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SIERRA CLUB

September 5, 2023

Mr. Bernard Logan, Clerk
c/o Document Control Center
State Corporation Commission
Tyler Building – First Floor
1300 East Main Street
Richmond, Virginia 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 August 8, 2023, the Sierra Club filed the **Public Version** of the Direct Testimony of Devi Glick. In responding to Virginia Electric and Power Company's Second Set of Discovery Requests to the Sierra Club, we determined that certain revisions to Ms. Glick's Direct Testimony were necessary. Attached for filing is a redlined version of Ms. Glick's Direct Testimony. The Sierra Club intends to move the admission of Ms. Glick's Direct Testimony, as corrected, into the record at the evidentiary hearing, which begins on September 19, 2023.

Sincerely,

Dorothy E. Jaffe
Managing Attorney
Sierra Club
50 F Street NW, Floor 8
Washington, D.C. 20001
dori.jaffe@sierraclub.org

Copied by Electronic Mail:
Commission
Service List

CERTIFICATE OF SERVICE

In accordance with the Commission's April 1, 2020 Order Requiring Electronic Service in Case No. CLK-2020-0007, I hereby certify that a true copy of the foregoing was served this 5th day of September, 2023 by e-mail to:

Lisa R. Crabtree
Paul E. Pfeffer
Lisa.crabtree@dominionenergy.com
Paul.e.pfeffer@dominioneenrgy.com

Vishwa B. Link
Nicole Allaband
Mary Lynne Grigg
Nicolas A. Dantonio
vlink@mcguirewoods.com
nallaband@mcguirewoods.com
mgrigg@mcguirewoods.com
ndantonio@mcguirewoods.com

Kiva Bland Pierce
Arlen Bolstad
Kiva.pierce@scc.virginia.gov
Arlen.bolstad@scc.virginia.gov

C. Meade Browder, Jr.
R. Scott Herbert
John E. Farmer
mbrosder@oag.state.va.us
jfarmer@oag.state.va.us
sherbert@oag.state.va.us

S. Perry Coburn
Timothy McCormick
Christian F. Tucker
pcoburn@cblaw.com
tmccormick@cblaw.com
ctucker@cblaw.com

William T. Reisinger
will@reisingergooch.com

Sheila Jane Weimer
sweimer@culpepercounty.gov

Mark W. DeLaquil
Glenn S. Benson
mdelaquil@bakerlaw.com
gbenson@bakerlaw.com

Nate Benforado
Will Cleveland
Josephus Allmond
Grayson Holmes
Rachel James
nbenforado@selcva.org
wcleveland@selcva.org
jallmond@selcva.org
gholmes@selcva.org
rjames@selcva.org

Jasdeep S. Khaira
Gregory D. Habeeb
habeeb@gentrylocke.com
khaira@gentrylocke.com

Eric M. Page
Cody T. Murphey
epage@eckertseamans.com
cmurphey@eckertseamans.com

Brian R. Greene
Eric W. Hurlocker
Eric J. Wallace
Victoria L. Howell
BGreene@greenehurlocker.com
ehurlocker@greenehurlocker.com
ewallace@greenehurlocker.com
vhowell@greenehurlocker.com

/s/ Dorothy Jaffe

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

COMMONWEALTH OF VIRGINIA, *ex rel.*

STATE CORPORATION COMMISSION

Case No. PUR-2023-00066

In re: Virginia Electric and Power Company's 2023 Integrated Resource Plan filing pursuant to Virginia Code § 56-597 *et seq.*

DIRECT TESTIMONY of

DEVI GLICK

on behalf of the

SIERRA CLUB

Revised August 30, 2023
(Redlined Version)

(PUBLIC VERSION)

Revised August 30, 2023

Summary of the Direct Testimony of Devi Glick

Dominion's 2023 Integrated Resource Plan presents the first look at the Company's plan to address the dramatic data center load growth that it expects to see over the next few decades. This data center load growth is the main driver of the results Dominion presents in this IRP – mainly the need for substantial new capacity and for the Company to keep its existing coal and gas resources online.

Dominion's Plan B (the closest the Company has to a "Preferred Plan") includes a sizable quantity of new clean energy resources, new gas combustion turbines (CT), and small modular reactors (SMR). In this Plan, Dominion also extends the life of its aging fossil units at the Virginia City Hybrid Energy Center (VCHEC), Clover and Mt. Storm - some of which previously had near-term retirement dates- beyond 2045. Because of its continued reliance on fossil resources, Plan B falls far short of both the VCEA requirement to retire all carbon-emitting resources by 2045 and the RPS requirement for renewable generation. Ratepayers will then be on the hook for large RPS penalties incurred from Dominion failing to meet its RPS, and large ongoing investments in capital and maintenance required to keep its aging fossil units online. Ratepayers could also be on the hook for large stranded-asset costs at the new fossil plants that Dominion is planning to build in Plan B if the plants are still carbon-emitting by 2045.

My independent modeling examines three scenarios: (1) Dominion Plan B, which fixes the resources from Dominion's Plan B; (2) Synapse Optimized, which optimizes resource additions and retirement dates and relaxes the build limit on solar PV and battery storage; and (3) Synapse 111 (d)-Compliant, which also uses the relaxed build limits and retires VCHEC, Clover, and Mt. Storm by 2035 to achieve compliance with the Environmental Protection Agency's proposed Clean Air Act Section 111(d) rules. I find that Dominion's decision to push back the retirement dates of its existing coal plants to meet data center load growth is not in the best interest of ratepayers. If Dominion retires the three plants, and builds incremental solar PV and battery storage, it will reduce CO_2 emissions and save ratepayers between ~~$4.1~~ **$1.8** (based on Dominion renewable costs) and ~~$9.0~~ **$7.7** billion (based on the National Renewable Energy Lab Annual Technology Baseline costs) over the 25-year study period.

I recommend that the Commission require Dominion to revise its 2023 IRP by (1) lifting or easing the build limits it has placed on solar PV and battery storage, and justifying the limit it chooses; (2) modeling the impact of the proposed 111(b) and (d) rule on its existing and proposed new fossil resources; and (3) testing a lower cost sensitivity for solar PV and battery storage resources to reflect the market trend in falling renewable energy costs. Dominion should then re-run its model with these updated assumptions and allow the model to choose from among the clean energy resources available.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION AND PURPOSE OF TESTIMONY

Q Please state your name and occupation.

A My name is Devi Glick. I am a Senior Principal at Synapse Energy Economics, Inc. (Synapse). My business address is 485 Massachusetts Avenue, Suite 3, Cambridge, Massachusetts 02139.

Q Please describe Synapse Energy Economics.

A Synapse is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, ratemaking and rate design, electric industry restructuring and market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government agencies, and utilities.

Q Please summarize your work experience and educational background.

A At Synapse, I conduct economic analysis and write testimony and publications that focus on a variety of issues related to electric utilities. These issues include power plant economics, electric system dispatch, integrated resource planning, environmental compliance technologies and strategies, and valuation of distributed energy resources. I have submitted expert testimony before state utility regulators in more than a dozen states.

In the course of my work, I develop in-house models and perform analysis using industry-standard electricity power system models. I am proficient in the use of spreadsheet analysis tools, as well as optimization and electric dispatch models. I have directly run EnCompass and PLEXOS and have reviewed inputs and outputs for several other models.

Before joining Synapse, I worked at Rocky Mountain Institute, focusing on a wide range of energy and electricity issues. I have a master's degree in public policy and a master's degree in environmental science from the University of Michigan, as well as a bachelor's degree in environmental studies from Middlebury College. I have more than 10 years of professional experience as a consultant, researcher, and analyst. A copy of my current resume is attached as Exhibit DG-1.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of Sierra Club.

Q Have you testified previously before the State Corporation Commission of Virginia?

A Yes, I submitted testimony in Case No. PUR-2023-00005, Case No. PUR-2022-00006, and Case No. PUR-2018-00195—all cases in which Virginia Electric and Power Company (Dominion or the Company) requested recovery of costs associated with environmental controls and compliance. I also submitted testimony in Case No. PUR-2022-00051, Appalachian Power Company's Integrated Resource Planning (IRP) docket.

Q What is the purpose of your testimony in this proceeding?

A In this proceeding, I review Dominion's 2023 Integrated Resource Plan (2023 IRP) and evaluate its final portfolios, modeling methodology, and input assumptions. I then present the results of Synapse's alternative clean energy analysis. Synapse's 111(d)-Compliant Clean Energy scenario meets the Company's high load forecast and complies with the Virginia Clean Economy Act (VCEA) while retiring the Clover, Mt. Storm, and Virginia City Hybrid Energy Center (VCHEC) power plants earlier, building substantially less new gas capacity, emitting less carbon dioxide (CO_2), and resulting in a lower cost to ratepayers than Dominion's preferred resource plan.

Q How is your testimony structured?

A In Section 2, I summarize my findings and recommendations for the Commission.

In Section 3, I review Dominion's resource plan. I summarize the major themes in this IRP, specifically data center load growth and VCEA compliance. I describe Dominion's resource portfolios, its findings on resource additions and retirements, and its modeling methodology. I discuss how the Company's projection of data center load growth is driving the need for substantial new capacity and is driving the need to keep existing coal and gas resources online.

In Section 4, I present the results of Synapse's alternative analysis. I describe our modeling tool and its capabilities. I describe the scenarios and sensitivities we modeled, and outline our input assumptions with a focus on where our

assumptions aligned with Dominion's and where they differed. I present the results of Synapse's modeling and show how our results compare to the results the Company presented. I explain the drivers of the differences between Synapse's modeling results and Dominion's.

In Section 5, I provide more context and detail on the sticky issues facing Dominion in this IRP: these include data center load growth, compliance with Virginia's renewable portfolio standards (RPS), and solar siting, as well as the U.S. Environmental Protection Agency's (EPA) proposed Greenhouse Gas Standards and Guidelines for Fossil-Fuel-Fired Power Plants issued under Section 111 of the Clean Air Act (Section 111 Rules). I will discuss the implications of the proposed Section 111 Rules, as well as other proposed environmental regulations, on the future of gas and coal development in the United States.

Q What information do you rely upon for your analysis, findings, and observations?

A My analysis relies primarily on the workpapers, exhibits, and discovery responses of Dominion's witnesses. I also rely on other publicly available documents and data, which I cite throughout my testimony.

2. FINDINGS AND RECOMMENDATIONS

Q Please summarize your findings.

A My primary findings are:

1. Dominion's projections around data center load growth are driving Dominion to maintain its existing coal and gas plants throughout the entire 15-year planning period and build a substantial quantity of new generation resources on its system in all its alternative portfolios.

2. Dominion's RPS requirements under the VCEA grow as its load grows. To meet this requirement, in all its alternative portfolios, Dominion must build a substantial quantity of new renewables, or else pay a large RPS compliance penalty.

3. In Dominion's Portfolio B, the Company continues to operate its coal plants at Clover, Mt. Storm, and VCHEC, as well as the majority of its existing gas plants throughout the planning period; the Company falls far short of meeting the RPS; and it does not meet the requirement to retire all carbon-emitting resources by 2045 under the VCEA.

4. Synapse's independent modeling analysis shows that, with the inclusion of the newly proposed section 111 requirements, retiring Clover, VCHEC, and Mt. Storm earlier than Dominion plans in its Plan B will result in lower CO_2 emissions; this earlier retirement will reduce costs for Dominion's ratepayers by between ~~$4.1~~ **$1.8** and ~~$9.0~~ **$7.7** billion over the 25-year study period.

5. Dominion put strict build limits on the quantity of solar PV and battery storage that the model could build in each year and did not justify this constraint with any data or analysis to support such a restriction. As a

result of these limitations, the model maxed out the amount of solar PV that it was allowed to add starting in 2031, and the amount of battery storage it was allowed to add starting in 2036.

6. Dominion erroneously calculated its RPS requirements and understated the RPS penalties associated with falling short of its RPS requirements in each portfolio by around $1 billion.

7. With the implementation of regulations under Section 111 of the federal Clean Air Act (Section 111 Rules), the cost to build and operate new gas plants and maintain existing coal plants will be substantially higher than Dominion projected and modeled in its IRP.

Based on those findings, I offer the following recommendations:

1. Dominion should revise its IRP by (1) relaxing the annual build limits on solar PV and battery storage that it imposed on the model, and by adding long-duration battery storage as a resource option; (2) including sensitivities that test lower capital costs for new solar PV and battery storage resources; (3) testing early retirement dates for its coal plants at VCHEC, Clover, and Mt. Storm.

2. Dominion should correct its RPS requirement calculations and update its RPS penalty costs associated with each portfolio.

3. Dominion should begin issuing All-Source RFP's and focus its near-term resource planning efforts on obtaining as much new renewable capacity and energy as soon as possible.

4. Due to the massive impact this proposed rule will have on ratepayers, Dominion should revise its IRP to reflect the proposed 111(b) and (d) requirements by modeling capacity factor limits, the cost to co-fire on natural gas, the cost to co-fire on hydrogen, and the cost to install carbon capture and storage (CCS) on existing and proposed new fossil resources.

3. DOMINION'S PREFERRED RESOURCE PORTFOLIO

Q How is Dominion's 2023 IRP different than the last full IRP it filed in 2020?

A Dominion's prior full IRP, the 2020 IRP, was the Company's first resource plan that modeled compliance with the VCEA. The VCEA mandates that Dominion produce 100 percent of its energy from carbon-free sources by 2045. It also sets development targets for solar PV, wind, battery storage, and energy efficiency, and requires the retirement of all carbon-emitting resources, with exceptions only for threats to grid reliability.

In the time since the Company filed its 2020 IRP, there have been several significant changes in the market and the regulatory field. Specifically, the Biden Administration enacted the Inflation Reduction Act, which provides tax incentives for renewables and battery storage, data center load has exploded in the region and is driving Dominion's projections of significant future load growth, and

the Biden administration proposed the Greenhouse Gas Standards and Guidelines for Fossil-Fuel-Fired Power Plants, which aim to limit CO_2 and other greenhouse gas emissions under Section 111 of the federal Clean Air Act. Dominion modeled the IRA and high load growth in this IRP; however, the Section 111 Rules were only recently proposed and thus were not modeled in the IRP.

Q Which of Dominion's portfolios do you focus on for your analysis?

A Dominion presents five resource plans labeled A through E. My testimony addresses only Plan B and Plan D, as those are the only two that comply with the renewable build limits in the VCEA. We use Plan B as the baseline for comparison with the Synapse alternative portfolio. The main difference between Plan B and D over the next 15 years is that Plan D retires all carbon-emitting resources by 2045, in compliance with the VCEA mandate to retire all carbon-emitting resources by 2045, while Plan B does not. Plan B also relies on a large quantity of new natural gas to meet growing load while Plan D relies on more small modular nuclear reactors (SMR) and a larger increase in capacity import limits.[1]

Q Please summarize the resource retirements Dominion modeled over the next 15 and 25 years in Plan B.

A Dominion modeled no coal or gas plant retirement for the next 15 and 25 years in Plan B beyond the 1,804 MW of capacity at Yorktown 3 and Chesterfield 5 and 6,

1 Dominion 2023 IRP at 26, 28.

which will retire in 2023. As shown in Table 1 below, this deviates from the Company's modeling in its 2020 IRP where it modeled the retirement of over 3,000 MW of capacity. This included 439 MW of coal capacity at Clover in 2025; 165 MW of gas capacity at Rosemary in 2027; and 153 MW of biomass capacity at the Altavista, Hopewell, and Southampton sites in 2028.

Table 1. Unit Retirements from Dominion's 2020 IRP Alternative Plan B and 2023 IRP

Year	Unit in 2020 IRP (MW)	Unit 2023 IRP (MW)
2023	Yorktown 3 (790 MW) Chesterfield 5 and 6 (1,014 MW)	Yorktown 3 (790 MW) Chesterfield 5 and 6 (1,014 MW)
2024		
2025	Clover 1 and 2 (439 MW)*	
2026		
2027	Rosemary (165 MW)	
2028	Altavista (51 MW) Hopewell (51 MW) Southampton (51 MW)	
2029 - 2038		
Total	**3,184 MW (2035 Total)**	**1,804 MW**

* *Note: Dominion planned to retire Clover in 2025 in both its 2021 and 2022 IRP updates. The 2023 IRP is the first time the Company has presented a later retirement date for the Plant.*

Q When does Dominion plan to retire its existing fossil units?

A As stated above, in Plan B, Dominion doesn't retire any other fossil units during the 15- or 25-year study periods in Plan B—though it does retire some of the units

in the 25-year window in Plan D.[2] Instead, Dominion states that it plans to keep its gas and coal plants online to provide energy and capacity to meet its growing data center load and maintain reliability while expanding renewable generation[3] (the Company plans to keep the three biomass units online so it can use the renewable energy credits for RPS compliance).[4] This is concerning as (1) the Company's own 10-year net present value (NPV) analysis shows that Rosemary and VCHEC—plants Dominion plans to keep operating for the next two decades—have negative ten-year cash flows;[5] and (2) the VCEA requires the retirement of all carbon-emitting resources by 2045 (with an exception for reliability reasons).[6]

Q What resources did Dominion add to its system in Plan B?

A In Plan B, Dominion added resources to meet the VCEA target of 16,100 MW of solar and/or onshore wind resources and 2700 MW of storage resources by 2038.[7] Dominion also included in Plan B two tranches of offshore wind, the first of which is under construction and scheduled to come online in 2027; 2910 MW of new gas

2 *Id.*

3 *Id.* at 23-24.

4 *Id.* at 82.

5 *Id.* at 83.

6 *Id.* at 81.

7 Company's Response to Commission Staff Discovery Request No. 9-194, attached as Exhibit DG-2.

combustion turbines (CT); and 804 MW of new SMRs. Table 2 below shows the annual resource additions by resource type through 2038.

Table 2. Capacity Additions in Dominion Plan B (MW)

Year	Solar PPA	Utility PV	Solar DER	Wind	Storage	Gas CT	SMR (Nuclear)	Capacity Purchase
2024								1,100
2025								1,100
2026								1,600
2027	210	390	15	2,600				700
2028	231	429	30	260	90	970		200
2029	231	429	45		120			600
2030	252	468	45		150			900
2031	315	585	111	60	180			1,300
2032	315	585	111		180			1,800
2033	315	585	111	2,600	240			1,600
2034	315	585	111	60	240		268	1,900
2035	315	585	114		270	485		2,100
2036	315	585	114		300	485	268	2,100
2037	315	585	114	60	300	485		2,300
2038	315	585	114		300	485	268	2,600
Total	**3,444**	**6,396**	**1,035**	**5,640**	**2,370**	**2,910**	**804**	**21,900**

Source: Dominion 2023 IRP at 26.

Notes: 2600 MW of offshore wind is currently under construction and is scheduled to come online in 2027. The second tranche of offshore wind was programmed into the model in 2033. Also, the solar capacity does not include CE-1, CE-2, and CE-3 resources.

Q How did Dominion create the portfolio of resources it presents in Plan B?

A Dominion used PLEXOS, a model designed for capacity optimization and dispatch. In Plan B, Dominion programmed into PLEXOS VCEA development

targets through 2038,[8] one set of CTs at Chesterfield[9] that it plans to bring online in 2027, and a second tranche of offshore wind in 2033. The remaining resources, specifically the CTs beyond 2035 and the SMRs, were selected endogenously by the model based on a least-cost optimization.[10] Dominion also allowed the model to increase capacity imports during the study period. In Plan B, Dominion purchased over 4 GW of capacity in 2041 and beyond, and in Plan D, Dominion purchased over 10.8 GW of capacity and 14 GW of energy in 2045 and beyond.[11]

Dominion allowed the PLEXOS model to optimize retirement dates for its existing fossil resources.[12] This is an improvement in the Company's modeling approach from its 2020 IRP where Dominion did not allow the model to optimize resource decisions and instead programmed in all resource retirements and

8 Dominion did not provide clarity on the exact resources it modeled for VCEA compliance. *See*, *e.g.*, Exhibit DG-2; Company's Response to Appalachian Voices Discovery Request No. 3-6, attached as Exhibit DG-3; Company's Response to Clean Virginia Discovery Request No. 3-28, attached as Exhibit DG-4.

9 Company's Response to Commission Staff Discovery Request No. 1-23, attached as Exhibit DG-10.

10 *See* Exhibits DG-2, DG-3.

11 Dominion 2023 IRP at 23–24.

12 *See* Company's Response to Sierra Club Discovery Request No. 2-12(a), attached as Exhibit DG-5.

additions without consideration for whether earlier retirements of other resource additions would be more economic.[13]

Q Should Dominion adopt an optimized portfolio as its preferred plan?

A Not necessarily. The use of optimized capacity expansion modeling is critical to the IRP process, but does not ensure the best outcome for ratepayers. A model is not a replacement for thinking critically and asking the right questions. An optimized model run will produce the lowest cost portfolio under a specific set of circumstances. But an optimization will not automatically show you all the other alternative portfolios that maintain reliability without materially increasing costs to ratepayers, or under slightly different assumptions. To see that solution set, Dominion must ask the model to test specific alternative portfolios.

In an environment with this level of uncertainty around load and future regulations, I would never recommend that Dominion blindly adopt the optimized portfolio without critically evaluating and understanding the level of uncertainty and risk inherent in its assumptions and testing alternative scenarios.

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13 Sierra Club Witness Rachel Wilson advocated for the Company to optimize the capacity expansion functions of PLEXOS during the 2020 IRP process. *See Commonwealth ex rel. State Corporation Commission in re: Virginia Electric & Power Company's Integrated Resource Plan Filing*, Case No. PUR-2020-00035, Direct Testimony of Rachel Wilson on Behalf of Sierra Club (September 14, 2020), available at https://tinyurl.com/y9t3784x.

Based on Dominion's current inputs and load growth assumptions, in Plan B the model showed that keeping Clover and Mt. Storm online beyond 2045 was part of Dominion's optimized portfolio. But if Dominion tested an earlier retirement scenario, as Synapse did in our portfolio, it should find that early retirement is actually very close in cost to the Company's optimized portfolio. And with slightly different assumptions, such as the relaxation of the build limit, an alternative portfolio may be lower in cost than the original optimized portfolio.

Q What constraints did Dominion place on the model in creating Portfolio B?

A Dominion placed an annual build limit on most resources, including 300 MW/year for battery storage,[14] and 900 MW/year for solar PV.[15] This build limit constrained the resources added in later years, as the model maxed out solar additions in every year after 2030 and storage in every year after 2035.[16]

4. SYNAPSE'S CLEAN ENERGY SCENARIOS

Q Please describe the modeling exercise that Synapse completed relating to Dominion's 2023 IRP.

A For the Synapse analysis I used the EnCompass capacity optimization and dispatch model to simulate resource choice and impacts in Dominion's service

14 Dominion 2023 IRP at 73.

15 *Id.* at 66.

16 *Id.* at 26.

territory. The model was developed by Anchor Power Solutions and covers all facets of power system planning, including:

- Short-term scheduling, including detailed unit commitment and economic dispatch, with modeling of load shaping and shifting capabilities;
- Mid-term energy budgeting analysis, including maintenance scheduling and risk analysis;
- Long-term integrated planning, including capital project optimization, economic generating unit requirements, and environmental compliance; and
- Market price forecasting for energy, ancillary services, capacity, and environmental programs.

Q Is the EnCompass model used throughout the power sector?

A Yes. The model is currently used by a number of major investor-owned utilities. These include Minnesota Power, Otter Tail Power, Excel Energy (in Minnesota, New Mexico, Colorado, and Texas), Great River Energy, Duke Energy (in the Carolinas and Indiana), and Public Service Company of New Mexico.

Q Describe the scenarios that Synapse modeled.

A Synapse modeled three scenarios: one as a baseline, one as an alternative clean energy optimized scenario that is not compliant with the proposed Section 111 Rules, and one clean energy scenario that is compliant with those Rules.

- **Dominion Preferred** fixes all of Dominion's Plan B resource additions and retirements in the year modeled by the Company. Synapse ran this scenario

to compare the resulting revenue requirement of the Company's preferred resource portfolio to Synapse's clean energy portfolios.

- **Synapse Optimized** increases the build limits for solar PV and battery storage, ~~offers~~ **builds** a third tranche of offshore wind ~~to the model~~, tests an earlier retirement date for Clover to align with 111(d) compliance, and then re-optimizes the retirement dates for VCHEC. We also allowed the model to select long-duration battery storage, and modeled Mercury Air Toxins compliance costs at Mt. Storm. The EnCompass model optimizes the remaining resources additions and retirements, subject to the VCEA. We also tested a sensitivity with lower capital costs for clean energy resources.

- **Synapse 111(d)-Compliant Clean Energy** is identical to the Synapse Optimized scenario except it hard-codes the retirement of both Clover and Mt. Storm in the 2030s so as to comply with proposed Section 111 Rules.

Q How do Synapse's input assumptions and model parameters compare to the ones Dominion used?

A To ensure our results were comparable to Dominion's, we maintained as many of Dominion's assumptions as possible in our scenarios.[17] Specifically, we used Dominion's assumptions for peak and annual energy, load shape, reserve margin,

17 With the time constraints in this docket, Synapse did not have an opportunity to independently evaluate each of the assumptions it incorporated from Dominion's modeling; we opted instead to focus on and modify only a few of the Company's assumptions, so as to isolate their impacts and ensure our results were comparable.

the first two offshore wind unit project additions, distributed solar additions, commodity prices (fuel, CO_2, and hourly energy market prices), resource capacity values, resource maximum capacity factors, resource capital costs, and sustaining capital costs at Dominion's thermal units.[18] We did not increase the import limits during the study period as Dominion did; instead we tested high renewable build limits. Table 3 shows the sources we relied on for our modeling.

18 For solar PV and offshore wind, we inadvertently used resource shapes from the Horizons Energy National Database for the PJM Dominion region instead of Dominion's internal resource shapes. This should have little effect on the modeling results, however, because the resource shapes used were still for the region.

Table 3. Synapse EnCompass Modeling Input Sources

Item	Source
Load Forecast	Attachment Staff Set 01-41 (KS) Attachment Sierra Club Set 02-04 (JLM)
Reserve Margin	Appendix 4I: Required Reserve Margin (Plan B)
Coal Prices	Attachment Sierra Club Set 05-01(b) (WWJ)
Gas Prices	Attachment Sierra Club Set 04-01 (WWJ)
RGGI Prices	Attachment APV Set 06-04(d-s) (WWJ)
Market Energy Prices	Attachment Sierra Club Set 05-04 (WWJ)
Onshore Wind Costs	Attachment CV Set 01-10(f) (CJR) (ES)
Offshore Wind Costs	Attachment CV Set 01-10(f) (CJR) (ES)
Solar Costs	Attachment CV Set 01-10(f) (CJR) (ES)
Battery Costs	Attachment CV Set 01-10(f) (CJR) (ES)
50-Hour Battery Costs	McKinsey & Company / Long Duration Energy Storage Council, *Net-Zero Power: Long Duration Energy Storage for a Renewable Grid* (November 2021), available at https://tinyurl.com/mrny7rz4.
New Gas CT Cost	Attachment CV Set 01-10(f) (CJR) (ES)
SMR Cost	Attachment CV Set 01-10(f) (CJR) (ES)
Heat Rates	Attachment APV Set 06-04(a-c)(t-y) (JLM) ES-CONF
Firm Capacity Ratings	Attachment CV 01-03(f) (JLM) CONF
Existing Resource FOM & VOM Costs	Attachment CV Set 01-03(f) (JLM) CONF
Resource Build Limits	Attachment CV 01-10(f)(CJR) ES CORRECTED
RPS Requirement	Attachment Staff Set 01-44 (JLM)
Starting RPS Bank	Response to Staff Set 03-100
ELCC Values	Attachment Staff Set 01-34 (JLM)
Renewable Capacity Factors	Attachment APV Set 06-04(a-c)(t-y) (JLM) (ES)
Financial Parameters (WACC)	Attachment Sierra Club 02-11 (JLM) (ES)
Interconnection / Integration Costs	Dominion 2023 IRP at 61

Note: Many of these input sources include voluminous spreadsheet data. As such, the input sources are not attached as exhibits to this testimony but can be provided to the Commission and properly-authorized parties upon request.

Q Which of Dominion's inputs or assumptions are you most concerned about?

A I am concerned that Dominion is unnecessarily restricting renewable deployment in the region and over-stating renewable costs. Dominion provided no tangible analysis to justify its renewable build limits,[19] therefore I relaxed the constraint in my alternative portfolios. For renewable costs, I relied on Dominion's assumptions in my two scenarios to ensure a valid comparison between the base and alternative portfolios. I then added a sensitivity that used the National Renewable Energy Laboratory (NREL) Annual Technology Baseline (ATB) 2023 lower costs assumptions for all scenarios. I am also concerned that Dominion did not include long-duration battery storage in its modeling.

Q Why did you conduct a sensitivity with lower solar and storage capital costs?

A When I compared Dominion's cost projections to the 2023 ATB report, I found that Dominion's costs for solar PV and battery storage were substantially higher than industry projections. Extraordinarily Sensitive Figure 1 below shows the comparison of the costs Dominion modeled (the costs we included in our base scenarios) and the NREL ATB costs that we modeled in a sensitivity. I modeled this sensitivity because I believe Dominion's cost projections are too high in light of trends in falling renewable costs, and with movement on interconnection reform.

19 Company's Response to Commission Staff Discovery Request No. 1-65, attached as Exhibit DG-6.

Extraordinarily Sensitive Figure 1. Comparison of Dominion and NREL ATB Solar and Storage Capital Costs

[BEGIN EXTRAORDINARILY SENSITIVE]

[END EXTRAORDINARILY SENSITIVE]

Sources: NREL ATB 2023; Dominion Response to CV 1-10(f), Attachment CV Set 01-10(f) (CJR) (ES). This document contains voluminous spreadsheet data in numerous tabs and can be produced upon request.

Q Does Dominion incorporate the recently proposed Section 111(d) and (b) Rules in its modeling?

A No. The proposed Section 111 Rules came out after Dominion filed its IRP. Regardless of timing, those rules will have a significant impact in limiting future emissions from new and existing fossil plants and require costly capital expenditures. Therefore, I considered them in designing the Synapse alternative scenarios.

Q How does the retirement timeline in the Synapse Optimized scenario compare to the timeline in Dominion's Plan B?

A In Plan B, Dominion's model did not retire VCHEC during the study period. In the Synapse Optimized scenario, the model chose to endogenously retire VCHEC as soon as it was allowed to in 2027. In Dominion's Plan B, no other gas or coal plants, including Clover and Mt. Storm, endogenously retired within the study period. In the Synapse Optimized scenario, the model also did not choose to endogenously retire the Clover or Mt. Storm coal plants prior to 2040. Table 4 below shows the coal plant retirement dates for each scenario.

Table 4. Coal Plant Retirement Dates by Scenario (End of Year)

Unit	Dominion Plan B	Synapse Optimized	Synapse 111(d)-Compliant
Clover Units 1-2	None		2031
VCHEC	None	2026	2026
Mt. Storm Unit 1	None		2032
Mt. Storm Unit 2	None		2033
Mt. Storm Unit 3	None		2034

Q Why doesn't the model choose to retire Clover in 2025 in either Plan B or Synapse's Optimized scenarios?

A With the large data center load growth that Dominion projects, combined with Dominion's renewable and battery storage build limits, Dominion needs much more energy and capacity than it did when it modeled its 2020 IRP. Without factoring in the proposed Section 111 Rules, the Company keeps its coal plants online longer and uses them to provide additional energy and capacity to meet this

data center load. But these results are not all that useful, because with the proposed Section 111 Rules, Dominion cannot run its coal plants through 2045 without changing its operations or making major investments for natural gas co-firing or CCS conversion. Both of these plants have retirement dates past 2040 in Plan B, therefore they would both be required to install CCS by 2030 to operate through their planned retirement dates.

Q Did you test a scenario with earlier retirement dates for Clover and Mt. Storm?

A Yes, in the Synapse 111(d)-Compliant Clean Energy scenario, I assumed Clover would retire by 2032 to avoid any investments or changes related to Section 111 and that Mt. Storm would reduce its capacity factor and retire with a staggered schedule by 2035 to avoid CCS investments.[20] The revenue requirement results of these early retirement scenarios were very similar to the revenue requirement for the optimized scenarios.

20 We assumed Mt. Storm would not choose the co-fire on gas compliance pathway to stay online through 2040 due to the need to build out additional new gas infrastructure for that option.

Q Did Dominion present other analyses on the economics of existing fossil units?

A Yes. The Company conducted a 10- and 25-year cash flow analysis for each of its existing units.[21] In Plan B, VCHEC had a negative cash flow ranging from -$119 to -$305 million over the next 10 years under the low, base and high capacity price forecasts. Clover and Mt. Storm both also have negative cash flows under a low capacity price forecast but have positive cashflows in the base and high scenarios.

Q What are the risks of keeping VCHEC, Clover, and Mt. Storm online until Dominion's modeled retirement dates beyond 2045?

A There are risks to reliability of continued reliance on thousands of MW of aging coal capacity. **[BEGIN CONFIDENTIAL]** [redacted][22] **[END CONFIDENTIAL]** Confidential Figure 2 below shows the recent historical and projected capacity factors for Dominion's coal-fired power plants.

21 Dominion 2023 IRP at 83.

22 Calculated based on the Company's Response to Clean Virginia Discovery Request No. 1-03(f), Attachment CV Set 01-03(f) (JLM) CONF. This document contains voluminous spreadsheet data in numerous tabs and can be provided to the Commission and properly authorized parties upon request.

Confidential Figure 2. Historical and Projected Capacity Factors for Dominion's Coal Plants

[BEGIN CONFIDENTIAL]

[END CONFIDENTIAL]

Sources: Company's Response to Clean Virginia Discovery Request No. 01-04, Attachment CV Set 01-04(a)(b)(c)(d)(l)(m)(JLS); Company's Response to Clean Virginia Discovery Request No. 1-03(f), Attachment CV Set 01-03(f)(JLM) CONF. These documents contain voluminous spreadsheet data in numerous tabs and can be provided to the Commission and authorized parties upon request.

Dominion's projections of increasing utilization are concerning because coal units become more costly to maintain as they age and are more likely to break down and require repairs. Mt. Storm Units 1-3 came online in 1965, 1966, and 1973 and are almost 60 years old, while the Clover units came online in 1995 and 1996 and are nearly 30 years old.[23] By the end of the study period, the Mt. Storm plant will be

23 Dominion 2023 IRP Appendix 5A.

around 80 years old and the Clover plant will be around 50 years old. As shown in Confidential Table 5 below, outages rates at the Company's coal plants over the past five years (2018–2022, and the first half of 2023) have been **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** than the Company's fleet average outage rates. Each plant has had an outage rate above 10 percent in at least one of the past five years. As the plants age, it is expected that they will need to be shut down more often for repairs.

Confidential Table 5. Equivalent Forced Outage Rates for Dominion's Coal Plants vs. Fleet Average

	2018	2019	2020	2021	2022	2023	Avg.
Clover 1	3.1%	15.9%	11.8%	41.7%	1.2%	0.5%	12.3%
Clover 2	1.1%	7.6%	10.9%	7.8%	4.6%	7.9%	6.6%
Mt. Storm 1	2.6%	8.4%	3.9%	15.3%	15.2%	5.4%	8.5%
Mt. Storm 2	10.2%	11.4%	14.6%	4.0%	6.8%	0.9%	8.0%
Mt. Storm 3	14.3%	2.4%	6.2%	2.5%	11.0%	8.5%	7.5%
VCHEC	12.0%	10.5%	0.6%	1.7%	14.0%	0.1%	6.5%

[BEGIN CONFIDENTIAL]

[redacted]

[END CONFIDENTIAL]

Sources: Company Response to Clean Virginia Discovery Request No. 01-04, Attachment CV Set 01-04(a)(b)(c)(d)(l)(m)(JLS); Company's Response to Appalachian Voices Discovery Request No. 05-44(a), Attachment APV Set 05-44(a) (JEC) CONF. These documents contain voluminous spreadsheet data in numerous tabs and can be provided to the Commission and authorized parties upon request.

Q How do the resource additions compare between Dominion Plan B and the Synapse Optimized and 111(d)-Compliant Clean Energy scenarios?

A The Synapse scenarios add more renewables and less gas capacity than Dominion's Plan B. Table 6 below shows total installed capacity additions as of 2038 for Dominion's Plan ~~D~~ **B**, Synapse's Optimized scenario, and Synapse's 111(d)-Compliant Clean Energy scenario. I also show the change in resource builds with NREL ATB costs used in place of Dominions costs; the resource builds in the Dominion Plan B are the same under both sets of cost assumptions.

Table 6. Comparison of Total Capacity in the Synapse Modeled Scenarios with Dominion Renewable Costs, 2038 (GW)

Resource Type	Dominion Plan B	Synapse Optimized		Synapse 111(d)-Compliant	
	DOM / ATB	DOM	Δ ATB	DOM	Δ ATB
Nuclear	4.3	3.5	-	3.5	-
Coal	2.7	2.1	-	0.0	-
Gas	13.0	12.3	-2.6	12.8	-3.1
Hydro	0.3	0.3	-	0.3	-
Biomass / Landfill / Other	0.2	0.2	-	0.2	-
Utility Solar	11.6	14.6	+14.2	15.3	+13.6
DG Solar	0.2	0.2	-	0.2	-
Pumped Hydro	1.8	1.8	-	1.8	-
Offshore Wind	5.2	7.8	-2.6*	7.8	-
Onshore Wind	0.3	0.3	-0.1	0.4	-0.2
Battery Storage	2.4	2.4	+4.8	3.3	+5.4
Total	**42.0**	**45.5**	**+13.6**	**45.5**	**+15.6**

**Note: Offshore wind project shifted from 2035 to 2039 in the optimized scenario; although that project does not appear in this table, it is still selected by the model in this scenario.*

In the Synapse scenarios, with the relaxation of the build limits on solar and battery storage, the model retires more coal and builds more clean energy resources than is seen in Dominion's Plan B. When I used the more realistic NREL ATB costs assumptions, the model built less gas capacity and more solar PV and battery storage as part of the least-cost resource mix in both the Synapse Optimized and the Synapse 111(d)-Compliant Clean Energy scenarios. The model also shifted back the third offshore wind project by a few years and instead opted to build more solar PV and battery storage earlier in the planning period.

Q How do the resource additions differ by year between Dominion Plan B and the Synapse 111(d)-Compliant Clean Energy scenarios?

A As shown in Table 7, the resource build-outs are different between the Synapse 111(d)-Compliant Clean Energy scenario and Dominion's Plan B, and the mix shifts even more away from firm capacity resources[24] and to clean energy resources when NREL ATB costs are used for renewables in place of Dominion's cost assumptions.

24 I modeled a CT as a placeholder for a firm capacity resource because the costs and operational characteristics of CTs are relatively well known. We anticipate, however, that Dominion will have access to an increasing array of technologies capable of providing firm capacity without the environmental impacts and fuel considerations of gas CTs.

Table 7. Annual Cumulative Capacity Additions (MW) by Resource Type

	Dominion Plan B			Synapse 111(d)-Compliant Clean Energy Scenario					
				Dominion Costs			ATB Costs		
Year	Firm Capacity Resource	Utility Solar	Battery Storage	Firm Capacity Resource	Utility Solar	Battery Storage	Firm Capacity Resource	Utility Solar	Battery Storage
2023									
2024									
2025									
2026									
2027		600						1,800	
2028	1,046	1,257	90				0	3,591	
2029	1,046	1,911	210				0	5,973	
2030	1,046	2,621	360		2,400		0	8,343	
2031	1,046	3,508	540	523	4,788		0	10,701	720
2032	1,046	4,391	720	1,046	4,864		0	13,048	1,920
2033	1,046	5,269	960	2,615	4,840		0	15,383	3,120
2034	1,046	6,142	1,200	3,138	4,816	120	0	17,706	4,320
2035	1,569	7,012	1,470	3,138	6,211	700	0	20,017	5,520
2036	2,092	7,876	1,770	3,138	8,580	700	0	22,317	6,720
2037	2,615	8,737	2,070	3,138	10,938	1,900	0	24,606	7,880
2038	3,138	9,593	2,370	3,138	13,283	3,100	0	26,883	8,640

Note: In all three scenarios, the model adds 2 tranches of 2,600 MW of offshore wind in each of 2027 and 2033. In the 111(d)-Compliant scenarios, the model adds a third tranche in 2035 (assuming Dominion renewable costs) and 2038 (NREL ATB renewable costs).

In Plan B, Dominion hard-codes in the addition of one set of new CTs in 2028,[25] and the model endogenously adds several more beginning in 2035. Plan B also adds 9,840 MW of solar PV, 5,200 MW of off-shore wind, 300 MW of onshore wind, and 2,370 MW of storage by 2038.

25 *See* Exhibit DG-3.

In the Synapse 111(d)-Compliant Clean Energy scenario, the model does not start adding firm capacity resources until after 2030 using Dominion cost assumptions, and the model waits until after 2038 (beyond the planning period) when I use the more realistic and current NREL ATB cost assumptions. By 2038, the model adds over 13,200 MW of solar PV, 7,800 MW of offshore wind, 400 MW of onshore wind, and 3,170 MW of battery storage. This is 3,000 MW more solar and 500 MW more battery storage than in Dominion Portfolio B. The solar PV and battery storage additions jump to nearly 27,000 MW of solar and 8,600 MW of battery storage when I use the NREL ATB Cost assumptions in the Synapse scenario.

Figure 3 and Figure 4 below show the installed capacity for Dominion Plan B and the 111(d)-Compliant Clean Energy scenario. Figure 5 shows the installed capacity for the 111(d)-Compliant Clean Energy scenario with the ATB cost assumptions.

Figure 3. Dominion Plan B Scenario Nameplate Capacity by Resource Type

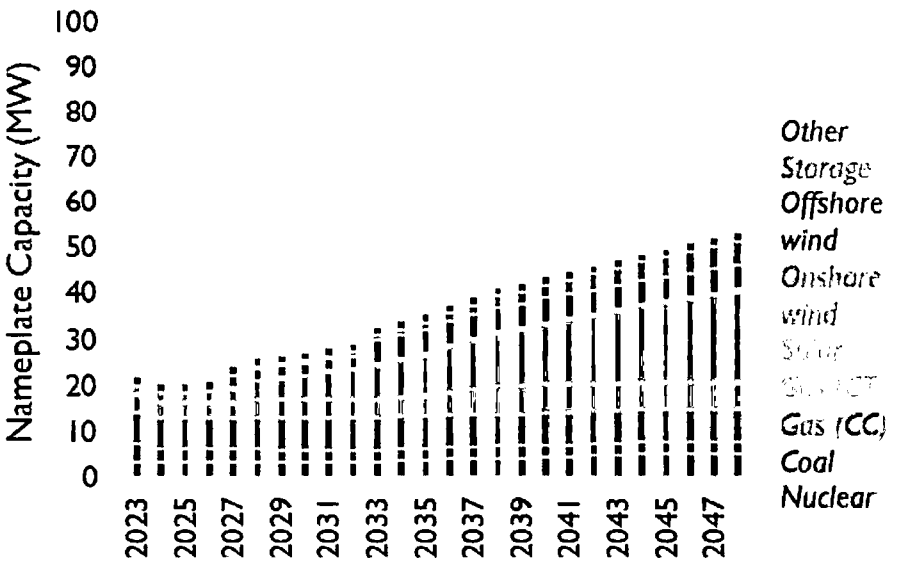


Figure 4. Synapse 111(d)-Compliant Clean Energy Scenario Nameplate Capacity by Resource Type (Dominion Costs)

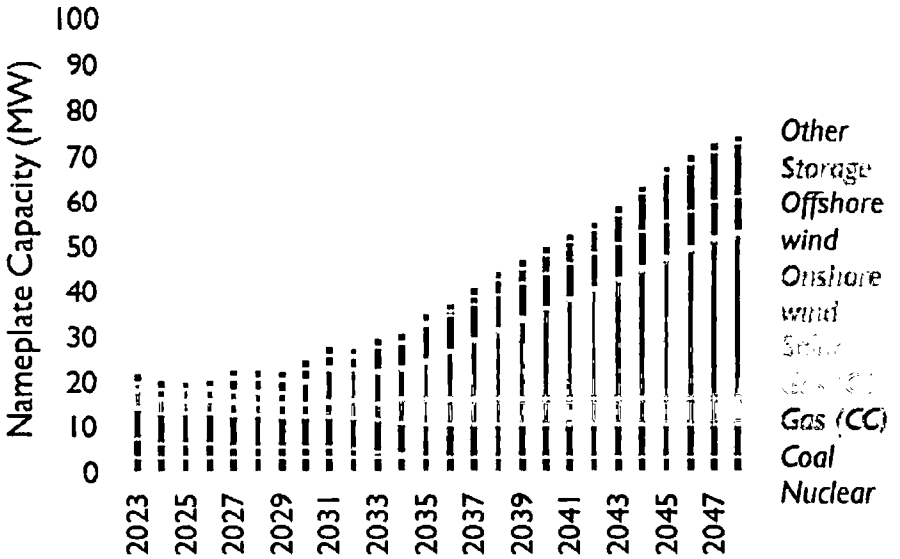
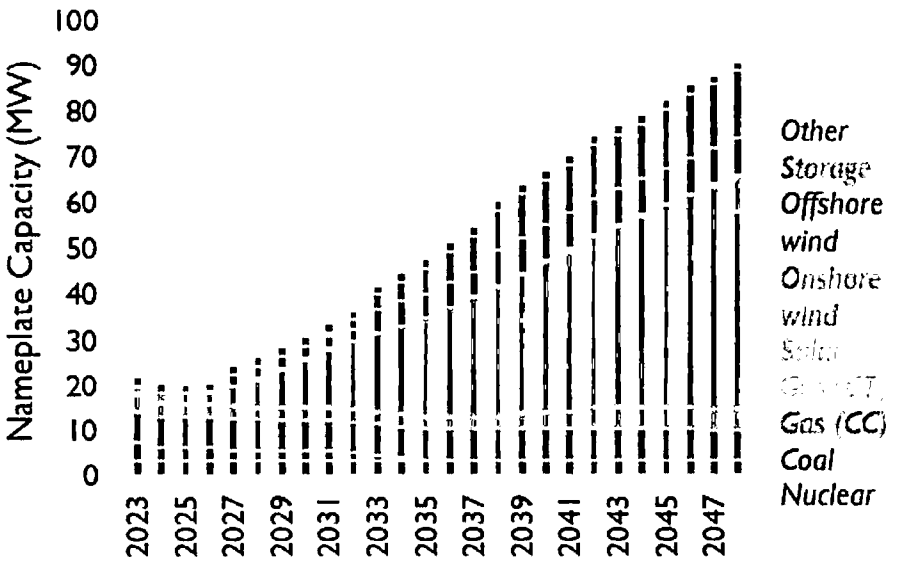


Figure 5. Synapse 111(d)-Compliant Clean Energy Scenario Nameplate Capacity by Resource Type (NREL ATC costs)



Q Why did the model wait until 2030 to start adding solar PV in the Synapse 111(d)-Compliance Scenario?

A In the Synapse 111(d)-Compliant Scenario, the model sees solar PV costs falling until around 2030, when they begin to flatten out. Based on that cost trajectory, and the model's foresight, the model opts to wait until 2030 to begin building out solar PV. This is not necessarily the best option for Dominion, in light of realities of solar development in the market today, including project delays, and when considering the alternative energy sources, which are subject to price volatility. All of these factors are not fully captured in the scenarios I modeled (fuel and market price volatility can be captured in the model with additional model runs).

Q How did generation levels by resource type differ between Plan B and the Synapse scenarios?

A Generation from coal and gas is higher in Plan B than in the Synapse scenarios. In the Dominion Plan B scenario, coal generation increases in the 2030s and remains high into the 2040s. Gas generation also increases. Solar and wind generation increase, but these only supply approximately 28 percent of Dominion's load in 2048. In the Synapse 111(d)-Compliant Clean Energy scenario, solar and wind generation increases more quickly and coal generation falls to zero as the last of the coal plants retire by 2035. This trend of increasing renewable generation is even more pronounced for the Synapse scenario when I use the more realistic and up-to-date NREL ATB costs in place of the Dominion resource costs. Figure 6 and Figure 7 below show the generation results of the Dominion Plan B and the

Synapse 111(d)-Compliant Clean Energy scenario. Figure 8 shows the Synapse scenario with NREL ATB costs.

Figure 6. Dominion Plan B Scenario Generation by Resource Type

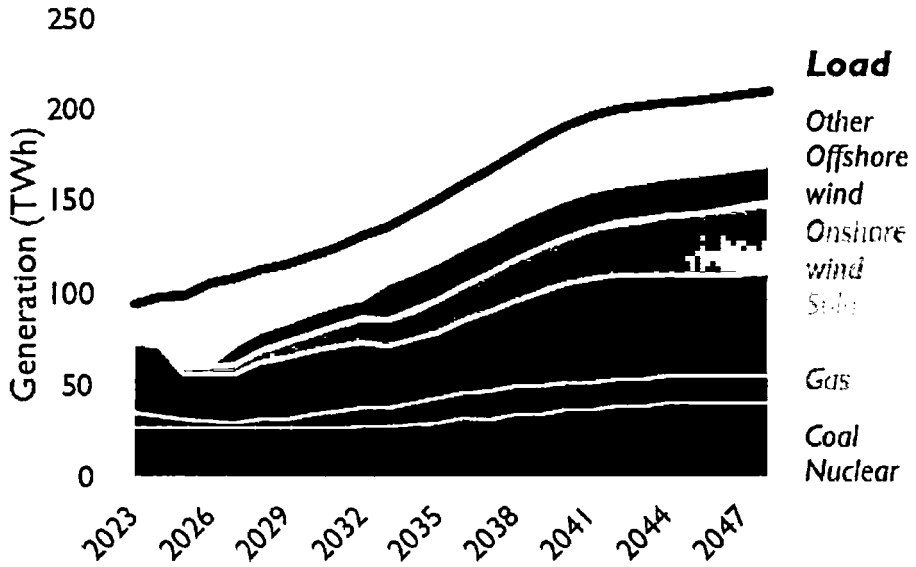


Figure 7. Synapse 111(d)-Compliant Clean Energy Scenario Generation by Resource Type (Dominion Costs)

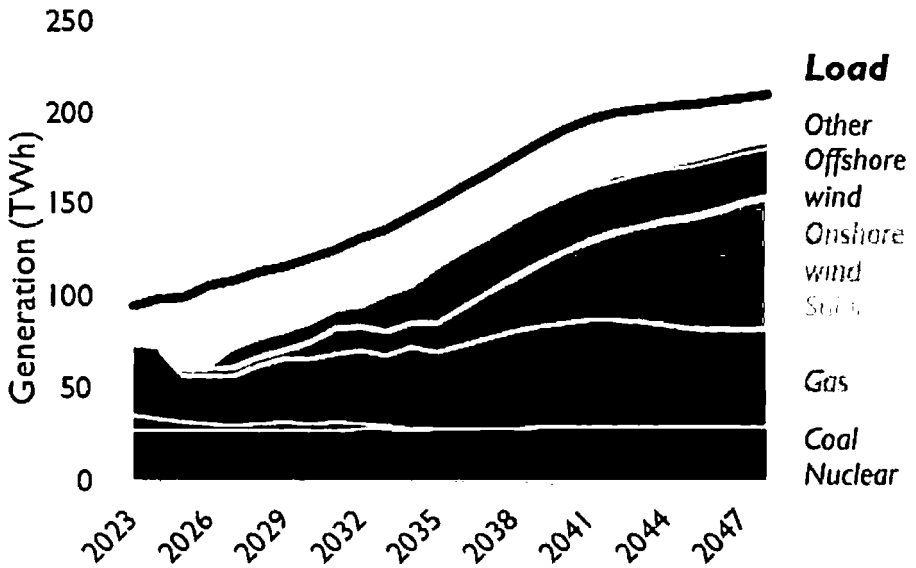
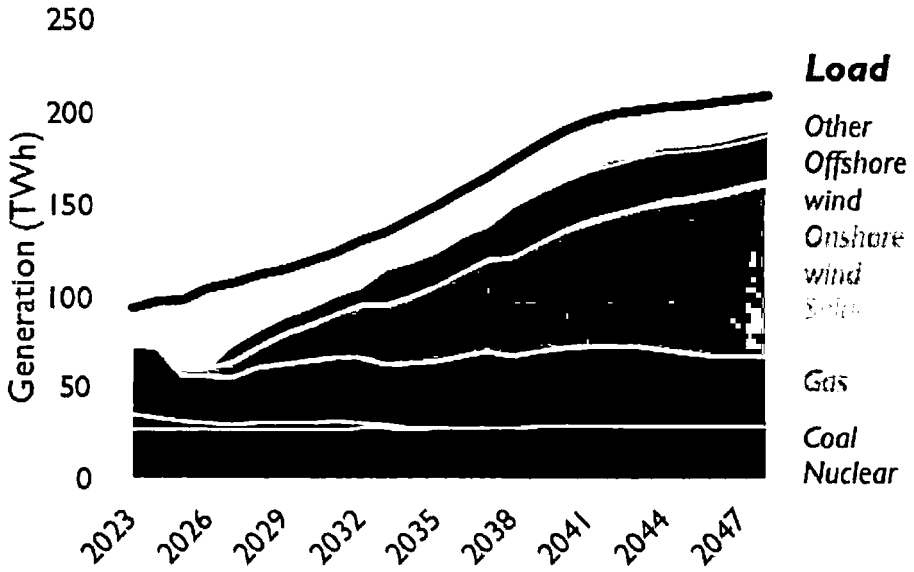


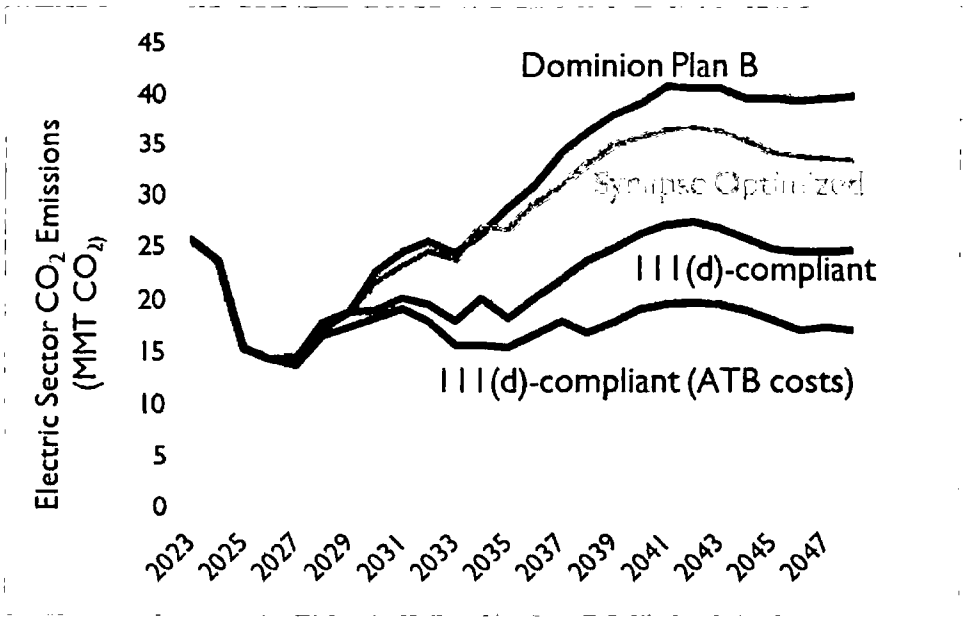
Figure 8. Synapse 111(d)-Compliant Clean Energy Scenario Generation by Resource Type (NREL ATB Costs)



Q How do CO_2 emissions compare between Dominion's Plan B and Synapse's scenarios?

A CO_2 emissions were lower in both Synapse scenarios. The Synapse Optimized scenario sees lower emissions—particularly after 2035, when solar, wind, and storage capacity increase faster than in the Dominion Plan B scenario. Dominion's emissions fall even lower with the 111(d)-Compliant Clean Energy scenario, and when NREL ATB costs are used for new renewables, emissions fall greater still.

Figure 9. Dominion Greenhouse Gas Emissions by Modeled Scenario



Note: Figure does not reflect emissions from imports.

Q How did the revenue requirement and total system costs compare between Dominion's Plan B and Synapse's scenarios?

A The total cost to ratepayers is ~~$4.1~~ **$1.8** billion lower in the Synapse 111(d)-Compliant Clean Energy scenario than in Dominion's Plan B, as shown below in Table 8. NPVRR ($2023) of Synapse Modeled Scenarios (2023–2048) even when using Dominion's renewable cost assumptions.

Table 8. NPVRR ($2023) of Synapse Modeled Scenarios (2023-2048)

Cost Category	Dominion Plan B ($B)	Synapse Optimization ($B)	Synapse 111(d)-Compliant ($B)
Operating Cost	$91.6	~~$88.1~~ **$88.4**	~~$89.2~~ **$89.1**
Property Taxes	$0.8	~~$0.7~~ **$0.8**	$0.8
Other Costs	$0.7	$0.9	$0.9
Book Depreciation	$8.3	$11.4	~~$12.5~~ **$12.6**
Allowed Return	$2.9	~~$(1.2)~~ **$1.1**	~~$(0.5)~~ **$1.7**
RPS Penalties	$3.6	$0.1	$0.1
Interconnection	Included	Included	Included
Integration	$1.1	$2.1	$2.1
REC Purchases	$1.5	$1.5	$1.4
Total Cost	**$110.5**	~~**$103.5**~~ **$106.1**	~~**$106.4**~~ **$108.7**

Q How did your results change with lower solar and battery storage capital costs?

A The revenue requirement difference between Dominion Plan B and the Synapse 111(d)-Compliant Clean Energy scenario widens with lower clean energy costs. In the NREL ATB cost sensitivities, clean energy portfolios become even more economic compared with Dominion's Plan B scenario, demonstrating the risk of deploying solar and battery storage too slowly. As shown in Table 9 below, operating costs are far lower in the Synapse Optimized and Synapse 111(d)-Compliant Clean Energy scenarios with the NREL ATB solar and storage capital costs. After accounting for savings on RPS penalty costs, the Synapse 111(d)-Compliant Clean Energy scenario is actually ~~$9.0~~ **$7.7** billion less expensive than Dominion's Plan B.

Table 9. NPVRR ($2023) of Synapse Modeled Scenarios with NREL ATB Solar and Storage Capital Costs (2023-2048)

Cost Category	Dominion Plan B ($B)	Synapse Optimization ($B)	Synapse 111(d)-Compliant ($B)
Operating Cost	$91.6	$79.0	~~$79.0~~ **$79.1**
Property Taxes	$0.8	$0.3	$0.5
Other Costs	$0.5	$0.8	$0.9
Book Depreciation	$5.5	$12.0	$13.2
Allowed Return	$(0.9)	~~$(6.3)~~ **$(4.8)**	~~$(6.4)~~ **$(4.3)**
RPS Penalties	$3.6	$0.1	$0.1
Interconnection	$1.6	~~$5.2~~ **$4.5**	~~$5.3~~ **$4.5**
Integration	$1.1	$3.4	$3.4
REC Purchases	$1.5	$0.3	$0.3
Total Cost	**$105.2**	~~**$94.7**~~ **$95.6**	~~**$96.2**~~ **$97.6**

Q What should the Commission take away from the Synapse modeling?

A Data center load is driving the need for substantial new capacity and is driving the need to keep existing coal and gas resources online. The RPS under the VCEA is driving the renewable build-out. The model wants as much renewable and battery storage as it can get once you get into the 2030s. And a clean energy portfolio that retires all of Dominion's coal by 2035 is lower cost than the Company's current plan to keep all remaining fossil units online beyond 2045. Assuming clean energy costs continue to fall and interconnection queue back-ups are cleared, the savings to Dominion ratepayers from investing in renewables will grow even larger.

Q What should the Commission understand about the impact of data center load growth on its system and ratepayers?

A Data center load growth is driving Dominion to keep its existing coal plants online for longer than previously planned, build out new gas in the 2030s, and pay large

RPS penalties. It is not in the best interest of Dominion ratepayers to continue investing money in aging fossil infrastructure and new fossil infrastructure, that may become stranded assets in 2045, and paying large RPS penalties; instead, Dominion should be using that money to build new, clean energy resources.

Q What impact does the RPS under the VCEA have on Dominion's modeling results?

A Dominion has to either build renewables to meet the RPS or pay a penalty when it falls short. But Dominion is limiting the amount of solar PV and battery storage the model can add each year and opting to pay an RPS penalty later in the study period. While it is reasonable for Dominion to place some limits on the quantity of batteries and solar PV it can add in each year, the limits Dominion has placed on the model—especially beyond 2030—are simply too low and are not justified. Starting in 2031 for solar and 2036 for battery storage, the model is choosing to build as much resource as it is allowed, and then paying the penalty for all remaining RPS requirements. By maxing out the amount of each renewable resource that it can add, the model is showing that the build limit, not resource economics, is the limiting factor here. This means that building out more renewables and battery storage is actually a lower cost option than paying the RPS penalty.

Q What are your recommendations on unit retirements?

A Dominion should retire the VCHEC and its coal plants as soon as possible, but no later than 2027 for VCHEC, 2032 for Clover and 2035 for Mt. Storm. Doing so

will allow Dominion to avoid incurring ongoing operations and maintenance costs (O&M), sustaining capital costs, and environmental compliance costs at its aging fossil units—and allow it to invest instead in new, RPS-compliant clean energy resources.

Q What are your recommendations on new resource additions?

A Dominion should issue RFPs and begin to procure solar PV to meet the growing data center load and allow the immediate retirement of VCHEC. Higher renewable costs over the past few years did slow the pace of renewable deployment, but costs are now falling and barriers to deployment are lifting. Synapse's analysis shows that Dominion needs to be planning for the retirement of its coal fleet over the next decade or sooner, and to do that it needs to procure clean energy replacement resources.

5. ECONOMIC & REGULATORY FACTORS IMPACTING THE IRP

Q Explain the data center load growth that is driving the need for Dominion to build out a significant quantity of new resources.

A Dominion is projecting unprecedented data center load growth in the region over the next decade in its 2023 IRP. Specifically, the PJM Load Forecast projects Dominion's peak demand will grow by nearly 5 percent and energy load will grow by around 7 percent over the next decade.[26] This is a substantial deviation from

26 Dominion 2023 IRP at 2.

the level of load growth that Dominion projected in its 2020 IRP. It is concerning that Dominion has just now started to plan for data center load growth, when the build-out of data centers has been occurring at a rapid pace in the region for years.

Q How does the projected data center load growth impact Dominion's RPS requirement?

A As load grows, so does Dominion's RPS obligation. In the 2020 IRP, Dominion's load forecast was much lower, and therefore the quantity of renewables it needed to build to meet its RPS was much lower. But with the 2023 IRP, the massive jump in load has also increased the RPS requirement. To meet its RPS, Dominion has to either build out large amounts of renewables or pay a large RPS penalty. In the model, Dominion places strict limits on solar and battery storage deployment, so in Plan B Dominion has no choice but to pay penalties to meet the RPS requirement. As discussed above, in the Synapse scenarios, I raised the build limits and used renewable resources to meet Dominion's RPS requirement.

Q How does the data center load growth impact Dominion's resource planning and its ratepayers?

A Previously, Dominion planned to retire the Clover coal plant in 2025 and several gas plants in the later 2020's. But in the 2023 IRP, Dominion has reversed course and decided to keep all its existing fossil units online throughout the entire study period. This is because Dominion's modeling shows that it needs the energy and capacity from these plants to meet its growing data center load forecast. But my modeling shows that it is not in the best interests of Dominion ratepayers for the

Company to extend the life of aging fossil resources and incur substantial RPS penalties, the cost of which will be passed on to Virginia ratepayers, simply to meet data center load. Although this is outside the purview of the IRP, Virginia should be incentivizing or even requiring data centers to invest in technologies to reduce their energy demand and should require them to play a role in procuring at least some of their own renewables. It is not clear that it is in the best interest of Virginia ratepayers to have Dominion solely responsible for building and procuring all resources needed to meet 100 percent of projected data center load growth.

Q Did Dominion incorporate its RPS penalties accurately into its IRP?

A No. I found an error in how Dominion calculated its RPS requirement and the associated penalties for falling short. Specifically, Dominion overstated the contribution of renewable purchases by Advanced Renewable Buyers (ARB) program and the impact ARB credits had in reducing its RPS requirements. The impact of this error was Dominion undercounting its RPS penalty in Plan B in its IRP by $1 billion. Dominion admitted to this mistake in a discovery response.[27]

27 Company's Response to Sierra Club Discovery Request No. 8-1, attached as Exhibit DG-7.

Q Why did you increase the renewable build limits and model a lower capital cost sensitivity?

A Because renewable costs are starting to come down and the regulatory bottlenecks that have slowed renewable deployment over the past several years are easing. This represents a shift in the market even from a few months ago.

Q Explain the trends you are seeing in falling renewable costs today.

A A report published by LevelTen Energy on July 17, 2023, found that solar power purchase agreement prices fell by around 1 percent (in aggregate) across the United States in the second quarter of 2023, following three years of large price increases. The report goes on to state that the aggregate 1 percent decline is actually composed of much larger declines in most parts of the country and was skewed upward by a 14 percent price jump in Texas due to their unstable legislative climate.[28] Thus for non-Texas regions in the aggregate, the price decline is greater than 1 percent.

Q Does this trend make sense to you?

A Yes, absolutely. As has been seen in previous trajectories of clean energy technology costs, underlying fundamental drivers of lower real costs for solar, wind, and battery energy storage arise from economies of scale, scope, and improvements in technologies. The trend of lower costs for these resources is re-

28 Emma Penrod, *Solar PPA Prices Drop for First Time Since Onset of COVID-19: LevelTen*, UTILITY DIVE (July 18, 2023), available at https://tinyurl.com/bdcy4u98.

establishing prominence over the shorter-term disturbances seen in the cost trends that arose from the aftermath of the pandemic and related supply chain pressures and inflationary increases.

Q Explain the recent generation interconnection reform.

A On July 27, 2023, the Federal Energy Regulatory Commission (FERC) issued an order on Improvements to Generators Interconnection Procedures and Agreements. This order adopts reforms to (1) implement a first-ready, first-served cluster study process; (2) speed up interconnection queue processing; (3) incorporate technological advancements into the interconnection process; and (4) establish an effective date and a transition process.[29] These reforms are expected to alleviate the interconnection backlog in PJM and speed up project approval timelines in the future.

Q Is there enough land in Virginia for Dominion and/or the data centers to build solar PV to meet their energy needs?

A Yes. I understand there has been concern in the past by the Company that solar PV requires a large land footprint. A study of solar siting in Virginia by the Nature Conservancy found[30] that there is around 6.48 million acres of land potentially

29 FEDERAL ENERGY REGULATORY COMMISSION, *Fact Sheet: Improvements to Generators Interconnection Procedures and Agreements* (July 27, 2023), available at https://tinyurl.com/nhjhhjpc.

30 THE NATURE CONSERVANCY, *Solar Siting in Virginia* (March 2021), available at https://tinyurl.com/2p87bd6v.

suitable for solar development. To meet the VCEA goal of 16,100 MW of solar PV would require roughly 161,000 acres of land. To meet the Synapse 111(d) Scenario, would require roughly double that quantity of incremental land. In both scenarios, that is much less than the total suitable land available in the state

Q Explain the recently proposed Section 111(d) and (b) Rules, and the impact the proposed Rules will have on both existing and new fossil resources.

A The proposed Rules apply to both coal- and gas-fired units, existing and new, and provides multiple pathways for compliance. These pathways differ based on: (1) whether the unit is coal or gas; (2) whether the unit is existing or new; (3) how much the unit runs; and (4) when the unit is scheduled to retire. Dominion does not contemplate any new coal in its IRP, so the Rule would apply only to Dominion's existing coal, existing gas, and new gas resources.

Q Did Dominion model compliance with greenhouse gas regulations in its 2023 IRP?

A No. Dominion filed its IRP on May 1, 2023. The EPA announced its proposed Greenhouse Gas Standards for New and Existing Generation Units under Section 111 of the Clean Air Act 10 days later on May 11, 2023. Given this timing, it would have been impossible for Dominion to model compliance with the proposed Section 111 Rules in its original IRP.[31] But given the large impact of the proposed

31 Company's Response to Sierra Club Discovery Request No. 3-4, attached as Exhibit DG-8.

rule, Dominion should be actively evaluating how the proposed rule will impact its plan to keep its existing coal and gas plants online and to build out new CTs. Table 10 below shows the 111(d) compliance options available to Dominion at its coal plants, based on their current planned retirement dates.

Table 10. Section 111 Compliance Options at Dominion's Existing Coal Units Based on Plan B Retirement Dates

	Plan B		Synapse 111(d)-Compliant	
Coal Unit	Retirement Date (EOY)	111 Compliance Option	Retirement date (EOY)	111 Compliance Option
Chesterfield 5	2023	Exempt	2023	Exempt
Chesterfield 6	2023	Exempt	2023	Exempt
Clover 1	>2040	90% CCS in 2030	2031	Exempt
Clover 2	>2040	90% CCS in 2030	2031	Exempt
Mt. Storm 1	>2040	90% CCS in 2030	2032	20% CF limit
Mt. Storm 2	>2040	90% CCS in 2030	2033	20% CF limit
Mt. Storm 3	>2040	90% CCS in 2030	2034	20% CF limit
VCHEC	>2040	90% CCS in 2030	2026	Exempt

Source: Synapse analysis based on planned unit retirement dates in 2023 IRP.

Synapse evaluated the impact of the rule in one of our scenarios. We assumed that the Company will not consider CCS at this point, based on its discovery response indicating the existence of critical constraints on storing captured carbon that limiting CCS's commercial viability.[32] We also assumed that the Company would not invest in new gas pipeline infrastructure at either Clover or Mt. Storm to allow the plants to co-fire on natural gas and operate through 2040, given the projected

32 Company's Response to Sierra Club Discovery Request No. 3-5, attached as Exhibit DG-9.

cost of the pipeline extension required ($600 million and $370 million respectively in $2022)[33] and the plant conversion and the limited time the gas infrastructure would be in use due to the VCEA's requirement that all fossil-fueled generation be retired by 2045. Table 10 above shows the compliance options we modeled.

Q Are there any other current or proposed rules that will impact Dominion's existing resources?

A Yes, the EPA proposed a more stringent Mercury Air Toxins rule on April 23, 2023. This rule would strengthen the filterable particulate matter pollutant emission standard from 0.030 pounds per million British thermal of heat input (lb/MMBtu) to 0.010 lb/MMBtu for all existing coal-fired electric utility steam generating units. EPA is also soliciting comments on an even more stringent standard of 0.006 lb/MMBtu or lower.[34] The EPA has already determined that plants such as Mt. Storm that use electrostatic precipitators to control particulate matter will need to upgrade their electrostatic precipitators to comply with the 0.010 lb/MMBtu standard; they will also have to install fabric filters to comply

33 ENVIRONMENTAL PROTECTION AGENCY, *Documentation for Power Sector Modeling Platform v.5.13* at Table 5-22: Cost of Building Pipelines to Coal Plants (November 27, 2013), available at https://tinyurl.com/6wvrpxrr.

34 *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 88 FEDERAL REGISTER 24854 (Proposed April 24, 2023), available at https://bit.ly/43emrFx.

with the 0.006 lb/MMBtu standard.[35] At a minimum, Dominion will need to implement potentially costly upgrades to comply with this standard and may need to install a new baghouse at Mt. Storm, which would require major capital investments. Mt. Storm is, in fact, one of only a few plants in the United States that will not be able to meet the proposed standard without upgrades.

In addition, EPA's proposed March 2023 Supplemental Steam Electric Effluent Limitations Guidelines and Standards Rule (Supplemental ELG Rule) includes a zero-discharge requirement and a proposed combustion residual leachate discharge requirement.[36] Dominion claims the bottom ash transport water system it is currently installing should meet the zero-discharge requirement, but the Company has been silent on the combustion residual leachate discharge requirements. Its current system likely does not meet those requirements, and compliance will require future plant upgrades.[37] Admittedly, those upgrades will be required regardless of when Mt. Storm retires. But the Supplemental ELG Rule illustrates EPA's continuing effort to rein in the disproportionate environmental footprint of coal-fired generation. It also highlights the importance of transparent,

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35 ENVIRONMENTAL PROTECTION AGENCY, *2023 Technology Review for the Coal- and Oil-Fired EGU Source Category* (2023), available at https://bit.ly/3Mij2yR.

36 *See Petition of Virginia Electric & Power Company for Revision of Rate Adjustment Clause Rider E etc.*, Case No. PUR-2023-00005, Direct Testimony of Devi Glick on Behalf of the Sierra Club at Exhibit DG-8 (May 23, 2023), available at https://tinyurl.com/2rya8afz.

37 *Id.* at Exhibit DG-9.

forward-looking decision-making for plants subject to increasingly stringent regulations.

Q What are your main take-aways from this IRP and the resource planning modeling the Company performed?

A Dominion classifies the results of each IRP exercise as showing just a snapshot in time. Each snapshot is only as accurate as the data available to model and the modeling decisions made by the Company at the time the modeling exercise is completed. In the 2023 IRP, Dominion is facing projections of unprecedented data center load growth for its service territory over the next several decades, challenges with VCEA compliance, increasing federal regulations of fossil fuel plants and incentives for renewable deployment, a renewable industry recovering from a period of supply chain challenges and record inflation, and interconnection backlogs in PJM delaying renewable deployment in the region. All of these factors make the current planning environment more uncertain and unstable than normal.

This does not mean that the modeling exercise is not useful, but rather that to make it useful Dominion needs to focus on what resource decisions are robust even in light of this uncertainty. The Commission has previously recognized the

need for detailed analysis in support of resource decisions is even more important in moments of "significant uncertainty."[38]

Dominion needs to critically review its modeling and see that, despite uncertainty, the results show that the solution is not to continue relying on its existing fossil coal and gas units but rather—reflecting ratepayers' best interest—to deploy as much renewable energy and battery storage as soon as possible.

Q Does this conclude your testimony?

A Yes.

38 *Petition of Virginia Electric & Power Company for Approval of Rate Adjustment Clause Rider E*, Case No. PUR-2018-00195, Order on Reconsideration at 6 n.21 (November 14, 2019), available at https://tinyurl.com/khxf5pbe.