past decade has been nil. The inaccuracy of the Company’s peak
 9 load forecasting has resulted in repeatedly over-stating future capacity needs (TRRs) by
 10 thousands of MW.



1 **Q 9: Please comment on the Company’s forecast of data center peak loads.**

2 A: The Company adjusts its econometric DOM Zone peak load forecasts upward based on
 3 separate forecasts of data center peak loads. In the past the Company commissioned
 4 studies by Quanta Technology to form the basis for these forecasts. However, the last
 5 Quanta Technology study and forecast was prepared in 2015. The Company did not rely
 6 on that study nor did it commission a new study. At this time the Company has no
 7 research or analysis to support its forecast of data center loads,² and apparently is not in
 8 possession of firm evidence of new data center loads in 2019 or later years.³

9 Instead, the Company’s new data center forecast results from fitting an S-shaped curve to
 10 the historical data. As I will discuss in detail, this is a highly unreliable and arbitrary
 11 approach that can be applied to produce just about any desired forecast.

1 At the same time, the Company provides data suggesting that the loads at existing data
2 centers are shrinking about ten percent per year due to efficiency improvements. Thus,
3 even if new data center capacity is added at a rate of ten percent per year, the total data
4 center load could remain flat due to efficiency improvements.

5 I conclude that the Company's data center forecast is not supported by firm evidence or
6 market studies and is highly speculative; while there likely will be additional new data
7 centers, it is also likely that the loads of existing data centers will continue to shrink. In
8 addition, the Company has apparently not incorporated its separate data center forecast
9 into its overall forecast correctly, taking into account the embedded amount. The
10 Commission should focus on the peak load forecast for all other customers, and consider
11 the future changes in data center load highly uncertain.

12 **Q 10: Please summarize your comparison of the Company's forecasting to PJM's.**

13 A: PJM produces a superior (if still too high) forecast for the Dominion Zone based on a
14 superior methodology. PJM's forecast is lower by over 1,000 MW for 2021, and over
15 1,700 MW by 2024, as shown in Table 1 below.

16 **Q 11: The 2018 Plan acknowledges that the Company's DOM Zone forecast remains well**
17 **above PJM's, but claims that this reflects methodological differences that were**
18 **explained in Section 2.3 of the 2017 Plan. Please comment.**

19 A: I evaluated these claims in detail in my testimony last year in regard to the 2017 Plan.⁴ I
20 concluded that none of the Company's criticisms or proposed changes is warranted or
21 would improve PJM's forecast. In addition, some of the Company's "adjustments" were

⁴ Direct Testimony of James F. Wilson on Behalf of Environmental Respondents, filed August 11, 2017 in Case No. PUR-2017-00051, pp. 43-52.

1 calculated incorrectly. The Company provided no updated narrative discussing the
2 differences, and provided no updated or corrected workpapers for the alleged
3 differences.⁵ My conclusion that the Company's forecast is far too high, and PJM's
4 forecast is likely to be more accurate than the Company's, is unchanged by these
5 incorrect claims.

6 **Q 12: Has the Company evaluated and implemented any enhancements to its load**
7 **forecasting methodology, in light of the poor recent performance?**

8 A: No; and this should perhaps be of greatest concern to the Commission. The Company
9 states that over the past twenty years it has made no changes to its methodology, only to
10 the data used.⁶ The Company does not systematically conduct accuracy analyses and
11 could not provide any documents pertaining to the accuracy of its forecasts. In particular,
12 the Company has not even evaluated using a shorter historical period than the thirty years
13 it has been using, a change that would allow the recent trends to have more influence on
14 the forecasts.⁷ Nor does the Company perform any sensitivity analysis around its
15 forecasting.⁸ The Company is apparently unconcerned about the chronic inaccuracy, and
16 lacking in curiosity about why its forecasts are inaccurate and how they could be
17 improved.

18 In contrast to the Company's inaction, PJM staff are continually evaluating and designing
19 potential enhancements to their load forecasting methodology. They apply their
20 methodology to forecast over twenty zones, and frequently evaluate the performance of

⁵ Responses to Data Requests ER 6-6 and ER 1-30.

⁶ Response to Data Request ER 1-7.

⁷ Response to Data Request ER 1-12.

⁸ Response to Data Request ER 1-27.

1 their forecasts. In these efforts, PJM staff benefit from suggestions and reactions from
2 approximately fifty load forecasters and other experts participating in the PJM Load
3 Analysis Subcommittee, who represent the diverse regions of the PJM footprint.

4 **Q 13: Please summarize your evaluation and conclusion regarding the Company's**
5 **forecast of the peak loads for the DOM LSE.**

6 A: While the Company has overstated DOM Zone peak loads, the Company has also
7 overstated the likely DOM LSE portion of current and future DOM Zone peak loads, as a
8 result of using a simple historical average to determine the DOM LSE portion. This is
9 inaccurate because peak loads are growing faster elsewhere in the DOM Zone. In
10 particular, the Company's approach fails to recognize that the one major source of peak
11 load growth – data centers – is largely occurring in areas served by other DOM Zone
12 LSEs (notably, Northern Virginia Electric Cooperative, or NOVEC), a fact that is
13 difficult to discern from the 2018 Plan and the Company's responses to data requests. I
14 have used a conservative approach to estimating the DOM LSE portion of the zonal
15 peaks, based on the Company's data and approach, but recognizing the faster growth of
16 other LSEs in the DOM Zone.

17 **Q 14: Please summarize your conclusions with respect to the Company's reserve margin**
18 **and TRR calculations.**

19 A: The Company attempts to follow PJM's approach for its reserve margin and total
20 resource requirement calculations, but the Company's approach is different, and some of
21 the values used were not accurate. However, the results (as a percentage of peak load)
22 are similar, so I used the Company's effective reserve margin for my TRR calculations
23 for all years.

1 **Q 15: Please present your revised peak load forecasts and TRR values.**

2 A: Table 1 presents the results. It reflects PJM's latest forecast for the DOM Zone, a revised
3 estimate of the DOM LSE peaks as a portion of DOM Zone peaks, and TRRs based on
4 the effective reserve margin applied to the revised DOM LSE peaks.

5 PJM's DOM Zone forecast is still too high, for the same reason the Company's is too
6 high – use of a long historical period results in a forecast that fails to recognize the well-
7 established recent trend of flat or declining loads. Thus, all of the values in Table 1 are
8 likely to be too high, with the PJM-based numbers likely to be high and the Company's
9 numbers far too high.

10 My conservative estimate of the DOM LSE adjusted peak load is 828 MW lower than the
11 Company's forecast by 2020, over 1,100 MW lower by 2022, and over 2,000 MW by
12 2026. My conservative estimates of the Company's TRRs are over 1,000 MW lower for
13 2021, and over 2,000 MW lower by 2025.

14 Table 1 also shows, for reference, the TRRs associated with the loads for all customers
15 other than the data centers. Note that the capacity need to meet these loads is roughly the
16 same in 2025 as for 2019, under the revised forecast based on PJM.

| Table 1: Peak Load Forecast and Total Resource Requirements (MW) | | | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
| <i>DOM Zone Peak Load Forecast</i> | | | | | | | | |
| 2018 Plan | 20,282 | 20,568 | 20,867 | 21,161 | 21,477 | 22,010 | 22,381 | 22,757 |
| Based on PJM [1] | 19,695 | 19,703 | 19,816 | 20,010 | 20,113 | 20,247 | 20,404 | 20,546 |
| <i>Difference</i> | -587 | -865 | -1,051 | -1,151 | -1,364 | -1,763 | -1,977 | -2,211 |
| <i>DOM LSE Adjusted Peak Load Forecast</i> | | | | | | | | |
| 2018 Plan | 17,674 | 17,766 | 18,026 | 18,284 | 18,559 | 19,025 | 19,351 | 19,682 |
| Revised [2] | 17,103 | 16,938 | 17,024 | 17,181 | 17,256 | 17,353 | 17,477 | 17,587 |
| <i>Difference</i> | -571 | -828 | -1,002 | -1,103 | -1,303 | -1,672 | -1,874 | -2,095 |
| <i>DOM LSE Total Resource Requirement</i> | | | | | | | | |
| 2018 Plan | 19,773 | 19,869 | 20,144 | 20,431 | 20,738 | 21,259 | 21,624 | 21,993 |
| Revised [2] | 19,134 | 18,944 | 19,024 | 19,198 | 19,281 | 19,390 | 19,529 | 19,652 |
| <i>Difference</i> | -639 | -925 | -1,120 | -1,233 | -1,457 | -1,869 | -2,095 | -2,341 |
| <i>DOM LSE Total Resource Requirement, for All Loads Other Than Data Centers</i> | | | | | | | | |
| 2018 Plan | 18,702 | 18,654 | 18,781 | 18,919 | 19,083 | 19,469 | 19,712 | 19,974 |
| Revised [2] | 17,945 | 17,650 | 17,606 | 17,694 | 17,749 | 17,859 | 17,999 | 18,124 |
| <i>Difference</i> | -757 | -1,004 | -1,175 | -1,226 | -1,334 | -1,610 | -1,713 | -1,850 |
| [1] Based on PJM July 2018 forecast update. | | | | | | | | |
| [2] Based on PJM July 2018 forecast and revised DOM LSE percentages. | | | | | | | | |

1
2

3 **Q 16: Do you have recommendations with regard to peak load forecasting and TRR**
4 **calculations for the purposes of future Integrated Resource Plans?**

5 A: Yes I do. I recommend that the Commission consider requiring the following of the
6 Company, for future plans:

7 1. To present recent weather-normalized peak loads for the DOM Zone and/or DOM
8 LSE (either prepared by the Company, or by PJM), and to discuss recent trends in
9 weather-normalized peak loads.

- 1 2. To commission a forecast of data center loads by an outside firm (as the Company did
2 in 2013 and 2015, resulting in the reports and forecasts prepared by Quanta
3 Technology).
- 4 3. To fully separate the forecasting of data center peak loads from the forecasting of all
5 other customer peak loads, and to present the history and forecast of data center and
6 other loads separately.
- 7 4. To evaluate and report the estimated embedded amount of data center load reflected
8 in the econometric forecasting, and to deduct this embedded amount from the
9 exogenous data center forecast.
- 10 5. To provide an explicit forecast of the peak loads of the DOM LSE as a portion of the
11 DOM Zone peak loads, taking into account data centers and any other sectors whose
12 growth differs substantially for DOM LSE and other DOM Zone LSEs, with a
13 discussion of recent trends in DOM LSE and Other LSE peak loads.
- 14 6. To present alternative load forecasts determined using 20- and 10-year historical
15 estimation periods, in addition to the longer period currently used, and to provide a
16 discussion of the differences and of the rationale for the choice of historical period.
- 17 7. To retain an outside consultant to perform a comprehensive review of the load
18 forecasting methodology and make recommendations for improving its accuracy.
- 19 8. To determine the TRRs using PJM's approach to these calculations (using the PJM
20 Forecast Pool Requirement and an estimate of the DOM LSE fleet-wide forced
21 outage rate) for all years.

1 **Q 17: How is the remainder of your testimony organized?**

2 A: Section III reviews recent trends in peak loads in the DOM Zone, and presents the
3 Company's and PJM's forecasts. Section IV discusses the data center forecasts and
4 forecast adjustments. Section V addresses the forecast for DOM LSE as a portion of the
5 DOM Zone forecast, and Section VI discusses the reserve margin and TRR calculations.
6 Finally, Section VII provides conclusions and recommendations.

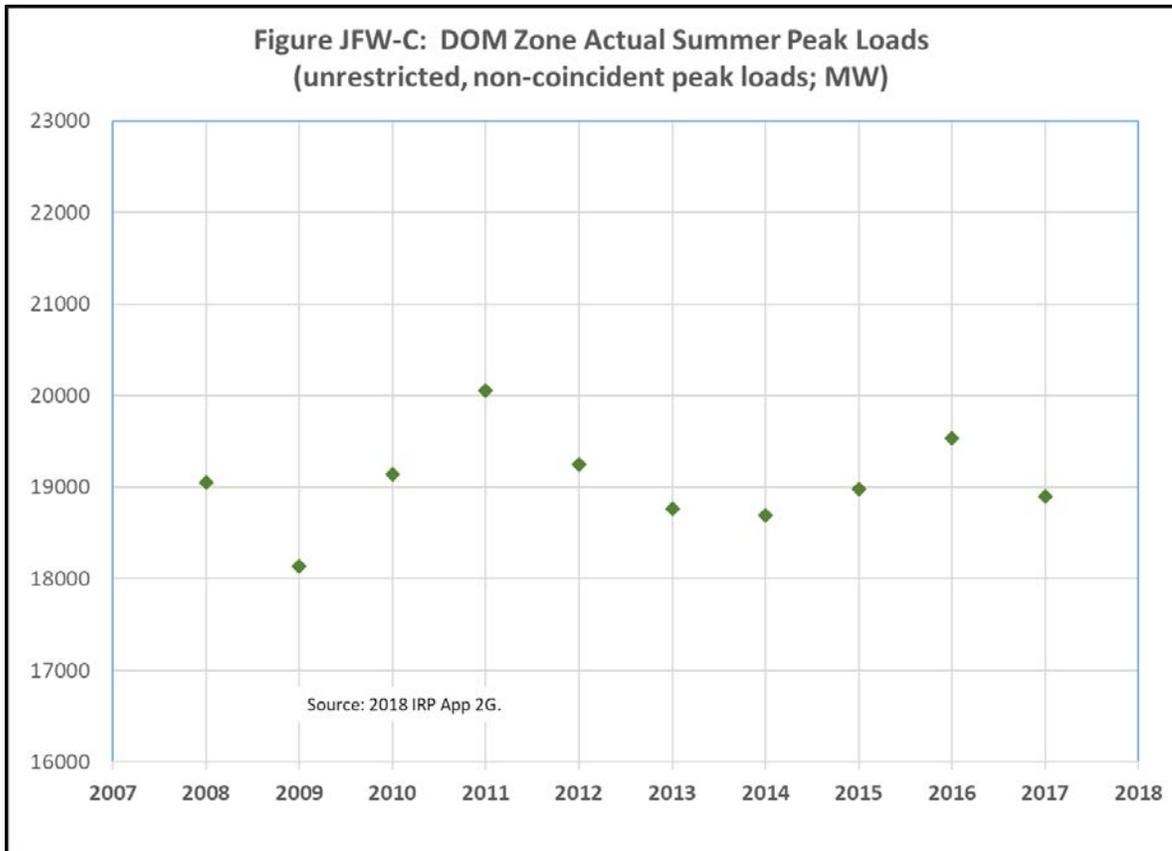
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9 **III. DOMINION ZONE PEAK LOAD TRENDS AND FORECASTS**

10 **Q 18: Please present the recent peak loads in the Dominion transmission zone.**

11 A: Figure JFW-C presents the actual DOM Zone annual peak loads since 2007. These are
12 the "unrestricted" peak loads, where any demand response or demand-side management
13 by PJM or the Company that may have occurred during the peak hour has been added
14 back.

15 **Q 19: Please discuss any trend exhibited by these peak load values.**

16 A: These actual peak loads do not suggest any clear trend over the past decade – for
17 instance, the values for 2015 and 2017 are very similar to the values for 2008 and 2010.
18 These actual peak loads reflect the actual weather that occurred each year, so they will
19 tend to be high in years in which a very extreme period of hot or cold weather occurred,
20 and they will tend to be low in years with only milder weather. Because actual peak
21 loads reflect changeable weather, their pattern over relatively short periods of time may
22 not reflect any trend, or may even be misleading, suggesting a trend that does not in fact
23 exist.



1 **Q 20: Is there a way to reveal the trends in past peak loads?**

2 A: Yes. To discern the underlying trends in past energy loads, energy forecasters remove
 3 the weather impact by calculating “weather-normalized” historical values. For example,
 4 weather-normalized historical summer peak loads are estimates of what the summer peak
 5 loads would have been in past years had the weather, at the time of the summer peak
 6 load, been the typical (very hot) weather that tends to occur at the time of the summer
 7 peak load. This removes the year-to-year variability due to weather in the historical peak
 8 loads. With the year-to-year weather variability removed, the underlying, more stable
 9 trends in peak loads (due to forces such as economic and demographic growth, and
 10 changing electrical equipment stocks) are revealed.

11

1 **Q 21: How do weather-normalized historical peak loads relate to forecast peak loads?**

2 A: Weather-normalized historical peaks and forecast peaks essentially represent the same
3 values. A forecast peak load is generally intended to be a median (or “50-50”) peak; that
4 is, the peak load level that has an equal chance of being exceeded, or not being exceeded,
5 in the future year, depending upon weather and other uncertainties. The weather-
6 normalized historical peak is generally the same concept – it is the peak load level in the
7 historical year that had a 50-50 chance of being exceeded due to weather variability.

8 Put another way, the weather-normalized historical peak load is exactly the peak load that
9 past and current peak load forecasting efforts attempt to determine. And, accordingly, we
10 would expect that a peak load forecast would generally be consistent with the trend
11 reflected in past weather-normalized peaks.

12 **Q 22: Is it a standard industry practice to calculate weather-normalized values?**

13 A: Yes. Energy forecasters consider historical weather-normalized loads extremely useful in
14 understanding past trends and likely future trends, and it is a standard practice to prepare
15 estimates of past energy loads on a weather-normalized basis. For example, the
16 Company’s witness Mr. Eric Fox of Itron testified in 2017 that weather-normalization
17 can be a useful tool in the forecasting process, and that his company always normalizes
18 electric and sales data, to evaluate historical trends.⁹

19 **Q 23: How are weather-normalized peak loads calculated?**

20 A: The approach usually entails modeling past energy demands, replacing the actual weather
21 that occurred (which may have been unusually extreme, or unusually mild) with a

⁹ Transcript of hearings in Case No. PUR-2017-00051, pp. 479-481.

1 “normal” weather pattern (including the usual magnitude and frequency of extreme
2 weather), which may be an actual historical pattern or a synthetic one. There are many
3 variations that can be used, and the various approaches will generally give similar results.
4 A 2014 report by Itron, Inc. summarized weather normalization practices based on a
5 survey to which energy forecasters from 135 companies across North America
6 responded.¹⁰

7 **Q 24: Does the Company prepare weather-normalized historical peak loads?**

8 A: No. The Company provided weather-normalized energy sales, but states that “as a
9 general practice, the Company does not weather normalize peak loads.”¹¹

10 **Q 25: Are weather-normalized peak loads available for the DOM Zone?**

11 A: Yes. PJM prepares weather-normalized historical peak loads for all of its zones.¹² PJM
12 evaluates and revises its weather-normalization methodology from time to time, most
13 recently in 2015.¹³ This year PJM is considering further changes to its approach.¹⁴

14 **Q 26: Please present and discuss the recent trends in weather-normalized peak loads for
15 the DOM Zone.**

16 A: Figure JFW-D presents PJM’s weather-normalized historical peaks for the DOM Zone.
17 The weather-normalized peak loads have been quite flat over the past decade. Even in

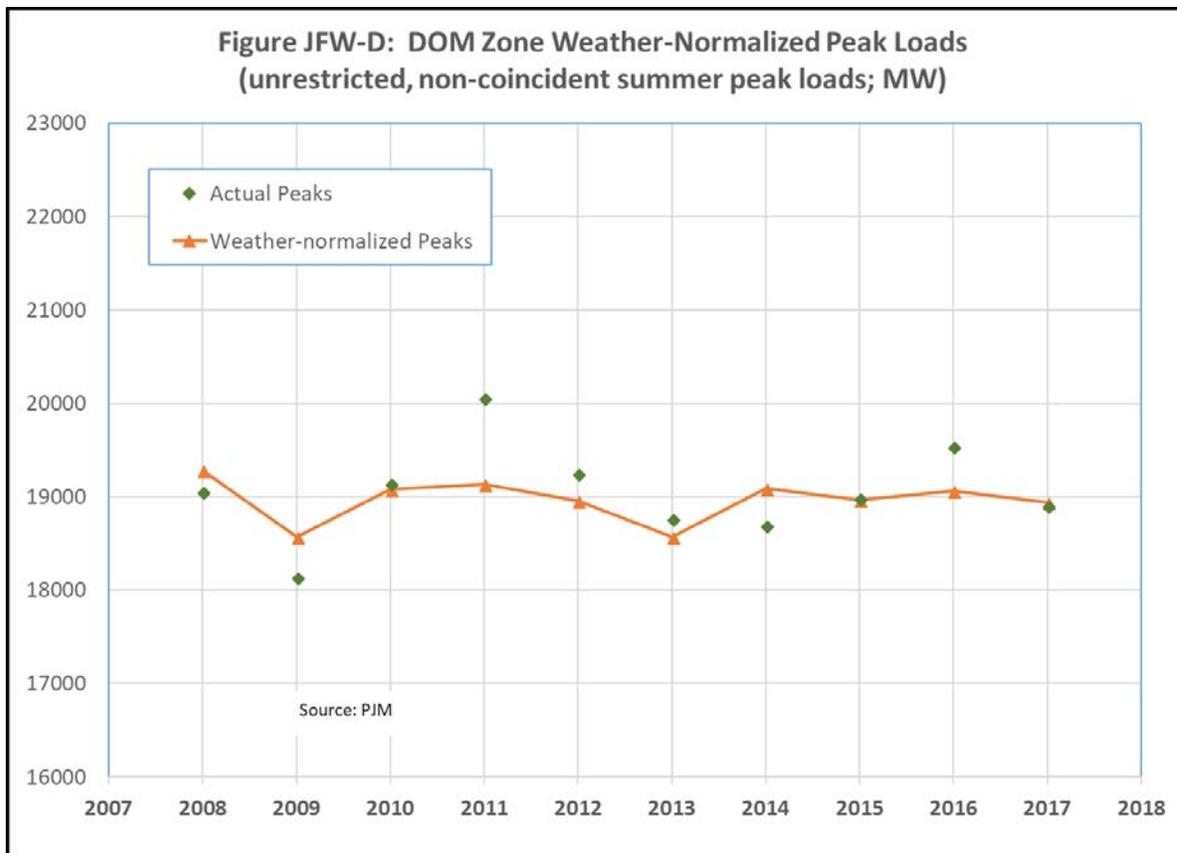
¹⁰ Itron, Inc., *2013 Weather Normalization Survey*, March 2014, available at http://capabilities.itron.com/efg/Reports/Itron_WeatherNormalizationReport2013.pdf.

¹¹ Response to Data Request ER 1-14.

¹² PJM, *Weather Normalized Peaks*, supplemental materials to the 2018 Load Forecast Report, available at <http://www.pjm.com/-/media/planning/res-adeq/load-forecast/weather-normalized-peaks.ashx?la=en>.

¹³ PJM, *Weather Normalization of Peak Load*, Load Analysis Subcommittee meeting September 2, 2015, Item 3, available at <http://www.pjm.com/-/media/committees-groups/subcommittees/las/20150902/20150902-item-03-weather-normalization.ashx>.

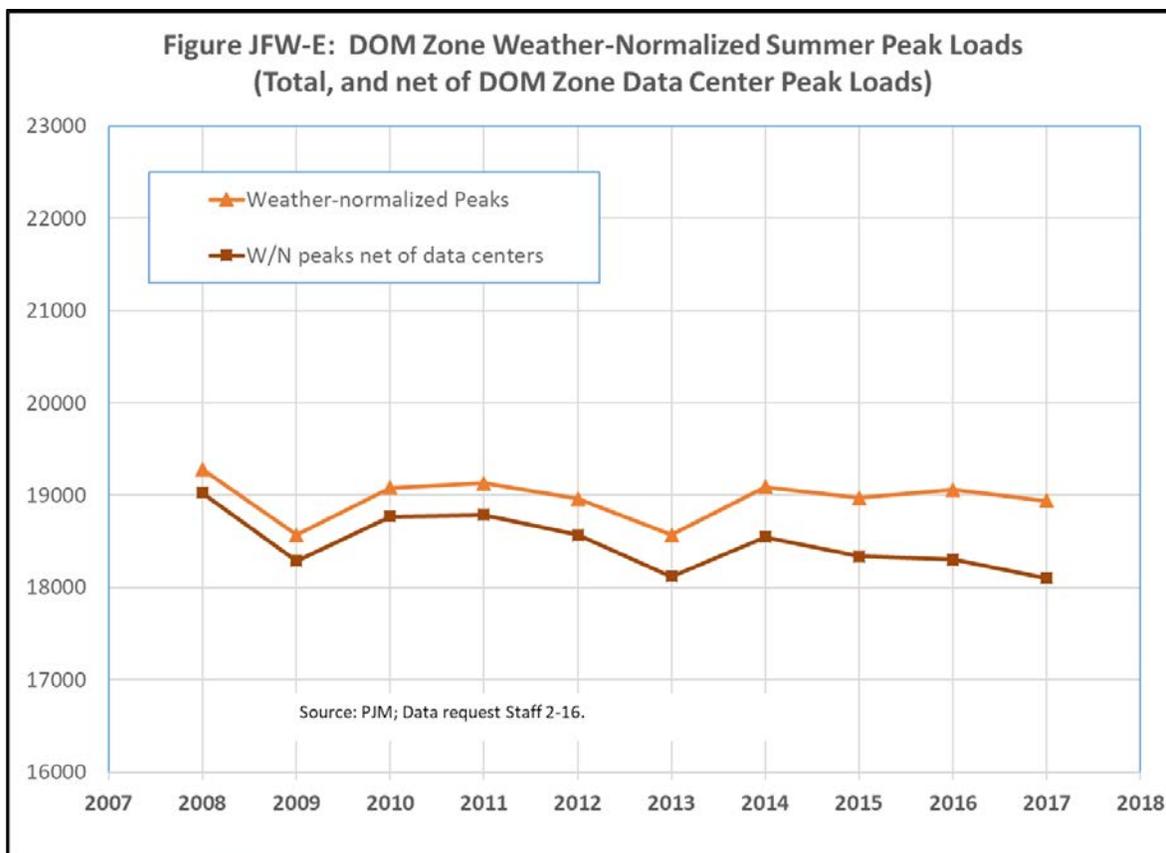
¹⁴ See, for instance, PJM, *Weather Normalization*, Load Analysis Subcommittee meeting July 18, 2018 Item 6, available at <http://www.pjm.com/-/media/committees-groups/subcommittees/las/20180718/20180718-item-06-weather-normalization.ashx>.



1 the post-recession period (from about 2010 to the present), peak loads have been flat; the
 2 2017 and 2010 values are also very close.

3 **Q 27: The 2018 Plan notes recent and anticipated growth in data center loads (pp. 17, 22).
 4 Why hasn't this growth resulted in an upward trend in peak loads in the DOM
 5 Zone?**

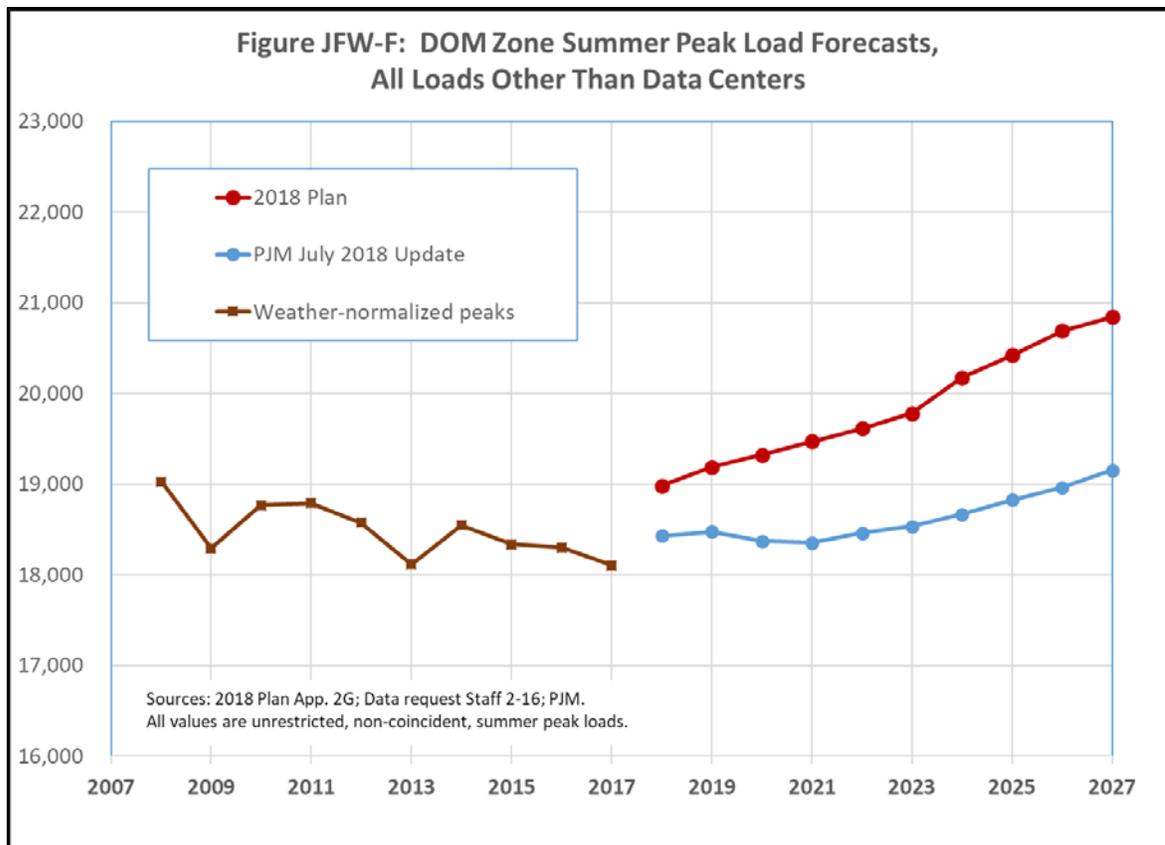
6 A: There has been strong growth in demand by data centers. However, this has only offset a
 7 declining trend in the peak loads of all other customers. Figure JFW-E shows the
 8 weather-normalized peak loads for all DOM Zone loads other than the data center peak
 9 loads. The trend in the Company's peak load for all customers other than the data centers
 10 is actually down over the past decade: the weather-normalized peaks for 2015 through
 11 2017 are lower than for 2010 through 2012.



1 **Q 28: Now please present the Company’s peak load forecast for the DOM Zone, focusing**
 2 **first on the forecast for all customers other than the data centers.**

3 A: Figure JFW-F presents the Company’s forecast that was relied upon for the 2018 Plan
 4 (Appendix 2G), showing the forecast for all loads other than the data center loads. The
 5 summer peak loads are shown; while annual actual peaks have occurred in winter, this is
 6 rare, and the Company continues to consider the zone summer-peaking on a forecast
 7 basis.¹⁵ As in its prior forecasts, the Company’s current forecast suggests robust growth
 8 in peak loads, starting right in 2018, even for the loads other than data centers that have
 9 been declining over the past decade.

¹⁵ 2018 Plan p. 18.



1 **Q 29: Please compare the Company’s forecast to PJM’s.**

2 A: Figure JFW-F also shows the latest PJM DOM Zone forecast, based on its July 2018
 3 forecast update, for all loads other than data centers.¹⁶ The mid-year update is based on
 4 economic and demographic projections from May 2018, and various other updates since
 5 the January 2018 forecast release. For its mid-year update, PJM publishes coincident
 6 peak forecasts for 2018 through 2021; so the updated non-coincident peak forecast shown
 7 here is estimated based on the ratios of non-coincident to coincident peaks from the 2018
 8 Load Forecast Report, which are very stable over time.

9 PJM’s forecast is considerably lower than the Company’s. PJM’s forecast is over 1,000
 10 MW lower than the Company’s for 2021, growing to more than a 2,200 MW difference
 11 by 2026.

1 **Q 30: Please comment on the consistency of these forecasts with recent trends.**

2 A: As Figure JFW-F clearly suggests, the Company's forecast breaks sharply with recent
3 trends. While peak loads for loads other than data centers have been declining, the
4 Company forecasts strong growth. PJM's forecasts are somewhat more consistent with
5 recent trends, but still anticipate peak load growth in the near term faster than recent
6 trends suggest.

7 **Q 31: Please describe the Company's approach to forecasting peak loads.**

8 A: The Company uses an econometric regression model that takes some inputs from a
9 separate model of sales by customer class. The regression model forecasts peak loads
10 based on various economic and demographic independent variables (shown in Figure
11 2.2.6 and Appendix 2K; forecasts from October 2017). The methodology is described in
12 the 2018 Plan at pp. 15-22 and in a separate forecast methodology document.¹⁷

13 **Q 32: What are the primary drivers of peak load growth under the Company's forecasting**
14 **methodology?**

15 A: The Company's econometric approach relies upon various economic and demographic
16 forecasts as independent variables that drive future peak load growth. These are
17 summarized in Figure 2.2.6 in the 2018 Plan, and include trends in the number of
18 customers and households, per capita income, and employment. However, the Company
19 states (2018 Plan p. 21), that the forecast of the Virginia economy is a "key driver" of the
20 forecast.

¹⁷ Dominion Energy Electric Load Forecast Models Documentation, May 2018, response to Data Request ER 1-4(a) (KS).

1 **Q 33: The 2018 Plan states (p. 21) that the Virginia economy is expected to “rebound**
2 **further” within the Planning Period. Do anticipated economic and demographic**
3 **trends support the Company’s forecast of a sharp change to robust growth in peak**
4 **load?**

5 A: No; the trends in these independent variables have been rather steady recently, and they
6 are expected to continue to show moderate but steady increases over the forecast period,
7 as shown in Figure 2.2.6 in the 2018 Plan. These forecasts do not explain the sharp
8 deviation from trend reflected in the Company’s peak load forecast.

9 **Q 34: Is there a way to compare the economic and demographic trends and forecasts to**
10 **the peak load trends and forecast?**

11 A: Yes. A sound approach is to compute a “composite index” that combines the various
12 economic and demographic measures into a single index. Then the history and
13 projections of the index can be compared to the peak load history and projections.

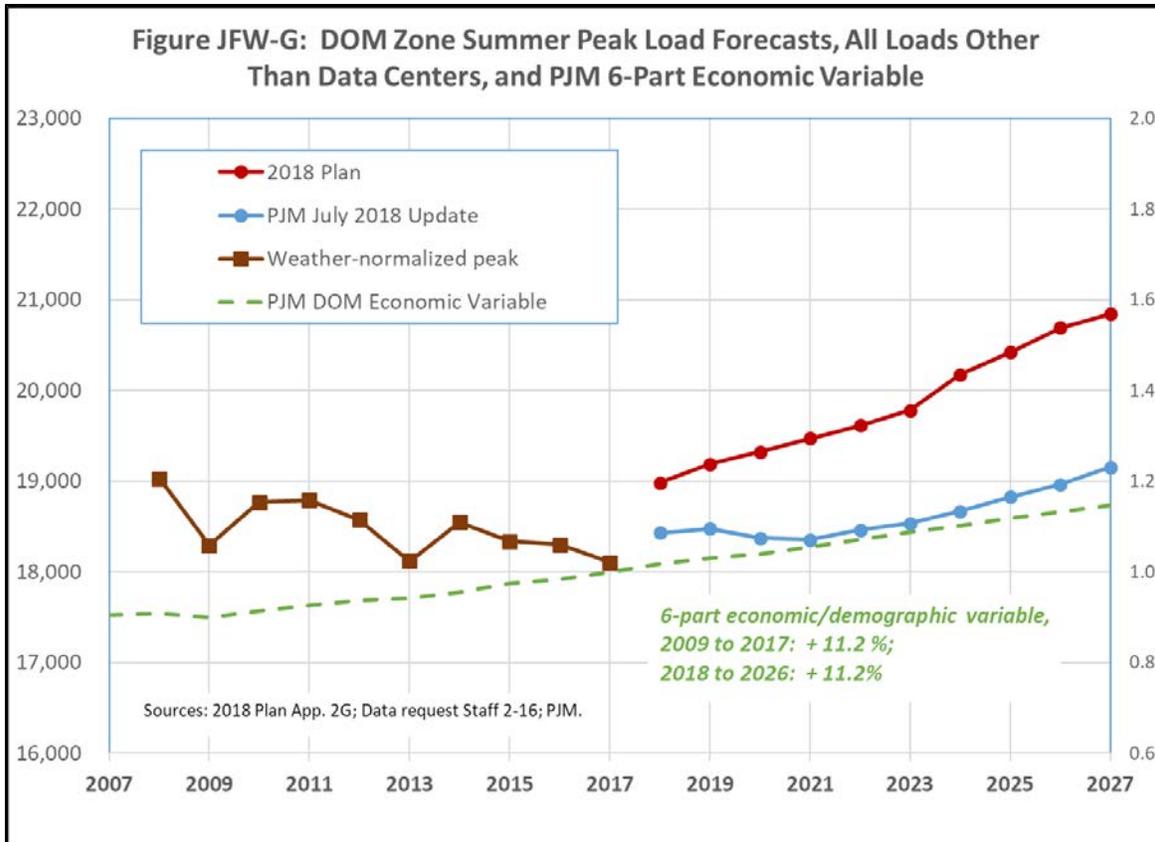
14 The Company has not prepared such an index.¹⁸ However, PJM prepares and published
15 such indices together with its forecasts.¹⁹

16 Figure JFW-G shows the composite index for the DOM Zone economic and demographic
17 variables used by PJM in its January 2018 forecast for the DOM Zone. This index
18 combines five DOM Zone-specific economic-demographic variables (households,
19 population, personal income, non-manufacturing employment, and state or metropolitan
20 product) and U.S. GDP.²⁰ These are the same or similar economic-demographic

¹⁸ Response to Data Request ER 1-26.

¹⁹ PJM, *2018 Economic Variable Data*, available at <http://www.pjm.com/-/media/planning/res-adeq/load-forecast/2018-economic-variable-data.ashx?la=en>.

²⁰ PJM, *PJM Manual 19: Load Forecasting and Analysis*, Revision: 31 Effective Date: 06/01/2016, p. 18, available at <http://www.pjm.com/~media/documents/manuals/m19.ashx>.



1 variables used by the Company in its forecasting, and sourced from the same vendor
 2 (Moody’s economy.com).

3 **Q 35: Please discuss how the composite economic-demographic index compares to the**
 4 **peak load forecasts.**

5 A: Figure JFW-G shows that while DOM Zone peak loads for these customers were
 6 declining over the past decade, the economic-demographic index continued to climb.
 7 The figure further shows that while the economic-demographic variable is expected to
 8 continue to rise in future years, it generally continues the past trend.

9 In particular, the six-part economic and demographic variable increased by 11.2 percent
 10 over the eight-year period from 2009 to 2017, and is expected to increase by that same
 11 percentage, 11.2, over the eight-year period from 2018 to 2026. Thus, these economic

1 and demographic trends provide no reason to expect future peak loads to break from past
2 trends.

3 **Q 36: How can peak loads remain flat or decline while the economic and demographic**
4 **drivers are increasing, as has occurred over the past decade?**

5 A: Peak loads can be flat or declining while economic and demographic measures rise due to
6 the increased penetration of more energy-efficient appliances; people and businesses are
7 doing more with electricity, while using less electricity.

8 **Q 37: If the economic and demographic forecasts do not point to robust growth in peak**
9 **loads, why does the Company's peak load forecast rise so sharply?**

10 A: The primary reason the Company's forecasts suggest robust peak load growth is that the
11 Company's forecasting methodology bases the forecast trends on thirty years of historical
12 data.²¹ This prevents capturing and reflecting recent trends in peak load growth, even if
13 such trends extend for a decade, as the current trend now has.

14 Many years ago, the DOM Zone, and other regions of the country, did indeed experience
15 much faster peak load growth. However, more recently, there has been a trend of
16 slowing peak load growth, both in absolute terms, and in relation to economic and
17 demographic growth. Including the long-ago history in the Company's forecasting leads
18 the model to discount the more current trends from the past decade, and place undue
19 weight on the higher rates of peak load growth seen ten to thirty years ago.

20 **Q 38: Please describe PJM's approach to forecasting peak loads for the DOM Zone and**
21 **compare it to the Company's approach.**

22 A: PJM also uses an econometric approach based on similar economic and demographic
23 forecasts. While there are numerous differences between the Company's and PJM's

²¹ Response to Data Requests ER 1-6, ER 1-11.

1 econometric models (of which some are described in the 2017 Plan at pp. 25-29), three
2 are likely the most important factors leading to the different results:

- 3 1. PJM uses a 19-year historical period for estimating the model, while the Company
4 uses 30 years. As a result, PJM's forecast will reflect recent trends to a somewhat
5 greater extent.
- 6 2. PJM's methodology has recently been enhanced to better capture trends and
7 projections regarding appliance saturation and energy efficiency.
- 8 3. PJM commissions a separate forecast of distributed solar generation and combines it
9 into its forecast (as Table B-8 of its load forecast reports).

10 **Q 39: The 2018 Plan asserts that the differences between PJM's and the Company's**
11 **forecasts are due to methodological differences that were explained in the 2017 Plan,**
12 **and that these differences still exist. First, please summarize your response to that**
13 **discussion from the 2017 Plan.**

14 A: The discussion at pp. 25-29 of the 2017 Plan identified changes to PJM's forecast that
15 purportedly close the gap between the Company's and PJM's forecasts. I reviewed the
16 claims in my testimony last year (cited above), and summarized my review as follows:

- 17 1. The adjustments for data centers and DERs were not warranted and would not be an
18 improvement to PJM's methodology, even if correctly applied (which they were not;
19 both of the Company's adjustments reflected errors).
- 20 2. While there is always potential for improvements to the forecasting of appliance
21 saturation and efficiency, the Company's "adjustment" apparently removed this
22 important enhancement to PJM's approach. This too would not be an improvement.
- 23 3. Separately forecasting the Public Authority sector could potentially improve a load
24 forecast; however, the Company provided no explanation of why it would, and its

1 forecast adjustment embedded a huge increase in government loads at a time when
2 the current administration has announced intentions to reduce government.

3 In my testimony last year, I concluded that none of the proposed adjustments was
4 warranted or would improve PJM's forecast. My conclusion that PJM's forecast was
5 likely to be more accurate than the Company's was unchanged by that analysis.

6 **Q 40: Did the Company update its comparison to the PJM forecast, using the forecast**
7 **presented in the 2018 Plan and the PJM 2018 forecast?**

8 A: No. The Company provided no updated narrative discussing the differences, and
9 provided no updated workpapers for the alleged differences.²² My conclusion remains
10 that PJM's forecast is likely to be more accurate than the Company's.

11 **Q 41: Does PJM continue to review its methodology and explore additional possible**
12 **enhancements?**

13 A: Yes. For example, this year PJM staff are exploring using separate models of weather-
14 sensitive and non-weather-sensitive peak loads to improve the forecast accuracy.²³

15 **Q 42: Does the Company also evaluate and enhance its load forecasting methodology over**
16 **time?**

17 A: Apparently not. In response to a data request asking about enhancements to the
18 methodology over the past twenty years, the Company noted no changes to its
19 methodology, only to data (a 2016 update to appliance saturation and intensity data).²⁴

20 The Company also states that it "does not systematically conduct accuracy analyses or
21 studies of its previous Integrated Resource Plan load forecasts" and could provide no

²² Responses to Data Requests ER 6-6 and ER 1-30.

²³ See, for instance, PJM, *Load Forecast Model Development*, Load Analysis Subcommittee meeting July 18, 2018 Item 4, available at <http://www.pjm.com/-/media/committees-groups/subcommittees/las/20180718/20180718-item-04-load-forecast-model-development.ashx>.

²⁴ Response to Data Request ER 1-7.

1 documents pertaining to the accuracy of its forecasts.²⁵ In particular, the Company states
2 that it has not evaluated using a historical period shorter than the 30 years it has been
3 using, but could provide no explanation for why it had not explored alternative historical
4 periods other than to maintain “consistency.”²⁶

5 **Q 43: The 2018 Plan suggests (p. 22) that PJM has substantially increased its DOM Zone**
6 **peak load forecast since its prior, 2017 forecast. Is this correct?**

7 A: No. PJM’s 2018 forecast is lower than PJM’s 2017 forecast for years 2018 through 2021,
8 and about one percent higher through 2024. PJM’s mid-year update is about one percent
9 lower than its January 2018 forecast. The 2018 Plan cited figures for fifteen years out.

10 **Q 44: You mentioned the strong growth in data center demand. Please present the**
11 **forecasts, including the forecasted data center growth.**

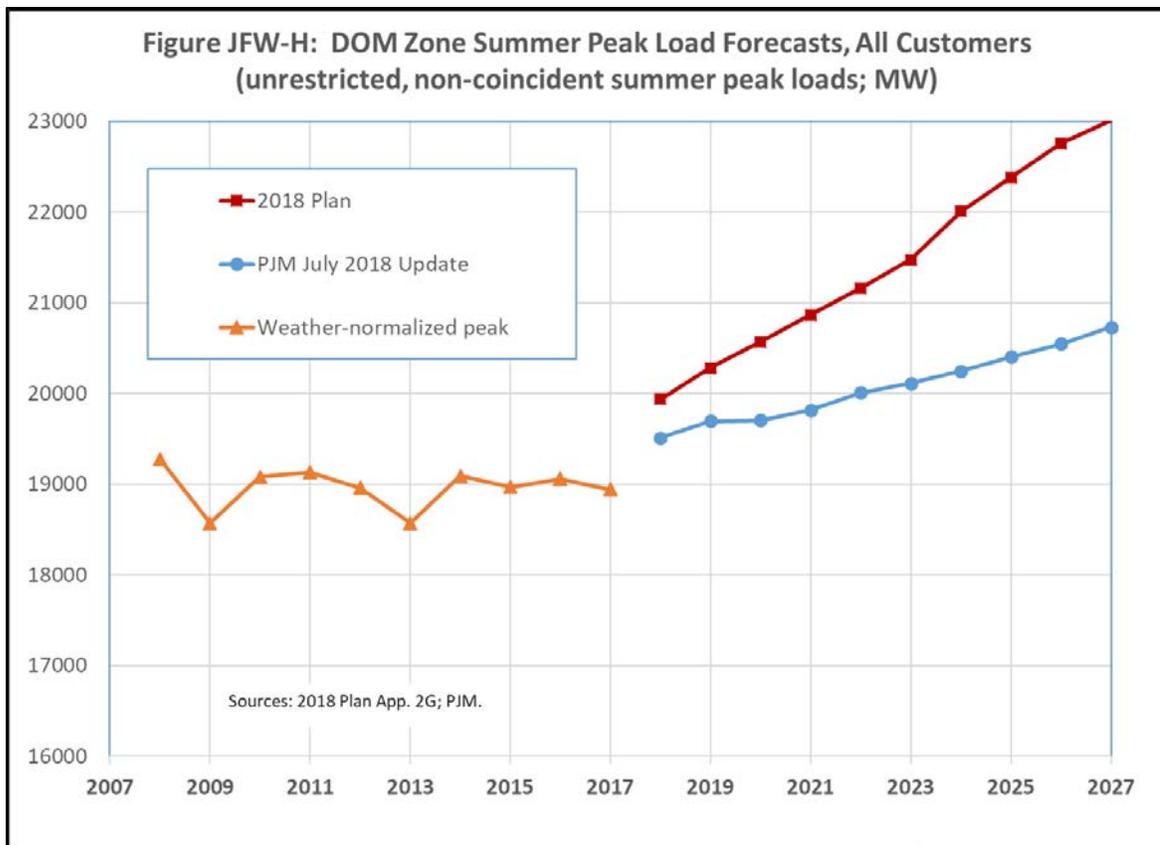
12 A: Figure JFW-H shows the weather-normalized history and the forecasts, now including the
13 projections for data centers. Figure JFW-H shows that the Company’s data center
14 forecasts (which are highly speculative, and discussed in detail in the next section of this
15 testimony) do not explain the sharp break in the Company’s forecast from past trends.

16 **Q 45: You noted that the economic and demographic trend is expected to be about the**
17 **same over the coming eight years as over the past eight years. How will peak loads**
18 **change over time, if the recent trends simply continue?**

19 A: This is shown in Figure JFW-I. For this figure I simply add linear trend lines based on
20 the ten years of actual summer peaks from 2008 to 2017 (green dashed line) and based on
21 the weather-normalized summer peaks over the same period (orange dashed line). These
22 projections show that if current trends continue, peak loads will remain flat.

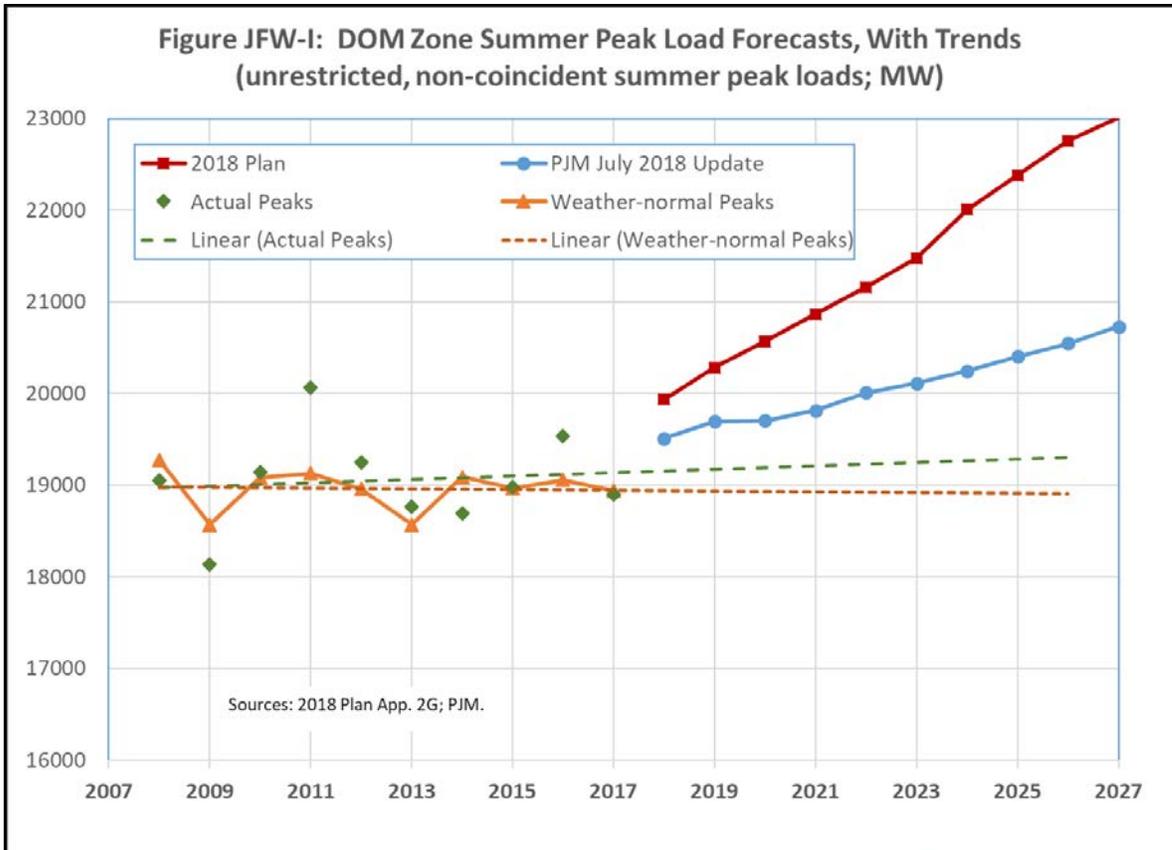
²⁵ Response to Data Request ER 1-9.

²⁶ Response to Data Request ER 1-12.



1 **Q 46: Please summarize your conclusions from this section of your testimony.**

2 A: The Company continues to forecast robust peak load growth for the DOM Zone, even for
 3 loads other than data centers, despite the decade-long trend of declining peak loads.
 4 PJM's forecast is lower but still suggests a rate of growth inconsistent with the recent
 5 trend. Both forecasts are very likely to be too high, but PJM's is more reasonable.



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IV. DATA CENTER LOAD FORECAST AND FORECAST ADJUSTMENT

Q 47: You mentioned that both the Company and PJM adjust their econometric peak load forecasts to take into account the anticipated growth in data center loads. Please explain the rationale for such adjustments.

A: The Company is concerned that its econometric forecasting approach will fail to accurately forecast the growth in data center loads, because the growth trend is fairly recent. Accordingly, the Company prepares a separate forecast of data center sales and

1 peak loads, and uses it to adjust their forecast. PJM also adjusts its forecasts, based on
2 data center forecasts provided to it by the Company.²⁷

3 **Q 48: How are such adjustments for data center load growth determined?**

4 A: The general approach is to 1) prepare a separate forecast of the data center peak loads, 2)
5 estimate how much future data center peak load growth is already projected by the
6 econometric forecasting (the “embedded” amount), and then 3) subtract the embedded
7 amount from the forecast amount, to determine the amount of future growth that is not
8 captured by the econometric model, and that should be added to the forecast.

9 **Q 49: How has the Company prepared its forecasts of data centers peak loads?**

10 A: For recent Plans through the 2017 Plan, the Company relied upon studies prepared in
11 2013 and again in 2015 by Quanta Technology,²⁸ in addition to internal forecasts.

12 The Quanta Technology reports provided forecasts of future data center peak loads along
13 with estimates of the amount of the load growth that is captured by the type of
14 econometric forecasting methods used by the Company. However, this year the
15 Company took a much simpler approach, using a simple S-shaped curve fitted to
16 historical data (“Bass Diffusion Model”) to project future data center loads based only on
17 historical trends.²⁹

²⁷ PJM’s general approach to such load forecast adjustments is documented in PJM, *PJM Manual 19: Load Forecasting and Analysis*, Revision: 32 Effective Date: December 1, 2017, Attachment B: Load Forecast Adjustment Guidelines, available at <http://www.pjm.com/~media/documents/manuals/m19.ashx>.

²⁸ Quanta Technology, *Dominion Northern Virginia Load Forecast Dominion Virginia Power*, Oct. 23, 2015 (“2015 Quanta Report”) and Quanta Technology, *Dominion Northern Virginia Load Forecast Dominion Virginia Power*, Oct. 17, 2013.

²⁹ Response to Data Request ER 6-3 “The data center load forecast is derived using a Bass Diffusion Model, which is a standard modeling approach for forecasting the adoption of new technologies.”; response to Data Request ER 1-36, referring to the response to Data Request Staff 2-16 attachment; and response to Data Request ER 1-4(a) (KS), *Dominion Energy Electric Load Forecast Models Documentation*, May 2018, pp. 6-9.

1 **Q 50: Before getting into the details of this new forecasting approach, what research, data**
2 **or analysis did the Company rely upon in preparing its data center forecast?**

3 A: Apparently, none. The Company has no research or analysis supporting its forecast of
4 data center loads.³⁰ The Company refers to a spreadsheet prepared by witness Eric Fox
5 of Itron in connection with his Rebuttal Testimony in the 2017 Plan proceeding (Case
6 No. PUR-2017-00051), which includes no data center data or analysis, only the Bass
7 Diffusion Model equation.³¹

8 **Q 51: Is the Company in possession of firm evidence of specific new data centers or data**
9 **center expansions in 2019 or later years?**

10 A: The Company is apparently not in possession of firm evidence of new data center loads.³²
11 The Company can only refer to “significant interest” by data centers, citing 58 “potential”
12 projects totaling a potential 3,883 MW, but noting that these are not “committed
13 projects.”³³ The Company states that it did not rely on this information to prepare its
14 forecast, due to “the speculative nature of the information.”³⁴

15 **Q 52: While the Company did not base its data center forecast on any firm evidence that**
16 **there will be further data center expansions, please explain how the Company**
17 **prepared its forecast.**

18 A: The Company simply fitted an S-shaped curve (“Bass Diffusion Model”) to the historical
19 data center loads, and used the extension of the S-shaped curve as its forecast. This
20 approach to projecting data center loads was first applied by Company witness Fox on
21 rebuttal last fall in connection with the 2017 Plan.

³⁰ Response to Data Requests ER 1-36a, ER 1-37g, ER 6-3.

³¹ Response to Data Request ER 6-5, referring to the response to ER 1-37; see also response to ER 1-36a.

³² Response to Data Request ER 6-12, referring to the response to ER 6-4 (referring to “potential” data center projects); see also response to Data Request ER 9-4.

³³ Response to Data Request ER 9-4.

³⁴ Response to Data Request ER 9-3.

1 **Q 53: Is using the Bass Diffusion Model curve a sound approach to projecting data center**
2 **loads?**

3 A: No, this is not a sound approach; it is highly arbitrary, and can be applied to produce just
4 about any desired forecast, as I will show. The Company has not provided any evidence
5 that this approach is used for forecasting, pointing only to Mr. Fox's testimony from last
6 year's proceeding.³⁵ Mr. Fox only testified that the Bass Diffusion Model is "a common
7 approach for fitting an S-shaped curve," but made no claim that the approach was used
8 for forecasting.³⁶

9 **Q 54: While you question the use of the Bass Diffusion Model curve for forecasting, has**
10 **the Company applied the approach to the historical data in an accurate manner?**

11 A: No. The S-shaped curve should be selected based on the best fit to the historical data, but
12 the curve the Company is using for its forecast is not the best-fitting curve. In addition,
13 the approach to selecting the curve reflects other totally arbitrary choices that have a
14 substantial impact on the resulting forecast.

15 **Q 55: How did the Company fit the Bass Diffusion Model curve to the historical data, to**
16 **produce its data center forecast?**

17 A: The Company does not know how the curve was fit or even what measure was used.³⁷
18 The Company used the curve parameters chosen by Mr. Fox, who did not document how
19 he chose them.³⁸ Furthermore, while the Company has updated the historical data, the
20 Company did not update the curve, but simply used the curve developed by Mr. Fox last
21 year, based on less historical data.³⁹

³⁵ Response to Data Requests ER 4A-1a and ER 9-2.

³⁶ Itron, *2017 Long-Term Electric Energy and Demand Forecast and Review*, September 6, 2017, p. 34.

³⁷ Response to Data Request ER 6-13 a, b.

³⁸ Response to Data Requests ER 4A-1a and ER 4A-1b, referring to the Fox 2017 testimony and to the response to Data Request Attachment Staff Set 2-16 (KS), which do not describe how the fit was performed.

³⁹ Response to Data Request 4A-5 (describing the updated data).

1 **Q 56: You stated that the S-shaped curve used by the Company is not the best-fitting**
2 **curve. Please elaborate.**

3 A: Two standard measures of good fit are Mean Absolute Percent Error (“MAPE”) and Root
4 Mean Squared Error (“RMSE”). According to either or both of these standard measures,
5 other, very different curves (resulting in very different forecasts) fit the historical data
6 better than the curve selected by Mr. Fox and used by the Company.

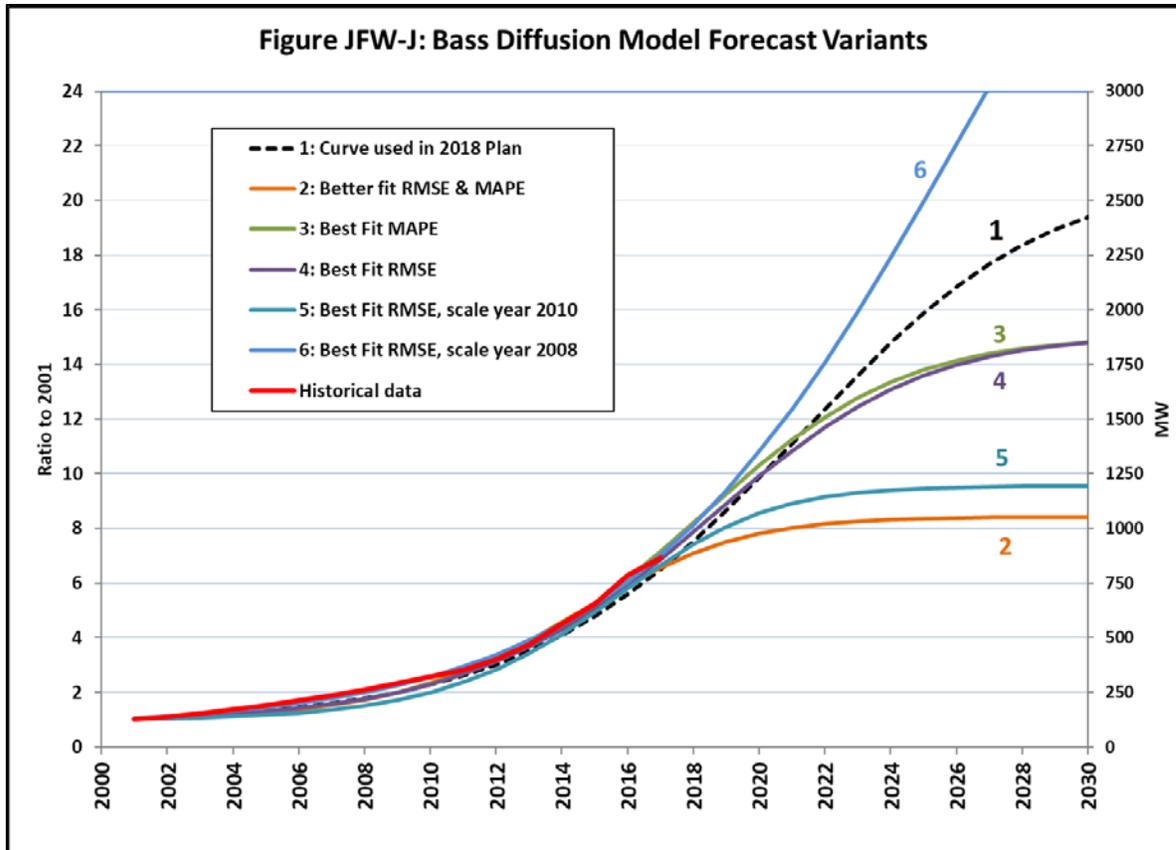
7 Figure JFW-J shows the curve used in the 2018 Plan (#1 in the graphic) and several
8 alternate curves. Curve #2 fits the data better according to both MAPE and RMSE, and
9 results in a forecast that tops out below 1,100 MW, far below the Company’s chosen
10 curve. Curves #3 and #4 are the best-fitting curves according to MAPE and RMSE,
11 respectively.

12 **Q 57: You stated that the S-shaped curve used by the Company reflects other arbitrary**
13 **choices. Please elaborate.**

14 A: Mr. Fox “scaled” the historical data before performing the fit, using 2009 as the year for
15 which the scaled data would equal 1.0. The Company does not know why Mr. Fox chose
16 2009, or whether using a different year would make any difference.⁴⁰ I tested the impact
17 of using a different year for this scaling, such as 2008 or 2010. When a different year is
18 used, the resulting best-fitting curve is entirely different, and results in an entirely
19 different data center forecast, as also shown in Figure JFW-J. Curves #5 and #6 compare
20 to curve #4 (best fit using RMSE), with the data scaled to 2010 and 2008, respectively.

21 In addition, there was apparently no historical data from before 2010, but Mr. Fox
22 fabricated such data, creating a value for each year from 2001 through 2009 set to 90% of

⁴⁰ Response to Data Request ER 6-17.



1 the following year.⁴¹ These additional, fabricated data points were nevertheless included
 2 in the range used by Mr. Fox to fit the S-shaped curve.⁴²

3 **Q 58: While the data center forecast based on the Bass Diffusion Model approach is**
 4 **apparently quite arbitrary, did the Company incorporate this separate data center**
 5 **forecast into its overall 2018 Plan peak load forecast in a correct manner?**

6 A: No. As I described, the correct approach is to determine the amount of anticipated future
 7 data center load already embedded in the econometric forecast, and only add the
 8 additional amount necessary such that the total equals the separate data center forecast.
 9 However, apparently the Company did not pursue this approach. The Company

⁴¹ Response to Data Request ER 6-14d.

⁴² Response to Data Request ER 6-13c.

1 acknowledges that its commercial model includes historical and projected data center
2 loads,⁴³ but states that it did not identify and does not know the embedded amount.⁴⁴
3 This suggests that the future data center load growth embedded in the Company's
4 econometric forecast may be double-counted in the Company's load forecast.

5 **Q 59: Now please describe how PJM determined its data center forecast and forecast**
6 **adjustment.**

7 A: PJM relied upon the forecast provided by the Company for 2018 through 2022.⁴⁵

8 Beyond 2022, PJM held the data center peak load values constant, because projections
9 were not available beyond 2022.

10 PJM updated its estimates of the amount embedded in its forecasting model, and
11 subtracted these values from the data center forecast, resulting in the forecast adjustments
12 shown in Table B-9 of the 2018 Load Forecast Report. Thus PJM, unlike the Company,
13 correctly determined the appropriate amount for the forecast adjustment.

14 **Q 60: How certain is any forecast of rapid growth in data center loads?**

15 A: The growth is highly uncertain; it could be considerably different from the forecast. The
16 2015 Quanta Report noted (p. 13) that data center owners are “deliberately optimistic in
17 giving the utility completion dates and future loads,” because they want no utility-side
18 constraints on when they can get the power they need.

⁴³ Response to Data Request ER 9-7a, b.

⁴⁴ Response to data requests ER 6-15c, 9-7c.

⁴⁵ PJM, *Load Forecast Adjustment - Dominion*, PJM Load Analysis Subcommittee meeting Item #4, November 15, 2017, p. 2, available at <http://www.pjm.com/-/media/committees-groups/subcommittees/las/20171115/20171115-load-forecast-adjustment-dominion.ashx>.

1 While it may be very likely that there will be strong growth in electric demand for data
2 centers in North America, at least in the near term, it is highly uncertain when and where
3 that growth will occur. And a report by Lawrence Berkeley National Laboratory suggests
4 that increasing energy efficiency at data centers will result in little additional growth in
5 their electricity demands at the national level in the coming years, despite strong growth
6 in the demand for their services:⁴⁶

7 “The combination of these efficiency trends has resulted in a relatively steady U.S
8 data center electricity demand over the past 5 years, with little growth expected
9 for the remainder of this decade. It is important to note that this near constant
10 electricity demand across the decade is occurring while simultaneously meeting a
11 drastic increase in demand for data center services; data center electricity use
12 would be significantly higher without these energy efficiency improvements.”

13
14 The 2015 Quanta Report also noted this possibility; it states that as existing and new data
15 centers upgrade to new technologies, “their electric loads could drop substantially.”⁴⁷

16 **Q 61: Has the Company researched whether the owners of the data centers are pursuing**
17 **efforts to become more energy efficient?**

18 A: No. The Company states that it has not conducted formal research of this question, and
19 has made no explicit assumption regarding efficiency improvements.⁴⁸

⁴⁶ U.S. Department of Energy, Ernest Orlando Lawrence Berkeley National Laboratory, *United States Data Center Energy Usage Report*, June 2016 (LBNL-1005775), p. ES-2, available at http://eta.lbl.gov/sites/all/files/lbnl-1005775_v2.pdf.

⁴⁷ 2015 Quanta Report p. 26.

⁴⁸ Response to Data Request ER 1-42.

1 **Q 62: Is there evidence that the existing data centers are reducing their peak demands**
2 **through efficiency improvements?**

3 A: Yes. In response to a data request, the Company provided historical hourly loads for a
4 “representative data center customer.”⁴⁹ This large, representative customer reduced its
5 energy and peak demands each year from 2014 to 2017, and consumed only 68% as
6 much energy in 2017 as in 2014.

7 **Q 63: Have some of the companies that build and operate data centers also announced**
8 **intentions to increasingly rely on renewable sources of energy?**

9 A: Yes, a number of these companies have announced such intentions over the past few
10 years. These commitments are summarized in a report by Greenpeace.⁵⁰

11 This report notes (p. 30) that of five U.S. “hot spots” for data center investment, Northern
12 Virginia ranks low, and far behind Northern California and Dallas with regard to access
13 to renewable energy; this suggests that the firms committing to renewable energy may
14 increasingly choose other regions of the country for their data center expansions.

15 **Q 64: Has the Company taken such intentions into account in the 2018 Plan?**

16 A: Apparently not. The Company states that only “quantifiable, proven and firm”
17 parameters are taken into account in the integrated resource planning (“IRP”) process,
18 and that such owners’ “intentions” to rely on renewable sources of energy do not
19 constitute observable quantities, so they are not part of the IRP process or modeling.⁵¹

20 However, the Greenpeace report (Appendix II: Company Scores Explained) documents

⁴⁹ Response to Data Request Staff 7-92b, Confidential Attachment Staff Set 7-92(b) (supp 6-26-2018).

⁵⁰ Greenpeace, *Clicking Clean: Who Is Winning the Race to Build a Green Internet?*, June 2017, available at <http://www.clickclean.org/downloads/ClickClean2016%20HiRes.pdf>.

⁵¹ Response to Data Request ER 1-43(b).

1 announced commitments by many of the leading companies in this industry, which
2 appear to reflect more than just intentions.

3 **Q 65: What is your conclusion and recommendation with respect to the DOM Zone data**
4 **center peak load forecast for the 2018 Plan?**

5 A: This forecast is unsupported and highly speculative; while there likely will be additional
6 new data centers, it is also likely true that the loads of existing data centers will be
7 shrinking. In addition, the Company has apparently not incorporated its separate data
8 center forecast into its overall forecast correctly. The Commission should focus on the
9 forecast for all other customers, as shown in the above figures, and consider the future
10 changes in data center load highly uncertain.

11
12 **V. DOMINION LOAD-SERVING ENTITY PEAK LOAD**

13 **Q 66: Turning now to the DOM LSE peak load forecast, how was this forecast prepared**
14 **for the 2018 Plan?**

15 A: The Company determined the DOM LSE adjusted peak load forecast (Appendix 2I line
16 6) that is used in the TRR calculations as follows:

- 17 1. The starting point was the Company's forecast summer peak load for the DOM Zone
18 (Appendix 2G), discussed earlier in this testimony.
- 19 2. Then the DOM LSE utility peak load "base forecast", shown in Appendix 2I line 1a,
20 was determined as a simple percentage (87.4%) of the DOM Zone forecast in each
21 year.
- 22 3. The DOM LSE "base forecast" was adjusted for conservation and efficiency
23 (Appendix 2I, line 2) to determine the DOM LSE adjusted peak load forecast shown
24 at Appendix 2I line 6 and Figure 4.2.2.1 column 5, and used for the TRR calculations.

1 **Q 67: How did the Company determine the 87.4% factor used to represent DOM LSE as a**
2 **fraction of the DOM Zone peak load?**

3 A: The 2018 Plan states (p. 17) that this was based on “a regression of historical DOM LSE
4 loads onto historical DOM Zone loads” and claims that “the estimated coefficients are
5 applied to the projected zonal loads resulting in a load forecast for the DOM LSE.”

6 The details of the calculation were provided in response to a data request.⁵² The
7 regression was based on the July actual peak loads for DOM Zone and DOM LSE over
8 2008 through 2017. The Company then assumed DOM LSE over the coming years
9 would represent the same constant fraction of DOM Zone peak load (87.4%) as it had
10 over this ten-year historical period.

11 **Q 68: Is this an accurate way to forecast the DOM LSE portion of the DOM Zone peaks?**

12 A: No. The peak loads of the Other LSEs in the DOM Zone are rising faster than DOM LSE
13 peak loads and represent an increasing fraction of the DOM Zone peak over time. This
14 trend is reflected in the historical data provided by the Company in support of the 87.4%
15 factor it is using.

16 The Other LSEs in the DOM Zone are Old Dominion Electric Cooperative (“ODEC”),
17 Northern Virginia Electric Cooperative (“NOVEC”), Central Virginia Electric
18 Cooperative (“CVEC”), and North Carolina Electric Membership Cooperative
19 (“NCEMC”). The faster load growth of these Other LSEs reflects, perhaps among other
20 factors, the strong growth in data center loads served by NOVEC. This trend is also

⁵² Data Request ER-1-20(a) attachment.

1 reflected in data provided to the Company by some of the Other LSEs, and provided
2 through discovery.

3 **Q 69: Please summarize the data regarding Other LSEs loads provided through discovery.**

4 A: While the Company stated that it does not have historical or forecast energy or peak load
5 information about any of these other LSEs,⁵³ the Company did ultimately provide some
6 data through discovery.⁵⁴ This data shows NOVEC's load projections for its delivery
7 points, excluding and including "large customer inquiries". This data shows that
8 NOVEC expects its load to grow by 25 percent from 2018 to 2022, *excluding* the potential
9 new large customers, or 37%, if these potential new large customers are included.

10 NOVEC's annual reports reveal that from 2009 to 2017, its sales grew steadily, by a total
11 of 38% over this period (over 1,200 GWh, and 4.1% per year on average). By contrast,
12 DOM LSE sales grew a total of 4.3% over the same period (0.5% per year), according to
13 the 2018 Plan, Appendix 2A.

14 **Q 70: How did the Company use such information about Other LSEs' load growth in**
15 **projecting the DOM LSE's share of the zone peak load growth.**

16 A: The Company states that it did not use this information:⁵⁵

17 "NOVEC's load projections were not used to develop the load forecast in the
18 Company's 2018 Plan, nor were any other DOM Zone LSEs' load projections or
19 forecasts of sales or peak loads."

⁵³ Response to Data Request ER 1-20e.

⁵⁴ Response to Data Request ER 6-10, Attachment ER Set 6-10 (RB).

⁵⁵ Response to Data Request ER 9-5 a-b.

1 **Q 71: Turning back to how the Company estimated the DOM LSE's share, please**
2 **elaborate regarding the trend in Other LSE peak loads reflected in the Company's**
3 **data.**

4 A: To calculate the 87.4% factor for the DOM LSE share, the Company used a regression
5 over a ten-year historical period. This regression identifies the trend toward a growing
6 share of Other LSE peak loads, and suggests that the Other LSE share, which was 12.8%
7 in 2017, would rise to 13.6% by 2029.

8 However, to develop its forecast of the future DOM LSE peak loads, the Company
9 ignored this trend, and simply applied the historical average (87.4% for DOM LSE,
10 12.6% for Other LSEs) throughout the forecast period.

11 **Q 72: Have you prepared an alternative estimate of the DOM LSE portion of future DOM**
12 **Zone peak loads?**

13 A: Yes. My preferred method would be to separate out the data center loads, and to project
14 the DOM LSE/Other LSE split separately for data centers and for all other loads.

15 However, the Company did not provide the data that would be needed to do this.

16 Instead, I simply used the Company's regression, discussed above, that projects the DOM
17 LSE share to decline slowly from 87.3% in 2017 to 86.3% by 2033. This has a modest
18 impact on the forecast of DOM LSE peak loads; it reduces them by 44 MW in 2019, 103
19 MW in 2022, and 270 MW by 2033, based on the Company's DOM Zone forecast. This
20 very likely overstates the DOM LSE share of the DOM Zone peak load.

21

1 **VI. RESERVE MARGINS AND TOTAL RESOURCE REQUIREMENTS**

2 **Q 73: Please describe how the Company calculated its Total Resource Requirements**
3 **(“TRR”).**

4 A: The annual TRR values shown in Figure 4.2.2.1 were calculated as follows (references
5 are to 2018 Plan appendices):

- 6 1. The starting point was the Company’s DOM Zone peak load forecast shown in
7 Appendix 2G and discussed in earlier sections of this testimony.
- 8 2. Then the Company determined the LSE adjusted peak load, shown at Appendix 2I
9 line 6 and Figure 4.2.2.1 column 5, as discussed in the prior section. An adjustment
10 for conservation and efficiency (Appendix 2I line 2) is also reflected in the LSE
11 adjusted peak load.
- 12 3. The reserve requirements (reserve margins), shown in the sixth column of Figure
13 4.2.2.1, were determined by multiplying the DOM LSE adjusted peak load (step 2
14 above) by an “effective reserve margin” of 11.74 percent, determined as the product
15 of two components:
 - 16 (a) a “coincidence factor”, to estimate the DOM LSE PJM RTO-coincident peak
17 load based on the non-coincident peak load (0.9647; 2018 Plan p. 53); and
 - 18 (b) PJM’s recommended installed reserve margin for 2021/2022 (15.9%).
- 19 4. Finally, the Total Resource Requirement for each year (final column of Figure
20 4.2.2.1) was the sum of the DOM LSE adjusted peak load and the reserve margin.
21 The Total Resource Requirement is expressed in installed capacity terms.

1 **Q 74: Does the Company’s approach to calculating reserve margins and capacity needs**
2 **match how capacity obligations are determined in PJM?**

3 A: No. Capacity obligations in PJM are determined beginning with PJM’s forecast of
4 coincident peaks (Table B10 in its load forecast reports), and by applying the Forecast
5 Pool Requirement (“FPR”) to the coincident peaks to determine capacity obligations on
6 an “unforced” capacity (“UCAP”), as opposed to installed capacity, basis.⁵⁶

7 The Company instead used the installed reserve margin to determine capacity obligations.
8 In addition, the Company used a single value for the installed reserve margin (15.9%) for
9 all years, while the PJM study that identified this reserve margin recommended values by
10 year through 2027, and the reserve margin and FPR values vary over time. In addition,
11 the Company used a single coincidence factor (averaged over 2018-2021) for all years, to
12 estimate coincident peaks. PJM forecasts coincident and non-coincident peaks by year,
13 so the coincidence factor varies from year to year.

14 However, while the Company’s approach differs from PJM’s, the results are likely very
15 similar.

16 **Q 75: Have you calculated the Total Resource Requirements based on the load forecast**
17 **and reserve margin values you recommend?**

18 A: Yes I have. My estimates of the TRR values reflect the following differences from the
19 Company’s estimates:

⁵⁶ PJM, *Planning Period Parameters for the 2021-2022 Base Residual Auction*, tab 2021-2022 Parameters (showing that the Reliability Requirement is calculated based on the FPR, and the installed capacity reserve margin is used only in the calculations of the shape of the VRR curve), available at <http://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2021-2022/2021-2022-bra-planning-period-parameters.ashx?la=en>.

- 1 1. I used PJM’s latest DOM Zone forecast (July 2018), as discussed in an earlier section
2 of this testimony.
- 3 2. I re-estimated the DOM LSE peak load using the Company’s regression for this
4 purpose, as described in an earlier section of this testimony, and applied the same
5 conservation and efficiency adjustment.
- 6 3. I applied the Company’s effective reserve margin values to determine the reserve
7 margin and TRR in all years.

8 The results of the calculation were shown above in Table 1.

9 **Q 76: The 2018 Plan states (p. 52) that the Company, as a PJM member and signatory to
10 PJM’s Reliability Assurance Agreement (“RAA”), is obligated to own or procure
11 sufficient capacity to maintain overall system reliability. Is it correct that the RAA
12 obligates the Company to own or procure capacity?**

13 A: No. PJM acquires commitments to provide the capacity needed for resource adequacy
14 through its Reliability Pricing Model (“RPM”) capacity construct. The RAA assigns
15 capacity responsibility for the purpose of allocating RPM costs to zones and to LSEs.
16 However, the RAA does not obligate the Company (or any other party) to own or procure
17 capacity; its references to “capacity obligations” ultimately have to do with cost
18 allocation, as the Company acknowledges.⁵⁷ Indeed, many LSEs in PJM do not own
19 capacity or have capacity under contract.

⁵⁷ Response to Data Request ER-1-44c.

1 **Q 77: The 2018 Plan also states (p. 54) that the TRRs represent “the Company’s total**
2 **resource need that must be met through existing resources, construction of new**
3 **resources, DSM programs, and market capacity purchases.” Is this an accurate**
4 **characterization of what the TRRs represent?**

5 A: No. Again, capacity obligations in PJM have only to do with cost allocation.

6 **Q 78: The 2018 Plan (p. 54) also identifies an “upper bound reserve margin”, and states**
7 **that the Company “may be required” to meet this reserve margin in the future. Is**
8 **this correct?**

9 A: No. Again, PJM does not require acquisition of capacity or any particular reserve
10 margin. The relevant calculations are only for purposes of cost allocation.

11 The Company calculates this higher reserve margin noting that RPM has often resulted in
12 total capacity commitments in excess of reliability targets. But this is merely a result of
13 the sloped RPM capacity demand (“VRR”) curve used in the RPM auctions. The sloped
14 VRR curve ensures that when capacity is relatively scarce and costly, RPM’s auctions
15 will result in a relatively low amount of committed capacity and high capacity prices; and
16 when capacity is relatively abundant and low cost (as it has been in recent years), RPM
17 will result in a total amount of committed capacity in excess of resource adequacy
18 targets, and relatively low capacity prices. This approach sends a price signal about the
19 need for capacity.

20 **Q 79: Would it be prudent for the Company to plan for the higher reserve margins that**
21 **often result from the RPM auctions?**

22 A: No, that would not be prudent, and it would make no sense. When RPM results in excess
23 committed capacity, this occurs at a relatively low capacity price, signaling that capacity
24 is abundant and incremental capacity is not needed. Under such circumstances, while the
25 nominal amount of capacity to be allocated to zones and LSEs is higher, the total capacity
26 cost to be allocated is actually much lower. To the extent market participants expect
27 RPM to result in excess capacity at low cost, it would make more sense for market

1 participants to react to such a situation of abundance by planning relatively less, not
2 more, capacity.

3 **Q 80: Please explain how the total capacity cost is actually lower when RPM clears excess**
4 **capacity.**

5 A: Consider the following example, using the parameters from the RPM base residual
6 auction for the 2019-2020 delivery year. If RPM cleared at the target reliability
7 requirement, the clearing price would be \$434.46/MW-day and the total market cost
8 would be \$25 billion. If instead, as actually occurred, RPM clears a large excess at
9 \$100/MW-day, the total market cost would be closer to \$6 billion (ignoring higher prices
10 in some zones). Thus, when RPM clears excess capacity, it results in less, not more
11 capacity cost allocated to Dominion and other LSEs.

12
13 **VII. CONCLUSIONS AND RECOMMENDATIONS**

14 **Q 81: Please summarize your conclusions with regard to the peak load forecast and Total**
15 **Resource Requirement values used in the 2018 Plan.**

16 A: I conclude that the Company's DOM Zone peak load values are far too high, and PJM's
17 forecast is also too high, but more accurate than the Company's. In addition, the
18 Company has overstated the DOM LSE's likely portion of that peak in future years.
19 More accurate estimates of DOM Zone and DOM LSE peak loads based on PJM's
20 forecasts, and the resulting TRR values, are shown in Table 1 above.

21 **Q 82: Do you have recommendations with regard to the load forecasts used in future**
22 **Integrated Resource Plans?**

23 A: Yes. With regard to the peak load forecast, I recommend that the Commission consider
24 requiring the following of the Company, in future plans:

- 1 1. To present recent weather-normalized peak loads for the DOM Zone and/or DOM
2 LSE (either prepared by the Company, or by PJM), and to discuss recent trends in
3 weather-normalized peak loads.
- 4 2. To commission a forecast of data center loads by an outside firm (as the Company did
5 in 2013 and 2015, resulting in the reports and forecasts prepared by Quanta
6 Technology).
- 7 3. To fully separate the forecasting of data center peak loads from the forecasting of all
8 other customer peak loads, and to present the history and forecast of data center and
9 other loads separately. The historical data center loads could be removed from the
10 econometric models used for all other loads, since in any case the Company states
11 that it relies on data center forecasts that it develops applying other methods.
- 12 4. To evaluate and report the estimated embedded amount of data center load reflected
13 in the econometric forecasting, and to deduct this embedded amount from the
14 exogenous data center forecast.
- 15 5. To provide an explicit forecast of the peak loads of the DOM LSE as a portion of the
16 DOM Zone peak loads, taking into account data centers and any other sectors whose
17 growth differs substantially for DOM LSE and other DOM Zone LSEs, with a
18 discussion of recent trends in DOM LSE and Other LSE peak loads.
- 19 6. To present alternative load forecasts determined using 20- and 10-year historical
20 estimation periods, in addition to the longer period currently used, and to provide a
21 discussion of the differences and of the rationale for the choice of historical period.

1 7. To retain an outside consultant to perform a comprehensive review of the load
2 forecasting methodology and make recommendations for improving accuracy.

3 **Q 83: Do you have recommendations with regard to the calculation of TRRs used in**
4 **Integrated Resource Plans?**

5 A: Yes. With regard to the calculation of TRRs, I recommend that the Commission consider
6 requiring the Company to use PJM’s Forecast Pool Requirement (“FPR”) values, applied
7 to a forecast of coincident peak loads, to determine the TRRs in unforced capacity terms,
8 consistent with how PJM allocates capacity cost. The TRRs can also be presented in
9 installed capacity terms, if needed, by applying a DOM LSE fleet-wide average forced
10 outage rate, again consistent with PJM’s approach.

11 **Q 84: Does this complete your testimony?**

12 A: Yes it does.

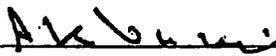
Attachment JFW-2

| | <u>Page</u> |
|--|-------------|
| Response to Data Request ER 1-3..... | 1 |
| Response to Data Request ER 1-4..... | 3 |
| Response to Data Request ER 1-6..... | 5 |
| Response to Data Request ER 1-7..... | 6 |
| Response to Data Request ER 1-9..... | 7 |
| Response to Data Request ER 1-12..... | 8 |
| Response to Data Request ER 1-14..... | 10 |
| Response to Data Request ER 1-20..... | 12 |
| Response to Data Request ER 1-26..... | 14 |
| Response to Data Request ER 1-27..... | 15 |
| Response to Data Request ER 1-30..... | 16 |
| Response to Data Request ER 1-36..... | 18 |
| Response to Data Request ER 1-37..... | 19 |
| Response to Data Request ER 1-42..... | 22 |
| Response to Data Request ER 1-43..... | 25 |
| Response to Data Request ER 1-44..... | 27 |
| Response to Data Request ER 4A-1..... | 29 |
| Response to Data Request ER 4A-5..... | 31 |
| Response to Data Request ER 6-3..... | 33 |
| Response to Data Request ER 6-4..... | 34 |
| Response to Data Request ER 6-5..... | 36 |
| Response to Data Request ER 6-6..... | 37 |
| Response to Data Request ER 6-10..... | 38 |
| Response to Data Request ER 6-12..... | 40 |
| Response to Data Request ER 6-13..... | 41 |
| Response to Data Request ER 6-14..... | 42 |
| Response to Data Request ER 6-15..... | 44 |
| Response to Data Request ER 6-17..... | 46 |
| Response to Data Request ER 9-2..... | 47 |
| Response to Data Request ER 9-3..... | 49 |
| Response to Data Request ER 9-4..... | 51 |
| Response to Data Request ER 9-5..... | 53 |
| Response to Data Request ER 9-7..... | 56 |
| Response to Data Request Staff 2-16..... | 57 |
| Response to Data Request Staff 7-92..... | 58 |

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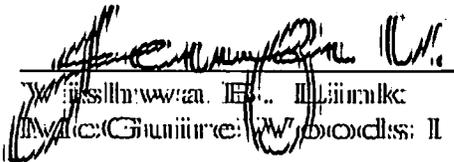
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 3 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Ashwani Vaswani
Manager, Energy Market Quantitative Analysis
and Integrated Resource Planning
Dominion Energy, Inc.

The following response to Question No. 3 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



George W. Williams
Attorney at Law
Williams & Williams, P.C.

Question No. 3

Reference page 4 ("Uncertainties assessed in this 2018 Plan include: load growth in the Company's service territory...").

- a) Explain in detail how the Company assessed load growth uncertainty. Provide full documentation for the approach.
- b) Provide all such analysis.

Response:

The Company objects to this request as overly broad, unduly burdensome and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the

extent it seeks "full documentation" and "all such analysis" without limitation. Notwithstanding and subject to these objections, the Company provides the following response:

The Company's load growth assumptions are discussed in detail in Chapter 2 of the 2018 Plan. See also the Company's response to ER Set 1-2.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 4 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 4

Reference page 15 ("The Company uses two econometric models with an end-use orientation to forecast sales, energy, and peak demand.").

- a) Provide full documentation for both models.
- b) Provide all inputs, assumptions, equations, and/or variables used in running both models in developing the Company's 2018 load forecast.
- c) Provide all statistics from estimation of these econometric models.
- d) Are any supplemental models used together with these two econometric models? If so, identify the supplemental models and provide full documentation.
- e) Are any dummy variables used in either of the models, for instance to handle singular events or outliers? If so, identify the variables and provide all details.

Response:

- a) See Attachment ER Set 1-4(a) (KS) for the requested model documentation.
- b) See Confidential Attachment ER Set 1-4(b) (KS) for the requested information, including confidential model inputs. Confidential Attachment ER Set 1-4(b) (KS) contains confidential information as designated therein by yellow highlighting, and is being provided pursuant to the protections set forth in 5 VAC 5-20-170, the Hearing Examiner's Protective Ruling and

Additional Protective Treatment for Extraordinarily Sensitive Information entered on May 18, 2018, the Company's Second Motion for Additional Protective Treatment for Extraordinarily Sensitive Information dated June 1, 2018, any subsequent protective order or protective ruling issued in this proceeding, and the Agreements to Adhere executed pursuant to any such orders or rulings.

- c) See Attachment ER Set 1-4(c), Sales Model (KS) and Attachment ER Set 1-4(c), Peak and Energy Model (KS).
- d) No.
- e) Any dummy variables used in the either of the models during the forecasting period were assigned a zero value during the forecasting. See Attachment ER Set 1-4(a) for a description of the dummy variables used.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 6 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 6

Reference page 15 ("The historical period used to develop the current 2018 Plan Load Forecast spanned the period from October 1988 through September 2017.").

- a) Identify any historical data used in these models for which a time period other than this 30-year period was used. Identify the historical period used for such data.
- b) Identify the time period for the weather data in the first stage of the system model.

Response:

- a) There was no additional historical data used.
- b) The same historical period was used for weather data to develop the 2018 Plan.

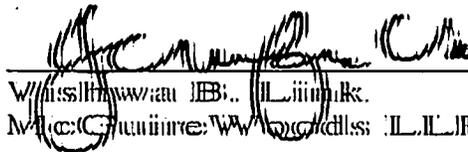
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 7 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
 Lead Economist,
 Load Research and Forecast
 Dominion Energy Services, Inc.

The following response to Question No. 7 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



William J. B. Williams
 Esq.
 Williams & Williams, LLP

Question No. 7

Reference page 15 ("The models used to produce the Company's load forecast have been developed, enhanced, and re-estimated annually for over 20 years."). Identify and describe every development, enhancement, and re-estimation the Company has made to its models over the last 20 years, including the specific year in which such development, enhancement, and re-estimation occurred and the reasons or justifications for such change.

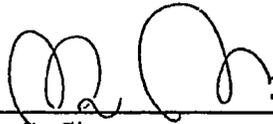
Response:

The Company objects to this request as overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "every development, enhancement, and re-estimation the Company has made to its models over the last 20 years." Notwithstanding and subject to these objections, the Company provides the following response:

Appliance saturation figures and average usage per appliance were updated in 2016 following a survey study commissioned by the Company and conducted by DNV-GL. Model re-estimation is conducted annually to reflect updated sales and load forecasts.

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 9 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 9 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



Viii: [unclear] [unclear]
M: [unclear] [unclear]

Question No. 9

Provide any and all analyses or studies of the Company's previous IRP load forecasts concerning or relating to the accuracy of the Company's load forecasts.

Response:

The Company objects to this request as overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "any and all analyses or studies of the Company's previous IRP load forecasts concerning or relating to the accuracy of the Company's load forecasts." Notwithstanding and subject to these objections, the Company provides the following response:

As the Commission has recognized, the Plan is a snapshot in time based on circumstances that exist when the Plan is developed. Accordingly, the Company does not systematically conduct accuracy analyses or studies of its previous Integrated Resource Plan load forecasts.

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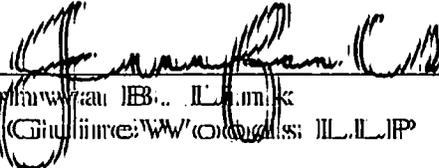
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 12 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 12 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



Michael J. Williams, Esq.
Michael Williams & Associates, PLLC

Question No. 12

Has the Company ever estimated the econometric models using alternative (shorter or longer) historical periods?

- a) If so, provide all available documentation of the inputs and outputs of such analyses.
- b) If not, explain why the Company has never explored alternative historical periods.

Response:

The Company objects to this request as overly broad, unduly burdensome and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks whether the Company has "ever estimated the econometric models using

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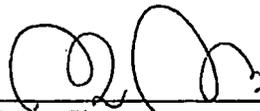
alternative (shorter or longer) historical periods” without limitation or qualification.
Notwithstanding and subject to these objections, the Company provides the following response:

The Company has not performed an analysis of the impacts of using alternative (shorter or longer) historical periods for purposes of integrated resource planning in order to maintain a certain level of year over year consistency.

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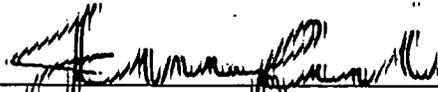
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 14 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 14 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



Witness: [illegible]
Mile: [illegible]

Question No. 14

Has the Company ever prepared estimates of historical weather-normalized (also called weather-adjusted) energy sales or peak loads? If so:

- a) Please provide the Company's estimates of historical weather-normalized energy sales and peak loads for the past ten years.
- b) Provide full documentation of the methodology used for this weather normalization.

Response:

The Company objects to this request as overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks whether the Company has "ever prepared estimates (also called weather-adjusted)

180820160

energy sales or peak loads" without qualification or limitation. The Company further objects to this request as vague to the extent it seeks "full documentation." Notwithstanding and subject to these objections, the Company provides the following response:

Yes.

- a) Below are the weather normalized historical energy sales (MWhs) for the past ten years. As a general practice, the Company does not weather normalize peak loads.

| | |
|------|-------------|
| 2008 | 81,324,387 |
| 2009 | 80,138,606 |
| 2010 | 79,611,758 |
| 2011 | 80,851,789 |
| 2012 | 82,220,685 |
| 2013 | 82,318,906 |
| 2014 | 82,719,282 |
| 2015 | 82,495,725 |
| 2016 | 82,709,032 |
| 2017 | 84,113,114. |

- b) The documentation for the weather normalization process is provided in the Company's response to ER Set 1-4, in particular, Attachment ER Set 1-4(a).

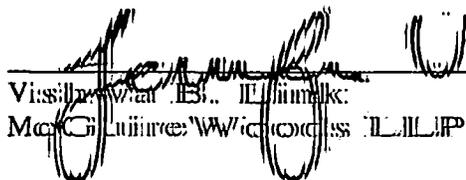
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 20 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
 Lead Economist,
 Load Research and Forecast
 Dominion Energy Services, Inc.

The following response to Question No. 20(d), (e) of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



Question No. 20

Reference page 17 ("The final monthly peak and energy forecast for the DOM LSE is based on a regression of historical DOM LSE loads onto historical DOM Zone loads. The estimated coefficients are applied to the projected zonal loads resulting in a load forecast for the DOM LSE that is then adjusted for known firm contractual obligations in the forecast period.").

- a) Provide workpapers for this regression.
- b) Confirm that the forecasted peak and energy values for DOM LSE, summed with the same values for all other LSEs in the DOM zone, equal the DOM zone peak and energy forecasts. If not, explain.
- c) Identify all other LSEs in the DOM zone.

- d) For each other LSE, provide the monthly peak and energy forecasts.
- e) For each other LSE, provide all information in the Company's possession about the LSE's historical and forecast peak loads and energy.
- f) Identify the "firm contractual obligations" that were added to the DOM LSE forecast.
- g) Provide the peak load and energy amounts for each "firm contractual obligation."

Response:

- a) See Attachment ER Set 1-20(a) (KS).
- b) The LSE peak and energy are calculated as a percent of the DOM Zone.
- c) The "other LSEs" are Old Dominion Electric Cooperative (ODEC), Northern Virginia Electric Cooperative (NOVEC), Central Virginia Electric Cooperative (CVEC), and North Carolina Electric Membership Cooperative (NCEMC).
- d) The Company objects to this request to the extent it requires original work. Notwithstanding and subject to the foregoing objection, the Company provides the following response: The peak load and energy for the customers that comprise "other LSEs" has not been calculated.
- e) The Company objects to this request as overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "all information in the Company's possession about the LSE's historical and forecast peak loads and energy."

From a forecasting perspective, in preparing the referenced Section 2.2 of the 2018 Plan, the Load Forecasting, Business Planning and Market Analysis group at the Company did not calculate other LSE's individual historical and forecast peak loads and energy, and does not have such information in its possession.

- f) There are no firm contractual obligations loads to be added to the forecast.
- g) See the Company's response to subpart (f) of this question.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 26 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 26

Has the Company prepared a single economic index that represents the various Virginia specific indices used by the Company in preparation of its load forecast (as discussed in the Rebuttal Testimony of Robert G. Thomas in Case No. PUE-2016-00049, p. 22, with regard to the 2016 IRP)?

- a) If so, provide the index values.
- b) If so, explain how the index was prepared (the weights applied to the various indices, etc.).

Response:

No. The Company has not prepared a single economic index that represents the various Virginia specific indices for purposes of the 2018 Plan.

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 27 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 27

Has the Company evaluated the sensitivity of its 2018 forecasts to any of the inputs?

- a) If so, provide the inputs and outputs of all such sensitivity analysis.
- b) In particular, has the Company evaluated the sensitivity of its forecasts to the Virginia GSP forecast, identified as a "key driver" of the forecast (p. 21)? Provide the inputs and outputs of all such sensitivity analyses.
- c) If the Company has not performed any sensitivity analysis, explain why not.

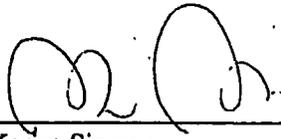
Response:

(a), (b) The Company has not performed sensitivity analysis on any input variables used in its load-forecast process. The Company compares the Virginia GSP year-end results provided by Moody's Analytics to the prior year for purposes of consistency.

(c) The Company maintains that every input variable used in its load forecasting process is important. As a matter of routine, the Company does not perform sensitivity analysis on any input variable. Rather, for load forecasting purposes, the Company uses the input variables provided by Moody's Analytics as provided.

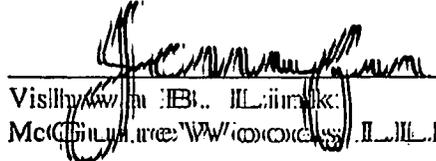
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 30 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 30 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



Vishal Vaidya
McGinnis & Associates, P.C.

Question No. 30

Reference page 22 ("In Section 2.3 of the 2017 Plan, the Company detailed the major differences between the methods used by PJM in its load forecasting process and those used by the Company. This presentation also reflected how these methodological differences are causing the differences in the resulting forecasts. These differences still exist between PJM and the Company, which again have resulted in differing peak demand and energy forecasts."). With regard to the differences explained in the Company's 2017 Integrated Resource Plan ("2017 Plan"), which the Company avers "still exist" in the 2018 Plan:

- a) Provide a narrative describing these differences as they pertain to the 2018 Plan, as was included in the 2017 Plan (see 2017 Plan, pages 25 to 29, Section 2.3).
- b) Provide graphs showing the impact of these differences to the 2018 Plan, as were included in the 2017 Plan (see 2017 Plan, pages 25 to 29, Figures 2.3.1, 2.3.2, 2.3.3, 2.3.4, and 2.3.5).

180820160

- c) Provide workpapers for the impact of each difference to the 2018 Plan, as were shown in 2017 Plan (see 2017 Plan, pages 25 to 29, Figures 2.3.1, 2.3.2, 2.3.3, 2.3.4, and 2.3.5).

Response:

The Company objects to this request because it would require original work, as the Company has conducted this analysis for the 2018 forecast. Notwithstanding and subject to this objection, the Company provides the following response: See the listed citations from the 2017 Plan.

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 36 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 36

Reference page 17 ("The final forecasted zonal peak and energy values include subsequent adjustments for projected block loads from incremental new data centers, or other significant load additions not reflected in the hourly regression equations."). For the subsequent adjustment to the forecast to represent incremental new data centers:

- a) Provide all research, analysis and documentation of the anticipated load addition.
- b) Provide workpapers for the adjustment that was made to the forecast for the load addition.
- c) Explain the methodology that was used to determine the amount of the load addition that is already reflected in the load forecast, and the amount of the adjustment.

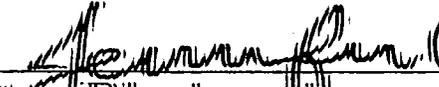
Response:

- a) See the Company's response to Staff Set 2-16.
- b) See the Company's response to subpart (a) of this question and the related attachments. See also the Company's response to ER Set 1-4, in particular, Attachment ER Set 1-4(a). The Company does not use its two econometric models to develop its forecast.
- c) See the Company's response to ER Set 1-4, in particular, Attachment ER Set 1-4(a).

180820160

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 37(a), (c), and (d) of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



William B. Clark
Director - Customer
Dominion Energy, Inc.

The following response to Question No. 37(b), (e), (f), and (g) of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 37(a), (c), (d) of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.



William B. Clark
Director - Customer
Dominion Energy, Inc.

Question No. 37

Reference page 22 ("Another driver of energy sales in the Company's service territory is new and existing data centers. The Company has seen significant interest in data centers locating in Virginia because of its proximity to fiber optic networks as well as low-cost, reliable power sources.").

- a) Provide historical data center loads since 2000, including monthly energy and peak loads as far back as data is available, and breaking out DOM zone and DOM LSE loads. Provide details for each individual other LSE, to the extent available.

180820160

- b) Provide all historical forecasts of DOM zone and DOM LSE data center peak load and annual energy prepared by the Company, or prepared for the Company, or relied upon by the Company, over the past twenty years.
- c) Provide separate historical hourly data center loads for DOM zone and DOM LSE since 2000.
- d) Provide all documents or other evidence of the "significant interest in data centers locating in Virginia".
- e) Provide the Company's forecasts of monthly data center energy sales and peak load, breaking out the DOM zone and DOM LSE forecasts separately.
- f) Identify all source documents, analyses and studies for the Company's data center load forecasts. Identify the source and date for each document, analysis or study.
- g) Provide any other data or analysis pertaining to historical or forecast data center loads in the DOM zone.

Responses:

- a) The Company objects to this request as overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "historical data center loads since 2000, including monthly energy and peak loads as far back as data is available." Notwithstanding and subject to these objections, the Company provides the following response:

The Company does not track data center actual load information in the DOM Zone, only in the DOM LSE. Therefore, the Company does not have any information as to the nature of the actual load of its wholesale customers, such as NOVEC, which also serves part of the data center industry in Virginia.

The data below represents the Dominion Energy (DOM LSE) customer annual maximum energy and peak load for data center customers from 2011 to current.

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 April YTD |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|
| Sales in MWH | 2,335,422 | 2,821,781 | 3,191,987 | 3,766,668 | 4,309,573 | 5,352,648 | 6,423,610 | 2,341,511 |
| Peak in MW | n/a | n/a | 462 | 532 | 636 | 753 | 931 | 980 |

- b) See the Company's response to Staff Set 2-16.

180820160

- c) The Company objects to this request as vague, overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "historical hourly data center loads...since 2000." The Company further objects to this request because it would require original work.
- d) The Company objects to this request on the basis it would require original work and to the extent it seeks confidential customer information. The Company further objects to this request to the extent it seeks publicly available information indicating "significant interest in data centers locating in Virginia," which is available to Staff and any party to this proceeding. Additionally, the Company objects to this request as vague, overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "all documents or other evidence," without limitation. Notwithstanding and subject to the foregoing objections, the Company provides the following response:

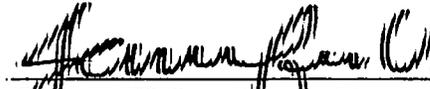
While a driver of energy sales in the Company's service territory is new and existing data centers, and the Company has seen significant interest, it is important to note that "significant interest" does not necessarily mean that those customers expressing interest will locate in the DOM LSE service territory.

- e) For forecasted load associated with data centers, see the Company's response to Staff Set 2-16. The Company does not break down the data center forecast between DOM Zone and DOM LSE.
- f) See the Company's response to Staff Set 2-16.
- g) The Company has no additional data to provide pertaining to historical or forecast data center loads in the DOM Zone.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 42 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to customer relations.



William Blackburn
Director - Customer
Communication & Emergency

The following response to Question No. 42 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to energy efficiency programs.

Michael T. Hubbard
Manager, Energy Conservation
Virginia Electric and Power Company

The following response to Question No. 42 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to load forecasting.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 42

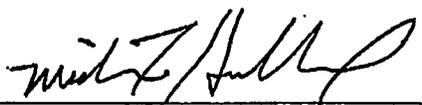
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 42 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to customer relations.

Stan Blackwell
Director – Customer Solutions
Dominion Energy Virginia

The following response to Question No. 42 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to energy efficiency programs.



Michael T. Hubbard
Manager, Energy Conservation
Virginia Electric and Power Company

The following response to Question No. 42 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to load forecasting.

Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 42

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Has the Company researched whether the owners of the existing or anticipated data centers are making efforts to become more energy efficient? What has the Company assumed about efficiency improvements over time at these facilities? Provide all supporting documents.

Response:

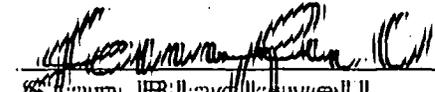
While Company representatives have had anecdotal conversations with data center customers regarding their efforts to become more energy efficient, the Company has not conducted formal research in this area since these facilities are largely exempt from participation in the Company's energy efficiency programs.

As such, the Company's current forecasting methodology makes no explicit assumptions regarding future data center efficiency improvements beyond what may be the trend in existing data centers efficiency embedded in its historical regression analysis.

180820160

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 43(a) of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to customer relations.


Karim Siamer
Director, Construction
Dominion Energy

The following response to Question No. 43(b) of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to load forecasting.


Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 43 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision as it pertains to legal matters.


Karim Siamer
Director, Construction
Dominion Energy

Question No. 43

Is the Company aware whether the owners of any of the existing or anticipated data centers have expressed intentions to increasingly rely on renewable sources of energy?

- a) If so provide all such documents.
- b) Explain how such intentions are taken into account in the 2018

Response:

The Company objects to the request as vague, overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks information regarding "intentions" of third-party data center owners of which the Company may be "aware." The Company further objects to this request to the extent it seeks confidential customer information. Notwithstanding and subject to the foregoing, the Company provides the following response:

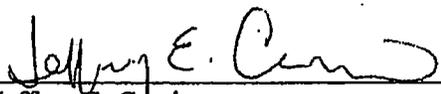
- a) The Company objects to this request as overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "all such documents" without limitation. The Company further objects to this request to the extent it seeks confidential customer information. Notwithstanding and subject to these objections, the Company provides the following response.

While not specifically aware of whether the owners of any of the existing or anticipated data centers have expressed interest have expressed intentions in increasingly relying on renewable sources of energy, the Company is generally aware of an increased interest in renewable sources of energy expressed by all of its customer segments. It is important to note, however, that Dominion Energy Virginia is not the only source of renewables for customers. Many of our customers achieve 100% renewables by securing world-wide RECs. Customers sometimes share their goals and ask what the Company can provide, but it is the Company's experience that these customers meet their needs from a variety of sources.

- b) See the Company's responses and objections to this question above. In general, the integrated resource planning ("IRP") process, including development of sales and load forecasts, takes into account only quantifiable, proven, and firm parameters. "Intentions" do not constitute observable quantity and, as such, are not part of the Company's IRP process or modeling.

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
First Set

The following response to Question No. 44 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on May 29, 2018 has been prepared under my supervision.


Jeffrey E. Currier
Manager – Planning & Analysis
Virginia Electric and Power Company

Question No. 44

Reference page 52: “As a PJM member, the Company is a signatory to PJM’s Reliability Assurance Agreement, which obligates the Company to own or procure sufficient capacity to maintain overall system reliability.”

- a) Provide a specific citation to the Reliability Assurance Agreement for an obligation for the Company to own or procure capacity.
- b) Provide a specific citation to the Reliability Assurance Agreement for the determination of the quantity of capacity the Company believes it is obligated to own or procure.
- c) Confirm that this obligation requires no action to own or procure capacity by the Company, because the obligation is satisfied through the RPM auction and resulting assignment of capacity obligations to LSEs. If not confirmed, explain.

Response:

- a) Article 7 of PJM’s Reliability Assurance Agreement (“RAA”), which is available at <https://www.pjm.com/directory/merged-tariffs/raa.pdf>, outlines the provisions for forecasted pool requirements and unforced capacity obligations. The following are the experts from the RAA that appear relevant to the question:

7.1 Forecast Pool Requirement and Unforced Capacity Obligations.

- (a) The Forecast Pool Requirement shall be established to ensure a sufficient amount of capacity to meet the forecast load plus reserves adequate to provide for the unavailability of Generation Capacity

Resources, load forecasting uncertainty, and planned and maintenance outages. . . .

7.2 Responsibility to Pay Locational Reliability Charge.

Except to the extent its capacity obligations are satisfied through the FRR Alternative, each Party shall pay, as to the loads it serves in each Zone during a Delivery Year, a Locational Reliability Charge for each such Zone during such Delivery Year. The Locational Reliability Charge shall equal such Party's Daily Unforced Capacity Obligation in a Zone, as determined pursuant to Schedule 8 of this Agreement, times the Final Zonal Capacity Price for such Zone, as determined pursuant to Attachment DD of the PJM Tariff.

7.3 LSE Option to Provide Capacity Resources.

A Party obligated to pay a Locational Reliability Charge for a Delivery Year may partially or wholly offset amounts it must pay for such charge by offering Capacity Resources for sale in the Base Residual Auction or an Incremental Auction applicable to such Delivery Year; provided such resources clear such auctions. . . .

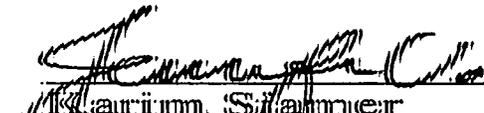
Article 1 of the RAA provides the definitions applicable to the RAA.

- b) See the response to subpart (a) of this question. Additionally, the RAA outlines the requirement for the load to pay a Locational Reliability Charge, which is defined by the RPM auction process. The resulting volume and price from the auction process for the applicable delivery area dictates the cost charged to the LSE for purchasing capacity vis-a-vis the Locational Reliability Charge. This is effectively the procurement of capacity from the RPM auction to service the LSE requirement. At the same time, the generation fleet is offered into PJM as a means to offset the load procurement obligation in the RPM market as described in Article 7.3 of the RAA.
- c) The Company confirms that this obligation requires no action or procure capacity by the Company because the obligation is satisfied through the RPM auction and resulting assignment of capacity obligations to LSEs.

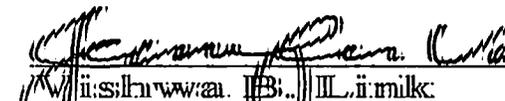
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Fourth Set

The following response to Question No. 4A-1 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 14, 2018 has been prepared under my supervision.


William S. Hamner
Lead Economist,
Lead Researcher
Dominion Energy Services, Inc.

The following response to Question No. 4A-1 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 14, 2018 has been prepared under my supervision.


William S. Hamner
Lead Economist,
Lead Researcher
Dominion Energy Services, Inc.

Question No. 4A-1.

Reference Attachment ER Set 1-4(a) (KS).

- a) The Company has adopted a "Bass Diffusion model" equation to forecast data center loads (pp. 6-7). Provide all documents of which the Company is aware documenting use of the Bass Diffusion model for forecasting adoption of a new technology years into the future (as distinguished from describing past adoption, or near term adoption).
- b) Reference p. 8 ("The Bass Diffusion equation is fit to the historical annual Data Center MW loads..."). Explain how the equation was fit, including how the particular values of the equation's "Innovation" and "Imitation" parameters were selected and on what basis. Provide all workpapers associated with this process to fit the equation.

- c) Reference p. 8. Explain why 2040 was selected as the date on which the “limiting value” was reached. Were other end dates evaluated? Provide all analysis supporting the selection of 2040.
- d) Reference p. 8 (“The historical monthly Data Center MWh sales and MW peak series are each regressed onto the monthly centered moving average of the diffusion-based index curve generated in step 1)).” Provide detailed information about the exact regressions that were performed. Provide the equations and identify the exact input data ranges that were used.

Response:

- a) The Company objects to this request as overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks “all documents of which the Company is aware documenting use of the Bass diffusion model” without limitation. Notwithstanding and subject to these objections, the Company provides the following response:

See the Rebuttal Testimony of Eric Fox filed on September 8, 2017, in the Company’s 2017 Plan proceeding, Case No. PUR-2017-00051, which is publicly available on the Commission’s website at <http://www.scc.virginia.gov/docketsearch#caseDocs/137173>.

- b) The goal in projecting data center sales is to design imitation values and innovation values such that the theoretical adoption curve (i.e., the output of the bass diffusion model, shown as the blue line on the chart in tab TrendCalc on Attachment Staff Set 2-16 (KS)) is a close “fit” to the historical indexed data center capacity (red line). These imitation and innovation values are selected through numerical calibration, such that the projections “fit” as close possible to the historical. The workpapers supporting these calibrations are provided in Attachment Staff Set 2-16 (KS).
- c) Neither the year 2040 or any other year was “selected” so as to determine the maximum index value of 1.0. Rather, 2040 was merely noted as the year at which the calibrated Bass curve attained the index value of 1.0.
- d) The Company regresses historical monthly data center sales (see Attachment Staff Set 2-16 (KS), DC_BSALES tab, Column D, 08/2010-07/2017) onto the monthly centered moving average of the diffusion-based index curve (see Attachment Staff Set 2-16 (KS), DC_BSALES tab, Columns F and G, 08/2010-07-2017). Regression results are presented in Attachment ER Set 4A-1 (KS).

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(b) The Company adopted the values determined by Itron, and provided in the report attached to the rebuttal testimony of Eric Fox. See the Rebuttal Testimony of Eric Fox filed on September 8, 2017, in the Company's 2017 Plan proceeding, Case No. PUR-2017-00051, which is publicly available on the Commission's website at <http://www.scc.virginia.gov/docketsearch#caseDocs/137173>. See also Confidential Attachment ER Set 4A-4(a) (KS).

(c) The Company adopted the values determined by Itron, and provided in the report attached to the rebuttal testimony of Eric Fox. See the Rebuttal Testimony of Eric Fox filed on September 8, 2017, in the Company's 2017 Plan proceeding, Case No. PUR-2017-00051, which is publicly available on the Commission's website at <http://www.scc.virginia.gov/docketsearch#caseDocs/137173>. See also Confidential Attachment ER Set 4A-4(a) (KS).

(d) CostIdx data is not used in the analysis.

(e) Mr. Fox of Itron was provided historical monthly data centers sales up to and including August 2017 and the 2017 data centers five-year plan. For its 2018 Plan modeling, the Company updated historical monthly data centers to include September and October of 2017 and an updated version of its internal five year plan. See the Company's response to ER Set 4A-2(a).

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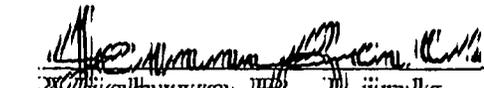
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 3 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.



Kenneth S. Smith
Legal, Economic, and
Environmental Services
Dominion Energy Services, Inc.

The following response to Question No. 3 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision as it pertains to legal matters.



Michael W. Woods
Attorney at Law
Woods & Associates, P.C.

Question No. 3

Reference the response to ER 1-36(a).

- a) Admit or deny that the Company has no research or analysis supporting its forecast of incremental new data center loads beyond the response to Staff Set 2-16.
- b) If the Company denies as to part (a), provide all such research and analysis.

Response:

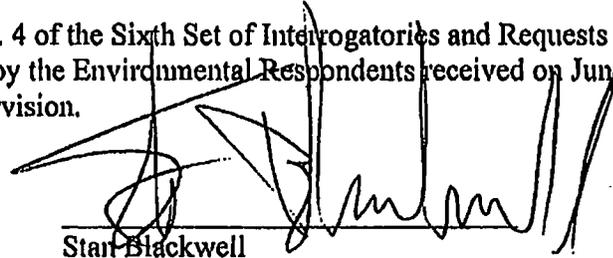
The Company objects to this request to the extent it appears the Environmental Respondents are attempting to serve requests for admission on the Company which is inconsistent with 5 VAC 5-20-260. Under the Commission's Rules of Practice and Procedure, Requests for Admission are only allowed in a proceeding pursuant to 5 VAC 5-20-280, which is "Discovery Applicable Only to 5 VAC 5-20-90 Proceedings."

See the Company's objections and response to ER Set 1-36(a-c). The data center load forecast is derived using a Bass Diffusion Model, which is a standard modeling approach for forecasting the adoption of new technologies.

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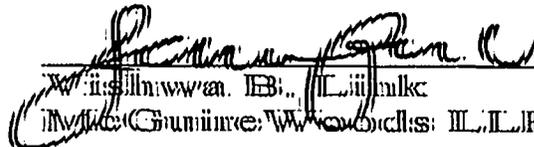
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 4 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.



Star Blackwell
Director – Customer Solutions
Dominion Energy Virginia

The following response to Question No. 4 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision as it pertains to legal matters.


www.vep.com | 1-800-468-6262
www.dominionenergy.com | 1-800-468-6262

Question No. 4

Reference the response to ER 1-37(d).

- a) Admit or deny that the Company has no documents or other evidence of the claimed "significant interest in data centers locating in Virginia."
- b) If the Company denies as to part (a), provide all such documents and other evidence.

Response:

The Company objects to this request to the extent it appears the Environmental Respondents are attempting to serve requests for admission on the Company which is inconsistent with 5 VAC 5-20-260. Under the Commission's Rules of Practice and Procedure, Requests for Admission are only allowed in a proceeding pursuant to 5 VAC 5-20-280, which is "Discovery Applicable Only to 5 VAC 5-20-90 Proceedings."

The Company further objects to this request to the extent that it seeks confidential customer information, as was stated in the response to ER Set 1-37, among other objections. Notwithstanding and subject to these objections, the Company provides the following response.

Consistent with Dominion Energy Virginia's Privacy Policy, the Company is committed to

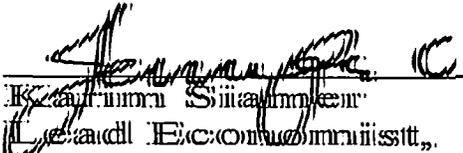
180820160

protecting customers' personal data while providing safe, reliable and affordable services. See <https://www.dominionenergy.com/privacy>. While the underlying data is confidential customer information, at an aggregate level, the Company has 58 potential data center projects with a requested capacity of 1,696 MW as of June 2018. While not all of these potential data center projects will be connected, this is a strong indicator of significant interest in Virginia. Note that the 2018 Plan is based on the 5-year plan developed in October of 2017. The aggregated project information above is as of June of this year.

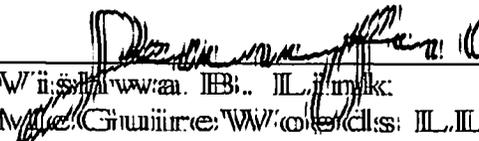
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 5 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


Kenneth S. Williams
Legal Economist,
Dominion Energy Services, Inc.

The following response to Question No. 5 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision as it pertains to legal matters.


William B. Williams
Legal Counsel,
Dominion Energy Services, Inc.

Question No. 5

Reference the response to ER 1-37(g).

- a) Admit or deny that the Company has no other data or analysis pertaining to forecast data center loads in the DOM Zone other than as provided in response to this data request.
- b) If the Company denies as to part (a), provide all additional such data and analysis.

Response:

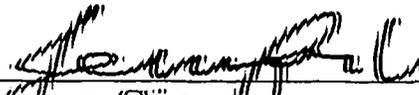
The Company objects to this request to the extent it appears the Environmental Respondents are attempting to serve requests for admission on the Company which is inconsistent with 5 VAC 5-20-260. Under the Commission's Rules of Practice and Procedure, Requests for Admission are only allowed in a proceeding pursuant to 5 VAC 5-20-280, which is "Discovery Applicable Only to 5 VAC 5-20-90 Proceedings."

See the Company's objections and response to ER Set 1-37.

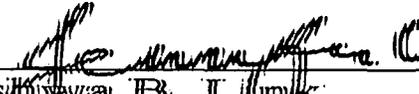
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 6 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


K. William Sittman
Legal Economic Analyst,
Load Research and
Dominion Energy Services, Inc.

The following response to Question No. 6 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision as it pertains to legal matters.


Virginia B. Linn
McGuire Woods LLP

Question No. 6

Reference the response to ER 1-30.

- a) With respect to the methodological differences discussed in Section 2.3 of the 2017 Plan referenced at page 22 of the 2018 Plan, admit or deny that the Company has not performed any analysis of the impact of these methodological differences with regard to the PJM 2018 load forecast and the Company's load forecast used in the 2018 IRP.
- b) If the Company denies as to part (a), provide the analysis with workpapers.

Response:

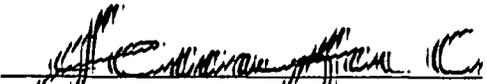
The Company objects to this request to the extent it appears the Environmental Respondents are attempting to serve requests for admission on the Company which is inconsistent with 5 VAC 5-20-260. Under the Commission's Rules of Practice and Procedure, Requests for Admission are only allowed in a proceeding pursuant to 5 VAC 5-20-280, which is "Discovery Applicable Only to 5 VAC 5-20-90 Proceedings."

See the Company's objections and response to ER Set 1-30. See also Sections 2.3 and 6.9 of the 2018 Plan.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 10 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


 Ronnie Bailey
 Managing Environmental Services
 Dominion Energy Virginia

The following response to Question No. 10 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision as it pertains to legal matters.


 Ronnie Bailey
 Managing Environmental Services
 Dominion Energy Virginia

Question No. 10

Reference Attachment ER Set 1-38(RB), page 1, an email from Ronnie Bailey that states, "We continue to try and obtain updated information from NOVEC on their block load data centers. We hope to get that any day and will forward to you as soon as they provide. In the mean time I see no choice but to use their 2016."

- a) Provide the "information" from NOVEC referenced in the email, whose receipt was anticipated "any day."
- b) Provide any other or more recent information the Company has received from NOVEC regarding its data center loads (past or forecast).
- c) Clarify what is meant by "block load data centers." Is this a subset of all data centers?

Response:

(a) The Company objects to this request to the extent it seeks information that was not used to develop the 2018 Plan. Notwithstanding and subject to these objections, the Company provides the following response.

180820160

The Company did not receive the additional "information from NOVEC" referenced as anticipated that was provided to John Reynolds at PJM. In a separate email, the Company did receive from NOVEC its yearly load projections for all its existing substation delivery points, which included some projects for Large Customer Inquiries. See Attachment ER Set 6-10 (RB), which has been redacted of customer information that is confidential to NOVEC.

(b) The Company objects to this request as overly broad, unduly burdensome, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "any other or more recent information," some of which may not have been used to develop the 2018 Plan. Notwithstanding and subject to the foregoing objection, the Company provides the following response.

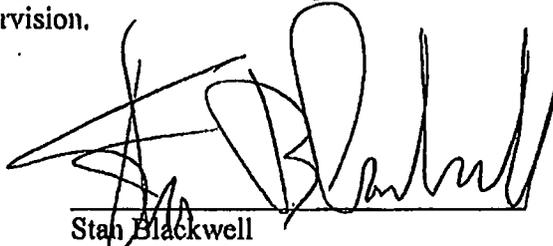
See Company's response to ER Set 4A-6 (b) and (c), and the Company's response to ER Set 6-10 (a) above.

(c) A block load is considered to be an area of concentrated load (e.g. data center campus) where the growth is expected to occur at a faster rate than the growth of the surrounding area or zone.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 12 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.



Stan Blackwell
Director - Customer Solutions
Dominion Energy Virginia

Question No. 12

Request 6-12. Reference the response to ER 1-39.

- a) Is the Company in possession of firm evidence of specific new data centers or data center expansions in 2020 or later years? If so, identify the nature of the evidence (such as contracts) and the total quantity of incremental peak load by year.
- b) Is the Company in possession of firm evidence of specific new data centers or data center expansions in 2019 or later years? If so, identify the nature of the evidence (such as contracts) and the total quantity of incremental peak load by year.

Response:

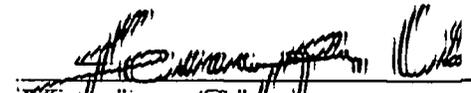
The Company objects to this request as vague, overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks "firm evidence" in the Company's "possession." The Company further objects to this request to the extent it seeks confidential customer information. Notwithstanding and subject to these objections, the Company provides the following response.

See the Company's objections and response to ER Set 6-4.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 13 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


Kenneth S. Summer
Lead Economist,
Dominion Energy Services, Inc.

Question No. 13

Reference the response to ER 4A-1(b) and Attachment ER Set 1-4(a) at p. 7.

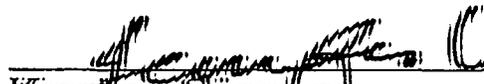
- a) Define "fit" as used in this response.
- b) Identify the measure or measures that were used to evaluate fit.
- c) Identify the time period over which the fit was evaluated.

Response:

- a) The term "Fit" refers to calculation of the values for the parameters of the Bass Diffusion Model ("Bass Model"). A Bass Model adoption curve is "fitted" to historical data center demand data and used to predict future data center demand. In this way, the model provides a reasonable long-term forecast of data center demand growth.
- b) See pages 6-7 of the Rebuttal Testimony of Eric Fox submitted in the 2017 Plan proceeding (Case No. PUR-2017-00051), including his Rebuttal Schedule 1.
- c) 2001-2017

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 14 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


 Kenneth M. Sullivan
 Lead Economist,
 Lead Research and
 Dominion Energy Services, Inc.

Question No. 14

Reference Attachment ER 1-4(a), page 8: "The Bass Diffusion equation is fit to the historical annual Data Center MW loads".

- a) Confirm that Bass Diffusion equation is fit to column W "actual" in Attachment Staff Set 2-16, tab Trend_Calc. If not confirmed, identify the data to which the Bass Diffusion equation was fit.
- b) Confirm that column W "actual" is calculated based on column F "MW_Idx", which in turn is calculated based on column B "DC_MW". If not confirmed, explain your understanding.
- c) Identify the source of the historical data in column B "DC_MW". (Note: the source is not identified in the Itron report referenced in the response to ER 1-38 and other responses, and in any case historical data center data would have been provided to Itron by the Company).
- d) For 2009 and each earlier year in column B "DC_MW" (2001 through 2009), the value is set to 0.9 times the value in the following year. Identify the source of this assumption. Provide the basis for this assumption.

Response:

- a) It is the Company's understanding that the Bass Diffusion equation was not fit to Column W, but column F.
- b) Confirmed.
- c) The Company provided historical DC_MW (as shown in Column B) for the years 2010

through 2016.

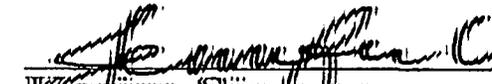
d) Itron is the source for this assumption.

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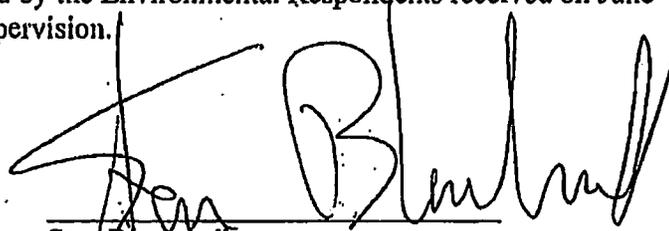
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 15(a-c, e) of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


Elizabeth Slaughter
Lead Economist,
Lead Research and
Dominion Energy Services, Inc.

The following response to Question No. 15(d) of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.


Stan Blackwell
Director – Customer Solutions
Dominion Energy Virginia

Question No. 15

Reference Attachment ER 1-4(a), p. 7: "The primary objective in fitting the Bass Diffusion model is to provide a forecast of Data Center sales that can then be compared to Dominion's internal 5-year anticipated firm Data Center growth which has been trended beyond 2022 at a declining rate of annual growth through 2025 and then at a fixed rate of growth thereafter. The difference between these curves results in the forecast of long-term incremental Data Center sales above that embedded in the estimated base Commercial sales model regression trend and incremental coincident peak loads not embedded in the Peak and Energy Model estimated regression trend."

These sentences suggest that "Dominion's internal 5-year anticipated firm Data Center growth which has been trended beyond 2022 at a declining rate of annual growth through 2025 and then at a fixed rate of growth thereafter" is the same as the forecast of "Data Center sales ... embedded in the estimated base Commercial sales model regression trend."

- a) If this is not correct, please explain.

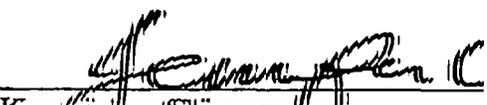
- b) Is "Dominion's internal 5-year anticipated firm Data Center growth..." the column labeled DCSales_Corp in Attachment Staff 2-16, tab DC_BSALES? If not, provide it or identify where in other data requests it can be found.
- c) Is "Data Center sales embedded in the Commercial sales model" the column labeled DCSales_Corp in Attachment Staff 2-16, tab DC_BSALES? If not, provide it or identify where in other data requests it can be found.
- d) Clarify how "Dominion's internal 5-year anticipated firm Data Center growth which has been trended" was prepared, and what it is supposed to represent.
- e) Clarify how "Data Center sales embedded in the Commercial sales model" was prepared, and what it is supposed to represent.

Response:

- a) It is not correct to characterize the internal 5-year forecast the same as the embedded data center sales. The 5-year plan includes both the embedded and the projected firm new data center projects.
- b) It is included. See the rows labelled November 2017-December 2022.
- c) It is not. The "Data Center sales embedded in the Commercial sales model" has not been calculated.
- d) The short-term data center forecast was developed using six different regression models based on historical growth adjusted for future trend expectations. Five of these models were developed for the five largest data center companies within the Company's service territory and contain confidential customer information. The sixth model provided a forecast for all other data centers within the Company's service territory. These six models were then added together to develop the short-term data center forecast.
- e) The Company did not prepare Data Center sales embedded in the commercial sales model. It represents actual data centers sales, corporate five-year data centers plan, and completed with declining growth rate.

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Sixth Set

The following response to Question No. 17 of the Sixth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on June 28, 2018 has been prepared under my supervision.



Kenneth S. Simon
Lead Economist,
Lead Research and
Dominion Energy Services, Inc.

Question No. 17

Reference Attachment Staff Set 2-16, tab Trend_Calc.

- (a) Column J "Cum_Idx" is scaled such that 2009 = 1.0. Explain why 2009 was chosen for this purpose.
- (b) Would the data center forecast be different if a different year was chosen for this scaling (say, 2008, or 2010)? If so, provide the resulting forecasts. If not, explain why not.

Response:

(a-b) The Company adopted the values determined by Itron, which the Company hired in 2017 to review the Company's long-term demand forecasts and develop an independent demand forecast for the Company's load service area. As such, the Company has not conducted analysis regarding an alternative base year.

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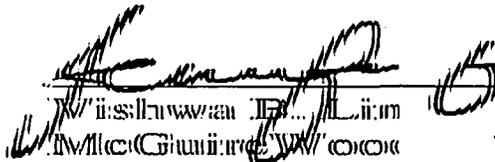
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Ninth Set

The following response to Question No. 2 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 2 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to legal matters.



Question No. 2

Reference the response to ER 6-3: Provide all documents supporting the claim that the Bass Diffusion Model is "a standard modeling approach for forecasting the adoption of new technologies."

Response:

The Company objects to this request as overly broad, unduly burdensome, voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence to the extent it seeks "all documents." Notwithstanding and subject to these objections, the Company provides the following response.

This characterization is based on Itron's use of the Bass Diffusion Model to model data center demand growth which they note is a common approach to fitting an S-shaped curve to new

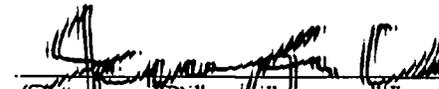
technology adoption when econometric modeling proves inadequate. See the Rebuttal Testimony of Eric Fox submitted in the 2017 Plan proceeding (Case No. PUR-2017-00051), including Section 2.9 of his Rebuttal Schedule 1.

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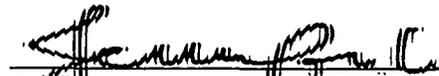
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Ninth Set

The following response to Question No. 3 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision.


Sita B. Blackwell
Director, Customer
Communication Emerg

The following response to Question No. 3 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to legal matters.


William B. Williams
Vice President, General Counsel

Question No. 3

Reference the response to ER 6-4: Provide all documents and “underlying data” supporting the claim that there are 58 potential data center projects with a requested capacity of 1,696 MW.

Response:

The Company objects to this request as overly broad, unduly burdensome and potentially voluminous to the extent it seeks “all documents.” The Company further objects to this request as not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding, as the information regarding the 58 potential data center projects discussed in the Company’s response to ER Set 6-4 was provided in support of the Company’s statements regarding “significant interest in data centers locating in Virginia,” but otherwise was not used by the Company to develop the short-term forecast in the 2018 Plan, due to the speculative nature of the information. Finally, the Company objects to this request to the extent it seeks confidential customer information, as was stated in the response to ER Set 1-37 and in ER Set 6-4, information that the Company cannot release without specific written customer consent by all

180820160

potential customers. Notwithstanding and subject to these objections, the Company provides the following response.

See Attachment ER Set 9-3 (SB) for a spreadsheet listing the 58 projects and their associated capacity. No identifying customer information is included in Attachment ER Set 9-3 (SB). Note that the 1,696 MW figure previously provided in the Company's response to ER Set 6-4 was incorrect. The correct capacity value of the 58 projects is 3,883 MW. This response should be considered as a correction to the Company's prior response to ER Set 6-4.

As a note, these projects represent requests for information and do not represent committed projects. As such, this information is not used to prepare the short-term forecast described in the Company's response to ER Set 6-15(d). All additional customer information is confidential, and cannot be provided by the Company without specific written consent by all potential customers.

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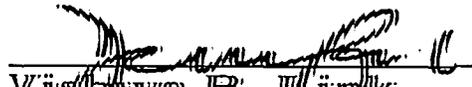
Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Ninth Set

The following response to Question No. 4 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision.



William B. Ilicik
Director - Customer
Customer Service Department

The following response to Question No. 4 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to legal matters.



William B. Ilicik
Director - Customer
Customer Service Department

Question No. 4

Reference the response to ER 6-8, which requested the data provided in Confidential Attachment Staff Set 7-92(b) (Supp 6-26-2018) for each data center customer. Provide the requested load data, without any associated customer identification or customer personal information.

Response:

The Company objects to this request to the extent it seeks confidential customer information, which cannot be provided in any format such that the identity of the customer is protected and cannot be provided without specific written consent by all customers. Notwithstanding and subject to this objection, the Company provides the following response.

Staff Set 7-92(b) requested the “[h]istoric hourly load data for an *existing typical* data center for the period 2014 to present...” (emphasis added), which the Company provided in its supplemental response to (6-26-2018) for a representative data center customer. Providing the

180820160

historical hourly load data "for each data center customer" as requested here, even without providing "any associated customer identification or customer personal information," would allow an informed external party the ability to determine the identity of the customer based on the scale of usage and growth demonstrated by the historical hourly load data, which is itself confidential and proprietary to the Company's customers. Put simply, the historical hourly load data is the "associated customer identification or customer personal information," and cannot be provided without the customers' identities being potentially revealed and cannot be provided without specific written consent by all customers.

180820160

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Ninth Set

The following response to Question No. 5 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to load projections.

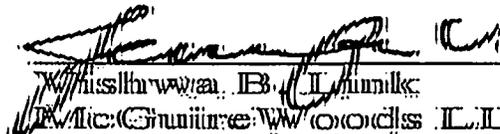


Ronnie Bailey
Manager Planning and Strategic Initiatives
Dominion Energy Virginia

The following response to Question No. 5 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to load forecasts prepared for the 2018 Plan.

Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 5 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to legal matters.


Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 5

Reference the response to ER 6-10, Attachment ER 6-10(RB) (NOVEC load projections).

Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Ninth Set

The following response to Question No. 5 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to load projections.

Ronnie Bailey
Manager Planning and Strategic Initiatives
Dominion Energy Virginia

The following response to Question No. 5 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to load forecasts prepared for the 2018 Plan.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

The following response to Question No. 5 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision as it pertains to legal matters.

Vishwa B. Link
McGuireWoods LLP

Question No. 5

Reference the response to ER 6-10, Attachment ER 6-10(RB) (NOVEC load projections).

- a) Provide the latest load projections, redacted of confidential information, for each of the DOM Zone LSEs (NOVEC, ODEC, CVEC, and NCEMC).
- b) Provide any other forecasts of these entities' sales or peak loads the Company may possess from the past two years.

Response:

(a)-(b) The Company objects to this request as not relevant or reasonably calculated to lead to the production of admissible evidence to the extent it seeks information that was not used to develop the 2018 Plan. The Company further objects to this request as overly broad and unduly burdensome to the extent it seeks "any other forecasts" that "the Company may possess from the past two years," which includes load projections, sales or peak load forecasts potentially containing customer confidential information specific to other DOM Zone LSEs. Notwithstanding and subject to these objections, the Company provides the following response.

The Company provided NOVEC's load projection in response to ER Set 6-10 as a follow up to ER Set 1-38, which requested "all documents and communications between the Company and PJM pertaining to the representation of data center growth in PJM's 2018 forecast for the Dominion Zone." Because an email included in the Company's response to ER Set 1-38 referenced a NOVEC load projection, the Company obtained approval from NOVEC to provide the load projection, with NOVEC's confidential customer information removed. However, as noted in the response to ER Set 6-10 and reiterated here, NOVEC's load projections were not used to develop the load forecast in the Company's 2018 Plan, nor were any other DOM Zone LSEs' load projections or forecasts of sales or peak loads. As noted previously (see, for example, the Company's response to ER Set 1-49), the 2018 Plan was prepared for the DOM LSE and not the DOM Zone; therefore the load projections or forecasts of sales or peak loads of other LSEs in the DOM Zone are not reflected in the load forecast developed in the 2018 Plan.

See the Company's response to ER Set 6-10 for the latest NOVEC load projection available to the Company.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Environmental Respondents
Ninth Set

The following response to Question No. 7 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Environmental Respondents received on July 18, 2018 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 7

Reference the response to ER 6-15(e) ("The Company did not prepare Data Center sales embedded in the commercial sales model.").

- a) Does the commercial sales model embed some data center sales history?
- b) Does the commercial sales model project some data center sales growth?
- c) If the answer is affirmative to both parts (a) and (b), identify the portion of the commercial sales model forecast that is data center sales (embedded, before adjustment).

Response:

(a) Yes.

(b) Yes.

(c) The Company does not identify the amount of data center sales that are embedded in the commercial sales forecast, because the Company models the commercial sales as a bloc.

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Virginia Electric and Power Company
Case No. PUR-2018-00065
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 16 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on May 9, 2018, has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 16

Please provide the Company's historic and forecasted load associated with data centers for the 25-year study period (2018-2043) as an excel spreadsheet with formulas intact.

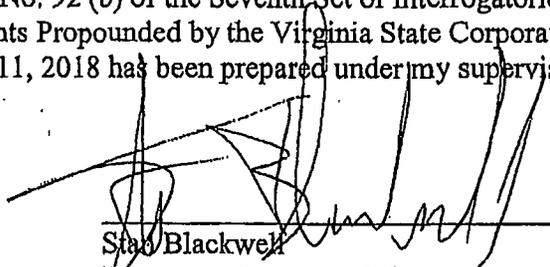
Response:

Historic and forecasted data centers loads and sales are provided in Attachment Staff Set 2-16 (KS). The data center sales can be found in column D of the sheet labeled 'DC_BSALES,' and the data center load in on the same sheet in column I.

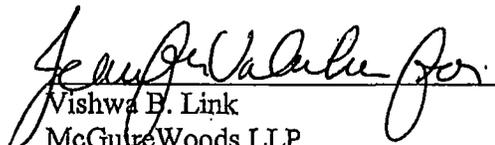
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Virginia Electric and Power Company
Case No. PUR-2018-00065
Virginia State Corporation Commission Staff
Seventh Set

The following response to Question No. 92 (b) of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on June 11, 2018 has been prepared under my supervision.


Stan Blackwell
Director - Customer Solutions
Dominion Energy Virginia

The following response to Question No. 92 (b) of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on June 11, 2018 has been prepared under my supervision as it pertains to legal matters.


Nishwa B. Link
McGuire Woods LLP

Question No. 92

Please provide the following load data for the Dominion LSE as an excel spreadsheet with all formulas intact:

- (b) Historic hourly load data for an existing typical data center for the period 2014 to present;

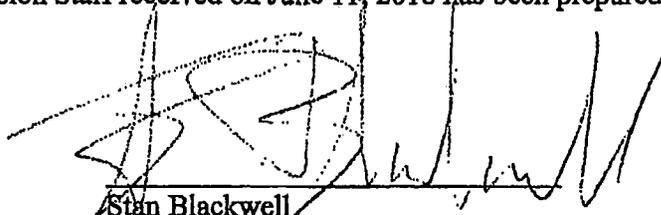
Responses:

- b) The Company objects to this request as vague, overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks historic hourly load data for "an existing typical data center" from 2014 to present that was not used to develop the 2018 Plan. The Company further objects to this request to the extent it would require original work.

180820160

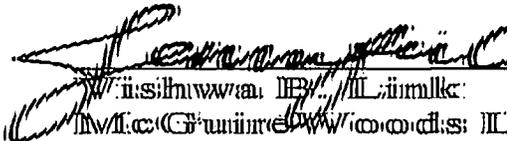
Virginia Electric and Power Company
Case No. PUR-2018-00065
Virginia State Corporation Commission Staff
Seventh Set

The following supplemental response to Question No. 92 (b) (dated June 26, 2018) of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on June 11, 2018 has been prepared under my supervision.



Stan Blackwell
Director – Customer Solutions
Dominion Energy Virginia

The following supplemental response to Question No. 92 (b) (dated June 26, 2018) of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on June 11, 2018 has been prepared under my supervision as it pertains to legal matters.


Dominion Energy Virginia

Question No. 92

Please provide the following load data for the Dominion LSE as an excel spreadsheet with all formulas intact:

- (b) Historic hourly load data for an existing typical data center for the period 2014 to present;

Response:

- b) The Company objects to this request as vague, overly broad, unduly burdensome, potentially voluminous, and not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks historic hourly load data for "an existing typical data center" from 2014 to present that was not used to develop the 2018 Plan. The Company further objects to this request to the extent it would require original work.

See Confidential Attachment Staff Set 7-92(b) (Supp 6-26-2018) for the historic hourly load data of a representative data center customer from 2014 to present. Confidential

Attachment Staff Set 7-92(b) (Supp 6-26-2018) contains confidential information as designated by yellow highlighting and is being provided pursuant to the protections set forth in 5 VAC 5-20-170, the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information entered on May 18, 2018, as modified by the Hearing Examiner's Rulings dated June 7, 2018 and June 14, 2018, any subsequent protective order or protective ruling issued in this proceeding, and the Agreements to Adhere executed pursuant to any such orders or rulings.

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CERTIFICATE OF SERVICE

I hereby certify that the following have been served with a true and accurate copy of the foregoing via first-class mail, postage pre-paid:

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DATED: August 10, 2018