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November 22, 2021

BY OVERNIGHT MAIL

Mr. Bernard Logan, Interim Clerk
c/o Document Control Center
STATE CORPORATION COMMISSION
Tyler Building — First Floor
1300 East Main Street
Richmond, Virginia 23219

RE: Application of Virginia Electric & Power Company
For revision of rate adjustment clause: Rider S, Virginia City Hybrid Energy Center for the Rate Years Commencing April 1, 2022 and April 1, 2023.

Case No. PUR-2021-00114

Dear Mr. Logan,

Please find enclosed for filing in the above-captioned case an original and one copy of the **Public Version** of the Direct Testimony of Rachel Wilson on Behalf of the Sierra Club.

Should you have any questions regarding the filing, please do not hesitate to contact me directly at (434) 738 – 1863.

Thank you,

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COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

APPLICATION OF

VIRGINIA ELECTRIC & POWER COMPANY **Case No. PUR-2021-00114**

For revision of rate adjustment clause: Rider S, Virginia City Hybrid Energy Center for the Rate Years Commencing April 1, 2022 and April 2, 2023

DIRECT TESTIMONY OF RACHEL WILSON

ON BEHALF OF THE SIERRA CLUB

PUBLIC VERSION

November 23, 2021

Summary of the Direct Testimony of Rachel Wilson

My testimony evaluates the economics of the Virginia City Hybrid Energy Center (VCHEC) and assesses the prudence of continuing to invest in and operate the unit. Dominion's 2021 Integrated Resource Plan continues the operation of VCHEC through the duration of the analysis period in 2033, even though the Company's own analyses indicate that the unit is uneconomic and should be retired in 2023. Based on my review of the data provided by Dominion in this docket, I conclude that VCHEC lost hundreds of millions of dollars over the past three years, from 2018 to 2020, and will continue to lose millions every year through at least 2030. Given these results, and Dominion's own analyses, the Company has failed to demonstrate that continued investment in this unit is a prudent decision, that it should be given recovery of capital expenditures intended to prolong the life of these units, and that the unit provides any value to its ratepayers.

I recommend to the Commission the following: First, I recommend that the Commission disallow future capital spending, totaling approximately $25.3 million, and future fixed O&M expenses, given that the data show anticipated future net losses. Dominion's plans for future investments at the unit ignores the fact that the unit has, and is projected to continue to have, negative value to the Company's ratepayers. Spending that is intended to extend the life of the plant over this period should be disallowed until Dominion announces a retirement date for VCHEC that minimizes unnecessary costs to ratepayers. I also recommend that the Commission require Dominion to perform a full accounting of its operational costs (fuel and variable O&M) and energy revenues in future proceedings. The Company should identify periods of sustained net operational losses (over a month or more) and justify its unit commitment decisions with supporting documentation. If no such support can be provided, the Commission should disallow recovery for variable O&M costs incurred during these periods.

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1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, business address, and position.

A. My name is Rachel Wilson and I am a Principal Associate with Synapse Energy Economics, Incorporated. 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 analysis and write testimony and publications that focus on a variety of issues relating to electric utilities, including: integrated resource planning; federal and state clean air policies; emissions from electricity generation; environmental compliance technologies, strategies, and costs; electrical system dispatch; and valuation of environmental externalities from power plants.

I also perform modeling analyses of electric power systems. I am proficient in the use of spreadsheet analysis tools, as well as optimization and electricity dispatch models to conduct analyses of utility service territories and regional energy markets. I have direct experience running the Strategist, PROMOD IV, PROSYM/Market Analytics, PLEXOS, EnCompass, and PCI Gentrader models, and have reviewed input and output data for several other industry models.

Prior to joining Synapse in 2008, I worked for the Analysis Group, Inc., an economic and business consulting firm, where I provided litigation support in the form of research and quantitative analyses on a variety of issues relating to the electric industry.

I hold a Master of Environmental Management from Yale University and a Bachelor of Arts in Environment, Economics, and Politics from Claremont McKenna College in Claremont, California.

A copy of my current resume is attached as Exhibit RW-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, in the following dockets:

- Case No. PUE-2015-00075

- Case No. PUR-2018-00065
- Case No. PUR-2020-00015
- Case No. PUR-2020-00035
- Case No. PUR-2020-00258

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

A. The purpose of my testimony is to evaluate the economics of the Virginia City Hybrid Energy Center (VCHEC) owned by Virginia Electric and Power Company (Dominion or the Company) and assess the prudence of continuing to invest in and operate the unit.

Q. Please identify the documents and filings on which you base your opinions.

A. My findings rely primarily upon the testimony, exhibits, and discovery responses of Dominion and its witnesses. I also rely to a limited extent on certain industry publications.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit Number	Description of Exhibit	Confidential or Non-Confidential
Exhibit RW-1	Resume of Rachel S. Wilson	Non-Confidential
Exhibit RW-2	Attachment Sierra Club Set 02-01(c)(1)(DA).pdf	Non-Confidential
Exhibit RW-3	Discovery responses used for historical cash flow analysis	Non-Confidential
Exhibit RW-4	Discovery responses used for projected cash flow analysis	Non-Confidential
Exhibit RW-5	Discovery responses used for unit commitment analysis	Non-Confidential

2. OVERVIEW OF TESTIMONY AND CONCLUSIONS

Q. Please summarize your primary conclusions.

A. My analysis indicates that Dominion's VCHEC unit lost approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** over the past three years using Company data on energy revenues, variable costs, fixed costs, and capital investments. Using projections provided by Dominion in discovery, I estimate that VCHEC will continue to lose money each year over the ten-year period between 2021 and 2030.[1] Those annual losses range between **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** depending on the year, and result in a cumulative discounted loss of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**

1 Historical values are shown in 2021$ while projected values are in nominal $.

I also examined the net operational revenues over the 2018 to 2020 period, which considers only energy revenues and variable production costs, on a monthly basis. I found that VCHEC incurred net operational revenues in 2018 and in January 2019, but incurred net operational losses in every month thereafter, through December 2020. Operational losses in 2019 totaled **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** between February and December, while losses in 2020 totaled **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**

Q. Please summarize your primary recommendations.

A. Based on my findings, I offer the following recommendations:

1. I recommend that the Commission disallow future capital spending, totaling approximately $25.3 million, given that the data show anticipated future net losses.[2] Dominion's plans for future investments at the unit ignores the fact that the unit has, and is projected to continue to have, negative value to the Company's ratepayers. Capital spending for this period should be disallowed until Dominion announces a retirement date for VCHEC that minimizes unnecessary costs to ratepayers.

2. I also recommend that the Commission disallow future fixed operations and maintenance (O&M) expenses, totaling approximately **[BEGIN**

2 Note that the Synapse analysis shows annual revenues and costs on a calendar year, which differs from the timing of Rate Year 1 and Rate Year 2.

CONFIDENTIAL] [redacted] **[END CONFIDENTIAL]** given the anticipated future net losses.

3. I recommend that the Commission require Dominion to perform a full accounting of its operational costs (fuel and variable O&M) and energy revenues in future proceedings. The Company should identify periods of sustained net operational losses (over a month or more) and justify its unit commitment decisions with supporting documentation. If no such support can be provided, the Commission should disallow recovery for variable O&M costs incurred during these periods.

3. VIRGINIA CITY HYBRID ENERGY CENTER

Q. Which of Dominion's generating units do you focus on in this testimony?

A. This testimony focuses on the economics of Dominion's Virginia City Hybrid Energy Center. The VCHEC plant is a 600-megawatt (MW) generation facility located in Wise County, Virginia and fueled by coal and biomass.[3]

Q. What is Dominion's plan regarding the future operation of VCHEC?

A. In its *2021 Update to the 2020 Integrated Resource Plan* (IRP), Dominion's Alternative Plans B and C model continue operation of VCHEC until 2045.[4]

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3 Direct Testimony of Christopher J. Lee at 1:13–1:15.

4 *Commonwealth ex rel. State Corporation Commission in re: Virginia Electric & Power Company's 2021 Update to its Integrated Resource Plan Pursuant to Virginia Code § 56-597 et seq.*, Case No. PUR-2021-00201, 2021 Update to the 2020 Integrated Resource Plan at 38 (September 1, 2021), available at https://scc.virginia.gov/docketsearch/DOCS/5jkv01!.PDF.

Q. What is the basis for this retirement date?

A. Not economic performance, by Dominion's own admission. The Company has instead justified continued operations at VCHEC because the plant "supports jobs, economic development, and water quality improvements in the coalfield region of Virginia. Based on these qualitative factors, the retirement of VCHEC was modeled in 2045 in Alternative Plans B and C."[5]

Q. Did Dominion provide any economic analysis of VCHEC in its *2021 Update*?

A. Yes, as part of the *2021 Update*, Dominion presented two different analyses of VCHEC, and both indicate that a retirement date earlier than 2045 would be more economic to ratepayers.

The first of Dominion's analyses was a unit evaluation in the form of a ten-year cash flow analysis over the period from 2021-2030, which assumes continued operation of the plant. In this market analysis, net present value (NPV) of projected net revenues was calculated by comparing the unit costs, including operations and maintenance and capital, to the forecasted unit benefits, including energy and capacity revenues. A positive result indicates that the unit is performing better than the market, while a negative result indicates that the unit is worse than the market. Note that this type of analysis does not include the cost of any replacement resources. In all four scenarios that Dominion evaluated, the results of this cash flow analysis for VCHEC were

5 *Id.*

overwhelmingly negative. The Company's own analysis shows that VCHEC, if it continues to operate, will continue to lose money. Those values are shown in Table 1.

Table 1. Ten-year cash flow results (NPV $Million)

Unit	2021 Plan A	2021 Plan B	Low Capacity Price	High Capacity Price
VCHEC	($357)	($381)	($483)	($347)

Source: Attachment Sierra Club Set 02-01(c)(1)(DA).pdf, included as Exhibit RW-2.

Second, following specific direction from the SCC, Dominion used the PLEXOS capacity optimization and production cost model to optimize the timing of unit retirements as part of its Alternative Plan A. The model selected the optimized retirement of VCHEC in 2023.

Q. What are the implications of these analyses for this docket?

A. Dominion is knowingly asking its ratepayers to subsidize the uneconomic operation of VCHEC, perhaps for as long as another 20+ years. In this docket, the Company is asking for recovery of projected costs over two consecutive rate years ending March 31, 2023, and March 31, 2024—years in which it can reasonably be expected that VCHEC will operate at a net loss, with ratepayers making up the difference. Not only will ratepayers subsidize the uneconomic operation of VCHEC, but they will also pay

to provide Dominion with a general rate of return on common equity (ROE) of 9.2 percent and an ROE adder of 100 basis points, for an enhanced ROE of 10.2 percent.[6]

Q. Are Dominion's results indicative of recent trends relating to coal-fired power plants?

A. Yes. At the national level, projections from the U.S. Energy Information Administration (EIA) show that almost 90 GW of coal capacity will retire between 2019 and 2030.[7] Regionally, capacity prices from the most recent PJM capacity auction were lower than they have been in the past decade. Renewables, nuclear, and gas generators increased their cleared capacity, while more than eight gigawatts (GW) of coal capacity failed to clear. Analysis from BloombergNEF reports that of the coal-fired power plants currently on the PJM grid, approximately 70 percent will be uneconomic by 2023.[8] Dominion's own capacity optimization modeling demonstrates that VCHEC will be one of those uneconomic plants, and its retirement in 2023 was part of the least-cost resource portfolio.

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6 Virginia & Electric Power Company's Rider S Biennial Update Filing and Request for Limited Waiver ¶ 17.

7 ENERGY INFORMATION ADMINISTRATION, *Today in Energy: U.S. Coal Plant Retirements Linked to Plants with Higher Operating Costs* (December 3, 2019), available at https://www.eia.gov/todayinenergy/detail.php?id=42155.

8 Will Wade, *Most Coal Plants In Biggest U.S. Grid Are Becoming Money-Losers*, BLOOMBERG (June 8, 2021), available at https://www.bloomberg.com/news/articles/2021-06-08/most-coal-plants-in-biggest-u-s-grid-are-becoming-money-losers.

A range of factors have contributed to these retirements, including flat electricity demand growth, sustained low gas prices, and increased competition from renewables. All of those trends are expected to persist in the future. Even for coal units that have staved off full retirement, competition from gas and renewables has led to decreases in capacity factors.[9]

Q. Have these market changes led to additional risks associated with continued operation of coal units?

A. Yes. Coal-fired generators are intended to operate as baseload generators that run with high capacity factors. Increased penetration of renewable energy technologies, which operate intermittently, and lower cost gas generation means that coal units are increasingly being called upon to operate at lower loading levels, ramp up and down more frequently, and cycle (start and stop) more often. This leads to increased wear and tear on the component parts, which contributes to increased costs and/or outages at the units. Actual data from Dominion on VCHEC shows that the unit operated at a 62 percent capacity factor in 2017, falling to a 16 percent capacity factor in 2020.[10] Figure 1 shows that Dominion's projections of VCHEC capacity factors rebound slightly in 2021-2022 before falling again, and reach single digits in 2028.

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9 ENERGY INFORMATION ADMINISTRATION, *U.S. Coal Consumption in 2018 Expected to be the Lowest in 39 Years* (December 28, 2018), available at https://www.eia.gov/todayinenergy/detail.php?id=37817.

10 Dominion's Response to Sierra Club Request No. 2-1, Attachment Sierra Club Set 02-01(c)(1)(DA), attached as Exhibit RW-2.

Figure 1. Dominion's projected capacity factors at VCHEC

	Actuals				Forecast									
Coal	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Virginia City	62	55	22	16	26	26	20	22	12	10	10	8	8	9

Source: Attachment Sierra Club Set 02-01(c)(1)(DA).pdf, included as Exhibit RW-2.

Q. Are there any other important risks to future coal plant operation?

A. Yes, there are risks to coal units associated with compliance with environmental regulations, particularly rules that put a cap on emissions of carbon dioxide (CO_2). Virginia is already moving ahead with such regulations, as it recently became a member of the Regional Greenhouse Gas Initiative, a regional cap-and-trade system for CO_2 emissions.

4. UNIT-RELATED COSTS FOR WHICH DOMINION IS SEEKING RECOVERY

Q. What is the time period covered by the docket?

A. Dominion's application covers two proposed rate years. The first commences on April 1, 2022, and extends through March 31, 2023 (Rate Year 1) and the second commences on April 1, 2023 and extends through March 31, 2024 (Rate Year 2).

Q. What types of VCHEC unit expenses is Dominion seeking to recover in this case?

A. Dominion's projected costs at VCHEC are recovered under Rider S. The Company is seeking to recover projected O&M costs and projected capital expenditures for the individual Rate Years as shown in Table 2.

Table 2. Projected O&M and capital expenses at VCHEC

	Projected O&M Expenses	Projected Capital Expenses
Rate Year 1	$58,836,664	$10,391,393
Rate Year 2	$60,815,482	$14,890,428
Total	$119,652,146	$25,281,821

Source: Virginia & Electric Power Company's Rider S Biennial Update Filing and Request for Limited Waiver ¶ 13

Dominion does not break down the projected O&M expenses into fixed and variable costs; however, I applied the Company's allocation from historical O&M to its projected costs to calculate the breakdown shown in Confidential Table 3.

Confidential Table 3. Projected VCHEC fixed and variable O&M expenses

[redacted]

Source: Filing Schedule 46A Stmt 1 – OM (Conf) for the allocation between fixed and variable O&M

5. ECONOMIC STATUS OF VCHEC: HISTORICAL & FOREWARD-LOOKING

Q. Did you assess the recent performance of VCHEC?

A. Yes. Using data provided by the Company, I evaluated the net revenues for VCHEC between 2018 and 2020.

Q. Please summarize your findings regarding the recent economic performance of VCHEC.

A. Confidential Table 4 summarizes the results of my analysis. I found that for VCHEC, the costs to maintain and operate the unit over the historical triennial period exceeded the revenues earned by the units by a total of **[BEGIN CONFIDENTIAL]** [redacted] **. [END CONFIDENTIAL]**

Confidential Table 4: Historical net revenue by year ($2021, Millions)

[redacted]

Source: Synapse Tabulation

Q. Describe how you arrived at the values in Confidential Table 4.

A. The annual net revenues presented in Confidential Table 4 were calculated using data provided by Dominion in response to numerous discovery requests.[11] These data include historical energy revenues, capacity revenues, ancillary services revenues, fuel costs, fixed and variable O&M costs, capital costs, and other spending. Annual revenues were calculated by subtracting fixed and variable O&M costs, fuel costs, and capital costs from the summed energy, capacity, ancillary services, and renewable energy credit (REC) revenues.

11 *See* attached Exhibit RW-3 for a list of all the discovery responses that were used to produce Confidential Table 3. The data contained in these discovery requests represents thousands of pages. Sierra Club can provide the Commission with copies of this information prior to the hearing if it would be helpful to the Commission.

The results with the individual revenue and cost streams are shown in Confidential Figure 2, below.

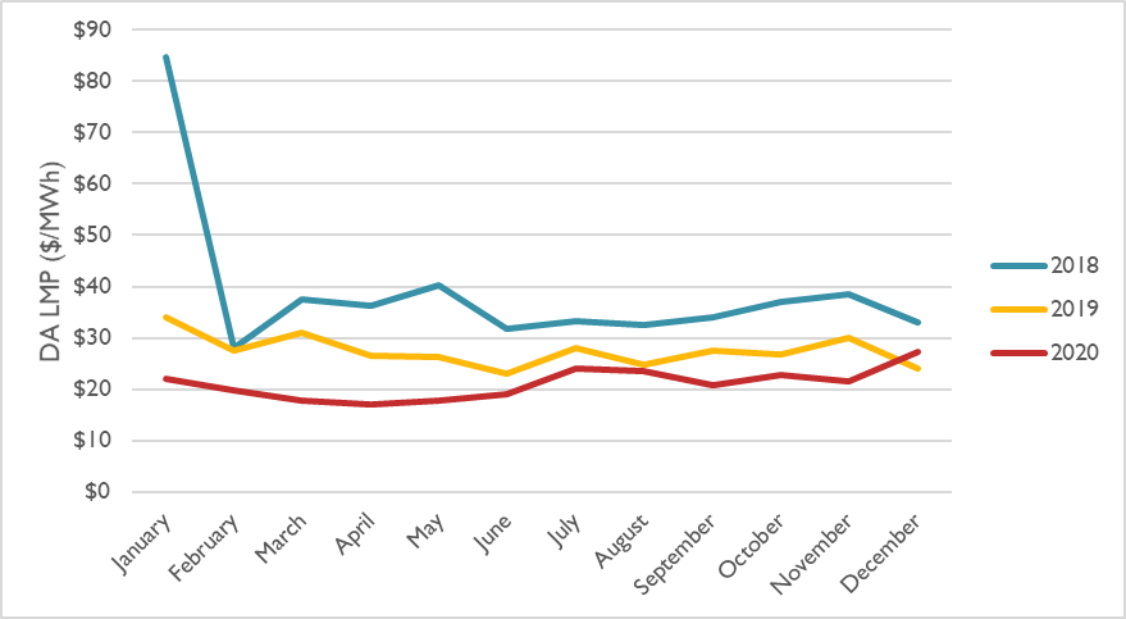
Confidential Figure 2. VCHEC historical revenues and costs, 2018-2020

Confidential Figure 2 shows the various annual revenue and cost streams for VCHEC between 2018 and 2020. The "Net Revenues" point in these Figures corresponds with the values shown in Confidential Table 4, above.

Q. Why were energy revenues so much higher in 2018 than in either 2019 or 2020?

A. As shown in Figure 3, locational marginal prices (LMPs) at the Dominion hub were higher in 2018 than in either 2019 or 2020. This is particularly true in January as a result of cold weather events, when average LMPs were more than double the other two years. Higher LMPs tend to lead to increased energy revenues. However, even these increased revenues during 2018 were not sufficient for VCHEC to be net positive during the year.

Figure 3. Average monthly day ahead locational marginal prices at the Dominion hub ($/MWh)



Source: PJM INTERCONNECTION, *Data Miner*, available at https://www.pjm.com/markets-and-operations/etools/data-miner-2.aspx.

Q. What were the recent historical capacity factors at VCHEC?

A. The capacity factors at VCHEC for 2018 through 2020 are shown in Table 5.

Table 5. Historical capacity factors at VCHEC

Unit	2018	2019	2020
VCHEC	55%	22%	16%

Source: Exhibit RW-2: Attachment Sierra Club Set 02-01(c)(1)(DA)

We see that VCHEC has operated less over the last three years in response to these declining energy prices.

Q. What are the implications of your findings regarding the economic performance at VCHEC?

A. My findings indicate that VCHEC is consistently incurring greater total costs than it earns in total market revenues. These losses point to the need for careful evaluation prior to Dominion making any additional capital investments intended to extend the life of the unit, particularly in light of the additional risks to coal units described above. Dominion's own economic assessments have shown that it is not beneficial to ratepayers to continue operating the unit.

Q. Do you expect these loss trends to continue?

A. Yes. I have done a similar forward-looking analysis that compares Dominion's projected costs and revenues at VCHEC and shows anticipated annual losses of between **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** over the ten-year period from 2021 to 2030. Using a discount rate of 6.46 percent, this results in a cumulative loss of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** on a net present value basis. The results with the individual revenue and cost streams are shown in Confidential Figure 4, below.[12]

12 *See* attached Exhibit RW-4 for a list of all the discovery responses that were used to produce Confidential Figure 4. The data contained in these discovery requests represents thousands of pages. Sierra Club can provide the Commission with copies of this information prior to the hearing if it would be helpful to the Commission.

Confidential Figure 4. VCHEC projected revenues and costs, 2021–2030

Q. Are resource planning issues and unit retirement dates relevant to this cost recovery proceeding?

A. Yes. Dominion is proposing to continue to recover VCHEC unit capital expenses, which are only justified to the extent that they are necessary to keep the unit online and available rather than retiring it. The Company is also proposing to recover annual unit O&M expenses, which are only justified if it is prudent for Dominion to commit and operate VCHEC online rather keeping it offline. Dominion's own analyses have shown that the continued operation of VCHEC is not in the best interest of ratepayers, and yet the Company is requesting recovery of $119 million in O&M expenses and $25 million in capital expenses for the same years in which it has shown that retirement is the least-cost option.

Q. What are your recommendations to the Commission with regard to the request for recovery of future capital spending at VCHEC?

A. I recommend that the Commission disallow future capital spending, totaling approximately $25.3 million, given that the data show anticipated future net losses.[13] Dominion's plans for future investments at the unit ignores the fact that the unit has, and is projected to continue to have, negative value to the Company's ratepayers. Capital spending for this period should be disallowed until Dominion announces a retirement date for VCHEC that minimizes unnecessary costs to ratepayers.

Q. Are you aware of any precedent for disallowing coal plant capital costs that are unsupported by a contemporaneous retirement analysis?

A. Yes. The Virginia State Corporation Commission denied Dominion $18 million in cost recovery for the wet-to-dry conversion for coal-fired Chesterfield Units 3 and 4. The Commission found that Dominion invested "additional long-term environmental compliance capital into these units" despite the Company's own analysis that showed that it was more economic to retire or convert the units to burn gas by 2020.[14]

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13 Note that the Synapse analysis shows annual revenues and costs on a calendar year, which differs from the timing of Rate Year 1 and Rate Year 2.

14 *Petition of Virginia Electric and Power Company for approval of a rate adjustment clause, designated Rider E, for the recovery of costs incurred to comply with state and federal environmental regulations pursuant to § 56-585.1 A 5 e of the Code of Virginia,* Case No. PUR-2018-00195, Final Order (August 5, 2019), available at https://scc.virginia.gov/docketsearch/DOCS/4%243v01!.PDF.

Q. What are your recommendations to the Commission with regard to the request for recovery of future fixed O&M expenses at VCHEC?

A. I also recommend that the Commission disallow future fixed O&M expenses, totaling approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** given the anticipated future net losses.

6. DISPATCH PRACTICES AT VCHEC

Q. How do generation owners operating in a regional transmission organization earn energy revenues?

A. At a basic level, generation owners bid their units into the market at their variable cost of production (fuel plus variable O&M). The grid operator stacks these bids from low to high and dispatches the generators in order until total generation meets the load. The grid operator does this for every hour in a year. The bid from the most expensive generator dispatched in a given hour becomes the market energy price in that hour, and all dispatched generators receive that price for each MWh they generate.

Q. What is a unit commitment status?

A. A unit commitment status refers to the basis for determining whether a unit will operate at least up to its economic minimum in a given hour. Dominion specifies the commitment status for its units in regular submissions to PJM.

Q. What commitment status options are available to PJM market participants?

A. PJM specifies the commitment status options available to market participants like Dominion. Those commitment status options include:

(1) *Economic*: The unit is available for economic dispatch by PJM.

(2) *Must-Run (Self-Commit)*: The unit operator commits the unit regardless of PJM's determination of an economic or reliability basis for having the unit online. The unit is committed at its economic minimum and allowed to move up to its economic maximum.

(3) *Emergency*: The unit will not be scheduled by PJM unless the market operator calls for maximum emergency generation.

(4) *Unavailable*: The unit is out of service and will not be scheduled.[15]

Q. What does it mean when a unit is committed "economically?"

A. When a unit is committed economically, PJM algorithms compare the costs to both the startup and operating costs of a particular unit with the costs of all other units available to the market to determine whether that unit will be online the next day. A plant committed as "economic" will operate if it has lower costs than the marginal resource.

15 PJM INTERCONNECTION, *PJM Real-Time Energy Market* at 7 (June 12, 2017), available at https://www.pjm.com/-/media/training/nerc-certifications/markets-exam-materials/generation-itp/real-time-energy-market.ashx?la=en.

Q. Why might a generation owner elect to designate its units as "must-run" or "self-committed?"

A. Coal-fired units typically have longer startup and shutdown times than other generating units. Plant owners often choose to "self-commit" in order to maintain control of some operational decisions at the coal-fired units and to avoid frequent stops and starts at a particular unit that might result if energy market prices are below the unit's fuel and variable O&M costs.

Q. What happens to a unit that is self-committed?

A. A self-committed generating unit will operate with a power output at or above its minimum operating level. The unit thus incurs costs associated with fuel and variable O&M and receives energy market revenue. It does not, however, set the market price for energy in a given hour. Unlike when a unit is economically committed, if the market price of energy falls below the unit's cost to operate, a self-committed unit does not shut down. In these instances, the unit would incur operational losses that the generation owner often seeks to recover from ratepayers.

Q. How has VCHEC historically been committed?

A. Dominion has recently utilized a "must-run" or "self-commit" commitment status for VCHEC in a large number of hours, particularly in recent years. Confidential Figure 5 shows that Dominion self-committed VCHEC in **[BEGIN CONFIDENTIAL]** [redacted]

[redacted]

[redacted] **[END CONFIDENTIAL]**

Confidential Figure 5. Percentage of hours by day-ahead commitment status

Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r)(WAH).

When we look only at the hours in which VCHEC was available, we see that the unit was self-committed **[BEGIN CONFIDENTIAL]** [redacted] [redacted] **[END CONFIDENTIAL]** depending on the year. These values are shown in **Confidential Figure 6**.

Confidential Figure 6. Percentage of non-outage hours by day-ahead commitment status

Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r)(WAH).

Notably, LMPs in 2019 and 2020 were lower than in 2018, and Dominion responded to these lower LMPs by self-committing VCHEC in an increasing number of hours.

Q. Could a generator incur negative net energy revenues in a given hour?

A. Yes. If a generator were selected to dispatch its energy in a given hour, and the price per MWh that it received was lower than its total production cost, it would incur net operational losses. This would occur if a generator bid its generation into the market at a value lower than its cost of production, or self-commits into the market at its economic minimum in an hour when it otherwise would not have been economically committed by PJM.

Q. Has this practice been documented in other jurisdictions?

A. Yes. Dockets have been opened in Indiana, Minnesota, and Missouri to investigate "uneconomic dispatch" practices of the coal units in those states.[16]

Q. Why would a generation owner choose to either bid its generation into the market at a value less than its production cost, or self-commit in a high number of hours?

A. Both practices would increase the likelihood that a unit would dispatch its generation. Generation owners have justified this practice by saying that it allows the generator to avoid start-up, shutdown, and cycling costs. Previous research has found that vertically-integrated utilities are more likely to engage in this behavior because they can absorb any market losses through their rate base, meaning that ratepayers ultimately pay for the uneconomic operation of coal units.[17]

Q. Have Dominion's dispatch practices at VCHEC resulted in unnecessary costs?

A. Yes. My review of VCHEC operational data (energy revenues minus variable production costs) indicates that the Company's unit dispatch practices have caused it to incur unnecessary net operational losses on behalf of ratepayers in 2018–2020.

16 *See* Catherine Morehouse, *Ex-FERC Commissioners Debate Solutions to Coal Self-commitments Said to Cost Millions*, UTILITY DIVE (June 1, 2020), available at https://www.utilitydive.com/news/ex-ferc-commissioners-debate-solutions-to-coal-self-committment-said-to-cos/578935/.

17 *Id.*

Q. How did you calculate net operational losses?

A. Dominion provided hourly energy and daily ancillary revenues, which were allocated to specific hours using net generation. Synapse requested hourly fuel and variable O&M costs; however, Dominion responded that it did not track these values on an hourly basis and referred us to the annual values. Annual variable O&M and fuel costs were provided in $/MWh, and so were multiplied by hourly generation to derive an estimated hourly value.

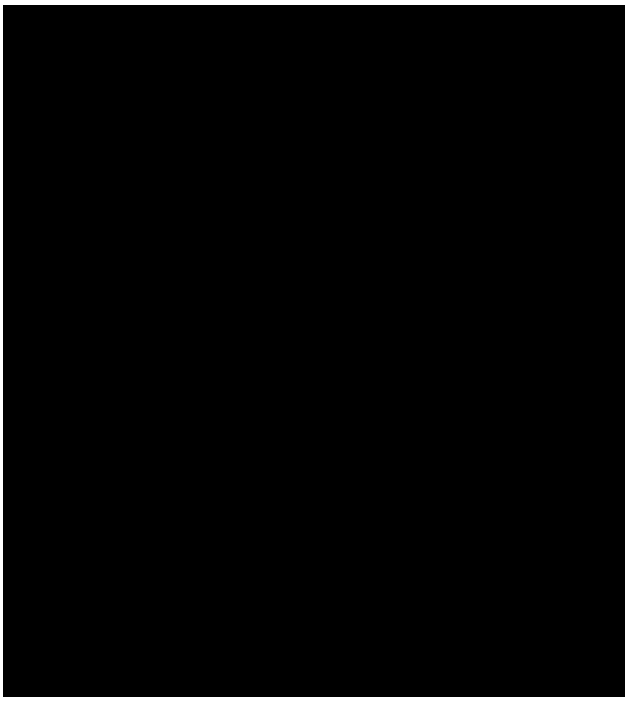
Hourly variable costs were subtracted from hourly energy revenues to estimate hourly *net* operational revenues. Finally, hourly net operational revenues were summed for each month to arrive at estimates of net operational revenues/losses.[18]

Q. Did Dominion's dispatch practices result in net operational revenues or net operational losses?

A. Both, depending on the year. Net operational revenues were positive in 2018 but were negative for all months in which the plant was not on outage starting in February 2019. Monthly results are shown in Confidential Table 6.

18 *See* attached Exhibit RW-5 for a list of all the discovery responses that were used to produce Confidential Table 6. The data contained in these discovery requests represents thousands of pages. Sierra Club can provide the Commission with copies of this information prior to the hearing if it would be helpful to the Commission.

Confidential Table 6. Monthly net operational revenues/(losses)



Q. What is the implication of these net operational losses?

A. Net operational losses over the period of a month or more indicate that Dominion may be self-committing its units into the PJM market in hours when it is uneconomic to do so, and that ratepayers are subsidizing this uneconomic generation. Given the inflexibility of coal units, it can sometimes make sense to leave a unit online for short periods of time, even when there are lower-cost resources available, in order to be available to provide electricity during hours of high demand. However, the unit must be projected to be economic overall across a multi-day or week period (inclusive of all commitment costs) to avoid excess, unjustified costs to ratepayers. Sustained losses over many months, like those incurred at VCHEC, demonstrate that the unit is generally uneconomic relative to the market.

Q. What are your recommendations to the Commission with regard to any request for recovery of future variable O&M spending at VCHEC?

A. Dominion is currently projecting net operational revenues (energy revenues net of fuel and variable O&M costs), as shown in Confidential Table 7 on a calendar year basis.[19]

Confidential Table 7. Dominion projections of net revenue, 2023-2030

[redacted]

Fuel costs are recovered via the annual fuel factor proceedings, and thus there is no docketed proceeding that provides a full accounting of the operational costs and revenues. I recommend that the Commission require Dominion to perform this accounting in future proceedings, and at that point disallow cost recovery for variable O&M costs that have not been recovered via energy revenues.

19 *See* attached Exhibit RW-4 for a list of all the discovery responses that were used to produce Confidential Table 7. The data contained in these discovery requests represents thousands of pages. Sierra Club can provide the Commission with copies of this information prior to the hearing if it would be helpful to the Commission.

7. CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your conclusions.

A. My analysis indicates that Dominion's VCHEC unit lost approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** over the past three years using Company data on energy revenues, variable costs, fixed costs, and capital investments. Using projections provided by Dominion in discovery, I estimate that VCHEC will continue to lose money each year over the ten-year period between 2021 and 2030. Those annual losses range between **[BEGIN CONFIDENTIAL]** [redacted], **[END CONFIDENTIAL]** depending on the year, and result in a cumulative discounted loss of **[BEGIN CONFIDENTIAL]** [redacted]. **[END CONFIDENTIAL]**

I also examined the net operational revenues over the 2018 to 2020 period, which considers only energy revenues and variable production costs, on a monthly basis. I found that VCHEC incurred net operational revenues in 2018 and in January 2019, but incurred net operational losses in every month thereafter, through December 2020. Operational losses in 2019 totaled **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** between February and December, while losses in 2020 totaled **[BEGIN CONFIDENTIAL]** [redacted]. **[END CONFIDENTIAL]**

Q. Please summarize your recommendations.

A. Based on my findings, I offer the following recommendations:

1. I recommend that the Commission disallow future capital spending, totaling approximately $25.3 million, given that the data show anticipated future net

losses.[20] Dominion's plans for future investments at the unit ignores the fact that the unit has, and is projected to continue to have, negative value to the Company's ratepayers. Capital spending for this period should be disallowed until Dominion announces a retirement date for VCHEC that minimizes unnecessary costs to ratepayers.

2. I also recommend that the Commission disallow future fixed O&M expenses, totaling approximately **[BEGIN CONFIDENTIAL]** [redacted], **[END CONFIDENTIAL]** given the anticipated future net losses.

3. I recommend that the Commission require Dominion to perform a full accounting of its operational costs (fuel and variable O&M) and energy revenues in future proceedings. The Company should identify periods of sustained net operational losses (over a month or more) and justify its unit commitment decisions with supporting documentation. If no such support can be provided, the Commission should disallow recovery for variable O&M costs incurred during these periods.

Q. Does this conclude your direct testimony?

A. Yes.

20 Note that the Synapse analysis shows annual revenues and costs on a calendar year, which differs from the timing of Rate Year 1 and Rate Year 2.

EXHIBIT RW-1

RESUME OF RACHEL WILSON

Rachel Wilson, Principal Associate

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Principal Associate*, April 2019 – present*, Senior Associate*, 2013 – 2019, *Associate*, 2010 – 2013, *Research Associate*, 2008 – 2010.

Provides consulting services and expert analysis on a wide range of issues relating to the electricity and natural gas sectors including: integrated resource planning; federal and state clean air policies; emissions from electricity generation; electric system dispatch; and environmental compliance technologies, strategies, and costs. Uses optimization and electricity dispatch models, including Strategist, PLEXOS, EnCompass, PROMOD, and PROSYM/Market Analytics to conduct analyses of utility service territories and regional energy markets.

Analysis Group, Inc., Boston, MA.

Associate, 2007 – 2008, *Senior Analyst Intern*, 2006 – 2007.

Provided litigation support and performed data analysis on various topics in the electric sector, including tradeable emissions permitting, coal production and contractual royalties, and utility financing and rate structures. Contributed to policy research, reports, and presentations relating to domestic and international cap-and-trade systems and linkage of international tradeable permit systems. Managed analysts' work processes and evaluated work products.

Yale Center for Environmental Law and Policy, New Haven, CT. *Research Assistant*, 2005 – 2007.

Gathered and managed data for the Environmental Performance Index, presented at the 2006 World Economic Forum. Interpreted statistical output, wrote critical analyses of results, and edited report drafts. Member of the team that produced *Green to Gold*, an award-winning book on corporate environmental management and strategy. Managed data, conducted research, and implemented marketing strategy.

Marsh Risk and Insurance Services, Inc., Los Angeles, CA. *Risk Analyst*, Casualty Department, 2003 – 2005.

Evaluated Fortune 500 clients' risk management programs/requirements and formulated strategic plans and recommendations for customized risk solutions. Supported the placement of $2 million in insurance premiums in the first year and $3 million in the second year. Utilized quantitative models to create loss forecasts, cash flow analyses and benchmarking reports. Completed a year-long Graduate Training Program in risk management; ranked #1 in the western region of the US and shared #1 national ranking in a class of 200 young professionals.

EDUCATION

Yale School of Forestry & Environmental Studies, New Haven, CT
Master of Environmental Management, concentration in Law, Economics, and Policy with a focus on energy issues and markets, 2007

Claremont McKenna College, Claremont, California
Bachelor of Arts in Environment, Economics, Politics (EEP), 2003. *Cum laude* and EEP departmental honors.

School for International Training, Quito, Ecuador
Semester abroad studying Comparative Ecology. Microfinance Intern – Viviendas del Hogar de Cristo in Guayaquil, Ecuador, Spring 2002.

ADDITIONAL SKILLS AND ACCOMPLISHMENTS

- Microsoft Office Suite, Lexis-Nexis, Platts Energy Database, Strategist, PROMOD, PROSYM/Market Analytics, EnCompass, and PLEXOS, some SAS and STATA.
- Competent in oral and written Spanish.
- Hold the Associate in Risk Management (ARM) professional designation.

PUBLICATIONS

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Stanton, E. A., P. Knight, J. Daniel, B. Fagan, D. Hurley, J. Kallay, E. Karaca, G. Keith, E. Malone, W. Ong, P. Peterson, L. Silvestrini, K. Takahashi, R. Wilson. 2015. *Massachusetts Low Gas Demand Analysis: Final Report.* Synapse Energy Economics for the Massachusetts Department of Energy Resources.

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Fisher, J., C. James, L. Johnston, D. Schlissel, R. Wilson. 2009. *Energy Future: A Green Alternative for Michigan*. Synapse Energy Economics for Natural Resources Defense Council (NRDC) and Energy Foundation.

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Washington Utilities and Transportation Commission (Docket Nos. UE-200900 and UG-200901): Direct testimony of Rachel Wilson evaluating Avista's treatment of the costs that it plans to incur for both integration with the Western Energy Imbalance Market (EIM) and ongoing operational support. On behalf of the Public Counsel Unit of the Washington Attorney General's Office. April 21, 2021.

South Carolina Public Service Commission (Docket Nos. 2019-224-E and 2019-225-E): Surrebuttal testimony of Rachel S. Wilson providing alternative resource modeling in the Duke Energy Carolinas and Duke Energy Progress Integrated Resource Planning dockets. On behalf of Carolinas Clean Energy Business Association, Natural Resources Defense Council, Sierra Club, Southern Alliance for Clean Energy, South Carolina Coastal Conservation League, and Upstate Forever. April 15, 2021.

Virginia State Corporation Commission (Case No. PUR-2020-00258): Direct testimony of Rachel Wilson evaluating the application of Appalachian Power Company for approval of a rate adjustment clause for

capital investments and operations and maintenance expenses to comply with the federal Coal Combustion Residuals and Effluent Limitation Guidelines regulations in lieu of retirement of the Amos and Mountaineer. On behalf of the Sierra Club. April 9, 2021.

West Virginia Public Service Commission (Case No. 20-0065-E-ENEC): Direct testimony of Rachel Wilson evaluating coal unit commitment decisions by Monongahela Power Company and the impact on ratepayers. On behalf of Sierra Club. November 16, 2020.

Virginia State Corporation Commission (Case No. PUR-2020-00035): Direct testimony of Rachel Wilson evaluating Dominion's 2020 Integrated Resource Plan and providing independent capacity optimization modeling. On behalf of the Sierra Club. September 15, 2020.

Virginia State Corporation Commission (Case No. PUR-2020-00015): Direct testimony of Rachel Wilson examining the economics of the coal units owned by Appalachian Power Company as part of the rate case. On behalf of the Sierra Club. July 30, 2020.

North Carolina Utilities Commission (Docket No. E-2, SUB 1219): Direct testimony of Rachel Wilson examining the economics of the coal units owned by Duke Energy Progress as part of the rate case. On behalf of the Sierra Club. April 13, 2020.

North Carolina Utilities Commission (Docket No. E-2, SUB 1219): Direct testimony of Rachel Wilson examining the economics of the coal units owned by Duke Energy Carolinas as part of the rate case. On behalf of the Sierra Club. February 25, 2020.

North Carolina Utilities Commission (Docket No. EMP-105, SUB 0): Rebuttal testimony of Rachel Wilson evaluating the application of Friesian Holdings, LLC for a Certificate of Public Convenience and Necessity. On behalf of Friesian Holdings, LLC. December 12, 2019.

Alabama Public Service Commission (Docket No. 32953): Direct testimony of Rachel Wilson regarding Alabama Power Company's petition for a Certificate of Convenience and Necessity. On behalf of the Sierra Club. December 4, 2019.

North Carolina Utilities Commission (Docket No. EMP-105, SUB 0): Direct testimony of Rachel Wilson evaluating the application of Friesian Holdings, LLC for a Certificate of Public Convenience and Necessity. On behalf of Friesian Holdings, LLC. November 26, 2019.

Georgia Public Service Commission (Docket No. 42516): Direct testimony of Rachel Wilson regarding coal ash spending in Georgia Power's 2019 Rate Case. On behalf of the Sierra Club. October 17, 2019.

Mississippi Public Service Commission (Docket No. 2019-UA-116): Direct testimony of Rachel Wilson regarding Mississippi Power Company's petition to the Mississippi Public Service Commission for a Certification of Public Convenience and Necessity for ratepayer-funded investments required to meet Coal Combustion Residuals regulations at the Victor J. Daniel Electric Generating Facility. On behalf of the Sierra Club. October 16, 2019.

Georgia Public Service Commission (Docket No. 42310 & 42311): Direct testimony of Rachel Wilson regarding various components of Georgia Power's 2019 Integrated Resource Plan. On behalf of the Sierra Club. April 25, 2019.

Washington Utilities and Transportation Commission (Dockets UE-170485 & UG-170486): Response testimony regarding Avista Corporation's production cost modeling. On behalf of Public Counsel Unit of the Washington Attorney General's Office. October 27, 2017.

Texas Public Utilities Commission (SOAH Docket No. 473-17-1764, PUC Docket No. 46449): Cross-rebuttal testimony evaluating Southwestern Electric Power Company's application for authority to change rates to recover the costs of investments in pollution control equipment. On behalf of Sierra Club and Dr. Lawrence Brough. May 19, 2017.

Texas Public Utilities Commission (SOAH Docket No. 473-17-1764, PUC Docket No. 46449): Direct testimony evaluating Southwestern Electric Power Company's application for authority to change rates to recover the costs of investments in pollution control equipment. On behalf of Sierra Club and Dr. Lawrence Brough. April 25, 2017.

Virginia State Corporation Commission (Case No. PUE-2015-00075): Direct testimony evaluating the petition for a Certificate of Public Convenience and Necessity filed by Virginia Electric and Power Company to construct and operate the Greensville County Power Station and to increase electric rates to recover the cost of the project. On behalf of Environmental Respondents. November 5, 2015.

Missouri Public Service Commission (Case No. ER-2014-0370): Direct and surrebuttal testimony evaluating the prudence of environmental retrofits at Kansas City Power & Light Company's La Cygne Generating Station. On behalf of Sierra Club. April 2, 2015 and June 5, 2015.

Oklahoma Corporation Commission (Cause No. PUD 201400229): Direct testimony evaluating the modeling of Oklahoma Gas & Electric supporting its request for approval and cost recovery of a Clean Air Act compliance plan and Mustang modernization, and presenting results of independent Gentrader modeling analysis. On behalf of Sierra Club. December 16, 2014.

Michigan Public Service Commission (Case No. U-17087): Direct testimony before the Commission discussing Strategist modeling relating to the application of Consumers Energy Company for the authority to increase its rates for the generation and distribution of electricity. On behalf of the Michigan Environmental Council and Natural Resources Defense Council. February 21, 2013.

Indiana Utility Regulatory Commission (Cause No. 44217): Direct testimony before the Commission discussing PROSYM/Market Analytics modeling relating to the application of Duke Energy Indiana for Certificates of Public Convenience and Necessity. On behalf of Citizens Action Coalition, Sierra Club, Save the Valley, and Valley Watch. November 29, 2012.

Kentucky Public Service Commission (Case No. 2012-00063): Direct testimony before the Commission discussing upcoming environmental regulations and electric system modeling relating to the application

of Big Rivers Electric Corporation for a Certificate of Public Convenience and Necessity and for approval of its 2012 environmental compliance plan. On behalf of Sierra Club. July 23, 2012.

Kentucky Public Service Commission (Case No. 2011-00401): Direct testimony before the Commission discussing STRATEGIST modeling relating to the application of Kentucky Power Company for a Certificate of Public Convenience and Necessity, and for approval of its 2011 environmental compliance plan and amended environmental cost recovery surcharge. On behalf of Sierra Club. March 12, 2012.

Kentucky Public Service Commission (Case No. 2011-00161 and Case No. 2011-00162): Direct testimony before the Commission discussing STRATEGIST modeling relating to the applications of Kentucky Utilities Company, and Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity, and approval of its 2011 compliance plan for recovery by environmental surcharge. On behalf of Sierra Club and Natural Resources Defense Council (NRDC). September 16, 2011.

Minnesota Public Utilities Commission (OAH Docket No. 8-2500-22094-2 and MPUC Docket No. E-017/M-10-1082): Rebuttal testimony before the Commission describing STRATEGIST modeling performed in the docket considering Otter Tail Power's application for an Advanced Determination of Prudence for BART retrofits at its Big Stone plant**.** On behalf of Izaak Walton League of America, Fresh Energy, Sierra Club, and Minnesota Center for Environmental Advocacy. September 7, 2011.

Resume updated May 2021

EXHIBIT RW-2

ATTACHMENT SIERRA CLUB
SET 02-01(C)(1)(DA).PDF

2021 Unit Evaluation

July 2021

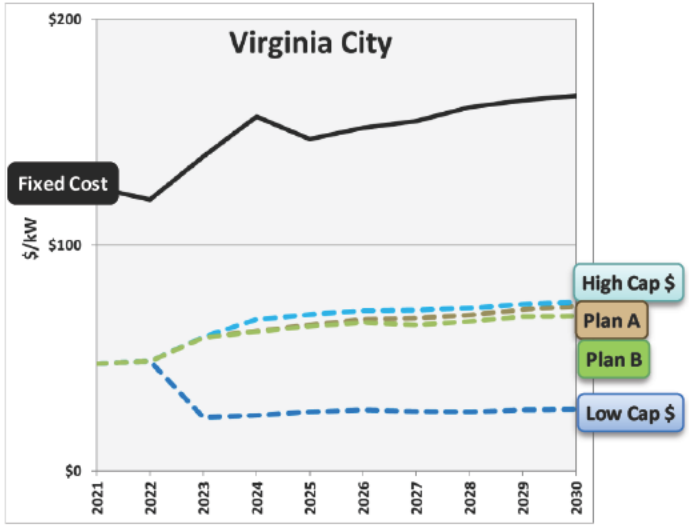
Global Assumptions

2021-2030	2021 Plan A	Low Capacity $	High Capacity $	2021 Plan B
2021 IRP ICF Projections	RGGI + Fed CO_2	RGGI + Fed CO_2	RGGI + Fed CO_2	RGGI + Fed CO_2
Load Forecast	2021 PJM	2021 PJM	2021 PJM	2021 PJM
CO_2 Tax	RGGI VA (starts in 2021) Fed CO_2 (starts in 2026)	RGGI VA (starts in 2021) Fed CO_2 (starts in 2026)	RGGI VA (starts in 2021) Fed CO_2 (starts in 2026)	RGGI VA (starts in 2021) Fed CO_2 (starts in 2026)
Capacity Price	ICF	22/23 BRA ($50/mw-day esc.)	18/19 BRA ($165/mw-day esc.)	ICF
VCEA	100% option for REC purchases & no VCEA mandates	100% option for REC purchases & no VCEA mandates	100% option for REC purchases & no VCEA mandates	15% REC purchases limit & VCEA mandates included

10-year NPV Results

2021-2030 ($ Million)

Unit	Fuel	2021 Plan A	Low Capacity $	High Capacity $	2021 Plan B	Est. T&D Impact
Virginia City	Coal	($357)	($483)	($347)	($363)	$20



Station Capacity Factors

	Actuals				Forecast									
Coal	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Virginia City	62	55	22	16	26	26	20	22	12	10	10	8	8	9

1. Estimated T&D cost is not included in unit 10-year NPVs 2. Revenue streams shown as dash lines include net energy revenue and gross capacity revenue 3. Fixed cost shown as solid black line represents associated fixed O&M, Capex, property taxes, and allocated overhead 4. NPVs are adjusted to account for applicable ancillary revenues

EXHIBIT RW-3

DISCOVERY RESPONSES USED FOR HISTORICAL CASH FLOW

Exhibit RW-3. Discovery responses used for historical cash flow

Variable	Source
Net Generation	Source: 2021-10-04 Sierra Club Set 2 Additional Responses – Confidential Response: Question 02-13 (d)
Gross Generation	Source: 2021-10-04 Sierra Club Set 2 Additional Responses – Confidential Response: Question 02-13 (c)
Energy Revenue	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: l.
Capacity Revenue	Source: 2021-10-08 Sierra Club Set 2 Remaining Responses – Confidential Response: question 13 (o)
Ancillary Revenue	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: m.
REC Revenue	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: p.
Energy Basis	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: o. and n.
Capacity Factor	Source: 2021-10-01 Sierra Club Set 2 Responses: Response: Question 02-13 (e)
Generator Data	Source: 2020 Form EIA-860 Data - Schedule 3, 'Generator Data' (Operable Units Only)
Fuel Costs	Source: 2021-10-01 Sierra Club Set 2 Responses Response: Question 02-13 (k)
Variable O&M	Source: Confidential Sierra Club Set 02-17 (PTA) Tab: 17(a)
Fixed O&M	Source: Confidential Sierra Club Set 02-17 (PTA) Tab: 17(a)
Capital Costs	Source: Confidential Attachment Sierra Club Set 02-13 (l, m) (TAH) Tab: Sheet 1

EXHIBIT RW-4

DISCOVERY RESPONSES USED FOR PROJECTED CASH FLOW

Exhibit RW-4. Discovery responses used for projected cash flow

Variable	Years	Source
Net Generation	2021	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-06 (d)
	2022-2030	Source: 2021-10-01 Sierra Club Set 2 Responses Response 02-14 (d)
Gross Generation	2021	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-06 (c)
	2022-2030	Source: 2021-10-01 Sierra Club Set 2 Responses Response 02-14 (c)
Energy Revenue	2021	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-01
	2022 -2030	Source: 2021-10-01 Sierra Club Set 2 Responses Response 02-14 (n)
Capacity Revenue	2021	Source: 2021-10-08 Sierra Club Set 2 Remaining Responses – Confidential Response: question 13 (o)
	2022 -2030	Source: Extraordinarily Sensitive Attachment Sierra Club Set 02-01(c)(2) (DA) Tab: Unit Margin – Plan A or Unit Margin Plan B
Ancillary Revenue	2021 - 2030	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-02
REC Revenue	2021 -2022	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-03
	2023 -2030	Source: Filing Schedule 46B Stmt 3 (Conf) Tab: Inputs Total
Energy Basis	2021 - 2030	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-07
Capacity Factor	2021	Source: 2021-10-28 Sierra Club Set 3 Responses – Confidential Response: 03-06 (e)
	2022-2030	Source: 2021-10-01 Sierra Club Set 2 Responses Response 02-14 (e)
Fuel Costs	2021	Source: 2021-10-28 Sierra Club Set 3 Responses Response: 03-04
	2022 -2030	Source: 2021-10-01 Sierra Club Set 2 Responses Response 02-14 (k)
Variable O&M	2021 -2025	Source: Filing Schedule 46A Stmt 1 - OM (Conf) Tab: Schedule 1 – 5 year
	2026 -2030	Source: Filing Schedule 46B Stmt 3 (Conf) Tab: Operating Expenses (divided by VA jurisdiction scalar (Inputs VA H17))
Fixed O&M	2021 -2025	Source: Filing Schedule 46A Stmt 1 - OM (Conf) Tab: Schedule 1 – 5 year
	2026 -2030	Source: Filing Schedule 46B Stmt 3 (Conf) Tab: Operating Expenses (divided by VA jurisdiction scalar (Inputs VA H17))
Capital Costs	2021 -2025	Source: Filing Schedule 46A, Stmt 1 - Capex (Conf) Tab: Schedule 1 – 5 year
	2026 -2030	Source: Filing Schedule 46B Stmt 3 (Conf) Tab: Inputs Total

EXHIBIT RW-5

DISCOVERY RESPONSES USED FOR UNIT COMMITMENT ANALYSIS

Exhibit RW-5. Discovery responses used for unit commitment analysis

Variable	Source
Net Generation	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: j
Energy Revenues	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: l
Ancillary Revenues	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: m *Note: Ancillary Revenues provided with daily periodicity. Synapse distributed to hours in day by weighting based on adjusted net gen (minimum of zero)*
Variable O&M	Source: 2021-10-01 Sierra Club Set 2 Responses Response: Question 02-13 (k)
Fuel Cost	Source: Conf Attach Sierra Club Set 02-02(f) (RTC) Tabs: 2018, 2019, 2020
DA LMP	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: k
Commit Status	Source: ES Attachment Sierra Club Set 02-02(a-e, j-p, r) (WAH) Tab: d&e
Expected Margin	Source: Extraordinarily Sensitive Attachment Sierra Club Set 02-06(d)(ii) (JRV) Tab: Sheet 1