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**Case Name (if known)** Commonwealth of Virginia ex rel. State Corporation  
Commission  
In re: Virginia Electric & Power Company's Integrated  
Resource Plan filing pursuant to Virginia Code §  
56-597 et. seq.

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August 28, 2023

**VIA ELECTRONIC FILING**

Mr. Bernard Logan, Clerk  
c/o Document Control Center  
State Corporation Commission  
1300 E. Main Street  
Richmond, VA 23219

**Re:** *Commonwealth of Virginia ex rel. State Corporation Commission  
In re: Virginia Electric & Power Company's Integrated Resource Plan filing  
pursuant to Virginia Code § 56-597 et. seq.  
Case No. PUR-2023-00066*

Dear Mr. Logan:

On May 1, 2023, Virginia Electric and Power Company submitted its 2023 Integrated Resource Plan ("Plan"). On May 26, 2023, the Commission issued an Order for Notice and Hearing that, among other things, established a procedural schedule authorizing respondents to file direct testimony regarding the Plan. Clean Virginia filed the Direct Testimony of Bryndis Woods, PhD, on August 8, 2023.

After further review, Clean Virginia has determined that certain corrections should be made to Dr. Woods' public pre-filed testimony. Specifically, Clean Virginia has corrected two typographical errors in the Testimony Summary and on page 20 and determined that language appearing on pages 31, 35-37, and 44 should be deleted. These corrections are attached hereto as Attachment A. Dr. Woods will discuss these corrections at the evidentiary hearing, which is scheduled to begin on September 19, 2023. Clean Virginia intends to move the admission of Dr. Woods' testimony, as corrected, into the record at the evidentiary hearing.

Respectfully submitted,

*/s/ William T. Reisinger*

William T. Reisinger

cc: Certificate of Service

**CERTIFICATE OF SERVICE**

I hereby certify that a true copy of the foregoing was served this 28<sup>th</sup> day of August, 2023, by e-mail to:

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/s/ William T. Reisinger

## Summary of the Direct Testimony of Dr. Bryndis Woods

Clean Virginia Witness Bryndis Woods, PhD provides an overview of issues in Virginia Electric and Power Company's 2023 Integrated Resource Plan (IRP), including: environmental justice, Dominion's least-cost plan, load and energy forecast, compliance with the Virginia Clean Economy Act (VCEA), greenhouse gas emission forecasts, cost assumptions regarding coal plants and carbon dioxide (CO<sub>2</sub>) emissions, and stakeholder engagement.

Dr. Woods' testimony addresses failures by the Company in its 2023 IRP to:

- Meet the basic obligations of the VCEA including energy efficiency requirements, renewable energy requirements and fossil fuel retirement requirements;
- Present useful modeling results: The Company fails to identify a preferred plan, a feasible least-cost plan, or present meaningfully distinct modeling results over the planning period as required by the Commission's 2020 IRP Final Order;
- Adequately account for the U.S. Environmental Protection Agency's (EPA) proposed new limits on coal units' CO<sub>2</sub> emissions as part of Section 111(d) of the Clean Air Act and the EPA's proposed Good Neighbor Plan—both of which will impact the Company's coal fleet—or consider a reasonable social cost of carbon; or
- Address environmental justice impacts of its resource planning decisions or conduct any stakeholder engagement as part of the 2023 IRP development.

As a result of these failures, Dr. Woods concludes that the Commission should not find Dominion's 2023 IRP to be reasonable and in the public interest.

Finally, Dr. Woods provides specific recommendations to the Commission concerning the Company's IRPs moving forward. The Commission should:

1. Require that the Company's IRPs consider environmental justice impacts of its resource decisions.
2. Establish a load forecasting working group that is led by the Commission and includes a broad range of representatives.
3. Mandate that Dominion assume new, increasing energy efficiency requirements in every three-year period after 2023-2025.
4. Require that the Company's Alternative Plans meet all its obligations under the VCEA by the dates specified.
5. Require that the Company assess the compliance costs associated with the EPA's proposed new regulations and model a social cost of carbon that is in line with the EPA's most recent proposed price.
6. Order Dominion to commence stakeholder meetings for its next IRP as soon as possible.

1 Dominion's peak load forecast is reduced by 800 MW—an amount greater than the total annual average  
 2 data center growth in each of the last three years. Conversely, there is also the risk that data centers of the  
 3 future will be more energy-intensive than data centers today, due to “rack densification” (i.e. data servers  
 4 allowing for more computing power in less space, therefore becoming more energy-intensive) or higher-  
 5 than-anticipated growth in artificial intelligence.

6 **Q. What would be the consequences of Dominion overestimating or underestimating peak load in its**  
 7 **2023 IRP?**

8 A. The consequences of Dominion overestimating peak load in its 2023 IRP are that the Company would  
 9 overbuild (or procure) generation capacity and overcharge customers for new capacity and associated  
 10 transmission and distribution infrastructure that is not needed to reliably meet demand. For example,  
 11 Dominion's short-term action plan indicates the Company's intentions to build 970 MW of gas-fired  
 12 combustion turbine capacity by 2029. If peak load over the same period is lower than anticipated, this  
 13 fossil fuel-fired generation capacity may not be needed to meet demand, but Dominion's customers would  
 14 pay for it all the same.

15 The consequences of Dominion underestimating peak load in its 2023 IRP are that the Company would  
 16 under build (or procure) generation capacity and be unable to reliably meet customer demand. This has, in  
 17 fact, already happened for some data center customers in Dominion's territory when—in June 2022—  
 18 Dominion told data centers that “new power delivery would be severely limited until January 2026 as it  
 19 temporarily paused hookups for new data centers.”<sup>38</sup>

20 **Q. How does Dominion's IRP load forecast impact other regulatory proceedings?**

21 A. Dominion's load forecast, as established in this IRP proceeding, is a foundational modeling exercise that is  
 22 also highly relevant in other filings, like RPS, RGGI, and DSM filings.<sup>39</sup> Therefore, it is critically important that  
 23 stakeholders and third-party experts have the opportunity to provide input during the development of  
 24 Dominion's load forecast and review a draft load forecast. See my *Conclusions and recommendations* below  
 25 for more detailed recommendations for the Commission regarding stakeholder engagement and a load  
 26 forecasting working group.

27 **V. Dominion's adjustment to PJM's annual energy demand forecast is based on unreasonable**  
 28 **assumptions regarding energy efficiency**

29 **Q. How does Dominion describe its adjustments to PJM's annual energy demand forecast?**

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<sup>38</sup> Peter Cary Piedmont Journalism Foundation. July 20, 2023. “Dominion scrambles to meet soaring power demand.”  
 Fauquier Times. Available at: [https://www.fauquier.com/news/article\\_41838802-2753-11ee-9875-935ae47126fb.html](https://www.fauquier.com/news/article_41838802-2753-11ee-9875-935ae47126fb.html).

<sup>39</sup> See, for example: Appalachian Voices Comments on the 2022 RPS Hearing Examiner's Report. Available at:  
<https://www.scc.virginia.gov/docketsearch/DOCS/7qv701!.PDF>.

1 *Plan B... includes the significant development of solar, wind, and energy storage envisioned*  
 2 *by the VCEA, petitioned by 2035 and built by 2038.*<sup>60</sup>

3 Alternative Plan A complies with the RPS but not the VCEA's renewable energy capacity requirements by  
 4 the dates specified in the VCEA. Alternative Plan B complies neither with the RPS nor the VCEA's renewable  
 5 energy capacity requirements by the dates specified in the VCEA.

6 **Q. Does the Company's Alternative Plan B in fact comply with its renewable energy and energy storage**  
 7 **development requirements under the VCEA?**

8 A. No, the Company's Alternative Plan B does not build sufficient Company-owned capacity to meet the  
 9 VCEA's renewable energy and energy storage development targets for solar and onshore wind by the dates  
 10 required in the VCEA. The Company also presents very inconsistent information about its planned capacity  
 11 additions between its IRP filing and its responses to discovery requests. Plan B fails to build:

- 12 • ~~1,950 MW (the 65 percent non-PPA share of the 3,000 MW target) of solar or onshore wind~~  
 13 ~~capacity by the end of 2024~~
  - 14 ○ ~~According to Figure 2.2.2 in the Company's IRP, Alternative Plan B builds 0 MW of solar~~  
 15 ~~non-PPA and wind capacity by the end of 2024~~
  - 16 ○ ~~According to Staff Set 01-52 Plan B (JLM), Alternative Plan B builds 0 MW of solar non-PPA~~  
 17 ~~and wind capacity by the end of 2024~~
- 18 • 3,900 MW of solar or onshore wind capacity by the end of 2027
  - 19 ○ According to Figure 2.2.2 in the Company's IRP, Alternative Plan B only builds 405 MW of  
 20 solar non-PPA and wind capacity by the end of 2027
  - 21 ○ According to Staff Set 01-52 Plan B (JLM), Alternative Plan B only builds 2,436 MW of solar  
 22 non-PPA and wind capacity by the end of 2027
- 23 • 6,500 MW of solar or onshore wind capacity by the end of 2030
  - 24 ○ According to Figure 2.2.2 in the Company's IRP, Alternative Plan B only builds 2,111 MW of  
 25 solar non-PPA and wind capacity by the end of 2030
  - 26 ○ According to Staff Set 01-52 Plan B (JLM), Alternative Plan B only builds 3,014 MW of solar  
 27 non-PPA and wind capacity by the end of 2030
- 28 • 1,755 MW of storage capacity by the end of 2032
  - 29 ○ According to Figure 2.2.2 in the Company's IRP, Alternative Plan B only builds 720 MW of  
 30 storage capacity by the end of 2032
  - 31 ○ According to Staff Set 01-52 Plan B (JLM), Alternative Plan B only builds 1,615 MW of  
 32 storage capacity by the end of 2032
- 33 • 10,465 MW (65 percent of the cumulative 16,100 MW target) of solar or onshore wind capacity by  
 34 the end of 2035
  - 35 ○ According to Figure 2.2.2 in the Company's IRP, Alternative Plan B only builds 8,314 MW of

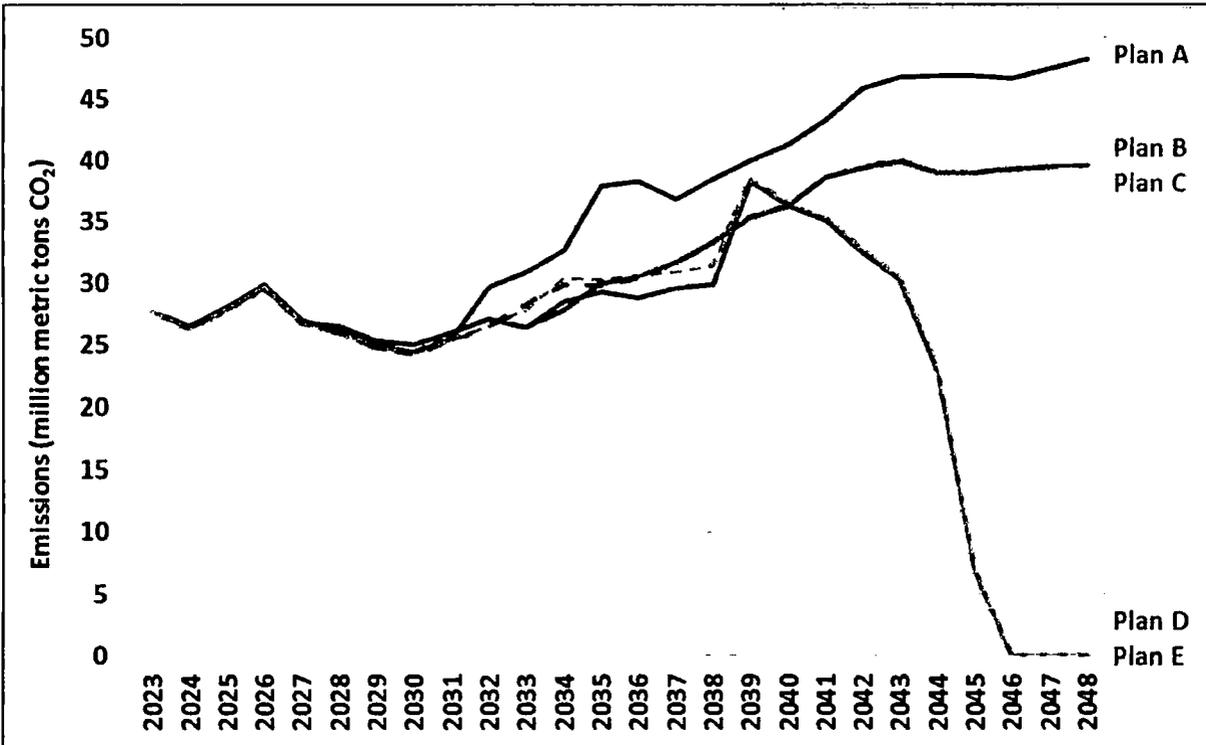
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<sup>60</sup> Ibid. Page 2.

1 another?

2 A. All five Alternative Plans result in nearly identical (within 3 percent) CO<sub>2</sub> emissions over the first nine  
3 years of the planning period (2023 to 2031). Throughout the entire forecast period (2023 to 2048),  
4 Alternative Plans D and E have nearly identical CO<sub>2</sub> emissions, as do Alternative Plans B and C (see Figure  
5 9). Alternative Plan A (Dominion’s least-cost plan) has the highest emissions of all Alternative Plans.

6 **Figure 9. Dominion 2023 IRP CO<sub>2</sub> emissions by Alternative Plan**



7  
8 Data source: Clean Virginia Information Request Set 01-17-i.

9 **Q. How many of Dominion’s Alternative Plans result in emission reductions over the forecast period?**

10 A. Two of the five Alternative Plans presented by Dominion (Plans D and E) result in CO<sub>2</sub> emissions  
11 reductions over the forecast period (by the end of 2048), by retiring all carbon-emitting units currently in  
12 operation.

13 The remaining three Alternative Plans (Plans A, B, and C) result in increased emissions at the end of the  
14 forecast period. Plan A (Dominion’s ‘least-cost’ plan) has the highest associated emissions—increasing by  
15 74 percent between 2023 levels (27.8 million metric tons carbon dioxide) and 2048 levels (48.2 million  
16 metric tons carbon dioxide). Plans B and C emissions increase by 43 percent between 2023 and 2048 (see  
17 Figure 9).

18 ~~Q. Has Dominion reported other projections of its greenhouse gas emissions that are inconsistent with~~  
19 ~~its 2023 IRP?~~

1 A. Yes. Clean Virginia's information request set 01-17-i asked the Company to refer to its emissions Figure  
2 2.2.6 and provide "a breakdown of emissions by Plan, by resource, and by year throughout the entire  
3 planning period." Dominion's response reports higher CO<sub>2</sub> emissions in 2038 than those reported in the  
4 2023 IRP for all Alternative Plans. For Alternative Plans A, B, and C emissions reported in 01-17-i are higher  
5 than those in the IRP through 2048 (see Table 4).

6 **Table 4. Dominion 2023 IRP reported CO<sub>2</sub> emissions by Alternative Plan**

	2038		2048	
	IRP	Info Request	IRP	Info Request
Plan A	34.9	38.5	43.8	48.2
Plan B	30.2	33.3	35.9	39.6
Plan C	30.3	33.4	36.0	39.6
Plan D	27.2	30.0	0.0	0.0
Plan E	28.5	31.4	0.0	0.0

7  
8 *Sources: 1) Clean Virginia Information Request Set 01-17-i; 2) Dominion 2023 IRP, Figure 2.2.6—System CO<sub>2</sub> Output*  
9 *from Company Fleet for Alternative Plans (based on current technology).*

10 The emissions data Dominion provided in response to an information request about its 2023 IRP emissions  
11 Figure 2.2.6 are inconsistent with the data represented in the IRP itself.

12 **Q. Which Alternative Plans does the Company claim comply with the VCEA requirement of retiring all**  
13 **carbon-emitting generating units by 2045?**

14 A. The Company claims that Alternative Plans D and E comply with the VCEA requirement to retire all  
15 carbon-emitting generating units by the end of 2045. The primary difference between the two plans—as  
16 described by Dominion—is that Alternative Plan E selects new resources on a least-cost optimization basis  
17 without regard for VCEA requirements:

18 *Plan D...retires all Company-owned carbon-emitting generation by the end of 2045,*  
19 *resulting in zero carbon dioxide ("CO<sub>2</sub>") emissions from the Company's fleet in 2046.*

20 *Plan E...is like Plan D in retiring all Company-owned carbon-emitting generation by the end*  
21 *of 2045. Plan E differs from Plan D in that all new generation resources were selected on*  
22 *a least-cost optimization basis without regard for the development targets for solar, wind,*  
23 *and energy storage resources in Virginia established through the VCEA.<sup>71</sup>*

24 **Q. Is Dominion correct in claiming that Alternative Plans D and E comply with its VCEA requirement to**  
25 **retire all carbon-emitting generating units by 2045?**

26 A. No. Alternative Plans D and E do not comply with the VCEA requirement to retire all carbon-emitting  
27 generating units by the end of 2045. Plans D and E both retain 153 MW of biomass-fired generating

<sup>71</sup> Dominion Energy. 2023. "Integrated Resource Plan." Page 3.

1 capacity as well as a 970 MW gas-fired combustion turbine beyond December 31, 2045—both of which  
 2 are carbon-emitting resources.<sup>72</sup> Dominion maintains that these plans can be interpreted as having zero  
 3 carbon emissions due to the Company's assumption that its 970 MW gas-fired CT will be "hydrogen  
 4 capable by 2045."<sup>73</sup>

5 **Q. Dominion states that Alternative Plan E differs from plan D because it does not select resources "with  
 6 regard for the development targets for solar, wind, and energy storage resources in Virginia established  
 7 through the VCEA."<sup>74</sup> Does Alternative Plan D's resource selection in fact comply with VCEA renewable  
 8 energy and energy storage capacity development targets?**

9 A. No, the Company's Alternative Plan D does not build sufficient Company-owned capacity to comply with  
 10 the VCEA renewable energy and energy storage capacity development targets on time. In fact, Plan D  
 11 builds exactly the same amount of non-PPA solar, onshore wind, and storage capacity between 2024 and  
 12 2035 as Plan B, that as shown in Figure 8 above, does not timely comply with VCEA requirements. It is also  
 13 important to note that—regardless of whether we compare Plans B and D using Figures 2.2.2 and 2.2.4  
 14 from the Company's IRP or the Company's responses to Staff's information request set 01-52 which  
 15 contain inconsistent information regarding the Company's planned capacity additions—Plans B and D have  
 16 identical solar, wind, and storage capacity additions between 2024 and 2035.

17 **Q. Did the Company consider costs associated with converting a gas-fired CT plant to run on hydrogen  
 18 fuel?**

19 A. Yes, in the Company's response to Clean Virginia information request set 01-16c, Dominion noted that it  
 20 "included estimated costs to convert facilities for hydrogen blending of approximately \$500/[kilowatt] in  
 21 Plans D and E to support the net zero goals of those plans."<sup>75</sup>

22 **Q. On what basis did the Company assume \$500 per kilowatt to convert 970 MW of gas-fired combustion  
 23 turbine capacity to run on hydrogen fuel?**

24 A. The Company did not have a source for hydrogen conversion costs and so used \$500 per kilowatt as a  
 25 proxy value, without any basis. In the Company's response to Clean Virginia information request set 02-22b  
 26 requesting the Company to provide the basis for its \$500 per kilowatt assumption, Dominion stated that:  
 27 "The estimated costs to convert facilities for hydrogen blending in 2045 is not yet known due to the future  
 28 nature of the technology. Therefore, the Company used the \$500/kW estimate in Plans D and E as a high-  
 29 level proxy value. The Company will continue to review costs as the technology develops and will update  
 30 the estimated costs in future IRPs as more cost information is available."<sup>76</sup>

31 **Q. Did the Company consider any other costs associated with running a gas-fired CT plant on hydrogen**

<sup>72</sup> Staff Information Request Set 01-52.

<sup>73</sup> Dominion Energy. 2023. "Integrated Resource Plan." Page 24.

<sup>74</sup> Ibid. Page 3.

<sup>75</sup> Clean Virginia Information Request Set 01-16c.

<sup>76</sup> Clean Virginia Information Request Set 02-22b.

1 A. No, Dominion's Plans D and E are not consistent with the VCEA, even if the Company's 970 MW gas-fired  
 2 CT plant is assumed to be "hydrogen capable" by 2045. Not only is the prospect of running Dominion's  
 3 proposed gas-fired CT on hydrogen wholly speculative, but even if Dominion assumes that it would be  
 4 feasible and cost-effective to run the CT on 100 percent green hydrogen, the plant would still emit NO<sub>x</sub> and  
 5 be at risk of leaking hydrogen resulting in indirect greenhouse gas emissions.

6 ~~Q. With the exception of the 970 MW gas-fired CT plant, does all remaining carbon-emitting capacity~~  
 7 ~~retire by the end of 2045 in Alternative Plans D and E?~~

8 ~~A. No, Alternative Plans D and E also retain 153 MW of biomass-fired generating capacity after 2045,<sup>95</sup>~~  
 9 ~~which is also a carbon-emitting resource.~~

10 ~~Q. Does the Company provide any explanation about how retaining biomass-fired capacity beyond 2045~~  
 11 ~~in Alternative Plans D and E is consistent with its claim that the Plans comply with VCEA's obligation to~~  
 12 ~~retire all carbon-emitting capacity?~~

13 ~~A. No, the Company does not provide any explanation about how retaining biomass-fired capacity beyond~~  
 14 ~~2045 in Alternative Plans D and E is consistent with its claim that the Plans comply with VCEA's obligation~~  
 15 ~~to retire all carbon-emitting capacity.~~

16 ~~Q. In Alternative Plans D and E, when does all carbon-emitting capacity (except the 970 MW gas-fired CT~~  
 17 ~~and 153 MW of biomass-fired capacity) retire?~~

18 A. According to the Company's response to Staff information request set 01-52, Alternative Plans D and E  
 19 have an identical fossil fuel-fired capacity retirement schedule: No retirements occur before 2039, with the  
 20 exception of 245 MW of gas-fired capacity scheduled for retirement in 2025. (Note that this is inconsistent  
 21 with the information provided in the Company's Figures 2.2.4 and 2.2.5 in its IRP, which does not show any  
 22 planned retirements in 2025 for either Alternative Plans D or E). For both Alternative Plans D and E, 11,370  
 23 MW of coal, gas-fired CT and gas-fired combined cycle (CC) capacity remains online until 2038 (see Table  
 24 5). The first coal retirement will take place in 2040.

25 Table 5. Retirements of coal, gas CT and gas CC capacity in Dominion's Alternative Plans D and E

	2023-2038	2039	2040	2041	2042	2043	2044	2045
Gas CT	-245	0	0	-1,005	0	-782	0	-604
Gas CC	0	-594	-155	0	-1,195	0	0	-4,370
Coal	0	0	-439	0	0	0	-1,617	-610
Total	-245	-594	-593	-1,005	-1,195	-782	-1,617	-5,584

26  
 27 Source: Staff Information Request Set 01-52.

28 ~~Q. What are the consequences of modeling 98 percent of planned retirements over a seven-year period~~  
 29 ~~in Alternative Plans D and E?~~

<sup>95</sup> Staff Information Request Set 01-52.